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Abbreviations[1]

AfDB	African Development Bank
AO&M	Administration, Operation and Maintenance
BAU	Business-as-Usual
CAPEX	Capital Expenditures
CDC	Commonwealth Development Corporation
CIE	Compagnie Ivoirienne d'Electricité
DFI	Development Finance Institution
DP	Development Partner
EAC	East African Community
EASP	Energy Access Scale up Project
ECP	Electricity Connection Policy
EPC	Engineering Procurement & Construction
ERA	Electricity Regulatory Authority
ERI	Electricity Regulatory Index
ERT	Energy for Rural Transformation
ESI	Electricity Supply Industry
EU	European Union
GDP	Gross Domestic Product
GETFIT	Global Energy Transfer Feed in Tariff
GIS	Geographical Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoIC	Government of Ivory Coast
GoU	Government of Uganda
GWh	Giga Watt Hour
HICs	High-impact countries
HVTG	High Voltage Transmission Grid
ICT	Information and Communication Technologies
IEA	International Energy Agency
IED	Innovation Energie Développement
IPP	Independent Power Producer
KPI	Key Performing Indicator
kV	Kilo volt
kVA	Kilo voltampere
LAA	Lease and Assignment Agreement
LCGP	Least Cost Generation Capacity Plan
LV	Low voltage
M&E	Monitoring & Evaluation
MDAs	Ministries, Departments and Agencies
MDTF	Multi-Donor Trust Fund
MEMD	Ministry of Energy and Mineral Development
MOFPED	Ministry of Finance, Planning and Economic Development
MV	Medium voltage
MVA	Mega voltampere
MW	Mega watt
MWh	Mega watthour
NARUC	National Association of Regulatory Utility Commissioners
NDP	National Development Plan

[1] This list has been taken from the document (CIG, 2020) with minor modifications.

NDPIII	Third National Development Plan 2020/21-2025/26
NES	National Electrification Strategy
NFA	National Forestry Authority
NGO	Non-Governmental Organisation
NPA	National Planning Authority
NRECA	National Rural Electric Cooperative Association
O&M	Operation and Maintenance
OPEX	Operating Expenses
PAYGo	Pay-as-you-go
PIU	Project Implementation Unit
PMO	Project Management Office
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSAC	Power Sector Action Committee
PV	Photovoltaic
RAP	Resettlement Action Plan
RCPT	Roadmap for Catalytic Power Sector Transformation
REA	Rural Electrification Agency
REFIT	Renewable Energy Feed in Tariff
RESP	Rural Electrification Strategy and Plan
ROI	Return on Investment
RR	Revenue Requirement
SDG	Sustainable Development Goal
SE4All	Sustainable Energy for All
SHS	Solar Home Systems
SMEs	Small and Medium Enterprises
SPCC	System Planning Coordination Committee
SPD	Small Power Distributor
SPMO	Sector Project Management Office
SPP	Small Power Producer
SP	Service Provider
SPV	Special Purpose Vehicle
SSA	Sub-Saharan Africa
T&D	Transmission and Distribution
TAF	Technical Assistance Facility
UEB	Uganda Electricity Board
UEC	Uganda Electricity Company
UECCC	Uganda Energy Credit Capitalisation Company
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UESI	Uganda Electricity Supply Industry
UETCL	Uganda Electricity Transmission Company Limited
UGX	Uganda Shillings
UIA	Uganda Investment Authority
UKAID	United Kingdom Aid
UMA	Uganda Manufacturers Association
UN	United Nations
UEC	Uganda National Electricity Company
UOMA	Uganda Off-grid Energy Market Accelerator
USAID	United States Agency for International Development
USD	United State Dollars, also $
USEA	Uganda Solar Energy Association
Ushs	Ugandan shilling

VAT	Value Added Tax
Vision 2040	Uganda Vision 2040

EXECUTIVE SUMMARY

Background

The general objective of the mission and this report is to perform an assessment of the electricity distribution sector in Uganda, which will provide a better understanding of the need and extent of an eventual reform.

This reform must include a solution to the future of the concession agreements – specially Umeme's concession agreement – and must specify the means of accelerating the pace of electrification and improving the reliability and quality of supply in the country – in rural areas in particular. Moreover, it must identify opportunities for possible engagement of the European Union (EU) and support to the Ugandan power sector.

A first mission to Uganda took place in November 2020 and – after receiving comments to a draft report circulated to the main stakeholders – a final report was delivered in June 2021.

Significant changes in the structure and regulation of the Ugandan power sector have been announced that require a reconsideration of some of the recommendations of the June 2021 report and the corresponding update. In addition, since the June 2021 report indicated the need for a solid financial analysis of the electrification plan proposed in the present National Electrification Strategy (NES)[2], a suitable computer tool to perform this analysis has been developed and a business plan for the NES electrification plan has been built. A second mission to Uganda has taken place during the months of March and April 2022.

The present document is a revised and updated version of the June 2021 report, and it also contains a detailed description of the financial model and its outcome when applied to the Ugandan NES. A sensitivity analysis – of a scenario not contemplated in the NES – examines the financial viability of an electrification plan that requires that no Ugandan household must be supplied with less than a 10 W solar kit, and that no village would lack at least one community and one productive electricity service.[3] The document consists of an extensive executive summary that tries to be self-sufficient for the reader that is not interested in the details and the much longer complete report. It also includes the complete updated version of the June 2021 report. The annexes provide background on the situation of the power sector in Uganda, a full description of the computer-based tool employed to study the financial viability of the NES, and a review of other reports on distribution regulatory reforms and electrification plans in Uganda.

A comprehensive reform of the critical and complex distribution segment of the power sector, which in Uganda comprises on-and off-grid activities, needs the broad agreement of the major stakeholders on the resulting structure, roles and responsibilities. It is hoped that these two missions – and this report as the major outcome of the missions – will provide the basis for such an agreement.

Highlights

This proposal leverages some strong features of the Ugandan power sector and the propitious opportunity of international funding mobilization to overcome some existing weaknesses in the sector and to promote an ambitious path to the provision of a reliable, affordable, and sustainable supply of electricity for all households, industries and businesses in Uganda in a reasonable timeframe – with an expected positive impact on job creation, demand augmentation, and lower tariffs – with the ultimate goal of increasing the wellbeing of the population and enabling economic growth.

[2] Ministry of Energy and Mineral Development (MEMD). (2022). 'National Electrification Strategy for Uganda'. NES report. Prepared by Innovation Energy Development (IED) and funded by the World Bank (WB) for MEMD.

[3] A justification for this deviation from the NES is provided in section 5.3. It can be argued that the minimum demand implicit in the NES is not compliant with the requirements of SDG7.1.

This proposal conforms to the existing and proposed pertinent legislation. The governance of the distribution segment, and the electrification plan in particular, corresponds to the Ministry of Energy and Mineral Resources (MEMD), in coordination with the Ministry of Finance, Planning and Economic Development (MOFPED). The Ugandan Cabinet Decision of 10 September 2018, approved recommendations for the rationalization of Agencies, Commissions and Authorities in the country (the 2018 Cabinet Decision). This led in May 2021 to include the former Rural Electrification Agency (REA) as a department of MEMD. It also seems that the publicly owned generation, transmission and distribution companies (Uganda Electricity Generation Company Limited (UEGCL), Uganda Electricity Transmission Company Limited (UETCL), and Uganda Electricity Distribution Company Limited (UEDCL) respectively) would be reintegrated in one publicly owned company called Uganda Electricity Company (UEC).

These are the major elements of the proposed reform in this report:

- The business and regulatory approaches that are proposed for *all the electrification modes – either on- or off-grid – share common criteria and are considered in an integrated fashion*, since they are all meant for Ugandan customers, although the specific business models and supply technologies must be adapted to each situation;
- *On-grid distribution will continue under a concession model, with a new format and contracting conditions.* The concessionaire, here termed NewCo, will preserve the existing managerial capability in Umeme, with a private company approach, and will be the distribution operator for the connected grid in the entire country. NewCo will be open to any levels of direct or indirect public participation in the property of the firm;
- *NewCo's territorial scope will cover the entire national territory*, but it will have different responsibilities in Umeme's present footprint and the rest of the territory. NewCo will continue present activities in the current footprint of Umeme, but it will have limited responsibilities in the rest of the country: only administration, operation and maintenance (AO&M) of all the new assets, plus a small fraction of the new investments that may be considered critical, to be authorized by the Electricity Regulatory Authority (ERA), and responsibility for contracting the engineering, procurement and construction (EPC) of all distribution network investments;
- *NewCo's return on investment (to be negotiated) must reflect current national and global macroeconomic conditions*, while maintaining a reasonable profitability in relation to the risks under a regulated cost-reflective remuneration that incentivises efficiency;
- NewCo will bill and collect the revenues from the application of regulated tariffs to all grid-connected customers. *Since the collected revenues will exceed the regulated NewCo´s costs, there will be a surplus* to be delivered to an entity named FinanceCo (see below) *and therefore NewCo will not need subsidies;*
- *A buyout of the residual value of the assets that have been invested by Umeme until the scheduled end of the present concession will not be necessary*, if the shareholders of Umeme agree to transfer to NewCo the rights to use these assets under the new conditions specified above;
- The Government of Uganda via its publicly owned electric utility will own all the assets – present and future – of the main grid, since *the proposed business model is a concession, not a privatization;*
- *A financial intermediary (FinanceCo) owned by the Government of Uganda will serve as a hub of all the financing sources* and will extend financing to NewCo and the off-grid developers. An upgraded Uganda Energy Credit Capitalisation Company (UECCC) is a possible option to implement FinanceCo without creating additional organizations;
- *This report assumes that the rebundling of UEGTL, UETCL, and UEDCL will take place*, although such rebundling is clearly against the trend of unbundling in Africa and elsewhere, often based on the example of Uganda. UEDCL would become the on-grid division of the distribution department of the Uganda National Electricity Company, who will own all the on-grid distribution assets;
- *A cost-reflective remuneration – a "regulated revenue requirement" – must be established for each min-grid deployed according to the NES*. This remuneration will be collected from two

sources: i) regulated tariffs, which will be the same for all mini-grid customers and grid-connected ones; and ii) direct subsidies to the mini-grid developers provided by FinanceCo;

- *A minimum level of demand to be supplied at household level must be defined.* In the financial analysis in this report, the value adopted in the NES has been adopted in principle. However, a sensitivity analysis with a higher level of required minimum demand has been also examined. *A cost-reflective remuneration – a "regulated revenue requirement" – for the supply of electricity with solar kits according to the NES must be established*. This remuneration will be collected from two sources: i) a regulated stream of payments by the households and collected by NewCo; and ii) direct subsidies to the minigrid developers by FinanceCo;
- *NewCo will be required by the new concession contract to participate in a new off-grid company* – a special purpose vehicle SPV-OffGrid – *that will also be the default and last resort provider of off-grid solutions in the designated areas in the NES, without interfering with the existing off-grid market activities.* This measure is necessary to ensure that nobody will be left behind in the electrification process in Uganda;
- *Current electrification initiatives by Development Partners (DPs) and private investors, although undoubtedly beneficial, are inadequate – in volume of funding and coordination level* – for the challenge of achieving universal access in Uganda in this decade. This is what this proposal tries to improve, both from the viewpoint of DPs and the Ugandan institutions. Achieving full electrification in a reasonable time requires joining forces to reach the necessary funding level around a comprehensive plan that makes political, financial, regulatory and technical sense;
- *This report asks the Government of Uganda to champion the distribution reforms and the electrification process,* establishing confidence and attracting support from DPs and other investors, realising that reliable, affordable, and sustainable power supply is a key enabler of population well-being and economic growth;
- *If the fundamental guidelines of this reform proposal are followed, a detailed financial analysis shows the viability of the proposed NES,* even if a mandatory minimum level of supply of 10W for the solar kits in poor rural areas, reinforced with basic productive and community uses in each village, were implemented.

Structure of the report

This report proposes a reform of the distribution segment of the Ugandan power sector that:

- Can be compatible with the existing and proposed pertinent legislation;
- Leverages some strong features of the Ugandan power sector and the propitious opportunity of international funding mobilization;
- Overcomes some existing weaknesses in the sector;
- Promotes an ambitious path to the provision of a reliable, affordable, and sustainable supply of electricity for all households, industries, and businesses in Uganda in a reasonable timeframe – with an expected positive impact on job creation, demand growth, and lower tariffs – with the ultimate goal of increasing the wellbeing of the population and enabling economic growth.

This document is an update of a prior report - issued in June 2021 - on the reform of electricity distribution in Uganda. The update responds to changes in the structure and regulation of the Ugandan power sector that are presently being discussed.

The reform proposed in this report starts from the same fundamental tenets that were included in the previous report, and whose justification is also provided in the present report:

- *Consider electricity distribution in its entirety* i.e., the supply of power to all end customers by a suitable combination of all electrification modes, either grid extension, mini-grids, or standalone systems. Design a sound business model for each mode, under a *common strategy of financing, tariffs, and cross subsidization*;
- *Adopt a single distribution company for the main connected grid in the entire country*;

- *Preserve the existing managerial capability in grid-connected electricity distribution*, under a concession business model with a private company approach, as a valuable asset of the Ugandan power sector that is almost unique in Sub-Saharan African countries;
- *Set the desired goal now* – a sound distribution sub-sector and full electrification by 2030 – *and design a viable plan to achieve it* – technical, economical, regulatory, business, and financial – to make sure that the adequate means and resources are employed from the outset;
- This reform will be only possible if a *broad agreement on these principles is reached among all the relevant stakeholders, pooling their resources together, with strong political support and the guidance of a local champion institution*, which seems to correspond to the MEMD.

The proposed reform is presented in the next sections in four successive layers: it is described from a techno-economic, business and regulatory, institutional, and financial viewpoint.

The techno-economic layer

Electricity distribution must expand to meet demand growth, to complete densification and to improve performance in areas already electrified, as well as to ensure the electrification of areas that do not have access yet – using a mix of grid extension, mini-grids and standalone systems.

A large part of Uganda's population still has no access to electricity. A distribution reform proposal must include a comprehensive electrification plan. Despite its shortcomings,[4] the NES is the best electrification plan currently available, and it will be adopted in this report as the reference case for the financial plan that is proposed here. The NES integrates on-grid and off-grid solutions (mini-grids and standalone systems) and provides an estimation of the costs that would be incurred in providing the service with a reasonably high level of detail.

According to the NES, the overall cost of the plan is USD 4.68 billion.[5] This plan should enable 10.4 million additional connections in the next 10 years. On-grid initiatives (3.4 million connections by densification and 1.2 million connections by grid extension) will account for the larger amount totalling USD 3.9 billion or 84%, with the remaining 16% dedicated to mini-grids (7% of the budget for 0.23 million connections) and stand-alone systems (9% of the budget for 5.5 million households). The implementation period covers 10 years from 2021 to 2030 and targets an overall access of 100% considering the minimum service level of Tier 1 (a 3W solar kit per household). Since this level is too low to be considered as meeting the United Nations (UN) Sustainable Development Goal (SDG) 7.1, an additional financial analysis has been made considering that a 10W solar kit is the minimum level of service for households and that extra effort is made in supplying electricity to productive and community uses in the clusters of population to be electrified, with an increment of 11% (USD 5.2 billion) in the investment cost.

The business model and regulatory layer

The business and regulatory approaches that are proposed for all the electrification modes – either on- or off-grid – share common criteria and are considered in an integrated manner, since they are all meant for Ugandan customers, although the specific business models and supply technologies must be adapted to each situation.

Figure 1 shows the proposed business model for each of the four supply zones comprising the entire territory of Uganda, which will evolve dynamically with time: the current footprint of Umeme, the rest of the territory to be supplied by grid extension, the demand clusters supplied by mini-grids, and the customers that will be initially assigned standalone systems.[6]

[4] The adopted Geographical Information System (GIS) model lacks precision to properly identify the least-cost electrification mode in each circumstance. The massive deployment of 3W solar kits planned in most rural areas (for 5.5 million households) should not qualify as proper access.

[5] This figure only includes overnight investment costs. Financial costs and O&M costs must be included to obtain the total cost of electrification.

[6] Regulation must be ready to facilitate the smooth transition between electrification modes, while preserving the rights of the developers of off-grid solutions, the incumbent on-grid distribution company and the customers.

The same principles of regulated cost-reflective revenue requirement and regulated tariff cross subsidization across-the-board apply to these four business models. There is freedom of installation for all companies in the off-grid space, respecting the territorial allocation defined by the NES. There would be a transitory adaptation period for all existing mini-grids and the suppliers of standalone systems.

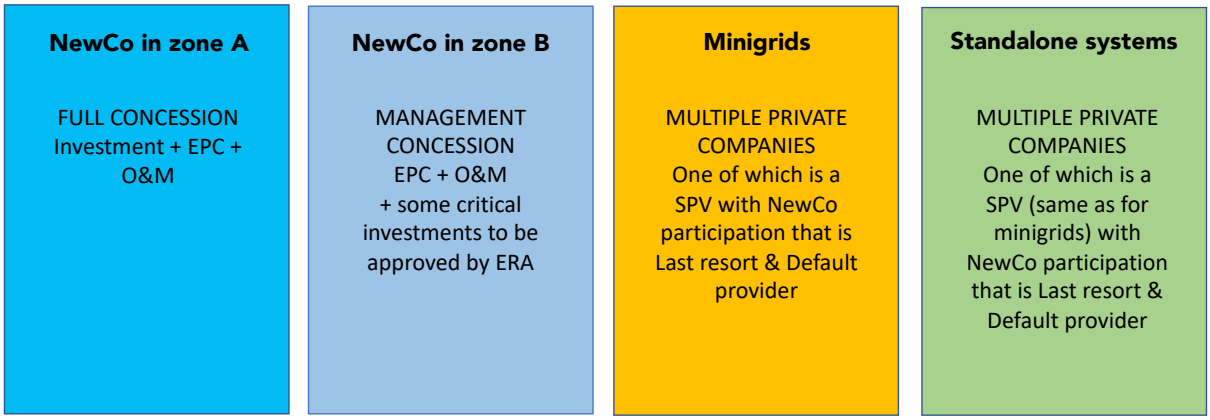

Figure 1. Breakdown of unelectrified demand according to electrification mode and business model approach

Electricity supply with the main grid

On-grid distribution will continue under a concession model, with a new format and contract conditions. The concessionaire, hereafter called "NewCo":

- Will preserve the existing managerial capability in Umeme, with a private company approach;
- Will be the distribution operator for the connected grid in the entire country, although with different responsibilities in Umeme's present footprint and the rest of the territory (see below);
- May increase to any level the present ratio of public participation – which presently is 24% via the National Social Security Fund – with the purchase of shares or with equity investment.

The following clarifications are necessary:

- In Umeme's present footprint *(hereafter called "zone-A", to be defined precisely),* NewCo will keep the same functions that Umeme has now – planning, investment, responsibility for contracting the EPC of all new network assets, plus the AO&M of all assets – but it will have a substantially lower rate-of-return (to be negotiated) and redefined targets (reliability, losses, customer service) with economic implications associated to performance;
- In the rest of the country *(hereafter called "zone-B", to be defined precisely),* NewCo will have limited responsibilities: planning, responsibility for contracting EPC and the AO&M of all new assets in zone B, which will be paid with public funds. Only a minor fraction of the new assets will be invested by NewCo, when proposed and justified by NewCo – for instance because of urgency of deployment due to reliability issues – and authorized by ERA, after consulting UEDCL (see the section on the institutional layer);
- NewCo will bill and collect the revenues from the application of the regulated tariffs to all grid-connected customers. The revenues collected by NewCo will exceed its regulated revenue requirement, since NewCo only incurs - at most - a small fraction of the investments in zone B, therefore generating a surplus, whose use will be discussed in the section on the financial layer.[7] Therefore, NewCo will avoid depending on direct monetary public subsidies, which will limit the risks it faces and reduce its cost of capital;

[7] It is important to make sure that NewCo is incentivized to bill all grid-connected customers and collect the corresponding revenues from the application of the regulated tariffs, since the surplus of NewCo – after retaining its regulated revenue requirement

- The Government of Uganda (GoU) (via its publicly owned electric utility) will own all the assets – present and future – of the main grid, since the proposed business model is a concession, not a privatization (see the section on the financial layer);
- A buyout of the residual value of the assets that have been invested by Umeme until the scheduled end of the present concession will not be necessary if the shareholders of Umeme agree to transfer to NewCo the rights to use these assets under the new conditions specified above.

Electricity supply with mini-grids

The proposed business and regulatory approach makes it possible to meet the following objectives:

- Achieve full electrification by 2030 as described in the NES. This requires the deployment of all the mini-grids included in the NES, so that not a single potential customer in Uganda is left behind;
- Encourage private initiative, already present in the country with several companies, and minimize the interference with the existing mini-grids in operation;
- Guarantee the sustainability of the mini-grids, i.e., the permanence of a reliable and affordable electricity supply from all of the mini-grids, i.e., those existing now and the ones to be deployed as specified in the NES;
- Make it possible for all customers connected to the main grid or to any of the mini-grids to pay the same regulated tariff, regardless of the differences in the incurred supply costs. Uniform tariffs at utility or national level is a generalized international practice, with implicit cross-subsidization among urban, peri-urban, and rural customers. The proposed reform also includes mini-grids' customers in the common regulated tariff. Ad hoc measures will be needed for the customers already being supplied with mini-grids.

Meeting all these objectives will require the GoU to intervene establishing the following regulations:

- A cost-reflective remuneration – a "regulated revenue requirement" – for each mini-grid deployed according to the NES. This remuneration will be collected from two sources: i) the regulated tariffs; and ii) direct subsidies to the mini-grid developers (see the section on the financial layer for the source of these subsidies);
- All new mini-grids must abide by these rules: compatibility with the NES, regulated end-customer tariffs (equal to the tariffs for grid-connected customers) and reception of subsidies to top up the cost-reflective revenue requirement. Existing mini-grids must be given a deadline to meet these new requirements;
- Ideally, a cost-reflective remuneration should suffice to attract mini-grid developers to deploy all mini-grids included in the NES and to guarantee their sustainability. In practice, some intervention will be needed to guarantee that some "default and last resort provider" will go where others do not want to go and will take control where others quit supplying. This can be achieved with the measure proposed in the next bullet. Tenders can be used in the zones where there is a lack of investment, although this may be considered too burdensome and be used only as a last resource solution;
- An additional condition in the NewCo concession agreement will be the creation, jointly with some off-grid solutions developer(s), of a Special Purpose Vehicle (SPV) company that will play the role of "default and last resort provider". The SPV will be a normal off-grid solutions company for all purposes, except for the mandate to build and operate the mini-grids in the NES that others do not build and to take charge of any mini-grid business that disappears. The

– is delivered to another entity (this entity is FinanceCo, see the financial layer). The right incentive scheme can be achieved by calculating a priori the surplus that NewCo must deliver to FinanceCo, as the difference between the regulated annual revenue requirement of NewCo as calculated by ERA for a given year minus the total revenue that NewCo could collect from application of the tariffs, assuming a stringent collection rate target. NewCo must deliver this surplus to FinanceCo, regardless of the actual collection rate.

participation of NewCo in the SPV facilitates the future transfer of mini-grid customers to the main grid when "the grid will arrive", which eventually must happen for most or even all mini-grids, given the high population density in Uganda and the absence of major geographical impediments to grid expansion (but it might take one or two decades). The mandate for NewCo to participate in the SPV should be included in the negotiation package of the new concession.

Electricity supply with standalone systems

As with mini-grids, the proposed business and regulatory approach makes it possible to meet the following objectives:

- Achieve full electrification by 2030 as described in the NES. This requires the provision of all the standalone systems – mostly solar kits, but also systems to supply commercial and industrial loads – included in the NES, so that not a single potential customer in Uganda is left behind;
- Encourage private initiative, already present in the country with several solar companies, and minimize the interference with the existing standalone assets in operation;
- Guarantee the sustainability of this electrification mode, i.e., the permanence of a reliable and affordable electricity supply to all customers to whom NES assigns standalone systems;
- Make it possible for all customers that are assigned standalone systems to afford them.

Meeting all these objectives will require the GoU to intervene establishing the following requirements:

- Definition of a minimum level of demand to be supplied at household level. It is understood that, in general, this minimum level must be compatible with the energy needs of the specific population – e.g., cooling or heating depending on weather conditions, refrigeration for perishable agricultural or fishing products – and the economic capability to purchase appliances such as a TV, a blender or a small fridge. The NES has been designed for a 3W solar kit per household. As indicated above, this report adopts the NES as the reference case for the proposed distribution reform as it is the only official plan presently available, but strongly disagrees with accepting this minimum level of supply as compliant with the UN SDG 7.1.[8] (see the section on the financial layer for a discussion of alternatives);
- A cost-reflective remuneration – a "regulated revenue requirement" – for the supply of electricity with solar kits according to the NES. This remuneration will be collected from two sources: i) a regulated stream of payments; and ii) direct subsidies to the mini-grid developers (see the section on the financial layer for the source of these subsidies);[9]
- All new deliveries of solar home systems (SHS) under the proposed business and regulatory model must abide by these rules: meet the established minimum demand level, regulated end-customer payment for the basic SHS compatible with the minimum demand, and regulated subsidy to the SHS supplier for each delivered system to top up the cost-reflective revenue

[8] "By 2030, ensure universal access to affordable, reliable and modern energy services." In the case of poor rural areas in Uganda, after consultation with several stakeholders, it could be concluded that the minimum demand should include a residential solar kit of at least 10W – enough for two or three lights, phone charging, and a radio – plus electricity supply for productive and community use of electricity, as the only way to promote human and economic development. The financial analysis of this report includes a sensitivity analysis of a scenario with a minimum residential demand of a 10W solar kit, plus at least one community and one productive electrical supply at every village.

[9] The sustainability of electricity supply with SHS can be guaranteed if the business model of the supplier is defined as a "utility-like" business. This is easier under a fee-for-service kind of arrangement, whereby the supplier is responsible to guarantee the continuity of service indefinitely – maintaining and replacing the SHS as needed – in exchange for a regulated monthly fee, which is the usual payment system of the customers connected to mini-grids or the main grid. However, the prevalent business model for SHS in Uganda is rent-to-own, whereby the residential customer pays an initial amount plus weekly or monthly instalments during two or three years, until which the solar kit becomes the customer's property, perhaps including some maintenance obligation by the supplier. Under the rent-to-own model, a new subsidy to the supplier will be needed each time the customer needs to replace the SHS. Hopefully, with time, most households will become grid-connected and the stream of explicit subsidies for the purchase of SHS will almost disappear. Under a fee-for-service scheme, the regulated tariff would be part of a broad tariff cross-subsidization scheme, including all customers in the country.

requirement for the supplier, including the costs of maintenance and customer attention. Existing SHS suppliers must be given a deadline to meet these new requirements;

- Ideally, a cost-reflective remuneration should suffice to attract SHS suppliers to offer their solutions in the locations established by the NES and to guarantee their sustainability. In practice, some intervention will be needed to guarantee that some "default and last resort provider" will go where others do not want to go and will take control where others quit supplying. As with mini-grids, tenders may be considered as a last resource solution in the zones where suppliers would not go, despite the incentives;
- Here it is proposed that an additional condition in the NewCo concession agreement will be that the SPV - which was defined before for mini-grids as the "default and last resort provider" - will also commit to this same role for the standalone systems. As indicated above, the SPV will be a normal off-grid solutions company for all purposes, except for the mandate to deliver standalone systems in the areas defined by the NES for this type of supply where other companies do not want to go, and to take charge of the customers of any SHS business that disappears;
- The interference between the suppliers of SHS with a market-based approach and the subsidized supply of SHS under regulated tariffs can be minimized, so that subsidies are not wasted with those customers that do not need them.[10]
- The participation of NewCo in the SPV facilitates the future transfer of standalone customers to mini-grids or to the main grid when "the grid will arrive". As indicated previously, the mandate for NewCo to participate in the SPV should be included in the negotiation package of the new concession.

The institutional layer

The definition of the governance of the distribution segment, and the electrification plan in particular, is the responsibility of the MEMD, in coordination with the MOFPED. The main goal of the MEMD is to meet the energy needs of Uganda's population for social and economic development, in an environmentally sustainable manner.

The Ugandan Cabinet Decision of 22 February 2021 on "Merging and Consolidating Government Agencies, Commissions, Authorities and Public Expenditure" was made with the overall objective of eliminating structural functional duplications and wasteful expenditure. It has already led to amending the REA Statutory Instrument to include REA as a department of MEMD. It also seems that UEGCL, UETCL, and UEDCL would be reintegrated in one publicly owned company called the Uganda Electricity Company (UEC).

This report will assume that the rebundling of UEGTL, UETCL, and UEDCL will take place, despite the fact that this decision has not been formally stated and that it has not been clarified how it would be implemented. So far it has created much uncertainty among the stakeholders and – if carried out – it will complicate matters under a regulatory perspective, with small (if any) benefit. The impact will be different for the transmission, generation, and distribution segments of electricity supply.

Rebundling generation and cancelling the present concession to operate and maintain the publicly owned power plants, would require transferring these functions to a "generation department" within a newly created Uganda National Electricity Company (UEC). No major problem is expected in this regard.

Merging transmission will amount to transferring the responsibilities of UETCL to another department within the UEC. However, in this case, since the system operation function is included in UETCL, special

[10] This can be achieved in several ways; for instance, directly providing a subsidy to help purchasing the minimum demand SHS only to the low-income households.

measures will be needed to guarantee the independence of the system operator, since it will be managing a power system with a mix of privately and publicly owned power plants.[11]

Distribution would become another department of the UEC. An integral perspective of distribution would require this department to comprise two divisions, one for on-grid supply and the other for off-grid solutions (i.e., mini-grids and standalone systems), under a common Department Head. UEDCL would become the on-grid division, overseeing the activities of NewCo, and supporting ERA from a technical perspective in the on-grid space, which is expected to eventually dominate distribution. The off-grid division could integrate most of the staff from the former REA, who are presently in the MEMD. All the on-grid distribution assets will be owned by the UEC. On the contrary, the physical assets of mini-grids and standalone systems will be owned by the private suppliers.

The role of the distribution companies, NewCo and the suppliers of off-grid solutions, must be reconsidered, so that the potential of electricity access can be fully exploited. While the aim of digitization and decentralization in developed countries focuses on *demand response*, developing power systems needs *demand growth* – associated to economic development and, more broadly, human development, especially in rural areas. This asks for an in-depth revision of the role of distribution companies as active retailers, promoting development via residential electricity utilization, productive, and community uses.

Two other organizations play a major institutional role in the distribution segment: ERA and a centralized financial organization, FinanceCo. ERA must continue its role as the independent regulatory authority, supported by the distribution department of the UEC for technical matters and the supervision regarding the on- and off-grid activities of the distribution activity.

Financing the capacity expansion, administration, operation, and maintenance of the entire distribution – including the electrification plan – is a major undertaking. The MEMD - in coordination with the MoFPED - is in the driving seat of this undertaking, but it is managed by a specialized company that will be named “FinanceCo”. FinanceCo will be a financial intermediary owned by the GoU that will serve as a hub of all the financing sources and will extend financing to NewCo and the off-grid developers. An upgraded UECCC is a possible option to implement FinanceCo without creating additional organizations.

An operation of this dimension needs the coordinated support of all the DPs presently operating in Uganda. Proper supervision and control of the electrification plan require that, in addition to the GoU represented by the MEMD and the MoFPED, the DPs with a significant contribution to the project must participate in the governance of FinanceCo. This will typically require taking part in the equity of FinanceCo.

Figure 2 represents the structure of the proposed institutional layer for the distribution subsector in Uganda, with a depiction of the most important functions of each entity, and how they will evolve in time.

[11] There is ample jurisprudence on this topic in the “Acquis Communautaire” of the Internal Electricity Market of the EU, where measures to mitigate the negative implications of this kind of integration of activities has been thoroughly debated.

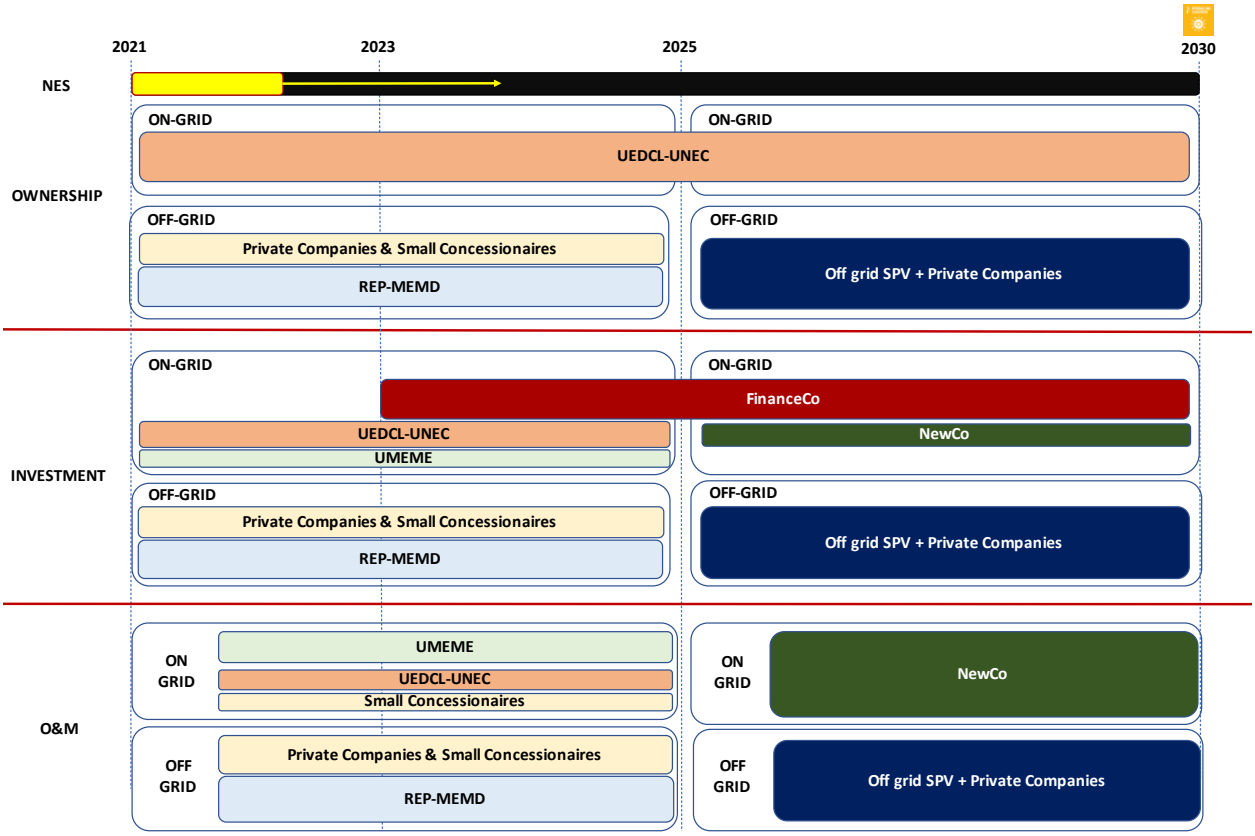

Figure 2. The institutional layer: relevant organizations for distribution reform and their evolution in time

The financial layer

FinanceCo is the hub in charge of coordinating, raising, and channelling the capital flows for the entire process of reform of the distribution sector and the electrification plan. FinanceCo should facilitate and optimize all financing and investment related to the key NES targets, including the financial contributions of the GoU, the DPs, and the surplus of NewCo, which jointly finance investments in the zone B of NewCo and the subsidies to the off-grid companies.

In the following paragraphs, a more detailed description of the economic flows into and out of FinanceCo is provided. These flows are also represented in *Figure 3*.

Cash flows into FinanceCo:

- Surplus of NewCo after collecting revenues from tariffs and retaining a cost-reflective revenue requirement;
- Equity from the GoU, maybe also open to private investors;
- Grants and concessional loans from the DPs (and/or other third parties' external financing, should additional funding be required).

Cash flows out of FinanceCo:

- Investments in assets of NewCo – starting in 2023 – on the new on-grid connections required by the NES;
- Subsidies to mini-grids to top up their cost of service beyond the revenues from the regulated tariffs;
- Subsidies to developers of SHS to top up their cost of service beyond the regulated payments of rent-to-own schemes;
- Financing repayment and/or refinancing, including satisfaction of cost of capital of debt and equity.

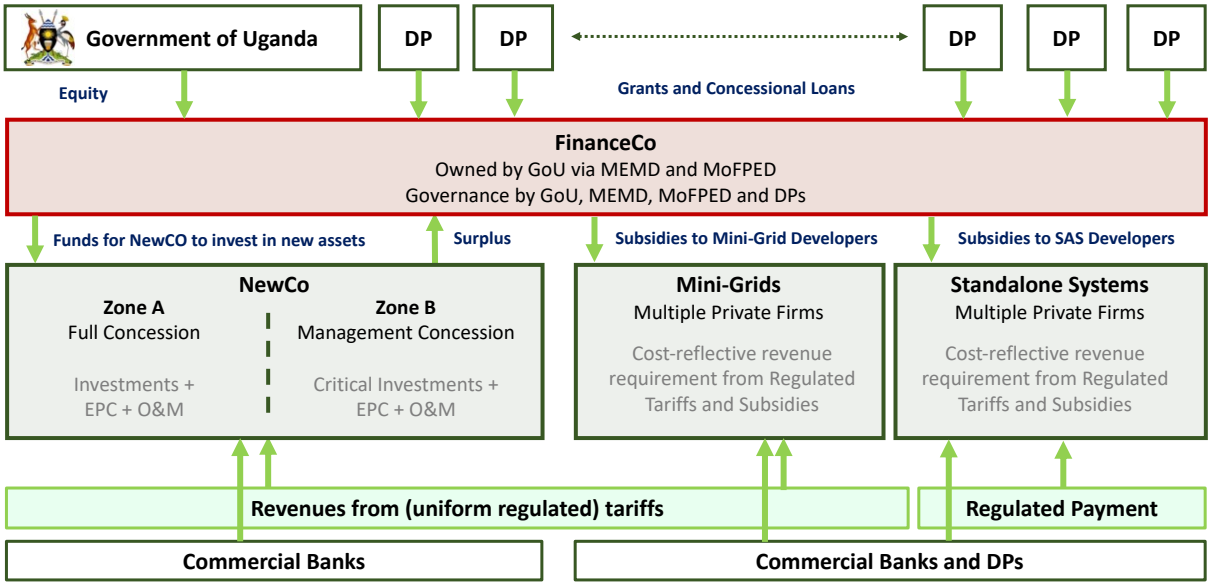

Figure 3. The financial layer: map of economic flows

The centralized role played by FinanceCo implies an across-the-board implicit cross-subsidization among all customers – rural or urban, supplied on- or off-grid. The electrification plan can be considered financially viable if, after a reasonable period of time, the revenues collected from the regulated tariffs will be able to repay the debt incurred during the electrification process, while also remunerating the equity during the considered period, and will be sufficient to cover the total annual costs of electricity supply in the future. This happens to be the case for the NES in Uganda, as shown by our detailed financial analysis (as described in the next section).

The financial analysis of the NES

A detailed business (i.e., financial) plan has been built to examine the conditions under which it is viable to finance the proposed reform of distribution, including the electrification plan according to the NES to achieve universal access to electricity in Uganda by 2030. The computer-based model supporting the business plan is described in Annex H of this document, including the main assumptions built into the model and the justification for the most significant decisions made regarding financial alternatives.

Our business plan is substantially different from the very basic financial analysis in the NES, which appears to have several serious flaws:

- In the first place, the financial analysis in the NES is "static", while an electrification financial plan must include yearly financial projections, which on the one hand reflect how the business plan execution evolves over time and on the other hand portray the evolving relationship in time between the operating and the financial variables: the country starts borrowing money to achieve full electrification in a few years and it also may need some grants from the Government and from the DPs; because of the electrification process the demand grows quickly as well as the revenues from application of regulated tariffs; once the electrification is complete, the revenues from all end customers may make it possible to pay back the debt and to stabilize the financial situation of distribution in the future. If this is the case, then the financial plan is viable. This dynamic process is entirely absent from the financial analysis in the NES;
- The financial analysis in the NES only includes investment costs (Capital Expenditures (CAPEX)), while the electrification process requires to also incur administration, operation, and maintenance costs, which are significant and do impact the overall financing strategy;
- The financial analysis in the NES includes a contribution of the revenues from the tariffs to cover 10% of the total investment costs. However, in a sound dynamic plan, the tariff revenues

are the key contributor that ends up paying for the incurred debt and stabilizes the sector financially.

The term "Reference Business Plan" is used to refer to a version of our electrification business plan that strictly follows the results of the NES.[12] The main conclusion that can be derived from the Reference Business Plan is that it is possible to finance the NES with a blended mix of financial resources, showing that the NES would be financially viable if our recommendations are followed. However, it will be challenging, since the current level of expenditure in the distribution segment of the Ugandan power sector is much lower than what the viable financial model for the NES requires.

The result is particularly significant as the Reference Business Plan assumes that the tariffs to end customers are constant in nominal value (i.e., the value is not adjusted for inflation) over the entire 2021 to 2040 period. The viability of the plan hinges on the brisk demand growth due to electrification, a significant amount of concessional loans, and some volume of grants. Cross-subsidization across the board makes it possible for all electrification modes to receive a remuneration capable to attract private capital. Note, however, that the NES only includes extremely basic solar kits of 3W for 5.5 million households during the entire considered period until 2040. This cannot be considered an adequate level of electricity access compatible with the SDG 7.1.

These are the main features of the Reference Business Plan (see the summary in Figure 4):

- Over the period from 2022 until 2030, when all customers in Uganda must have access to electricity, FinanceCo must receive a total amount of USD 3,800 million of funding, broken down as USD 2,800 million of concessional debt (74% of the total amount; six years of grace period; 2% interest rate), USD 600 million in grants, and USD 400 million in equity provided by the Government;
- This financial effort is concentrated over the period until 2030, when the major investments associated to electrification of the entire country have to be made. The investment is not uniform over the years, with an average investment per year of USD 470 million;
- Analysing FinanceCo's cash inflows and outflows, given the Return on Investment (ROI) adjustment payment from NewCo to FinanceCo, this amount over the 2022-2030 period rises to USD 834 million. On the other hand, the subsidies required to guarantee 12% ROI to private off-grid companies reach USD 827 million over the same period;[13]
- FinanceCo's cash inflows derived from the surplus of NewCo generate a positive operating cash flow. This surplus allows FinanceCo meet 5% of its investment needs during the 2023-2030 period, in addition to grants (20%), concession debt (65%), and government equity (10%);
- In the case of NewCo, in the 2025-2030 period, with the new ROI adjustment, the revenue requirement and the estimated cash reserves can account for 86% of its investment needs. This allows NewCo to leverage commercial debt (10%) and to raise equity (5%);
- During the same time interval (2025-2030) the ensemble of private off-grid companies, which receive subsidies and collect regulated tariffs that allow them to receive a cost-reflective revenue requirement, can cover 68% of their investment needs, leverage commercial debt for 22% and raise equity for the remaining 10%;

[12] Other versions of the electrification business plan can be easily developed with the same analytical tool, for instance replacing the 3W solar kits for more capable SHSs and adding more electrical supply for productive and community uses in the rural villages.

[13] The value of the new ROI for NewCo would result from a negotiation between the GoU and NewCo. Therefore, 12% is a placeholder to be replaced by other tentative numbers during the negotiation process, until an agreement is reached eventually.

FinanceCo		
Positive Operating Cash Flow	USD 219 million	5%
Grants based on DFIs funds to Government linked to the deployment of the CAPEX	USD 800 million	20%
Concessional Debt from DFIs	USD 2.600 million	65%
Equity	USD 400 million	10%
Total	**USD 4.019 million**	

NewCo		
Net Cash Variation	USD 57 million	6%
Positive Operating Cash Flow	USD 815 million	80%
Commercial debt with potential implications on sovereign debt	USD 100 million	10%
Equity	USD 50 million	5%
Total	**USD 1.022 million**	

Off-grid SPV&PC		
Positive Operating Cash Flow	USD 697 million	69%
Commercial debt directly channeled through the Government.	USD 220 million	22%
Equity	USD 100 million	10%
Total	**USD 1.017 million**	

Figure 5. The proposed financing: summary of the period 2021-2030

- In summary, over a long period of time – since the proposed financial plan covers the period from 2021 to 2040 – the total distribution costs (CAPEX plus Operating Expenses (OPEX)) are paid by grants (from the Government and the DPs) during the electrification phase plus the tariffs from the end customers. Financial stability is achieved at the end of the considered period. We mean by financial stability that the regulated tariffs – including a fair amount of cross-subsidization – are sufficient to cover the total regulated costs (the "revenue requirement") of the distribution business, including both off- and off-grid supply.

Financial analysis of a scenario not contemplated in the NES: minimum supply of 10W

There is no universally-adopted definition of what "access to electricity" means in reference to the UN SDG 7.1 "*by 2030, ensure universal access to affordable, reliable and modern energy services*". The NES has adopted the target of deploying 3W solar kits for 5.5 million households in rural Uganda. These systems may not even meet the minimum threshold of what could be considered access – being able to charge a phone and supply one LED light or a radio for four hours a day.

The report examines the impact that a small enhancement in the capacity of solar kits has on the financial viability of the electrification plan. We have chosen a popular product - much in demand among the low-income rural population In Uganda – 10 W solar kits with a cost of USD 170, which can supply two or three lights, phone charging, and a radio for a longer time. In addition, it has been assumed at least one productive and one community use in each village or population cluster of a minimum size.[14]

We have performed a sensitivity analysis of the reference business plan for the NES, examining a scenario where the 5.5 million rural residential households have 10W solar kits instead of the 3W solar kits in the NES. The rest of the operating assumptions of the business model from 2021 to 2040 have not been modified, therefore ensuring that 100% electrification is achieved by 2030.

The CAPEX of investment in solar kits now increases from USD 418 million in the NES to USD 935 million. The total CAPEX of the NES increases from USD 4.68 billion to USD 5.2 billion (up 11%).

The volume of subsidies coming from FinanceCo towards the standalone solar systems companies (with a specified ROI of 12%) must cover the increase in the cost of the solar kits. A new capital structure

[14] From a quantitative viewpoint, the relevance of this additional amount of community and productive use of electricity has been found to be much smaller than the assumed increment in residential use.

has been designed to address this temporary mismatch between subsidies and higher investment needs. In order to comply with the limits of the financial ratios of the aggregated off-grid companies, the commercial debt requirements must increase from USD 220 million in the reference case to USD 510 million.

The increase in subsidies needed to guarantee the 12% ROI to the aggregated off-grid companies (Off-grid SPV and private companies, SPV&PC) generates a deficit in FinanceCo that must be financed. The increment in subsidies that FinanceCo must provide must come from an increase in concessional debt, grants, and equity, leaving a percentage of 12% equity, 22% grants, and 66% debt. Debt restructuring was carried out by analyzing the debt limit through financial ratios, always making sure that all debt will be repaid by 2040.

Figure 6 sums up the key figures of our business plan for the 10W scenario, which we also consider to be financially viable.

Our Proposed Financing (Summary 2021-2030)			
External Funds - DFIs			
	Concessional Debt	USD 2.700 million	66%
	Grants (based on DFIs funds to Government linked to the deployment of the On-grid CAPEX)	USD 900 million	22%
		USD 3.600 million	
Internal Funds - GoU			
	Equity FinanceCo	**USD 500 million**	12%
	Total	**USD 4.100 million**	
Commercial debt with potential implications on sovereign debt		*USD 610 million*	*16% NewCo*
			84% Off-grid SPV&PC

Figure 6. The financial proposal for the 10W scenario: summary for the interval 2021-2030

Table 1. Contribution of the assignment to the project indicators.

Contribution of the assignment to the project's indicators		**Explanation / rationale** *(qualitative data to support the quantitative ones)*
Energy access	• No MW max. capacity added. • 10.1 million households benefiting from energy access.	• The report is focused on distribution. • According to the NES.
Renewable energy	27 GWh/year supply from renewable energy.	Solar production from SHS.
Energy efficiency	No MWh/year savings.	The project is about new demand.

1. THE MISSION

1.1. THE OBJECTIVE OF THE MISSION

The general objective of the mission of the EU Global Technical Assistance Facility (TAF) for Sustainable Energy is to perform an assessment of the electricity distribution sector in Uganda, which will provide a better understanding of the need and extent of an eventual reform.

This reform must include a solution for the future of the concession agreements – specially Umeme's concession agreement – and must specify the means to accelerate the pace of electrification and improve the reliability and quality of supply in the country – in rural areas in particular. Moreover, it must identify opportunities for possible EU engagement and support to the Ugandan power sector, in coordination with all other development institutions active in the country.

This proposal must conform to the existing and proposed pertinent legislation, in particular to the Ugandan Cabinet Decision of 10 September 2018, which approved recommendations for the rationalization of Agencies, Commissions and Authorities in the country (the 2018 Cabinet Decision). This led in May 2021 to include the former REA as a department of the MEMD. It also seems that UEGCL, UETCL, and UEDCL would be reintegrated in one publicly owned company, UEC.

A comprehensive reform of the critical and complex distribution segment of the power sector which, in Uganda, includes on-and off-grid activities, needs the broad agreement of the major stakeholders on the resulting structure, roles and responsibilities. This mission – and this report as its major outcome– will hopefully provide the basis for such an agreement.

During the last few years, under the forward-looking leadership of the MEMD, several reports by authors from different institutions have presented thoughtful assessments of the situation of electricity distribution in Uganda (see Annex F). Most of them coincide in their diagnoses of the situation. However, these reports either fell short on proposing remedies, or the remedies are not commensurate with the dimension of the problem. Also, the recommendations often miss essential elements of the implementation plan.

This report takes a different tack. Instead of dwelling on a detailed description and analysis of the present situation, which is well-known to most of the readers of this document, the report focuses on the presentation and justification of actionable[15] recommendations. The necessary background information is provided in annexes, with extensive references to and quotes from several reports that have already done an excellent job in this regard.

The recommendations of this report have been specified at a level of detail that should allow to start a negotiation process among the relevant stakeholders, without the need to enter into practical details that would obfuscate an initial basic agreement, and that the parties – with their legal, economic and regulatory specialised teams – should elaborate and agree on by themselves at a later stage.

1.2. THE FUNDAMENTALS OF THE PROPOSAL

This report proposes a reform of the electricity distribution subsector in Uganda – including a suitable solution for the future of Umeme's current concession – that will allow achieving a reliable, affordable, and sustainable supply of electricity for all households, industries and businesses in Uganda in a reasonable timeframe – with an expected positive impact on job creation, demand augmentation, and lower tariffs – with the ultimate goal of increasing the wellbeing of the population and enabling economic growth.

The report draws attention to the need of considering the electrification problem in its true dimension and the urgency to seize the propitious present time to launch the reform. Ending energy poverty is a

[15] Actionable: able to be done or acted on; having practical value. Definition from the Oxford Language Dictionary.

prerequisite to end poverty. Uganda is ready to receive the support that it needs to achieve full electrification of the country by 2030.

Uganda already has the basic ingredients to achieve this goal: an advanced regulation with a capable regulatory authority, a competent and economically viable distribution company, the presence of several sound mini-grid developers and many companies of standalone solar systems, good energy professionals, the support of a large ensemble of development partners, and a strong political governance.

However, several relevant weaknesses have been pointed out repeatedly in recent reports. They are presented in detail in the main text of this report and the annexes. The power sector regulatory compact in Uganda has been well considered under the energy regulation perspective. However, several areas of concern can be highlighted:

- Excess generation capacity presently, with an impact on tariffs, which are among the highest in Sub-Saharan Africa;
- Low rate of electricity access and rate of progress below expectations;
- Uncertainty affecting the power sector, in principle associated with waiting for the decision on the future of Umeme's concession, and more recently compounded by the lack of information on the specific measures that would implement the significant changes in the structure and regulation of the Ugandan power sector that the Government has announced;
- Discontinuity between an almost purely urban concession that can be financially viable, and several almost purely rural concessions condemned to depend heavily on subsidies and with scant possibilities to raise private capital;
- Lack of adequate solutions for the provision of services – including electrification – to the slums around major cities; this problem is compounded by the urbanization trend, which is affecting Uganda with particular vigour;
- Lack of an integrated vision of electrification planning, which includes the lack of prioritisation regarding off-grid electrification;
- Flaws in the remuneration approach to publicly managed distribution assets;
- Inadequate level of monitoring and enforcement of reliability and quality of service targets, with an impact in the regulated distribution remuneration;
- The need to build capacity in institutions and companies.

Thus, a reform of the electricity distribution subsector is needed. And it has to be made at a time of uncertainty: uncertainty regarding the future of Umeme's concession, uncertainty regarding the measures that can be adopted regarding rebundling and administrative simplification of the structure of the power sector, and uncertainty regarding how to finance the substantial electrification effort to provide a reliable, sustainable, and affordable electricity supply to the entire population of Uganda and their community, industrial, and commercial activities. Major decisions are needed concerning the distribution segment of the power sector to dispel the uncertainties and to make it possible for each agent to start playing its role within a consistent vision of the future power sector in Uganda.

This report focuses on the big picture, since an agreement among the relevant players on the key essential measures is necessary to make sure that a workable path is clear, has political support, a local champion institution, and a business and regulatory model able to attract the necessary blend of public and private finance to do the job within a reasonable timeframe. The details will be worked out later.

This document is an update of a prior report, by the same author and on the same topic, which was issued in June 2021. The update responds to the changes in the structure and regulation of the Ugandan power sector that are presently being discussed and implemented.

The proposed reform starts from the same fundamental tenets that were included in the previous report. Their justification can be found in the complete document:

- *Consider electricity distribution in its entirety*, i.e., the supply of power to all end customers by a suitable combination of all electrification modes, either grid extension, mini-grids, or

standalone systems. Design a sound business model for each mode, under a *common strategy of financing, tariffs, and cross subsidization*;

- *Adopt a single distribution company for the main connected grid in the entire country*;
- *Preserve the existing managerial capability in grid-connected electricity distribution*, under a concession business model with a private company approach, as a valuable asset of the Ugandan power sector that is almost unique in Sub-Saharan African countries;
- *Set the desired goal now* – a sound distribution sub-sector and full electrification by 2030 – *and design a viable plan to achieve it* – technical, economical, regulatory, business, and financial – to make sure that the adequate means and resources are employed from the outset;
- This reform will be only possible if a *broad agreement on these principles is reached among all the relevant stakeholders, pooling their resources together, with strong political support and the guidance of a local champion institution*, which seems to correspond to the MEMD.

1.3. THE ROADMAP OF THE REPORT

After this introductory Chapter 1, the context of the study is presented in Chapter 2, highlighting, in the first part, the factors that must be taken into consideration in the design of the distribution reform. This first part can be skipped by readers already familiar with the Ugandan power sector. The second sub-part of Chapter 2 draws attention to the need of considering the electrification problem in its true dimension and the urgency to seize the propitious present time to launch the reform.

Chapter 3 prepares the design of the proposed approach from a conceptual point of view. The first sub-part presents the basic principles that must be followed in any successful electrification programme and their most immediate implications. Having those principles in mind, the second sub-part reviews strategic topics that cannot be ignored in the design of the distribution reform. This second part presents the fundamental decisions that this report makes and their justification, based on the basic principles in the first part and the context of the Ugandan power sector presented in the preceding chapter. The reform proposal presented in Chapter 4 build on these fundamental decisions.

Chapter 4 is the central chapter of this report. Readers who are already familiar with the Ugandan power sector, with experience in electrification, and who are eager to know what this report is proposing, may jump to this chapter directly. Chapter 4 starts by summing up the fundamental decisions already made and the essential elements of the reform to be proposed that are a direct consequence of the material presented in Chapter 3. It follows the proposed reform, presented in four consecutive layers: techno-economic, business and regulatory, institutional, and financial. Special attention is paid in all layers to the future of Umeme's concession, but within an integral perspective of the entire distribution segment, both on- and off-grid. A section of Chapter 4 is devoted to explaining the reasoning underlying the major components of the proposal.

The business plan that must be associated to the techno-economic electrification plan and the regulatory and business model is presented in Chapter 5. We have accepted the NES as the techno-economic plan that specifies what has to be done every year in new investments and in operation in the three electrification modes, and the expenditures derived from these activities. The proposed reform has departed from the existing institutions and has specified the regulatory and business models for each one, i.e., who does what. In this chapter, the way to cover the incurred costs is defined. A techno-economic plan, with its agents and institutions, has little value if it cannot be financed. The chapter shows that the NES can be financed if the recommendations of this report are followed. It also shows that a slightly more ambitious plan, with more capable residential solar kits, can be also financially viable. The computer tool that has been used to prepare the business plan is described in an annex.

After a section listing the references used, several annexes provide the background for the major topics covered in the main report:

- Annex A, the country context;
- Annex B, the national energy policy and power sector regulation;
- Annex C, the power sector in Uganda;

- Annex D, the distribution of electricity in Uganda;
- Annex E, electricity access in Uganda;
- Annex F, the proposals for the distribution reform in Uganda;
- Annex G, the national energy plans for Uganda;
- Annex H, the business plan for the NES;
- Annex I, Sustainable energy for some;
- Annex J, a list of the meetings held during the missions in Kampala.

2. THE CONTEXT OF THE STUDY

This chapter presents essential background information on Uganda and its power sector, which supports the analysis and proposals in Chapters 3, 4 and 5. Only a brief account of the facts, without assessments or recommendations, is presented here. Detailed information and references to key documents can be found in the annexes. The readers already familiar with the Ugandan power sector may directly go to Section 2.2.

Section 2.2 highlights the need to adopt measures and reforms that are commensurate with the challenges being addressed, the urgency to adopt some decisions regarding the distribution segment of the power sector, and the window of opportunity that exists to achieve full electrification in Uganda in the next decade, enabling economic growth and reducing inequalities.

2.1. BACKGROUND INFORMATION AND DETERMINING FACTORS[16]

The country context

Uganda's population is currently estimated at 48.7 million (annual population growth of 3.3 %), of which 74.3 % is considered rural population and with a median age of 16.7 years. Uganda's population is estimated to grow to over 60 million in 2030, 74 million in 2040[17], and more than double to around 104 million by 2060 (World Bank, 2020). Of these people, 70 % will be of working age, and half of the population will be living in urban areas (World Bank, 2020). This could become a curse or a boom, depending on how the government invests resources and steers reforms in the coming years. Uganda has a progressive refugee policy and presently hosts about 1.4 million refugees, the third-largest refugee population in the world. See Annex A for more detailed information and references.

Uganda has recently achieved considerable progress towards reducing the share of the population living in poverty. Nevertheless, it is still among the world's group of least developed countries and remains one of the poorest countries in the world, with 21.4 % of the population living on less than USD 1.25 a day. The COVID-19 sanitary crisis has worsened the effects of poverty and up to three million people could fall into poverty, particularly in urban areas, above the currently estimated 8.7 million (World Bank, 2020) and (IEA, 2021).

With fertile soils and regular rainfall, agriculture is the most important sector of the economy, employing over 80 % of the work force. Economic growth in recent years has been constrained by the inadequacies of the infrastructure, and presently the GoU prioritises investments in public infrastructure, especially roads, electricity and airports.

The Ugandan economy reported strong growth in 2019, estimated at 6.3 %, largely driven by the expansion of services. However, because of the global COVID-19 pandemic, plus a locust invasion, and flooding caused by heavy rains, Uganda's growth has slowed considerably in 2020. The pandemic may also hamper human capital development and the country's chances of benefiting from its demographic transition. The stability of the current regime has allowed for steady institutional development and improvements in governance that have facilitated a strong economic growth rate and substantial developmental gains in poverty reduction.

One of the key aspects when designing the business plan for an electrification programme is not to trespass the limit of sovereign debt that the country can absorb. According to the World Bank report, "Uganda remains at low risk of debt distress, but with heightened vulnerabilities (…). However, with total debt service (interest and principal due) expected to be above 50 % of government revenues over the next three years, Uganda faces increased liquidity vulnerabilities and reduced fiscal space" (World Bank, 2020). The energy sector must compete with other essential services, like health (now in particular), education, transportation, or Information and Communication Technologies (ICT), for the limited

[16] Further information and the references that have been used can be found in the corresponding annexes.

[17] https://www.worldometers.info/world-population/uganda-population/

funds from the government. It is therefore relevant to know the order of magnitude of the financial requirements in other sectors.

National energy policy and power sector regulation

The regulatory framework and a competent regulator are valuable assets for Uganda.[18] The 1999 Electricity Act adopted a large fraction of the standard package of liberalisation reforms that were followed by many countries around the world in the nineties.

Uganda's power sector structure is among the most sophisticated in Sub-Saharan Africa, with a fully unbundled utility, an independent regulator and private concessions in generation and distribution segments, as well as independent power producers (IPPs). The major distribution concessionaire, Umeme, together with Seychelles, are the only utilities in Sub-Saharan Africa that can be considered broadly financially viable, according to a well-known report by the World Bank Group (Kojima et al., 2016). Uganda, for the third time in a row, has been ranked number 1 in the Electricity Regulatory Index (ERI) for Africa, released by the African Development Bank.

The 1999 Electricity Act is the centrepiece of the regulation of the Electricity Supply Industry (ESI). It provides the framework for regulation of the generation, transmission, distribution, sale, export and import of electrical energy in Uganda. A large number of subsidiary regulations develop the Act. Details can be found in Annex B and its references.

Several aspects of the regulatory framework are currently the subject of reform proposals. In 2015, the Cabinet approved the principles to be embodied in the Electricity Act Amendment Bill and authorised the Minister of Energy and Mineral Development to issue drafting instructions. In September 2018, the Cabinet of the GoU approved recommendations for the rationalization of Agencies, Commissions and Authorities in the country (the 2018 Cabinet Decision).[19] The justification for these recommendations was given in March 2021, in a Concept Paper entitled "Improving efficiency and effectiveness through rationalization of Government Agencies, Commissions and Authorities," developed by the Ministry of Public Service. The motives indicated were: duplication of mandates; weak institutional and technical capacity to deliver on mandates; high overhead costs; inefficient utilization of resources; bloated structures within some institutions, and lack of clarity in some cases relating to policy, regulation and implementation functions across Ministries, Departments and Agencies (USAID and Power Africa, 2022).

In application of these recommendations, REA has been merged into the MEMD as a department.

The Cabinet also approved the merge of UEGCL, UETCL, and UEDCL into one company, to be called the "Uganda Electricity Company" (UEC), operating with one Board of Directors. We shall refer to this change as the "re-bundling of the power sector". This decision has not been activated yet and, so far, no implementation plan or additional information have been made publicly available.

The measures proposed in this report are compatible with a properly organized rebundling, where REA and UEDCL will find their place and a meaningful role to play in the MEMD and the UEC. In fact, this report has been written under the assumption that the rebundling will take place, but the report's recommendations can be easily adapted to the simpler present situation where UEDCL remains unbundled.

The decision to incorporate REA in the MEMD correctly responds to a situation where the overlapping mandates of UEDCL, REA, and Umeme over service territories and roles, resulted in institutional conflicts and inefficiency. However, going further with the rebundling will probably create more problems than it will solve, as explained later in this report. So far, the announcement of the "rebundling of the

[18] "The steady development of regulatory capacity, autonomy and accountability has proved to be one of the most successful aspects of reforms in Uganda. ERA has benefited from strong legislation and (in its early years) the support of the MOFPED in steadily building capacity and a robust regulatory culture, that has increasingly been able to engage constructively with stakeholders." (Godinho and Eberhard, 2019).

[19] Uganda Cabinet Meeting decisions taken on 10 September 2018, available at http://dc.sourceafrica.net/documents/118452-Decisions-taken-during-Uganda-Cabinet-Meeting.html.

power sector" has created much uncertainty among the stakeholders and – if carried out – will complicate matters under a regulatory perspective, with small (if any) benefit. The impact will be different for the transmission, generation, and distribution segments of electricity supply, as explained in Chapter 4.

Power sector structure and performance

Presently, the Ugandan power sector is fully vertically unbundled into generation, transmission, and distribution segments. In generation, state owned generation assets are currently managed under a concession agreement with Eskom Uganda, while the remaining power is supplied by IPPs under Power Purchase Agreements (PPAs). Eskom entered into a concession and assignment agreement with the GoU in 2002 to operate and maintain Nalubaale and Kira Dam on behalf of UEGCL, the asset owner. The concession, which took effect in 2003 for a period of 20 years, will expire in December 2023.

The GoU retains full ownership of transmission and system operation in the company UETCL, which also manages a single buyer scheme for bulk power. Most of the distribution network infrastructure and management is under private management, with Umeme's 20-year concession for the main distribution network since 2005; other concessions have since been awarded for small rural networks.

Umeme Limited is Uganda's main electricity distribution company, distributing 97 % of all electricity used in the country. The company's core business activities are electricity distribution and electricity supply and service after sales. Electricity distribution entails operation, maintenance and upgrading of the electricity distribution network not exceeding 33 kV within the authorised territory in Uganda, which comprise 1 km radial distance from the existing distribution grid. Umeme has the rights and obligation to make the necessary modifications to the distribution system as deemed desirable to be in proper conduct and in accordance with the requirements of the laws of Uganda. However, UEDCL retains title to the modifications and additions from the effective date of the modification. In order for Umeme to recover its investments in the distribution network and earn a return through the tariff, investments need to be preapproved by ERA. These new investments are remunerated with a ROI of 20 % that many considered excessive now, but it was perhaps not so when the concession agreement was signed in 2005, with much more uncertainty about the performance of the concession than in 2020. Umeme has not engaged into rural electrification, which was to be expected, since it is not required in the terms of the concession. A 'buyout clause' in the concession requires the GoU to pay the residual value of the assets invested by Umeme if the concession is not renewed.

The Ugandan power sector has improved considerably in all respects since the 1999 reform, although with some caveats. On security of supply, Uganda has moved from a situation of acute shortages of supply and vulnerability to drought in the early 2000s, to an acceptable supply-demand balance after 2012, and a sizeable surplus presently once the new hydro-power projects are completed. Private investors are undertaking small renewable energy generation projects. On the transmission side, the network has expanded 50 % between 2003 and 2016, and cross-border interconnections with neighbouring countries are built. National electricity demand has doubled from 2008 to 2018. Distribution losses have decreased from 38 % to 16.4 % and collection rates for the grid-connected customers have increased from 55 % to 99.7 %. Private sector investments in distribution have reached nearly USD 2 billion (CIG, 2020 and Elahi R, 2019).

Uganda is practically the only country in the Sub-Saharan Africa region where tariffs are close to being cost reflective, for grid connected customers under Umeme. The tariff regulation process follows international standards and has been consistently applied according to design. The regulator has implemented substantial tariff increases whenever they were needed for cost recovery. Annex C presents a detailed description of the situation in Uganda regarding tariff design and implementation, as well as a comparison between the tariffs in Uganda and in other countries of the region – Uganda's tariffs being among the highest – and a discussion on the results and their limitations.

The average annual consumption per capita remains very low at 100 kWh per annum (against an average of 518 kWh in Africa). The government wants to increase it to 578 kWh within the period of the Third National Development Plan (NDPIII). There are high regional disparities in terms of electricity access. For example, according to the National Electrification Strategy (NES), 52 % of the population is connected to the main grid in the Central Region, as opposed to a rate of 3 % only in the Northern Region.

There is a significant (but unquantified) percentage of households along existent power lines that have been unable to connect to the grid due to reasons such as high connection and wiring costs. The affordability level for energy services is very low in rural areas. Only 40 % of the households spend more than USD 3 per month for energy services, while only 20 % of the surveyed population spends more than USD 5 per month.[20]

A related and increasingly important problem is the lack of utility-provided electricity access in the slums around Kampala and probably other major cities in Uganda; a tough challenge that requires the cooperation of other organizations besides the distribution companies (see Annex I). Commitments in relation to the provision of electricity to informal settlements, like the slums around Kampala, should also be included in the distribution reform.[21]

Taking all this into consideration, the low level of electricity access is a major topic of concern in Uganda. The latest information from the International Energy Agency (IEA) data base (updated in October 2020) gives a rate of electrification of 28.9 % for Uganda, 47.9 % for Sub-Saharan Africa, 99.6 % for North Africa, and 90.0 % for the world. These percentages depend on the minimum definition of access that is adopted, see Annex E.

The imminent situation of bulk oversupply is encouraging efforts to prioritise demand growth. With regards to the current projections, if adequate measures are not put in place to grow demand, there will be an excess capacity of >1,000 Megawatt (MW) by 2025. The very significant stranded generation costs will put significant financial pressure on the tariff if additional demand of power is not created. The current moratorium on signing new PPAs will improve previous forecasts, but stranded costs could be in excess of USD 500 million per year for the next 10 years (Ricardo, 2019).

The feasible path to achieving a financially sustainable demand growth is to improve the reliability and quality of supply to existing industrial demand centres and to attract new large consumers to establish businesses in the short term. Domestic demand growth must also be developed, in particular by providing access to the large fraction of the population that does not have it and by taking strategic actions that will encourage use of electricity in cooking, washing and well-adapted productive and community activities. All this puts pressure on the performance of the distribution segment, as the intermediary between the surplus in generation and the unserved latent demand.

The present organisation and structure of the sector at distribution level, and regarding access in particular, is not functional, as several recent reports have indicated (see section 1.2 on general shortcomings of the power sector in Uganda, and more specifically the section on 'Issues in the distribution segment' of Annex D and also Annex I on the situation of electricity access in Kampala's slums). The major problems highlighted for the distribution segment are:

- The uncertainty affecting the power sector, in principle associated to waiting for the decision on the future of Umeme's concession, and more recently compounded by the lack of information on the specific measures that would implement the significant changes in the structure and regulation of the Ugandan power sector that the Government has announced;
- Low rate of electricity access and rate of progress below expectations;
- The discontinuity between an almost purely urban concession that can be financially viable, and several almost purely rural concessions condemned to depend heavily on subsidies and with scant possibilities to raise private capital;

[20] The Electricity Connections Policy was passed in 2018 (see Annex B) to address this problem, by subsidizing the connection costs completely. Unfortunately, the GoU has run out of funds for this programme, thus not being able to reimburse the service providers, which stopped connecting customers under this scheme, resulting in its interruption.

[21] "A slum household is defined as a group of individuals living under the same roof lacking one or more of the following conditions: access to improved water, access to improved sanitation, sufficient living area, and durability of housing. The most recent global estimates suggest just under 1-in-3 people in urban areas in the world lived in slum households. (…) [In the latest data], most countries across Asia and Latin America had between 10 to 30% of urban populations living in slum households (some slightly higher). Slum households were most prevalent across Sub-Saharan Africa; most had more than half of urban populations living in slum households, and some (such as Sudan, South Sudan, and the Central African Republic) had more than 90%". In 2018 in Uganda, 48.3% of the urban population lived in slums. (Ritchie, H., Roser, M., 2018).

- The lack of adequate solutions for the provision of services – including electrification – to the slums around major cities. This problem is compounded by the urbanization trend, which is affecting Uganda with particular vigour;
- Lack of an integrated vision of electrification planning, which includes the lack of prioritisation regarding off-grid electrification;
- Flaws in the remuneration approach to publicly managed distribution assets;
- Inadequate level of monitoring and enforcement of reliability and quality of service targets, with an impact in the regulated distribution remuneration;
- The need to build capacity in energy technology, economics, and regulation in institutions and companies related to the power sector;
- The issues with the administrative partitions of the land and the overlapping responsibilities of UEDCL, REA and Umeme over service territories and roles, have resulted in institutional conflicts and inefficiency, but the incorporation of REA within the MEMD may have mitigated the problem. Hopefully the measures proposed in this report will clarify the situation entirely.

Off-grid solutions

Off-grid solar systems are a necessary mode of electrification in many rural areas, where the private sector can play a major role. Numerous private solar companies are active in Uganda and, according to the Uganda Solar Energy Association,[22] for the full year of 2018, a total of 313,424 off-grid solar products were sold, contributed a total of 8.18 MW of newly installed electricity capacity, leading to improved energy access for almost 1.3 million people throughout the country. However, the solar photovoltaic (PV) sector faces a number of challenges (MEMD-NES, 2020) such as: the current policy focuses more on on-grid electrification and, to date, does not include specific measures targeting the small-scale solar market; there is a lack of clarity and uncertainties of the fiscal policy; insufficient measures for consumer protection and awareness regarding quality issues of solar products and services;[23] a limited capacity of distribution of solar products and services to the last mile; a lack of access to finance by solar companies; and limited payment capacity of end-users and financing facilities in rural areas.

Some private companies and – formerly – REA, in association with development partners, are undertaking mini-grid projects – existing and under preparation – in many areas of Uganda where they can supply electricity at lower cost than the main grid. There are conflicting viewpoints on the potential of mini-grids in Uganda and a conclusive quantitative analysis is still missing (GIZ, 2020).

Summary

Summarizing section 2.1, it can be stated that, although the power sector reform in Uganda is well considered under the energy regulation perspective, several major areas of concern can still be highlighted:

i) Excess generation capacity with an impact on tariffs, which are among the highest in Sub-Saharan Africa;
ii) Diverse shortcomings in the structure and organisation of the distribution activity (that have been mentioned above);
iii) Low rate of electricity access and rate of progress below expectations;
iv) Lack of an integrated vision of electrification planning, which includes the lack of prioritisation regarding off-grid electrification;
v) And the uncertainty concerning the future of Umeme's concession, augmented by the lack of information on the implementation of the power sector unbundling approved by the GoU.

[22] https://www.useaug.org

[23] "The proliferation of poor-quality products across Uganda has now built up a significant level of customer defiance and mistrust towards this technology option." (Ricardo, 2019).

2.2. A WINDOW OF OPPORTUNITY

Uganda needs a reliable and affordable supply of electricity for every household, to support industries and all kinds of businesses throughout the country, and to enable economic growth and increase the well-being of the population. Ending energy poverty is a prerequisite to ending poverty. Uganda is ready to receive the support that it needs to achieve full electrification of the country by 2030.

Uganda has already the basic ingredients to achieve this goal. It has indeed an advanced regulatory system that is considered the best in Africa, and a competent energy regulatory agency. The country has a 'normal distribution company', Umeme, which is very much like any other distribution company in developed countries. This is unique in Sub-Saharan Africa in that Umeme collects the fees from all customers, has moderate losses, is economically viable without subsidies, is able to attract private capital, and provides reasonably reliable power to most of its customers.

Uganda also has the presence of numerous and experienced off-grid companies that can provide the large-scale deployment of mini-grids and standalone systems needed to attain full electrification. The country has good professionals that understand the power sector after 20 years of far-reaching reforms, successful for most of them. It also has a stable working relationship with a large number of very powerful and experienced development partners, who understand the country and are willing to support a convincing electrification plan. To finish, Uganda has a centralised system of political governance that can set a course and get things done.

What is needed is an approach to the electrification problem that is commensurate with the size of the problem, seizes the opportunity of the moment and acts with a sense of urgency and is technically, socio-economically, financially and politically sound. An approach that can attract the required level of investment is necessary, but this will not be possible while the uncertainties created by the lack of decision on the future of Umeme's concession and the announcement of the "rebundling of the power sector" without further information, are dispelled.

Thinking big

The electrification approach must be commensurate with the size of the problem that is being addressed. The objective is to provide reliable and affordable power in a sustainable way to every household, industry and business in Uganda by 2030 or earlier, and beyond. Uganda's population is growing at one of the fastest rates in the world, as indicated previously. For the country to benefit from this demographic transition – which could be mitigated by education, of the girls mainly – Ugandans must have the skills and good health to be productive and contribute to the country's economic transformation, where electricity access can play a major enabling role.

The overnight investment cost of a universal electrification programme by 2030 has been roughly estimated between USD 5.22 and USD 4.45 billion, according to the most recent electrification plans in the National Electrification Strategy (MEMD-NES, 2020) Draft Final Report, performed by the company Innovation Energie Développement (IED) for the World Bank and the MEMD.[24] This study performs its own Geographical Information System (GIS)-based plan with a modified previous REA plan, which only covered grid extension and it has been completed now with off-grid solutions. Both plans aim to achieve full electrification by 2030 and do not differ much in the proposed electrification modes and the costs to be incurred. Both rely heavily on electrification of a large fraction of the rural households with very basic and unexpensive solar systems (3 W) barely enough to charge a cell phone and supply one or two lights for a few hours. They also include the electrification of public infrastructures (278 in one case and 4,860 in the other; they seem too few for the estimated 22,787 villages to be electrified). More precise models, in particular for the identification of off-grid solutions that could compete favourably with grid extension, could be applied, but the results in MEMD-NES of 2020 may be good enough for the purpose of this report.

[24] Different versions of the report differ slightly in the global figures for the investment costs.

It is important to notice that this is a 'minimalist' electrification programme, since these two plans only provide an extremely basic electricity supply to 5.9 or 6.1 million households, respectively, and all these households are assumed to have a minimum affordability level. It looks more like ticking a box than real electrification. It is acknowledged in the NES draft report that the grid will have to be extended – or mini-grids will have to be built – after 2030 to electrify many of these households at a substantially higher capacity level. Simply replacing the basic 3 W solar systems by 10 W ones with more storage capacity, would allow the use of more lights for longer time and a radio, obviously increasing the overnight investment cost.[25] Given the low level of affordability of the population, basic solar kits can be justified if extra effort is placed on productive uses. However, as indicated before, the number of public infrastructures to be electrified in both plans appears to be quite small. Note that the purchase of bulk power for grid connected customers, plus the costs of operating and maintaining the main grid and the mini-grids and providing customer service to the standalone systems will add a significant amount of OPEX to the purely investment costs provided by the plans.

It will be challenging to attract the volume of investment that will be necessary during the 2021-2030 decade – to be paid for during the long economic lifetime of most of the assets – and to secure the guarantees that the investors will seek. This will necessitate a convincing business plan with a detailed financial analysis (see Section 4.3).

A review of the most recent domestic programmes and initiatives by DPs that have targeted electrification shows that the level of funding is way below what is necessary to comply with any of the national plans that have been proposed to meet the universal-access-by-2030 component of the SDG 7 . The current programmes funded by the DPs are piecemeal and of medium size – about one order of magnitude below what is necessary to meet the SDG 7, and they seem to lack a comprehensive long-term vision of the power sector and the electricity access problem.[26]

Evidently, all the DPs' initiatives are positive and welcome, but the existing or planned ones are inadequate – in terms of volume of funding and coordination level – for the challenge of achieving universal access in the next decade or earlier. Achieving this goal needs to join forces to reach the necessary funding level around a comprehensive plan that makes financial, regulatory and technical sense.

A sense of urgency

Multiple reasons suggest that now is the right moment for some important decisions in the Ugandan power sector. First, the GoU has established the extension of reliable electricity supply as a major priority for industrialisation and economic growth in the country, taking advantage of the estimated generation surplus during the next few years. Second, a declaration of the GoU about the future of the Umeme concession is pending and should not wait more. Third, international plans for post COVID-19 economic recovery will facilitate access to significant funding and Uganda ought to present a better plan including universal access to electricity by all households, industries, and businesses.[27] All major Development Finance Institutions (DFIs) are mobilised and looking for sound economic recovery projects to be financed. New initiatives have been created for this purpose.[28]

As indicated in the previous section, Uganda has every reason to be a beneficiary of these programmes. It could indeed offer a comprehensive electrification project, oriented towards achieving economic re-

[25] Note that in the results presented in the draft National Electrification Strategy, the overnight investment cost incurred in basic solar kits for 5.9 million households (58%) out of 10.1 million household are only USD 413 million (8%) out of a total of 5.22 billion. Adding energy and AO&M costs would augment the difference even more. Other studies, like (SE4All, 2019c), adopt SHS with more capacity and account for diverse household availability levels, resulting in larger financial requirements, like USD 1.5 billion of investment costs for 5.2 million customers supplied with standalone solar systems, see annexes E and G (NES draft report).

[26] See: MOFPED, 2020, SE4All and CPI, 2019a, and SE4All, 2019c, as well as Annex E (financing electrification).

[27] An estimated USD 2.5 trillion COVID-19 rescue package – including a USD1 trillion investment injection – is urgently needed for the world's emerging economies. See UN (2020), $2.5 trillion COVID-19 rescue package needed for world's emerging economies. https://news.un.org/en/story/2020/03/1060612

[28] For instance, the Africa Europe Foundation has created a high-level Africa Europe Energy Strategy Group to support innovative proposals to turn them into action. See https://www.friendsofeurope.org/initiatives/africa-europe-foundation/

covery and growth, based on a robust business and regulatory model rooted in a sound techno-economic electrification plan that establishes targets and milestones, founded on a consensus of the main stakeholders on the path to follow, and supported by a viable business plan.

The central role of the power sector in economic recovery and growth

The COVID-19 crisis has underlined the importance of a reliable, affordable and secure electricity supply.[29] The recovery from the crisis in emerging economies should be cantered on advancing inclusive, climate-friendly energy infrastructure. In this context, the electricity sector will play a key role in supporting economic recovery, and an increasingly important long-term role in unlocking economic opportunities, local jobs and welfare in currently underserved areas.

As governments and other institutions plan trillions of dollars of stimulus funding, investing in energy access in developing countries must be a priority in international and national efforts to 'build back better' and in ways that are guided by sustainable development and climate objectives.

The global and national recovery packages that governments and international institutions are currently developing have a scale that will shape infrastructure and industries for decades to come, aiming for long-term growth and sustainable development.

The volume of total expenditure (CAPEX and OPEX) required to achieve universal electrification in Uganda will probably exceed six billion of dollars. This demands substantial participation by the private sector, supported by public investment and by guarantees from governments and DFIs, as well as by suitable policies and regulations and innovative business models that can support both centralised and distributed solutions.

Governments must make important investment decisions in a short period of time. According to the IEA's 2020 World Energy Outlook Special Report, "these decisions will shape economic and energy infrastructure for decades to come and will almost certainly determine whether the world has a chance of meeting its long-term energy and climate goals"' (IEA, 2020a), Sustainable Energy for All emphasises that governments have a "unique, once-in-a-generation opportunity to reset their economies and address the underlying structures that enable development and competitiveness" (SEforAll, 2020).

Access to electricity is a necessary – even if not sufficient – factor for inclusive economic development (Eberhard, A. and Dyson, G., 2020). Reliable and affordable power from the main grid or from off-grid solutions enables delivery of critical public services in cities, towns, and villages. It also improves the competitiveness and profitability of millions of commercial and industrial customers who are presently relying on expensive fuel-based generators. Economic recovery and growth to close the gap between emerging and advanced economies can only happen with affordable and reliable power for all.

COVID-19 forces us to think hard and adjust the ambition and focus of current electrification strategies. As governments in emerging economies face significant fiscal constraints, it is important for recovery stimulus to be directed at sectors that yield significant socio-economic dividends. Now and in the post-COVID-19 world, universal electricity access must be recast as a necessary pillar of an inclusive economic recovery. Moving forward, it must remain a key contributor to delivering resilient services in healthcare, water and education, and, when approached correctly, a step in the path towards a clean and decarbonised economy.[30]

Access to affordable, reliable and sufficient electricity catalyses local economies, creates jobs and improves access to public services, especially in rural areas. Evaluations of DFI electricity investments in developing countries have shown a significant impact on the Gross Domestic Product (GDP). The effect is especially large in low-income countries with small power sectors (CDC Group, 2020).

[29] In the words of the IEA, electricity "has enabled hospitals to provide care, food to be delivered, and allowed millions of people to work remotely and be home-schooled. It has also underpinned digital connections with family and friends. Where access to reliable electricity remains a challenge, the impact of this on health services, economic activity and the wellbeing of households during the crisis has served to underline the urgency of achieving universal access to energy." (IEA, 2020b).

[30] "A technologically advanced, sustainable, and resilient infrastructure can pave the way for an inclusive post-COVID economic recovery." "Low and middle-income countries could see $4 return for every $1 spent on building infrastructure that focuses on long-term resilience" (see WEF, 2020).

Investments in the electricity sector generate new jobs due to construction and operations. However, the greatest effect is seen through increased economic activities (CDC Group, 2020). There is also growing evidence of the socio-economic impacts of off-grid solutions such as SHS. In East Africa, one-third of the solar home systems purchased are used to extend the working day or boost enterprise activities. These purchases result in increased earnings by an average of USD 46 per month, equivalent to a 14 % increase on average income in the region (GOGLA, 2020).

Universal electricity access is a catalyst for inclusive development. The COVID-19 crisis has demonstrated the importance of linking electricity supply with end-uses to maximise socio-economic benefits. Delivery of public services such as healthcare, education and water is improved substantially with access to reliable and sufficient electricity, thus contributing to multiple SDGs. Productive use of energy is also crucial to maximise the impacts of electrification on people's livelihoods. Focusing on rural enterprise development, job creation, gender-sensitive programming, and demand stimulation supports inclusive economic growth. Such focus also improves the viability of electricity service delivery in rural areas.[31]

[31] In Ethiopia, linking agriculture and rural electrification could unlock $4 billion in benefits to smallholder farmers from improvements in agricultural productivity and processing. Further, communities could save another $120 million in fuel costs and improve the utility's annual revenue stream by $22 million. See Borgstein, E., Wade, K., and Mekonnen, D., 2020.

3. PRINCIPLES AND THEIR IMPLICATIONS

This chapter provides the conceptual basis for the report. The first part presents the basic principles that electrification projects must follow and the implications in the implementation of these principles. The second part reviews a selected number of topics with considerable strategic importance in the design of the proposal for distribution reform and the future of Umeme's concession that will be presented in the following chapter.

3.1. THE PRINCIPLES FOR SUCCESSFUL ELECTRIFICATION[32]

Description of the four principles

Any sound approach to electrification at a large scale must adhere to four basic principles: universal access to electricity, a combination of the three modes of electrification, financial viability of the business model, and a focus on the development of the electrified communities. These lead to different implementations, depending on the context in each country.

First. A commitment to universal access that leaves no one behind. This requires permanence of supply and the existence of a utility-like entity with ultimate responsibility for providing access in a defined territory.

Second. Efficient and coordinated integration of on- and off-grid solutions (i.e. grid extensions, mini-grids and stand-alone systems). This requires integrated planning and appropriate business models for all types of consumers in the defined service territory.

Third. A financially viable business model for distribution. This will typically require some form of distribution concession to provide legal security and ensure the participation of external and mostly private investors, as well as subsidies for viability gap funding.

Fourth. A focus on development to ensure that electrification produces broad socio-economic benefits. This principle links expanded access to the delivery of critical public services (e.g. health and education) and to multiple economically beneficial end-uses.

To reach universal access efficiently, faster, and in a way that maximises the social impact of electrification, a strict adherence to all four of these fundamental principles is crucial. All of the principles matter and they work collectively to accomplish the objective. Principles may be partially implemented along the way, but ultimately all must be present. They look deceptively simple, but they are not. Their power lies in bringing them to bear *collectively* and *rigorously* to achieve a durable transformation of the entire distribution sector.

The implications of the principles

The implications of these four principles can be examined now at a first level of depth.

The principle of **universal access** requires that some entity, or combination of entities, make sure that all customers in a considered territory will be supplied with at least a minimum level of service and reliability through an appropriate mix of on- and off-grid solutions. Some entity must accept the role of default supplier (that is, being responsible for ensuring that nobody is left without service) and supplier of last-resort (being responsible for providing service in the event some previously existing supplier fails to do so). This responsible entity does not necessarily have exclusivity of supply in the considered territory.

It is important to note that permanence of supply and compatibility with a sound long-term vision of the power sector are additional requirements that follow from a commitment to universality. Unfortunately, both are frequently ignored in electrification initiatives that focus solely on meeting

[32] This section closely follows the reference (Pérez-Arriaga et al. 2020) where the principles and implications of the Integrated Distribution Framework (IDF) approach to electrification processes are presented in detail.

short-term access targets while ignoring the regulatory and business model aspects of programme design that are needed to guarantee continuous service far into the future. Too often, this results in electrification projects becoming inactive after a few years because of the absence of proper maintenance, funding, or management, or when demand grows and equipment needs to be repaired, replaced, or upgraded.

In practical terms, guaranteeing the universality conditions laid out above will require strong instruments, such as long-term concessions, to attract the private and public capital needed for universal access. This is clearly needed to guarantee electricity access to disperse populations with low demand, low income, and in semi-isolated communities, both socially and geographically. Under these conditions, grid extension will probably be very costly, and mini-grids or standalone systems would be the least cost option, but still expensive. Given the low affordability of the households in these communities, the provision of electricity under market conditions would not be economically viable, and many of these customers would never be supplied without some external support.

Universal access for these populations anywhere would only be possible if some kind of long-term agreement – a concession – can be established via a tender or direct negotiation between the government and off-grid companies to take the role of default and last resort provider in underserved areas. The company or companies would commit to supply some prescribed level of electricity access to all customers, with the costumers only paying a reduced (subsidised) tariff that they could afford, and the difference (the viability gap) to complete the total cost of service (including a reasonably attractive return on investment) being paid to the solar companies by some official institution**.** The same company or companies must also accept the role of last resort provider in the assigned area(s) and be paid the corresponding cost for this service. Other solar companies may be present in the same territory. More complex situations can exist, whereby grid extension can be also an option, but in all cases the existence of an entity responsible for default and last resort provision is key to maintain the principle of universality of service.

The principle of **coexistence of on- and off-grid solutions** requires the development of a least-cost, integrated electrification plan that includes all electrification modes. Such a plan should provide (i) a roadmap for investment and project implementation that meets electrification targets at least cost, subject to the availability of funds and in accordance with political, social, development, or environmental priorities and (ii) estimates of the cost of supply, which are needed to calculate regulated tariffs and assess the need for subsidies.

A sufficiently detailed plan can provide the bill of materials and the associated cost of the investments to be made every year, as well as the costs of managing, operating, and maintaining them. It will also contain the information needed to develop a business plan and identify financing needs, including estimates of demand and revenue based on the tariffs applicable to each type of customer.

Turning a geospatial plan into reality requires addressing additional challenges with respect to the design of mode-specific regulations for remuneration, the management of interfaces between modes, provisions for default and last-resort service, and the dynamic integration of different supply modes with changing demand over time.

The principle of **financial viability** is a requirement to attract private partners who can mobilise investment capital, advanced technologies, and technical and managerial expertise. Financial viability requires that the regulated revenue requirement of the distribution activity must be cost reflective. The distribution network activity must be remunerated using some version of the cost-of service method, with some performance-based incentives. Deviating from this basic regulatory approach increases the cost of capital, deters investment, and compromises service reliability and quality of service. This remuneration method must be applied to the three modes of electrification.

Financial viability also requires a stable and predictable regulatory environment. A distribution company or concessionaire is dependent on the legal security in the country of operation, particularly if it works under an explicit mandate for electrification and relies on subsidy support for the viability of its business model. Governments, supported by DFIs, must provide the necessary backstops in the form of guarantees (e.g., payment security mechanisms, political risk guarantees, etc.).

A long-term, investment-worthy concession can generally be an adequate instrument for delivering permanent, sufficient, reliable, affordable and universal access to electricity in a given area, provided its design is guided by a robust electrification plan and adequate public support to ensure cost-of-service recovery for all three electrification modes.

Finally, the fourth principle demands that the electrification process must **focus on delivering socio-economic benefits.** The goal of universal access goes well beyond just connecting customers. A top-down approach has to be complemented by the bottom-up participation of electricity end-users. Entities such as non-governmental organisations (NGOs), foundations, and cross-sector agencies have important roles to play. No electrification scheme will work if the end-customers do not receive quality services and are not properly metered and billed. Beyond connection, productive and consumptive end-uses also need to be supported in ways that comport with community desires and priorities.

Stronger links between electricity supply and productive uses of electricity would also strengthen the financial viability of business models for expanding access (EEP, 2019 and World Bank, 2019b). It is now well-known that access to modern energy, by itself, does not necessarily unlock the full potential of productive end-uses in rural and underserved communities (IIED, 2019 and IEA, World Bank, IRENA, UNSD, WHO, 2019). Rather, access must be complemented by targeted efforts to facilitate the purchase of efficient appliances, consumer and enterprise financing, access to markets, capacity building, and data and information (IIED and Hivos, 2019). More attention is also needed to achieving gender equitable outcomes when promoting productive end-uses (ENERGIA, 2019).

Implementation considerations

Given the magnitude of the challenge of achieving full electrification in a country, and based on numerous experiences, it can be concluded that success is not possible without a visionary leadership and a strong political commitment. This commitment must be further backed by key development partners and embedded in a lead ministry or public agency – the local champion – that can guide the efforts of the many stakeholders and participants who will be involved.

The four principles that have been presented here must be used as a flexible set of guiding principles that have to be tailored to the specific conditions of particular countries.

They are not a theoretical construct, but the basis for a practical methodology which – in general terms – must consist of the following key steps: developing an integrated electrification plan, preparing a viable business plan, identifying the most appropriate partnership model between various agents, defining concession agreements and awarding the concessions through auctions or direct allocation, and focusing on electricity as enabler of socio-economic growth.

3.2. STRATEGIC CONSIDERATIONS

This report has already examined the context of the country and of the power sector (section 2.1), it has highlighted the opportunity and the dimension of the problem (section 2.2), and it has formulated the principles – more or less obvious and easy to accept but hard to implement – that must guide the search for solutions for the distribution subsector and electricity access in particular (section 3.1). Before presenting a proposal on these matters (in Chapter 4), this section discusses some aspects to be considered when designing a strategy to improve the distribution subsector and to accelerate electricity access in Uganda. These aspects have been grouped into eight categories.

‘Reverse engineering’: start from a clear formulation of the objective

The objective of this report is to design a structure, a business and regulatory model, and a financing approach of the distribution subsector in the mid and long-term – including a suitable solution to the future of Umeme’s current concession – that will allow achieving a reliable, affordable, and sustainable supply of electricity for all households, industries and businesses in Uganda in a reasonable timeframe, with the ultimate goal of increasing the well-being of the population and enabling economic growth.

The approach that is used in this report to obtain this design somehow consists of a free interpretation of the method of 'reverse engineering'.[33] It is assumed that the objective will be achieved in 2030, and then it has to be figured out what has to be done to get there. The method also helps to identify initiatives that are presently being done or planned that cannot succeed in meeting the objective.

When the 'reverse engineering' perspective is adopted, it becomes apparent that a dramatic change will be needed from the current piecemeal approach to expanding energy access in most developing countries – Uganda included – which has often suffered from the lack of an ambitious and comprehensive overarching vision and strategy. Perhaps more problematic has been the tendency of energy access policy to be driven by the availability of specific concessional financing instruments in search of medium-sized investment problems to be addressed.[34]. As it was indicated before, both the GoU and the DPs, joined by private financing, need to increase their level of effort by about one order of magnitude to achieve the desired results.

Uganda's strengths as a foundation for the proposal

The proposal for reform of the distribution sector and to achieve universal access in Uganda must make good use of the strengths that were described in section 2.2 of this report: advanced regulation, a competent and economically viable distribution company, the presence of several sound mini-grid developers and many companies of standalone solar systems, good energy professionals, the support of a large ensemble of development partners, and a strong political governance.

Some relevant weaknesses cannot be ignored: low level of electrification, many 'below the level of poverty' households, the disconnect between Umeme's concession and rural electrification, the dispersion of the initiatives of the development partners, end-customer tariffs that are comparatively high with respect to other countries in the region, weak small concessionaires in rural areas, a temporary surplus of generation capacity, and uncertainty regarding the future of Umeme's concession and the implementation of the "rebundling of the power sector", which includes the definition of the functions and legal status of the several organizations involved in the process.

The small service providers and the need for a more centralised approach

Until now, rural electrification has been mostly in the hands of REA – presently a department within the MEMD – and the small service providers formerly with REA's support. This arrangement was not working adequately and must be reconsidered. A detailed review of the small service providers in Uganda – both on- and off-grid – performed by Ricardo Energy & Environment (Ricardo, 2019), found that their performance was inadequate, both from a technical and financial viewpoint. They are financially unsustainable in their current form and do not seem to have the capacity to fulfil their operational mandate in line with the terms of their license. Significant diseconomies of scale translate into the poor level of performance. Although not sufficiently emphasised in (Ricardo, 2019), the low level of income of rural populations, with low and frequently disperse demand, results in high distribution costs, which make economic viability impossible without sustained subsidies.

It was also found that the capacity of the former REA to procure and commission new distribution assets efficiently had capacity gaps in several areas including in key technical, project management, construction management, financial management and planning.

According to the 2020 draft NES, achieving GoU's policy target of 100 % electricity access by 2030 (including approximately 50 % from the main grid) would require connecting approximately 6.1 million new customers between 2019 and 2030 and about USD 5 billion of investment in distribution network expansion and new on-grid and off-grid connections. It seems unlikely that the current services providers (SPs) will have the capacity to meet the Government's objectives. The pace of electrification achieved in the past by REA and the small service providers will soon be offset by population growth

[33] Reverse engineering is "to disassemble and examine or analyse in detail (a product or device) to discover the concepts involved in its manufacture, usually in order to produce something similar", https://www.merriam-webster.com/dictionary/reverse%20engineer

[34] See SEforAll and CPI, 2019a; IEA et al., 2019; MEMD, 2020; Umeme annual reports; Elahi, R.-EASP WB, 2019; EU External Investment Plan; as compared with the actual needs in MEMD-NES, 2022.

Note that UMEME has connected around 100,000 customers in rural areas, mostly by densification. In comparison, the projects focused exclusively on rural electrification have achieved less than 40,000 connections altogether (Ricardo, 2019).

It seems reasonable to look for a more centralised approach and a stronger agent. According to (Ricardo, 2019) and the opinion elicited by the author from the DPs (2020), the optimal solution from an economic and a national budget perspective is keeping only one service provider for the whole country. This would limit the need for subsidies, and the resources available could be focused on improving the quality of service and electrifying the country. Adding additional distribution concessions would be less cost-effective and would make sector management more complex.

But the question is the following: Who could be an adequate candidate? It seems obvious to link the search for a solution to the expiration of Umeme's license in March 2025 with finding the entity that would be in charge of carrying out the massive rural electrification effort proposed by the NES.

Letting Umeme be also in charge of rural electrification by grid extension appears to be an obvious solution to be considered. However, major challenges are foreseen, as will be discussed next.

Umeme's concession: If it ain't broke

The old saying goes: 'If it ain't broke, don't fix it.' But do not be complacent about it either.

Uganda has a valuable asset that should be preserved: a distribution company, Umeme, whose performance is very much like the one of hundreds or thousands of distribution companies throughout the world – most of them in developed countries – but that is almost unique in Sub-Saharan Africa. Umeme is a profitable privately-owned company, with the government as a key shareholder, that does not require explicit subsidies, operates under a standard cost-of-service regulation, provides a service with a reasonable level of quality and reliability, and the billing and revenue collection are close to 100 %, with tariffs to end customers that are cost reflective. Under the present concession agreement, Umeme has improved considerably the performance of the electrical supply in the concession territory – the 'Umeme footprint' – see section 2.1 and Annex D for details. Black spots remain, like the lack of utility-provided electricity access in the slums around Kampala and probably other major cities; a tough problem that requires the cooperation of other organizations besides Umeme (see Annex I).

Umeme's success can be credited to the efficient management of the company and to a regulation that incentivises good behaviour, but also to the fact that the regulated remuneration that was established in the concession agreement has been sufficient to cover the investment, administrative, operation, and maintenance costs that have been necessary to achieve this good performance.

As the government decides on the future of the distribution sector in Uganda, the following advances made so far must be preserved and leveraged upon: i) the participation of the private sector in distribution, which is capable of attracting investments,[35] open to modifications in the composition of its shareholders, and with the intent to build long-term value within the country; ii) a carefully designed concession agreement that has been tested for more than 15 years so that the items to be adjusted have been identified perfectly; and iii) a competent management and capacity within the distribution company, Umeme, which has brought standard sound international practices in well-functioning distribution utilities to Uganda.

A complex tendering and negotiation process could bring a new concessionaire – which could be named NewCo – under an improved concession contract, so that points (i) and (ii) above could be kept, but there is no guarantee that (iii) will be maintained. Thus, this report strongly recommends the GoU to negotiate directly with Umeme – an entity identified as a result of a competitive process concluded in 2005 – to reach an agreement over an improved concession contract that aligns with the Government's long-term objectives, also preserving the three points laid out above, leading to a renewal of the present concession with the same legal company (Umeme) but introducing amendments and new clauses in the concession contract. Given the very important changes in the definition of the concession – as proposed in this report – and the potential increased presence of public ownership in the company, the

[35] See Annex D for the performance of Umeme in this regard during the 17 years of the concession so far.

new concessionaire company could be renamed NewCo – or some other name, but we shall use NewCo hereafter.

There are some issues of concern with Umeme, to be considered in the eventual negotiation process leading to the new concession contract. For instance, further improvements of the reliability and quality of supply in some areas and a continuation in the reduction of technical losses are routine aspects that could be fixed by adjusting the targets – or adding new ones – as well as the associated incentives in the conditions that would be established in an eventual new concession. Enforcement of the compliance with pre-established network investment programmes could be another issue to be debated, as well as expedient authorisation of critical investments with reliability or quality of service implications. Other topics on which an agreement might be needed are further efforts in metering, digitalisation or the incorporation of distributed energy resources – demand response, rooftop solar or batteries. Commitments in relation to the provision to electricity to informal settlements, like the slums around Kampala, should be also included in the deal.

Some of these concerns are moderately easy to solve. But two major issues require a major change in the conditions of the present concession. The first one is the modification of the ROI in the present concession agreement. The present value of 20 % is considered excessive now by both parties – the GoU and also Umeme – although (as it was indicated earlier) it was probably a reasonable value in 2005 when the concession was signed – given the existing uncertainty at that time about this type of business model. A new value of the ROI should emerge, based on objective procedures and negotiation.

The change in the value of the ROI may have other implications. Should Umeme's concession not be renewed, the GoU would have to compensate Umeme with the residual value of the assets invested by Umeme during the duration of the concession – the buyout. If the concession is renewed, there is no need for the GoU to pay the buyout, since these assets will continue being remunerated to NewCo until the end of their economic lives. The possible concern here is the change on the ROI. This should not be a problem, since the commitment of the GoU regarding these assets was to pay the current ROI only until the end of the concession. The residual value of the assets will continue to be remunerated under the renewed concession, but under the new terms and ROI that will be agreed.

The second issue is much harder to solve and will require some creativity. The rate of rural electrification in Uganda is very low – lower than the average in Sub-Saharan Africa – and Umeme's contribution to rural electrification is way below what would be necessary to meet the 2030 universal access objective of SDG 7. This has an obvious explanation: The concession agreement does not require Umeme to engage in rural electrification; it gives Umeme an exclusive right to supply electricity in an area up to one-kilometre radial distance from the existing distribution lines – with other service providers being free to compete to supply electricity beyond this area – and an obligation to provide service within the area of exclusivity.

Planning and developing the distribution network beyond 'Umeme's footprint' has been REA's responsibility until recently. Generally, REA used to pass the resulting developed network onto any of the small service providers to be operated and maintained and also sometimes to Umeme. These arrangements created confusion to both customers and suppliers regarding responsibility and accountability for the distribution network. This report proposes a better way to address grid extension in the rural areas beyond Umeme's footprint, involving NewCo.

However, even if NewCo were authorised to extend the grid into rural areas under the new concession contract, the company would be reluctant to do so since rural electrification is significantly more expensive than electrification inside Umeme's present footprint. Therefore, unless the current tariffs were increased considerably, the new business model would have to include subsidies from the GoU, something that would increase the financial risk of NewCo significantly and that the shareholders of that company probably would not be willing to accept. Similarly, NewCo would probably not be interested in providing electricity access with mini-grids or standalone systems – a least cost solution for some rural

communities – since it lacks the required expertise[36] and would need subsidies to close the 'viability gap' between the actual cost of providing the service and the tariffs that the customers of these villages can afford (or the regulated tariffs that apply to grid-connected customers).

This seems to pose an unsolvable dilemma for the GoU. On the one hand, it is desirable to retain in the future NewCo the managerial expertise of Umeme and its capacity to attract private investment. On the other hand, it does not seem possible to engage NewCo in rural electrification (and, for that matter, any other private operator). The approach used by REA in the past was too slow and was criticised by most stakeholders as inefficient and lacking a consistent pattern. The GoU must find a solution to respond to the mounting pressure from the increasing number of Ugandans without electricity and the international commitments under the SDG.

The end of the concession is only a few years away (March 2025) and both parties – Umeme and the GoU – want any extension or cancellation to be decided well in advance. The present level of uncertainty is not good for any of the parties. The GoU will need time to find an acceptable alternative to a solution in the line of NewCo in case an agreement to sign a revised concession contract is not reached. Umeme will be increasingly reluctant to make any urgently needed investments if the time left to obtain a ROI is too short and, moreover, if there is any risk that the residual value of any new investment may increase the volume of the buyout, which the GoU might not be able to pay in full and on time. The development partners have also expressed their concerns about making concessional funds available without a clear definition of the future distribution business model. Uncertainty is the major deterrent of investment.

Should the GoU and Umeme be able to reach an agreement soon, an additional advantage could be the immediate adoption of some measures as part of the deal. These measures could be beneficial both for the GoU – on behalf of the present and future supplied customers – and for Umeme.[37]

It should be noted that the fraction of private versus public ownership of the concessionaire is not the issue of concern here. The proposal to be presented is a new concession, not a privatisation. The owner of all the distribution assets belonging to the main network is the publicly owned distribution company UEDCL, and in the future will be UEC. The GoU, via the National Social Security Fund, is presently Umeme's largest shareholder (24%). From Umeme, no objection seems to exist for this public participation to increase if this is what the GoU wants, at any given time.

The challenge, therefore, is to design a business model for the new concession that is attractive for Umeme's shareholders and also (i) maintains and improves the current performance of Umeme within its present footprint; and (ii) directs the efforts of the new concessionaire NewCo towards rural electrification with the objective of achieving full electrification by 2030, as established in the National Electrification Strategy. Chapter 4 of this report proposes an institutional, regulatory and business model that meets these requirements.

The techno-economic plan and the business plan

Numerous plans have been developed in Uganda that include the power sector. Following them has proven to be challenging for the most part (see Annex G). Some plans concern several industrial sectors, others the entire power sector, and a few plans focus on specific subsectors of the power sector, such as generation or transmission, while others limit their scope to electrification. The current official electrification plan is the last version of the Rural Electrification Strategy and Plan (RESP), developed by the National Rural Electric Cooperative Association (NRECA) for REA. This effort resulted in a Master Plan for each one of the 13 service territories for the period 2018-2027 (NRECA International, 2019).

The most recent attempt to offer an updated electrification project is the NES draft report (MEMD-NES, 2022). The NES draft report actually offers two plans for consideration. Both make use of geospatial

[36] Umeme participates in a programme of Power for All named Utility 2.0, in a consortium with several off-grid solar companies and funded by the Rockefeller Foundation, whose purpose is to explore and to get acquainted with the interplays among the three electrification modes and the efficient and productive uses of electricity access, see https://www.powerforall.org/resources/reports/utilities-20-integrated-energy-optimal-impact

[37] A case example could be the approval by ERA of a bundle of new network investments that Umeme considers to be of reliability importance and within Umeme's footprint at a negotiated ROI lower than 20% but still attractive to Umeme's shareholders.

software tools. One of them has been built by IED, the consultancy company that is developing the NES. The second one has been completed by IED, taking as starting point the grid extension plan previously made by NRECA. See Annex G for a more detailed description.

Both plans are techno-economic ones i.e., they are the result of searching out of all the many possible electrification plans, to find the one that meets all the technical requirements – supply every individual demand, adequate capacity of the network, voltages within tolerable limits, etc. – at minimum cost. For the purpose of this report, the results of any of these two plans can be accepted as basis for discussion.[38]

A techno-economic plan provides a large amount of useful information: the electrification mode for each individual demand; the estimated consumption of electricity and expected hours of supply; the bill of materials to expand the network, develop mini-grids, and deploy standalone systems; and the total cost of the programme (both CAPEX and OPEX) as well as any kind of cost breakdowns by mode of electrification, CAPEX and OPEX, for each year of the electrification programme.

However, a techno-economic plan does not provide information on how an electrification programme can be financed. Money has to be borrowed to perform the necessary investments and needs to be returned according to the lending conditions. Equity has to be remunerated to make the shareholders happy with their investments. Administration, operation and maintenance costs have to be paid as soon as the assets start to be utilised. Revenues are collected from end-user tariffs, but regulated tariffs are usually designed to recover the investment costs over the entire economic life of the investments, a much longer period of time than what the lenders are willing to wait to get their money back. Regulated tariffs are typically subsidised and therefore, they cannot recover the supply costs fully and subsidies are needed. The electrification plan is dynamic, and it needs to account for demand growth, transfers between electrification modes, tariff evolution and customer affordability, as the economy grows.

A business plan – a detailed financial model of the entire electrification project – is necessary to account for all these factors so that all the stakeholders that are involved in the electrification project feel comfortable with it. So far, none of the proposed electrification strategies has presented a comprehensive business plan. However, without it, the GoU will not be able to bring the support of the DPs for the electrification plan proposed by NES, or any other, nor to convince NewCo or other private operators to participate in it. Without the business plan the GoU itself will not know if they can take the responsibility of launching such a plan.

In fact, the GoU, backed up by any guarantees that the DPs could supply, will be responsible for the provision of the subsidies that will be necessary to complement the revenues obtained from the customers' tariffs and it will have to borrow money. Limits to sovereign debt may eventually condition the implementation of the reform plan. And this can only be ascertained with a business plan with the features that have been formulated here. The current RESP (NRECA International, 2019) contains an incomplete financial evaluation (see comments in Annex G). The same can be said about the financial analysis in the NES, as explained in Chapter 5. The development of a viable business plan associated to the currently accepted electrification techno-economic plan is absolutely necessary to verify the financial viability of the techno-economic plan, if the objective of distribution reform and full electrification by 2030 is taken seriously. Chapter 5 of this report presents such a business plan for the NES.

Political economy: being aware of the existing concerns and red lines

Some regulatory or business organisation measures can make technical and economic sense, but they might not be well aligned with prevalent political priorities. They may also encounter strong opposition from the general population in the country or some specific instances. There are some red lines that should not be crossed. An attempt is made here to identify some of them and, in some cases, to suggest how they can be addressed. This is not an exhaustive list: there are probably other red lines and concerns that might have been omitted here.

[38] Better geospatial techniques than the ones used in the two aforementioned models are available, see https://universalaccess.mit.edu/#/main. These more advanced models work at individual demand level and therefore can distinguish more precisely the need for off-grid solutions, i.e., mini-grids and standalone systems.

Alignment with prevalent political priorities.

The energy sector has been a constant priority of the GoU, and, in particular, the provision of a reliable and affordable power supply for industrialisation and economic growth in the country – taking advantage of the estimated generation surplus during the next few years.

It has been shown that access to affordable, reliable and sufficient electricity catalyses local economies, creates jobs and improves access to public services, especially in rural areas. The greatest effect is seen through increased economic activities (Redqueen, 2016). Demand growth could help in reducing the current generation surplus, subsequently lowering the price of electricity and making the domestic industry more competitive. There is also growing evidence for the socio-economic impacts of off-grid solutions such as SHSs. The estimated vigorous demography growth in Uganda can be a source of wealth for the country if the new generations can be properly educated and driven to contribute to economic prosperity, but the opposite may happen if those people are not given the opportunity.

A solid business and regulatory case for an ambitious electrification project has to be prepared, with a large consensus of all relevant stakeholders. It has then to be presented, showing how it is well aligned with the priorities established by the Presidency of the country.

The level of the end customer tariffs.

A major concern of the GoU is to achieve low electricity tariffs that could help domestic industry and businesses to be more competitive and attract foreign investment, as electricity is a significant input factor in many industrial processes. As shown in Annex C, electricity tariffs for all kinds of customers in Uganda are well above the average value of the tariffs in other countries of the region. High tariffs for some industrial and business customers may hinder competitiveness and discourage investment. High tariffs for domestic customers deter access and have a political cost.

The design of the distribution reform and the future of Umeme's concession must therefore account for their impact on the electricity tariffs for the end customers. The business model must be able to attract enough concessional funding and to be perceived with low risk for private investors and commercial banks so that the cost of capital for the large investments that have to be made will be reduced as much as possible.

Furthermore, there is a red line in financing that cannot be crossed: the limit to sovereign debt.

Sovereign debt

The situation of the sovereign debt of Uganda and the priorities of the GoU with respect to borrowing for other investments in health, education, transport infrastructures or other needs, may create another red line that an electrification plan cannot cross.

Even if private entities do much of the necessary investment, the GoU will probably have to guarantee a large part of this investment explicitly or implicitly. While private sector debt may indeed help reduce the financial burden on the public sector, DFIs have become increasingly wary of these arrangements, and they may want to make sure that any off-Balance Sheet financing options are correctly accounted for at the State level.[39]

This may determine the pace of lending to Uganda by DFIs (so that Uganda can absorb the debt) and, therefore, the pace of electrification. It will then be necessary to find how this pace can be accelerated, and this can only be done with a quantitative business plan that the financial team can use to explore and select the best strategy.

Priorities and concerns of the development partners

The DPs are expected to play a key role in any major electrification programme in Uganda, and their opinions must be carefully considered. In a recent document (Development Partners, 2020), the DPs

[39] These are useful references on the topic of sovereign debt and contingent liabilities: Polackova, 1999 and Thobani, 1999. See also https://www.elibrary.imf.org/view/IMF069/20662-9781484366622/20662-9781484366622/ch09.xml?language=en&redirect=true&redirect=true

have presented their viewpoints on the process of reform in the power sector and the access to electricity in particular. In relation with the subject matter of this report, the DPs have highlighted the importance of the topic and have offered their opinion on the following points:

a) The risks involved in the transition that will happen, when Umeme's concession expires, should be limited. In this regard, it must be taken into account that Umeme has been successful in reaching the operational targets that have been set (improve reliability, reduce losses and increase access). Direct negotiation with Umeme, however, would not be in line with the pro-tendering position of some of the DPs. However, this case seems to have some exceptional features;
b) The DPs also have noticed that the Ricardo report stated that the optimal solution from an GoU economic and budget perspective is keeping only one service provider for the whole country. It is costly to maintain the present status, since significant cash injections are needed annually to ensure the sustainability of each small service provider;
c) Some stakeholders may want to see more public sector involvement in the distribution sector. This is possible, since it is possible for the GoU to take a significant shareholding in the upcoming concession company;
d) From the point of view of the GoU, the time is now right to address Umeme's concession. This allows the GoU to have a fallback position in the form of a competitive selection for a new concession company, in case the negotiations with Umeme fail;
e) The DPs are willing to provide financing support to Uganda to carry out further analysis to help prepare a roadmap for the reforms and the consultation, as needed.

The DPs consider electricity access a top priority and they want to provide support to the sector. However, at least some of them, lack confidence in how electrification is planned, and in the way that rural electrification was handled by REA and the small service providers. Because of that, they are finding difficulties in making a strong case for serious funding. They would like to see a solid business plan and governance approach for electrification. Any reform of the power sector and the renegotiation of the Umeme concession should be guided by addressing these shortcomings.

The buyout clause

It seems that the end-of-concession buy-out amount is a particular source of concern for some GoU representatives. The current estimate of the buyout is about USD 280 million. Recently, the Ministry of Finance declared that it would be difficult for the GoU to pay this amount at the termination of the concession, in case the concession with Umeme is discontinued.

First of all, it must be clarified that the buyout should not be a matter of concern for the GoU if a new concession is established following a negotiation with Umeme. A buyout of the residual value of the assets that have been invested by Umeme until the scheduled end of the present concession will not be necessary, if the shareholders of Umeme agree to transferring to NewCo the rights to use these assets under the new conditions specified above. NewCo will continue being remunerated for these assets until the end of their economic lives, but now under the new ROI to be negotiated, since the commitment of the GoU regarding these assets was to pay the current ROI only until the end of the initial concession.

With the purpose of strengthening the negotiating position of the GoU, the DPs have suggested the GoU not to take a decision that would have country-wide impacts on a long-term basis, just based on short-term budgetary considerations. The DPs have indicated that financial resources could be mobilised by the GoU (including from DPs, to keep the bargaining position from the GoU strong) to cover the needs on the short-term, or an alternative solution could be developed. This could involve for instance transferring costs to the future concession partnership.

It is important to be aware of the comparison between the quoted buyout amount; USD 280 million, and the total overnight cost – about USD 5 billion (MEMD-NES, 2022) – that would be necessary to achieve universal access in Uganda with a mix of grid extension, mini-grids, and standalone systems.

Previous expert recommendations on distribution reform

In the past years, the GoU has been advised from different sources and in different directions regarding the distribution sector and electricity access (see Annex F for a review). As indicated in Section 2.1, in general terms, these reports have contributed to an in-depth assessment of the situation of the Ugandan power sector, and the distribution of electricity in particular. They have also provided useful recommendations to improve aspects of the distribution subsector or to accelerate access either on- or off-grid, and in fewer cases on how to handle the situation of distribution after the expiration of Umeme's license in March 2025. However, a comprehensive approach that examines the three topics jointly and provides a recommendation addressing all of them is missing. This report tries to accomplish this difficult task.

The 2019 report by Ricardo Energy and Environment for the World Bank Group and financed by ESMAP (Ricardo, 2019) gets closer than all the other reports to the objective set in the present report. It arrives at the conclusion – also shared here – that the optimal solution from an economic and budget perspective is to only have one service provider for the whole country. More specifically, all the distribution networks that are connected directly to the UETCL transmission system must be operated and maintained by a single company that must also be responsible of delivering the power to the end-customers, billing them and collecting the payments. This would reduce the volume of subsidies needed, so that the resources made available now could be focused on improving the quality of service and electrifying the country. Having more distribution concessions would be less cost-effective and more complex to manage.

In the past, several reports (Ricardo, 2019; AF-Mercados, 2017; MEMD-NES, 2022) had indicated poor performance of the former REA, resulting in a slow pace of electrification. One probable factor was the lack of sufficient funds to finance more rural electrification projects. Another might have been the lack of corporate personality, since REA was not established under the primary legislation and had no legal capacity to act in its name, thus limiting its role and constraining its work. The 2019 Ricardo report particularly insisted on the issues related to the overlap of the functions of REA and other entities. This has obviously changed radically with REA having become a department within the MEMD. It is interesting to note that (Ricardo, 2019) praises the public/private collaboration between REA and Umeme since 2015 through subsidised grid connections and assets being built by REA and transferred to Umeme for AO&M. The present report proposes using a similar approach at much larger scale, but now between an entity that we shall denominate FinanceCo and NewCo.

(Ricardo, 2019) rejects the business-as-usual (BAU) option, i.e., the current situation, considering that this model is unacceptable since the current pace of the electrification process is too slow. Somewhat surprisingly, for the single service provider model, (Ricardo, 2019) recommends not to use a concession model but a Public-Private Partnership (PPP). The report acknowledges that "although there is no widely accepted definition for PPPs, the World Bank defines a PPP as a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance". This looks very much like the definition of a concession.

Unfortunately, the report does not properly characterise the solution that it proposes. Two important features are made explicit: First, the GoU must have a majority share in the single service provider. Second, the report states that "(…) under such a model it would not necessarily be required to enter into a competitive bidding process, which by nature would be lengthy, costly, and politically challenging." Direct allocation, then. To Umeme again? Did the authors of the report have another consortium in mind? Unfortunately, no additional information is given.

Further evaluation is not possible, because of the lack of information. One concern is the mandatory requirement of public ownership of 51%, which in principle, would amount to the control by the GoU of the company emerging from the PPP. This might be understood as a nod or some sort of signal to those who dislike the presence of private companies in utility companies. This seems to miss the point that a concession is not a privatisation and that the performance record of the privately owned Umeme has been better than the one of their publicly owned counterparts across sub-Saharan Africa and in Uganda prior to Umeme.

Umeme largest shareholder (24%) is the National Social Security Fund, and the GoU could increase this participation – either directly or indirectly – until a majority is reached. But declaring the public majority rule as a precondition looks like a sure way of scaring away potential future investors.

An international experience of interest: CIE in Ivory Coast[40]

Concessions, with a mixed record of successes and failures are a promising instrument to address the problems that plague distribution in Sub-Saharan Africa and other parts of the world. Properly structured agreements can expand electrification by connecting more households to the national grid or to mini-grids. Lessons from case studies shed light on the circumstances under which concessions work best, as shown in (Jacquot et al. 2020) and (Hosier et al., 2017).

The Compagnie Ivoirienne d'Electricité (CIE) signed a 15-year concession agreement in October 2005 to provide electricity service at national level, with exclusivity in distribution and transmission, in power exports and imports, and in the operation of the publicly owned generation power plants. The Government of Ivory Coast (GoIC) announced in 2020 the renewal of CIE's concession.

This case example is brought here since it has important similarities with the case of Uganda with Umeme. It may help to realise that the concerns and the solutions being proposed in this report are not unique to Uganda. Only a very brief description of the case is presented below.

The new concession has the following features:

- The Ministry of Energy is in charge of the design, implementation and monitoring of the new concession, by an intermediary public institution;
- The concession has shorter 12-year term, down from 15 years from 1990 to 2020;
- The GoIC has committed to a plan of full electrification by 2025, unlocking large grants for technical assistance and loans for network renovation and expansion from DFIs;
- The electrification plan is based on an integrated approach largely driven by grid extension and punctually complemented by mini-grids and SHS;
- The new concession builds on the "affermage" model used by Ivory Coast for the past 30 years, whereby CIE is responsible for operation and maintenance (O&M) of the grid extension assets while the GoIC through the CI-Energies (the Ivorian equivalent to Uganda's UEDCL) is responsible for network investments – including for energy access. Establishing clearly defined boundaries between CIE's and Ci-Energies' responsibilities has required lengthy discussions;
- The GoIC is a minority shareholder of CIE. It has a 15 % stake directly and 7 % via participations of other state-owned companies. The main private shareholder ERANOVE owns 54 %.[41] The rest of the shares is spread between small investors. The GoIC has managed to control the concession process by (i) negotiating hard with CIE over the terms of the renewal of the concession, (ii) spreading funding sources between many DFIs, and (iii) announcing that it would be open to further opening the capital of CIE to new private investors;
- Following the renewal of the concession agreement, CIE has received several requests for technical assistance from other Sub-Saharan economies interested in reforming their concessions, or in transitioning to concessions.

[40] This section has benefited from discussions and information provided by Grégoire Jacquot, from MIT.

[41] See https://en.wikipedia.org/wiki/Eranove

4. THE REFORM PROPOSAL

This chapter presents an approach to accomplish the objective that has been set for this report: A reform of the distribution subsector in Uganda – including a suitable solution to the future of Umeme's current concession – that will allow achieving a reliable, affordable, and sustainable supply of electricity for all households, industries and businesses in Uganda in a reasonable timeframe – with an expected positive impact on job creation, demand augmentation, and lower tariffs – and with the ultimate goal of increasing the well-being of the population and enabling economic growth.

This proposal conforms to the existing and proposed pertinent legislation, in particular with the Ugandan Cabinet Decision to reintegrate UEGCL, UETCL, and UEDCL in one publicly owned company called Uganda Electricity Company (UEC), i.e., the "power sector rebundling".

4.1. THE STARTING POINT

The previous chapters, and the preceding Chapter 3 in particular, have presented and justified the principles underlying the proposal that will be presented in this chapter. They are repeated here, before the presentation of the proposal that is derived from them:

- Distribution is understood as the provision of electricity to the end customers by a suitable combination of all electrification modes, either grid extension, mini-grids, or standalone systems. Under this integrated perspective, sound – i.e., financially viable, sustainable – business models must be adopted for each electrification mode, under a common strategy of financing, tariff design, and cross subsidisation;
- The preferred solution from the managerial and economic perspectives is keeping only one distribution provider by grid extension for the whole country. This is particularly attractive because Uganda already has a well-performing distribution company, operating under a concession contract since 2005, which expires in March 2025, therefore offering the opportunity of negotiating an extension under substantially improved conditions for the benefit of the Ugandan people, and also attractive for the company;
- Aim for full electricity access in Uganda by 2030, within a sound long-term vision for the distribution sector, and design a viable plan to achieve this objective – from the technical, economical, regulatory, business, and financial viewpoints – to make sure that the adequate means and resources are employed from the outset and that the business and regulatory conditions are adequate to attract sufficient amount of public and private capital.

This reform and the achievement of the 2030 objective will be only possible if a *broad agreement on these principles is reached among all the relevant stakeholders, pooling their resources together, with strong political support and the guidance of a local champion institution*, which seems to correspond to the MEMD.

The proposed integrated perspective of distribution must consider all the electrification modes and associated business models jointly. They can be classified into the four categories or "zones" depicted in *Figure 7*: the current footprint of Umeme, the rest of the territory to be supplied by grid extension, the demand clusters supplied by mini-grids, and the customers that will be initially assigned standalone systems. These four zones comprise the entire territory of Uganda, and they will evolve dynamically with time. As it will be discussed later, the design of the regulation and the business models must facilitate the smooth transition of the customers between electrification modes, while preserving the rights of the developers of off-grid solutions, the incumbent on-grid distribution company and the customers.

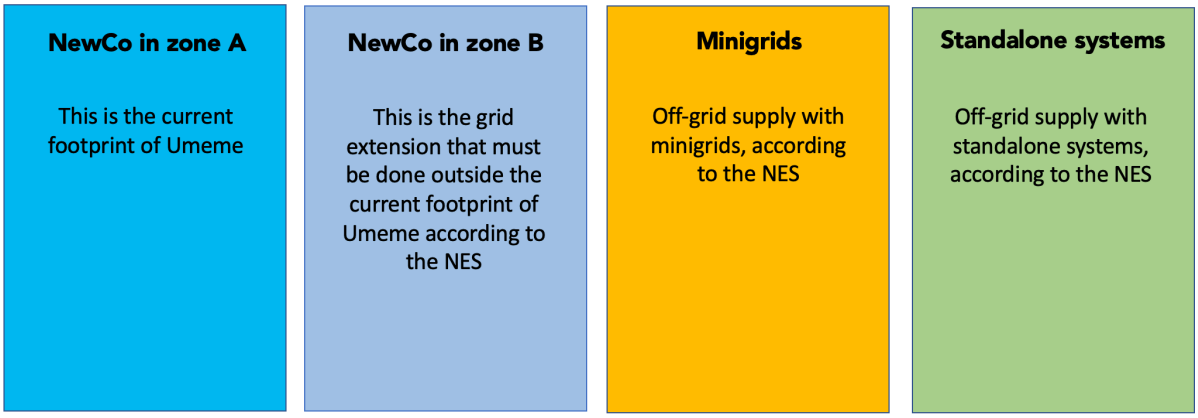

Figure 7. The four zones with different situations of supply technology, geographical location, and business model.

From a methodological perspective, a comprehensive approach to electrification from the perspective of the distribution subsector must comprise the following components, in this same order:

i. *A techno-economic electrification plan* for the entire national territory that integrates on- and off-grid supply solutions in a least cost manner to support industrialization, commercial and social activities and to achieve universal electricity access;

ii. *An institutional, business and regulatory model*, specifying the structure, ownership and the roles – who does what – of the ensemble of companies and institutions involved in electricity supply, functioning under a predefined regulatory framework;

iii. And *a viable business plan* that shows how these companies can be financed and will be expected to remain profitable on a permanent basis. Regulated tariffs cross-subsidization among the customers of the four zones, supplemented by public subsidies to those customers unable to pay the regulated tariffs (or the costs of the standalone systems) is necessary to achieve an economically sustainable – i.e., permanent in time – business model for each supply zone.

In this report, component (i) will be assumed to be given, in principle, as the outcome of the NES which, despite its limitations, is the last serious attempt to produce a comprehensive least-cost geospatial techno-economic national electrification plan for Uganda. The focus of the report are component (ii) – the institutional, business, and regulatory models – and (iii), the business plan that examines the financial viability of the NES. These two components are examined in detail in Chapter 4 (this chapter) and Chapter 5, respectively.

The proposed reform is presented next in successive layers: it is described from a techno-economic, business and regulatory, institutional, and financial viewpoint.

4.2. THE TECHNO-ECONOMIC LAYER

Electricity distribution must expand to meet demand growth, to complete densification and to improve performance in areas already electrified, as well as to ensure the electrification of areas that do not have access to electricity yet, using a mix of grid extension, mini-grids and standalone systems.

A large part of Uganda's population still has no access to electricity. A distribution reform proposal must include a comprehensive electrification plan. Despite its shortcomings,[42] the National Electrification Strategy (NES) is the best electrification plan currently available, and it will be adopted in this report as the reference case in the financial plan that is proposed here. The NES integrates on-grid and off-grid solutions (mini-grids and standalone systems) and provides an estimation of the costs that would be incurred in providing the service with a reasonably high level of detail.

[42] The adopted Geographical Information System (GIS) model lacks precision to properly identify the least-cost electrification mode in each circumstance. The massive deployment of 3W solar kits planned in most rural areas (for 5.5 million households) should not qualify as proper access.

According to the NES, the overall cost of the plan is USD 4.68 billion.[43] This plan should enable 10.4 million additional connections in the next 10 years. On-grid initiatives (3.4 million connections by densification and 1.2 million connections by grid extension) will account for the larger amount totalling to USD 3.9 billion or 84%, with the remaining 16% dedicated to mini-grids (7% of the budget for 0.23 million connections) and stand-alone systems (9% of the budget for 5.5 million households). The implementation period covers 10 years from 2021 to 2030 and targets an overall access of 100% considering the minimum service level of Tier 1 (a 3W solar kit per household). Since this level may be considered too low to be a target in a national electrification strategy, an additional financial analysis has been made considering that a 10W solar kit is the minimum acceptable level of service for rural households.

Details on the methodology used to develop the plan and its results can be found in the original document (MEMD, 2022), which is briefly summarized in the last section of Annex G.

4.3. THE BUSINESS MODEL AND REGULATORY LAYER

The business and regulatory approaches that are proposed for all the electrification modes – either on- or off-grid – share common criteria and are considered in an integrated manner, since they are all meant for Ugandan customers, although the specific business models and supply technologies must be adapted to each situation.

Figure 8 shows the proposed business model for each of the four supply zones comprising the entire territory of Uganda, which will evolve dynamically with time: the current footprint of Umeme, the rest of the territory to be supplied by grid extension, the demand clusters supplied by mini-grids, and the customers that will be initially assigned standalone systems.[44]

The same principles of regulated cost-reflective revenue requirement and regulated tariff cross subsidization across-the-board apply to these four business models. There is freedom of installation for all companies in the off-grid space, respecting the territorial allocation defined by the NES. There would be a transitory adaptation period for all existing mini-grids and the suppliers of standalone systems.

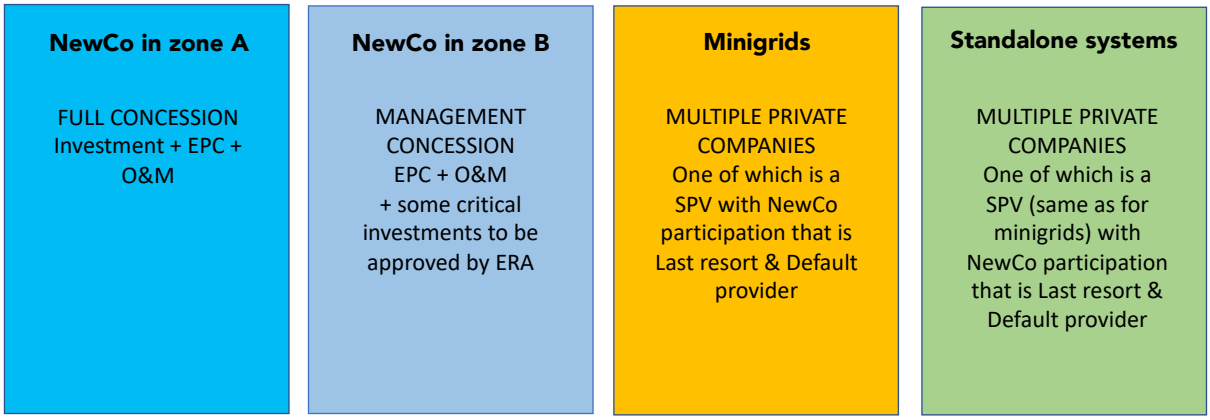

Figure 8. Breakdown of unelectrified demand according to electrification mode and business model approach.

Electricity supply with the main grid

On-grid distribution will continue under a concession model, with a new format and contracting conditions. The concessionaire, hereafter called NewCo:

- Will preserve the existing managerial capability in Umeme, with a private company approach;

[43] This figure only includes investment costs.

[44] Regulation must be ready to facilitate the smooth transition between electrification modes, while preserving the rights of the developers of off-grid solutions, the incumbent on-grid distribution company and the customers.

- Will be the distribution operator for the connected grid in the entire country, although with different responsibilities in Umeme's present footprint and the rest of the territory, (see below);
- May increase to any level the present ratio of public participation – which presently is 24% via the National Social Security Fund – with the purchase of shares or with equity investment.

The following clarifications are necessary:

- In Umeme's present footprint *(hereafter named "zone-A", to be defined precisely)* NewCo will keep the same functions that Umeme has now – planning, investment, responsibility for contracting the EPC of all new network assets, plus the AO&M of all assets – but it will have a substantially lower rate-of-return (to be negotiated), and redefined targets (reliability, losses, customer service) with economic implications associated to performance;
- In the rest of the country *(hereafter named "zone-B", to be defined precisely),* NewCo will have limited responsibilities: planning, responsibility for contracting EPC and the AO&M of all new assets in zone B, which will be paid with public funds. Only a minor fraction of the new assets will be invested by NewCo, when proposed and justified by NewCo – for instance because of urgency of deployment due to reliability issues – and authorized by ERA, after consulting UEDCL (see the section on the institutional layer);
- NewCo will bill and collect the revenues from the application of the regulated tariffs to all grid-connected customers. The revenues collected by NewCo will exceed its regulated revenue requirement, since NewCo only incurs - at most - a small fraction of the investments in zone B, therefore generating a surplus, whose use will be discussed in the section on the financial layer.[45] Therefore, NewCo will avoid depending on direct monetary public subsidies, what will reduce its risk and its cost of capital;
- The GoU (via its publicly owned electric utility) will own all the assets – present and future – of the main grid, since the proposed business model is a concession, not a privatization (see the section on the financial layer);
- A buyout of the residual value of the assets that have been invested by Umeme until the scheduled end of the present concession will not be necessary if the shareholders of Umeme agree to transfer to NewCo the rights to use these assets under the new conditions specified above.

Electricity supply with mini-grids

The proposed business and regulatory approach makes it possible to meet the following objectives:

- Achieve full electrification by 2030 as described in the NES. This requires the deployment of all the mini-grids included in the NES, so that not a single potential customer in Uganda is left behind;
- Encourage private initiative, already present in the country with several companies, and minimize the interference with the existing mini-grids in operation;
- Guarantee the sustainability of the mini-grids, i.e., the permanence of a reliable and affordable electricity supply from all of the mini-grids, i.e., those existing now and the ones to be deployed as specified in the NES;

[45] It is important to make sure that NewCo is incentivized to bill all grid-connected customers and collect the corresponding revenues from application of the regulated tariffs, since the surplus of NewCo – after retaining its regulated revenue requirement – is delivered to another entity (this entity is FinanceCo, see the financial layer). The right incentive scheme can be achieved by calculating a priori the surplus that NewCo must deliver to FinanceCo, as the difference between the regulated annual revenue requirement of NewCo as calculated by ERA for a given year minus the total revenue that NewCo could collect from application of the tariffs, assuming a stringent collection rate target. NewCo must deliver to FinanceCo this surplus, regardless of the actual collection rate. [NewCo cannot pay more than its surplus, hence, if collection rate is lower than anticipated it is envisioned the 12% will not be guaranteed but FinanceCo is paid instead from these dividends (partially)? Response: 12% is guaranteed for the small amount of investments that ERA will authorize NewCo to make in grid extension for rural electrification. ERA will make sure not to authorize too many investments by NewCo so that there will be no surplus and NewCo will need subsidies, something that this approach is meant to avoid fully. FinanceCo is the public financial hub that will have to deal with the deficit, subsidies, concessu¡ional loans, etc., not NewCo.

- Make it possible for all customers connected to the main grid or to any of the mini-grids to pay the same regulated tariff, regardless of the differences in the incurred supply costs. Uniform tariffs at utility or national level is a generalized international practice, with implicit cross-subsidization among urban, peri-urban, and rural customers. The proposed reform also includes mini-grids' customers in the common regulated tariff. Ad hoc measures will be needed for the customers already being supplied with mini-grids.

Meeting all these objectives will require the GoU to intervene establishing the following regulations:

- A cost-reflective remuneration – a "regulated revenue requirement" – for each mini-grid deployed according to the NES. This remuneration will be collected from two sources: i) the regulated tariffs; and ii) direct subsidies to the mini-grid developers (see the section on the financial layer for the source of these subsidies);
- All new mini-grids must abide by these rules: compatibility with the NES, regulated end-customer tariffs (equal to the tariffs for grid-connected customers) and reception of subsidies to top up the cost-reflective revenue requirement. Existing mini-grids must be given a deadline to meet these new requirements;
- Define a cost-reflective remuneration, which ideally should suffice to attract mini-grid developers to deploy all mini-grids included in the NES and to guarantee their sustainability. In practice, some additional intervention will be needed to guarantee that some "default and last resort provider" will go where others do not want to go and will take control where others quit supplying. Tenders can be used in the zones where there is a lack of investment, although this may be considered too burdensome and be used only as a last resource solution;
- Add a new condition in the NewCo concession agreement, which will be the creation, jointly with some off-grid solutions developer(s), of a Special Purpose Vehicle (SPV) company that will play the role of "default and last resort provider". The SPV will be a normal off-grid solutions company for all purposes, except for the mandate to build and operate the mini-grids in the NES that others do not build and to take charge of any mini-grid business that disappears. The participation of NewCo in the SPV facilitates the future transfer of mini-grid customers to the main grid when "the grid will arrive", which eventually must happen for most or even all mini-grids, given the high population density in Uganda and the absence of major geographical impediments to grid expansion (but it might take one or two decades). The mandate for NewCo to participate in the SPV should be included in the negotiation package of the new concession.

Electricity supply with standalone systems

As with mini-grids, the proposed business and regulatory approach makes it possible to meet the following objectives:

- Achieve full electrification by 2030 as described in the NES. This requires the provision of all the standalone systems – mostly solar kits, but also systems to supply commercial and industrial loads – included in the NES, so that not a single potential customer in Uganda is left behind;
- Encourage private initiative, already present in the country with several solar companies, and minimize the interference with the existing standalone assets in operation;
- Guarantee the sustainability of this electrification mode, i.e., the permanence of a reliable and affordable electricity supply to all customers to whom NES assigns standalone systems;
- Make it possible for all customers that are assigned standalone systems to afford them.

Meeting all these objectives will require the GoU to intervene establishing the following requirements:

- Definition of a minimum level of demand to be supplied at household level. It is understood that, in general, this minimum level must be compatible with the energy needs of the specific population – e.g., cooling or heating depending on weather conditions, refrigeration for perishable agricultural or fishing products – and the economic capability to purchase appliances such as a TV, a blender or a small fridge. The NES has been designed for a 3W solar kit per household. As indicated above, this report adopts the NES as the reference case for the proposed distri-

bution reform as it is the only official plan presently available, but strongly disagrees with accepting this minimum level of supply as compliant with the UN SDG 7.1[46] (see the section on the financial layer for a discussion of alternatives);

- A cost-reflective remuneration – a "regulated revenue requirement" – for the supply of electricity with solar kits according to the NES. This remuneration will be collected from two sources: i) a regulated stream of payments; and ii) direct subsidies to the mini-grid developers (see the section on the financial layer for the source of these subsidies);[47]
- All new deliveries of SHS under the proposed business and regulatory model must abide by these rules: meet the established minimum demand level, regulated end-customer payment for the basic SHS compatible with the minimum demand, and regulated subsidy to the SHS supplier for each delivered system to top up the cost-reflective revenue requirement for the supplier, including the costs of maintenance and customer attention. Existing SHS suppliers must be given a deadline to meet these new requirements;
- Ideally, a cost-reflective remuneration should suffice to attract SHS suppliers to offer their solutions in the locations established by the NES and to guarantee their sustainability. In practice, some intervention will be needed to guarantee that some "default and last resort provider" will go where others do not want to go and will take control where others quit supplying. As with mini-grids, tenders may be considered as a last resource solution in the zones where suppliers would not go, despite the incentives;
- Here it is proposed that an additional condition in the NewCo concession agreement will be that the SPV - which was defined before for mini-grids as the "default and last resort provider" - will also commit to this same role for the standalone systems. As indicated above, the SPV will be a normal off-grid solutions company for all purposes, except for the mandate to deliver standalone systems in the areas defined by the NES for this type of supply where other companies do not want to go, and to take charge of the customers of any SHS business that disappears;
- The interference between the suppliers of SHS with a market-based approach and the subsidized supply of SHS under regulated tariffs can be minimized, and subsidies must not be wasted with those customers that do not need them. [48]
- The participation of NewCo in the SPV facilitates the future transfer of standalone customers to minigrids or to the main grid when "the grid will arrive". As indicated previously, the mandate for NewCo to participate in the SPV should be included in the negotiation package of the new concession.

4.4. THE INSTITUTIONAL LAYER

[46] "By 2030, ensure universal access to affordable, reliable and modern energy services." In the case of poor rural areas in Uganda, after consultation with several stakeholders, it could be concluded that the minimum demand should include a residential solar kit of at least 10W – enough for two or three lights, phone charging, and a radio – plus electricity supply for productive and community use of electricity, as the only way to promote human and economic development. The financial analysis of this report includes a sensitivity analysis of a scenario with a minimum residential demand of a 10W solar kit, plus at least one community and one productive electrical supply at every village.

[47] The sustainability of electricity supply with SHS can be guaranteed if the business model of the supplier is defined as a "utility-like" business. This is easier under a fee-for-service kind of arrangement, whereby the supplier is responsible to guarantee the continuity of service indefinitely – maintaining and replacing the SHS as needed – in exchange for a regulated monthly fee, which is the usual payment system of the customers connected to mini-grids or the main grid. However, the prevalent business model for SHS in Uganda is rent-to-own, whereby the residential customer pays an initial amount plus weekly or monthly instalments during two or three years, until which the solar kit becomes the customer's property, perhaps including some maintenance obligation by the supplier. Under the rent-to-own model, a new subsidy to the supplier will be needed each time the customer needs to replace the SHS. Hopefully, with time most households will become grid-connected and the stream of explicit subsidies for the purchase of SHS will almost disappear. Under a fee-for-service scheme the regulated tariff would be part of a broad tariff cross-subsidization scheme, including all customers in the country.

[48] This can be achieved in several ways; for instance, directly providing a subsidy to help purchasing the minimum demand SHS only to the low-income households.

The governance of the distribution segment, and the electrification plan in particular, is the responsibility of the Ministry of Energy and Mineral Resources (MEMD), in coordination with the Ministry of Finance, Planning and Economic Development (MOFPED). The main goal of the MEMD is to meet the energy needs of Uganda's population for social and economic development, in an environmentally sustainable manner.

The Ugandan Cabinet Decision of 22 February 2021, on "Merging and Consolidating Government Agencies, Commissions, Authorities and Public Expenditure" was made with the overall objective of eliminating structural functional duplications and wasteful expenditure. It has already led to amending the REA Statutory Instrument to include REA as a department of MEMD. It also seems that UEGCL, UETCL, and UEDCL would be reintegrated in one publicly owned company called the Uganda National Electricity Company (UEC).

This report will assume that the rebundling of UEGTL, UETCL, and UEDCL will take place, despite the fact that this decision has not been formally stated and that it had not been clarified how it would be implemented. So far it has created much uncertainty among the stakeholders and – if carried out – it will complicate matters under a regulatory perspective, with small (if any) benefit. The impact will be different for the transmission, generation, and distribution segments of electricity supply.

Rebundling generation and cancelling the present concession to operate and maintain the publicly owned power plants, would require transferring these functions to a "generation department" within a newly created UEC. No major problem is expected in this regard.

Merging transmission will amount to transferring the responsibilities of UETCL to another department within the UEC. However, in this case, since the system operation function is included in UETCL, special measures will be needed to guarantee the independence of the system operator, since it will be managing a power system with a mix of privately and publicly owned power plants.[49]

Distribution would become another department of the UEC. An integral perspective of distribution would require this department to comprise two divisions, one for on-grid supply and the other for off-grid solutions, i.e., mini-grids and standalone systems, under a common Department Head. UEDCL would become the on-grid division, overseeing the activities of NewCo, and supporting ERA from a technical perspective in the on-grid space, which is expected to eventually dominate distribution. The off-grid division could integrate most of the staff from the former REA, who are presently in the MEMD. All the on-grid distribution assets will be owned by UEC. On the contrary, the physical assets of mini-grids and standalone systems will be owned by the private suppliers.

The role of the distribution companies, NewCo and the suppliers of off-grid solutions, must be reconsidered, so that the potential of electricity access can be fully exploited. While the aim of digitization and decentralization in developed countries focuses on *demand response*, developing power systems needs *demand growth* – associated to economic development and, more broadly, human development, especially in rural areas. This asks for an in-depth revision of the role of distribution companies as active retailers, promoting development via residential electricity utilization, productive, and community uses.

Two other organizations play a major institutional role in the distribution segment: ERA and a centralized financial organization FinanceCo. ERA must continue its role as the independent regulatory authority, supported by the distribution department of the UEC for technical matters and the supervision regarding the on- and off-grid activities of the distribution activity.

Financing the capacity expansion, administration, operation, and maintenance of the entire distribution – including the electrification plan– is a major undertaking. The MEMD - in coordination with the MoFPED – is in the driving seat of this activity, but it is managed by a specialized company that will be termed FinanceCo. FinanceCo will be a financial intermediary owned by the GoU that will serve as a hub of all the financing sources and will extend financing to NewCo and the off-grid developers. An upgraded UECCC is a possible option to implement FinanceCo without creating additional organizations.

[49] There is ample jurisprudence on this topic in the "Acquis Communautaire" of the Internal Electricity Market of the EU, where measures to mitigate the negative implications of this kind of integration of activities has been thoroughly debated.

An operation of this dimension needs the coordinated support of all the DPs presently operating in Uganda. Proper supervision and control of the electrification plan require that, in addition to the GoU represented by the MEMD and the MoFPED, the DPs with a significant contribution to the project must participate in the governance of FinanceCo. This will typically require taking part in the equity of FinanceCo.

Figure 9 represents the structure of the proposed institutional layer for the distribution subsector in Uganda, with a depiction of the most important functions of each entity, and how they will evolve in time.

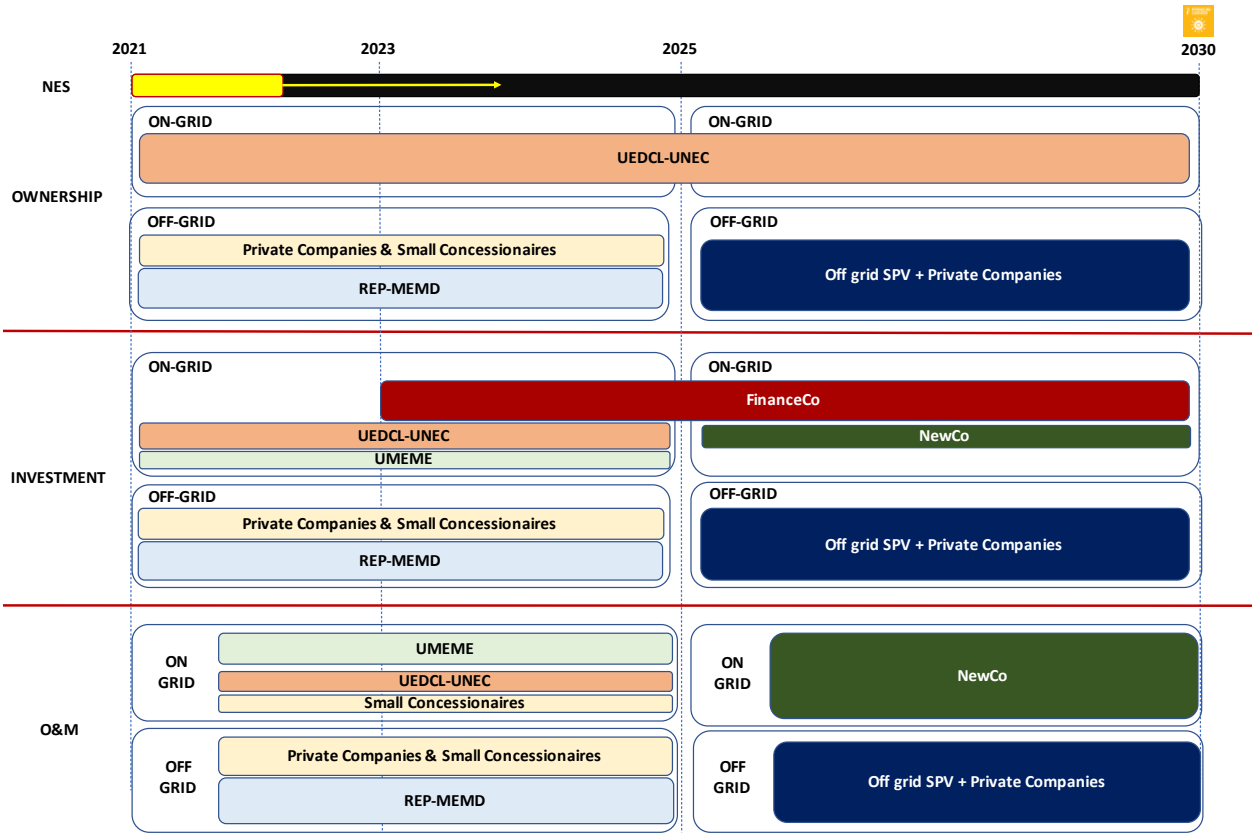

Figure 9. The institutional layer: relevant organizations for distribution reform and their evolution in time.

4.5. THE FINANCIAL LAYER

FinanceCo is the hub in charge of coordinating, raising, and channelling the capital flows for the entire process of reform of the distribution sector and the electrification plan. FinanceCo should facilitate and optimize all financing and investment related to the key NES targets, including the financial contributions of the GoU, the DPs, and the surplus of NewCo, which jointly finance investments in the zone B of NewCo and the subsidies to the off-grid companies.

In the following paragraphs, a more detailed description of the economic flows into and out of FinanceCo is provide. These flows are also represented in *Figure 10*.

Cash flows into FinanceCo:

- Surplus of NewCo after collecting revenues from tariffs and retaining a cost-reflective revenue requirement;
- Equity from the GoU, maybe also open to private investors;
- Grants and concessional loans from the DPs (and/or other third parties' external financing, should additional funding be required).

Cash flows out of FinanceCo:

- Investments in assets of NewCo – starting in 2023 – on the new on-grid connections required by the NES;
- Subsidies to mini-grids to top up their cost of service beyond the revenues from the regulated tariffs;
- Subsidies to developers of SHS to top up their cost of service beyond the regulated payments of rent-to-own schemes;
- Financing repayment and/or refinancing including satisfaction of cost of capital of debt and equity.

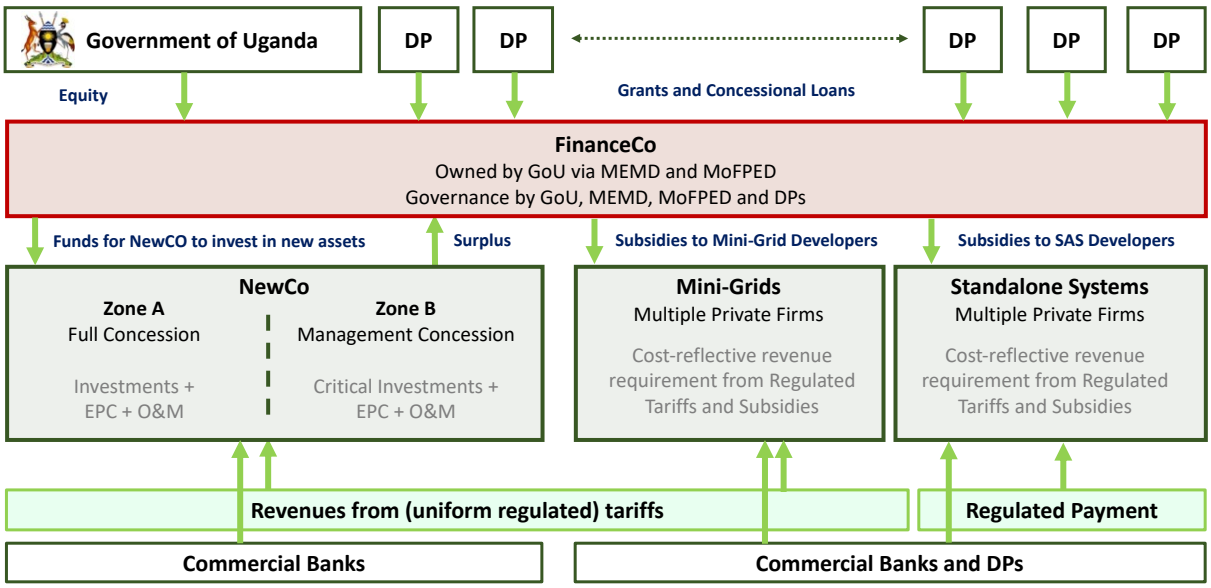

Figure 10. The financial layer: the map of economic flows.

Note that the centralized role played by FinanceCo implies an across-the-board implicit cross-subsidization among all customers – rural or urban, supplied on- or off-grid. The electrification plan can be considered financially viable if, after a reasonable period of time, the revenues collected from the regulated tariffs will be able to repay the debt incurred during the electrification process, while also remunerating the equity during the considered period, and will be sufficient to cover the total annual costs of electricity supply in the future. This happens to be the case for the NES in Uganda, as shown by our detailed financial analysis, as described in the next chapter.

5. THE BUSINESS PLAN

5.1. JUSTIFICATION

A comprehensive electrification programme needs a (techno-economic) electrification plan, an institutional, regulatory and business model, and a business plan, as explained in Section 3.2. on general strategic considerations. A techno-economic plan has little value if it cannot be financed, as is shown by how many of these plans have been developed for Sub-Saharan African countries – including the case of Uganda – just to be ignored because of a lack of a viable plan to finance them.

A *techno-economic plan* (see in Annex G describing the latest electrification plans that have been proposed for Uganda) specifies what has to be done, i.e., the investments that have to be made every year over the considered period of time in the three electrification modes, and what is needed to operate and maintain the assets and to supply electricity to the end-customers. The techno-economic plan provides the annual bill of materials and the corresponding investment and operation expenses. *The institutional, regulatory and business model* depicts the entities involved in the process, their functions and the rules they have to abide by.

The *business plan* is a mathematical model – usually in the form of a spreadsheet – that the financial team can play with by exploring the interactions between the amounts of equity and debt, the proportion of public and private capital, the blend of concessional and commercial capital, the need for grants or public subsidies, the terms of the loans, the trajectory of tariffs, the influence of currency exchange, or the impact of the loans for electrification on the country's sovereign debt. The business plan shows to potential investors, among others, how much money will be needed and when, from which sources, under which conditions, how revenues will be raised that will allow to return the loans on time and with the agreed interest, and to provide an attractive return on investment to the equity. The business plan also supplies the financial ratios that quantify the viability of the model according to the accepted standards of the financial community. Serious investors need to see a convincing business plan.

'Financial viability' may seem a fuzzy term, but the financial community has strict criteria to accept a business plan as viable. We have followed these criteria here, in terms of the proportions of sources in the proposed blended financing and the values of the key financial ratios for every year of the business plan, as explained in Annex H, where the results of this exercise are presented in detail. The excel spreadsheet supporting the business plan has been given to several key stakeholders for inspection and we have not received negative comments. In any case, the proof of the pudding is in the eating, and our financial model can be a useful tool to employ in any negotiations that might take place to implement the reform that is proposed in this report, adapting the input values as convenient. The only real business plan will be the one that is finally agreed by all the parties, resulting in the actual financing of the electrification plan.

5.2. METHODOLOGY

A business plan can be contemplated from different perspectives, resulting in different designs for the GoU, UECCC, NewCo, the different investors, or each one of the off-grid companies, according to their particular interests and time perspectives. Our business plan is meant for the GoU, but it has to represent the behaviour of every one of the parties involved. The business plan for the GoU must contain the trajectory over a long period of twenty years, for instance, of all the estimated expenditures (investments and AO&M costs) that will be incurred in the development of the electrification plan. This business plan must also include the revenues – the payments from the regulated tariffs of all end-customers – over the same period. Finally, the planner must add some hypothesised sources of financing, each one with specific amounts and conditions – shareholders of the involved companies, development partners, GoU, commercial investors – and verify that the entire operation makes sense from a financial viewpoint, i.e., that the key financial ratios stay within reasonable value ranges, and that the requirements of each investor can be satisfied with the resources that can be reasonably expected to be generated.

The design of the business plan must find a delicate – and hopefully possible – balance between a number of requirements, some of which are hard constraints. For instance, given the large volume of funding needed to achieve full electrification in most developing countries, a substantial participation of private capital is expected, complemented by the contributions of DFIs and some of them – MIGA, World Bank, African Development Bank, or the EU – maybe providing guarantees. The situation in Uganda, with much governmental concern about the level of the tariffs for end customers – industrial and businesses, in particular – suggests resorting to a high proportion of concessional funds, which would have lower impact on tariffs than equity or loans from commercial investors. Then, sovereign debt could be a limiting factor. A number of measures can be tried with NewCo, such as diluting the CAPEX base for NewCo investors through patient public capital or CAPEX subsidies to reduce NewCo's required return on equity, buying shares of NewCo by the GoU or issuing new NewCo's shares to be held by the GoU and reinvesting the GoU equity returns in electrification. Slower pace of electrification eases the tension on tariffs and debt limits, at the risk of not meeting the 2030 target of the SDG7. Tariff cross-subsidisation can reduce the global electrification subsidy need (including on- and off-grid, since in the end all remaining subsidy is on public financing). Demand growth (industrialisation, electrification, demography, no grid defection) increases the rate of utilisation of the physical assets, therefore diluting the weight of fixed generation costs on the tariff, but it may also result in the need for more of these assets. A serious assessment of the potential impact of electricity tariffs on industrialisation would be useful, as electricity is a major cost input in some businesses, but not in many others. Economic growth and good reliability facilitate social acceptance of tariff raises.

Figure 10 in section 4.5 of the previous chapter, explaining the financial layer of the proposed reform, represents the economic transfers among the different entities that are relevant in the electrification process. We have copied the same figure here, as *Figure 11*. At the centre of the entire financial operation is the GoU, represented by FinanceCo, which can be seen as the hub of all transactions – the metaphor of a lake, with water inflows and outflows can provide a useful mental representation.

Building the business plan requires an iterative adjustment procedure between two interrelated steps. In the first step, the financial needs of each one of the several companies supplying electricity to the end consumers must be met. We separately consider NewCo, and the aggregate of the private companies in the off-grid space, including the Off-grid SPV. NewCo is financed by its own private equity and debt, funds from FinanceCo to invest in new distribution network assets, and the tariffs from the end customers, a fraction of which NewCo must deliver to FinanceCo – i.e., the surplus of the estimated revenue from an efficient tariff collection over the regulated revenue requirement of NewCo. The off-grid companies are financed by their own private equity and debt, sometimes provided by donors even in the form of debt, and by the regulated tariffs collected from customers. In addition, they also receive regulated subsidies from FinanceCo.

Both for NewCo and for the off-grid companies, the total amount to be financed must be calculated over the period of the financial projections. This includes any negative operating cash flow (until the business plan becomes cash flow positive and starts contributing to the CAPEX needed in the electrification process), the investment plan until 2030, and the cash outflows (financial interest and taxes) required by the adopted capital structure. The business plan must maintain acceptable values of the key financial ratios for each company, so that it is possible for each one to raise the necessary capital and debt for the electrification plan until 2030. There will be different capital structures depending on the peculiarities of each company and the different possible sources of financing.

In a second step, once the cash outflows and inflows of FinanceCo - the surplus coming from NewCo and the grants from the aggregated SPV&PC – have been determined, we start adjusting, as before, the parameters of the financial plan considering not only the debt and equity but also the grants provided by the DFIs from the viewpoint of FinanceCo. FinanceCo's financial ratios are analysed to study the feasibility of the maximum borrowing capacity with concessional debt, which must be repaid by 2040.

Then the iteration between the two steps proceeds as many times as needed. Starting with the first step (bottom of *Figure 11*), we analyse how the mix of financial instruments copes with the investments that must be made each year according to the techno-economic electrification plan. We iteratively adjust the parameters of the financial plan while accounting for the fact that the different components – debt and equity – are interrelated and conditioned to each other. In each iteration, the key financial ratios of

each company are analysed not to exceed the debt limit, while trying to achieve a sound capital structure and not to exceed the maximum amount of debt – corporate and commercial – that the company can tolerate.

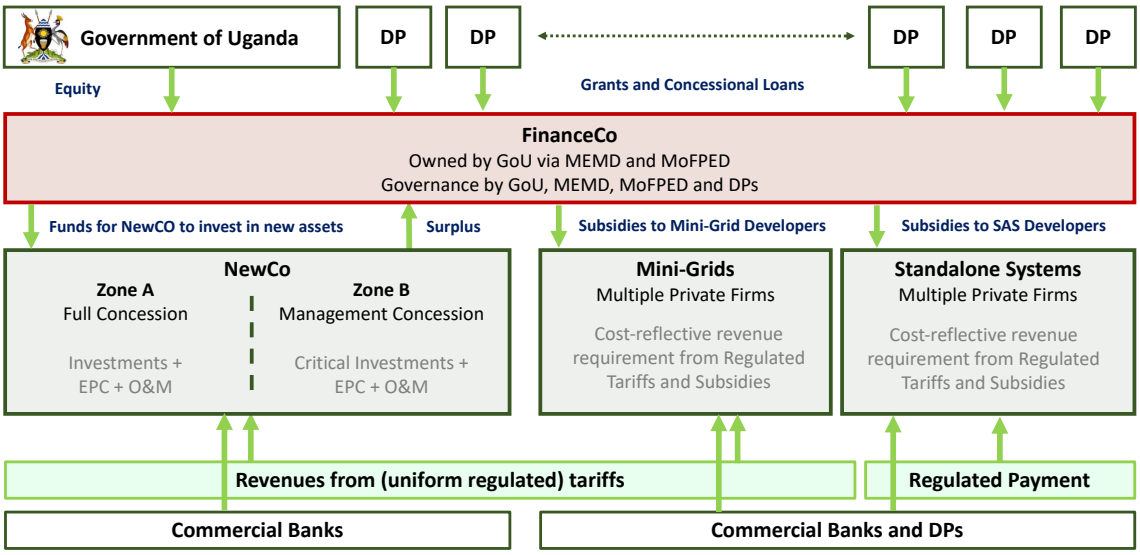

Figure 11. Entities and flows of money in the business plan.

5.3. THE FINANCIAL ANALYSIS OF THE NES

A detailed business (i.e., financial) plan has been built to examine the conditions under which it is viable to finance the proposed reform of distribution, including the electrification plan according to the NES to achieve universal access to electricity in Uganda by 2030. The computer-based model supporting the business plan is described in Annex H of this document, including the main assumptions built into the model and the justification for the most significant decisions made regarding financial alternatives.

Our business plan is substantially different from the very basic financial analysis in the NES, which appears to have several serious flaws:

- In the first place, the financial analysis in the NES is "static", while an electrification financial plan must include yearly financial projections, which on the one hand reflect how the business pan execution evolves over time and on the other hand portray the evolving relationship in time between the operating and the financial variables: the country starts borrowing money to achieve full electrification in a few years and it also may need some grants from the Government and from the DPs; because of the electrification process the demand grows quickly as well as the revenues from application of regulated tariffs; once the electrification is complete, the revenues from all end customers may make it possible to pay back the debt and to stabilize the financial situation of distribution in the future. If this is the case, then the financial plan is viable. This dynamic process is entirely absent from the financial analysis in the NES;
- The financial analysis in the NES only includes investment costs (CAPEX), while the electrification process requires to also incur administration, operation, and maintenance costs, which are significant and do impact the overall financing strategy;
- The financial analysis in the NES includes a contribution of the revenues from the tariffs to cover 10% of the total investment costs. However, in a sound dynamic plan, the tariff revenues are the key contributor that ends up paying for the incurred debt and stabilizes the sector financially.

The Reference Business Plan

The term “Reference Business Plan” is used to refer to a version of our electrification business plan that strictly follows the results of the NES.[50] The main conclusion that can be derived from the Reference Business Plan is that it is possible to finance the NES with a blended mix of financial resources, showing that the NES would be financially viable if our recommendations are followed. However, it will be challenging, since the current level of expenditure in the distribution segment of the Ugandan power sector is much lower than what the viable financial model for the NES requires.

The result is particularly significant, as the Reference Business Plan assumes that the tariffs to end customers are constant in nominal value (i.e., the value is not adjusted for inflation) over the entire 2021 to 2040 period. The viability of the plan hinges on the brisk demand growth due to electrification, a significant amount of concessional loans, and some volume of grants. Cross-subsidization across the board makes it possible for all electrification modes to receive a remuneration capable to attract private capital. Note, however, that the NES only includes extremely basic solar kits of 3W for 5.5 million households during the entire considered period until 2040. This cannot be considered an adequate level of electricity access compatible with the SDG7.1

These are the main features of the financial plan:

- Over the period from 2022 until 2030, when all customers in Uganda must have access to electricity, FinanceCo must receive a total amount of USD 3,800 million of funding, broken down as USD 2,800 million of concessional debt (74% of the total amount; six years of grace period; 2% interest rate), USD 600 million in grants, and USD 400 million in equity provided by the Government;
- This financial effort is concentrated over the period until 2030, when the major investments associated to electrification of the entire country have to be made. The investment is not uniform over the years, with an average investment per year of USD 470 million;
- Analysing FinanceCo's cash inflows and outflows, given the ROI adjustment payment from NewCo to FinanceCo, this amount over the 2023-2030 period rises to USD 834 million. On the other hand, the subsidies required to guarantee 12% ROI to private off-grid companies reach USD 827 million over the same period;
- FinanceCo's cash inflows derived from the surplus of NewCo generate a positive operating cash flow. This surplus allows FinanceCo meet 5% of its investment needs during the 2023-2030 period, in addition to grants (20%), concession debt (65%), and government equity (10%);
- In the case of NewCo, in the 2025-2030 period, with the new ROI adjustment, the revenue requirement and the estimated cash reserves can account for 86% of its investment needs. This allows NewCo to leverage commercial debt (10%) and to raise equity (5%);
- During the same time interval (2025-2030) the ensemble of private off-grid companies, which receive subsidies and collect regulated tariffs that allow them to receive a cost-reflective revenue requirement, can cover 68% of their investment needs, leverage commercial debt for 22% and raise equity for the remaining 10%.

Figure 12 sums up the key statistics of our financial proposal for the 10W scenario, which we consider to be viable. *Figure 13* shows further details and a breakdown for FinanceCo, NewCo, and the aggregate of off-grid companies.

[50] Other versions of the electrification business plan can be easily developed with the same analytical tool, for instance replacing the 3W solar kits for more capable solar home systems and adding more electrical supply for productive and community uses in the rural villages.

Our Proposed Financing (Summary 2021-2030)			
External Funds - DFIs			
	Concessional Debt	USD 2.600 million	68%
Grants (based on DFIs funds to Government linked to the deployment of the On-grid CAPEX)		USD 800 million	21%
		USD 3.400 million	
Internal Funds - GoU			
	Equity FinanceCo	**USD 400 million**	11%
	Total	**USD 3.800 million**	
Commercial debt with potential implications on sovereign debt		*USD 320 million*	*31% NewCo*
			69% Off-grid SPV&PC

Figure 12. Our proposed financing: summary for the interval 2021-2030

FinanceCo		
Positive Operating Cash Flow	USD 219 million	5%
Grants based on DFIs funds to Government linked to the deployment of the CAPEX	USD 800 million	20%
Concessional Debt from DFIs	USD 2.600 million	65%
Equity	USD 400 million	10%
Total	**USD 4.019 million**	

NewCo		
Net Cash Variation	USD 57 million	6%
Positive Operating Cash Flow	USD 815 million	80%
Commercial debt with potential implications on sovereign debt	USD 100 million	10%
Equity	USD 50 million	5%
Total	**USD 1.022 million**	

Off-grid SPV&PC		
Positive Operating Cash Flow	USD 697 million	69%
Commercial debt directly channeled through the Government.	USD 220 million	22%
Equity	USD 100 million	10%
Total	**USD 1.017 million**	

Figure 13. Our proposed financing: detail for the interval 2021-2030

In summary, over a long period of time – the proposed financial plan covers the interval 2021 to 2040 – the total distribution costs (CAPEX plus OPEX) are paid by grants (from the Government and the DPs) during the electrification phase plus the tariffs from the end customers. All incurred debt – concessional and commercial – has been served and repaid and also the specified return on equity. Financial stability is achieved on a permanent basis at the end of the considered period, i.e., when the regulated tariffs – designed with some amount of cross-subsidization – are sufficient to cover the total regulated costs (the “revenue requirement”) of the distribution business, including both off- and off-grid supply.

The case with minimum residential demand of 10W

There is no universally-adopted definition of what ‘access to electricity’ means in reference to the UN SDG 7.1 "by 2030, ensure universal access to affordable, reliable and modern energy services". The definition used in international statistics adopts a very low cut-off for what it means to ‘have access to electricity’. It is defined as having an electricity source that can provide very basic lighting and charge a phone or power a radio for four hours per day (see https://ourworldindata.org/12-key-metrics). The International Energy Agency (IEA) definition entails more than just the delivery to the household. It also

requires households to meet a specified minimum level of electricity, which is set based on whether the household is rural or urban, and which increases with time. For rural households, this minimum threshold is 250 kilowatt-hours (kWh) per year and for an urban household it is 500 kWh per year (see https://www.iea.org/reports/world-energy-model).

The NES has adopted the target of deploying 3W solar kits for 5.5 million households in rural Uganda. This barely meets the first criterion above – one LED light and charging a phone or a radio for four hours a day – it is very far from meeting the second, which would require a SHS in between 50 to 100W and an adequate battery.

Setting a minimum level of demand in electrification planning is always a controversial topic. It is reasonable to accept that the minimum demand level is context dependent, with the context being defined by the climate, the level of income, the efficiency of the available appliances, and the typical productive activities, among other factors. The specification should be "consumer-centric" and therefore made in terms of a minimum package of services to be provided by electricity, rather than a minimum level of electricity to be supplied, or the minimum capacity of a SHS or a connection to a mini-grid or to the main network.

In this section, we examine the impact that a small enhancement in the capacity on solar kits has on the financial viability of the electrification plan. After consultation with various stakeholders, we have concluded that in poor rural Uganda this enhanced solar kit should have at least 10W and a battery of 25Wh, which is a popular product in much demand by the low-income rural population. This system would be enough for two or three lights, phone charging, and a radio, for a longer period of time than the 3W system. In addition, electrification cannot be considered complete at communal level without electricity supply for at least one productive and one community use in each village or population cluster of a minimum size, as the only way to promote human and economic development.

We have performed a sensitivity analysis of the reference business plan for the NES, examining a scenario where the 5.5 rural residential households have 10W solar kits instead of the 3W solar kits in the NES. We do not modify the rest of the operating assumptions of in the business model from 2021 to 2040, also ensuring that 100% electrification is achieved by 2030.

Thus, only these two inputs to the model have been modified:

- The cost of the solar kits, which now change from the 3W kits with a cost of USD 76 in the NES to 10W kits with a cost of USD 170[51];
- The average useful life of these new kits increases from 5 to 10 years.

The CAPEX of investment in solar kits now increases from USD 418 million in the NES to USD 935 million. In Figure 14, we have represented in red colour lines how this increment falls initially on the aggregate of the companies supplying standalone solar systems (an increase of 224% of the investment cost). The total CAPEX of the NES increases from USD 4.68 billion to USD 5.2 billion (up 11%).

[51] Data obtained in private conversations with suppliers of solar home systems in Uganda, which are consistent with data from publications of industry associations such as in UOMA and GOGLA".

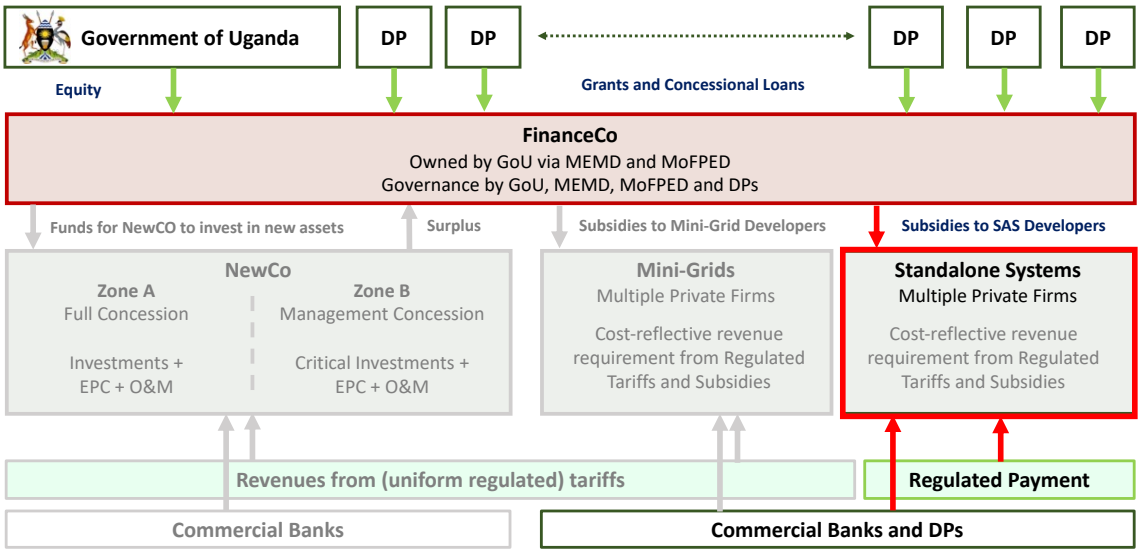

Figure 14. Impact on the business model layer's economic flows

First, we examine the impact on the financing of the off-grid companies. The volume of subsidies coming from FinanceCo towards the standalone solar systems companies (with a specified ROI of 12%) must cover the increase in the cost of the solar kits. Altogether, the subsidies needed for the aggregated off-grid solutions (jointly mini-grids and standalone systems, all of them with a 12% ROI) must increase[52] from USD 840 million to USD 1.2 billion by 2030. A new capital structure has been designed to address this temporary mismatch between subsidies and higher investment needs. In order to comply with the limits of the financial ratios of the aggregated off-grid companies, the commercial debt requirements must increase from USD 220 million in the reference case to USD 510 million. The changes in economic flows have been highlighted in red in *Figure 14*, and the new key quantities describing the financing of the off-grid solutions are shown in *Figure 15*.

Off-grid SPV&PC - Reference Case		
Positive Operating Cash Flow	USD 697 million	69%
Commercial debt directly channeled through the Government.	USD 220 million	22%
Equity	USD 100 million	10%
Total	**USD 1.017 million**	

Off-grid SPV&PC - 10W Standalone systems		
Positive Operating Cash Flow	USD 1.073 million	64%
Commercial debt directly channeled through the Government.	USD 510 million	30%
Equity	USD 100 million	6%
Total	**USD 1.683 million**	

Figure 15. Financing off-grid companies: reference case (NES, 3W) vs. alternative case (10W)

Next, we examine the impact on FinanceCo. The increase in subsidies needed to guarantee the 12% ROI to the aggregated off-grid companies (SPV&PC in the figures) generates a deficit in FinanceCo that must be financed. With respect to the reference case, in this new scenario the contribution of New-Co's surplus is significantly diluted by the increase in subsidies, from positive operating cash flow financing of 5% to 1% of the total financial needs, as shown in *Figure 16*.

[52] The off-grid subsidies are the difference between the Revenue Requirement (RR) with the 12% ROI, minus the mini-grid tariff revenue and the SAS revenue. As the RR increases, due to the increased investment cost of the equipment, the difference is larger, and therefore the subsidy increases.

FinanceCo - Reference Case		
Positive Operating Cash Flow	USD 219 million	5%
Grants based on DFIs funds to Government linked to the deployment of the CAPEX	USD 800 million	20%
Concessional Debt from DFIs	USD 2.600 million	65%
Equity	USD 400 million	10%
Total	**USD 4.019 million**	

FinanceCo - 10W Standalone systems		
Positive Operating Cash Flow	USD 42 million	1%
Grants based on DFIs funds to Government linked to the deployment of the CAPEX	USD 900 million	22%
Concessional Debt from DFIs	USD 2.700 million	65%
Equity	USD 500 million	12%
Total	**USD 4.142 million**	

Figure 16. Financing FinanceCo: reference case (NES, 3W) vs. alternative case (10W)

The small operating cash flow in the 10W scenario is offset by an increase in concessional debt, grants, and equity, leaving a percentage of 12% equity, 22% grants, and 66% debt. Debt restructuring was carried out by analysing the debt limit through financial ratios, always making sure that all debt will be repaid by 2040.

Figure 17 sums up the key figures of our financial proposal for the 10W scenario, which we also consider to be viable.

Our Proposed Financing (Summary 2021-2030)			
External Funds - DFIs			
	Concessional Debt	USD 2.700 million	66%
Grants (based on DFIs funds to Government linked to the deployment of the On-grid CAPEX)		USD 900 million	22%
		USD 3.600 million	
Internal Funds - GoU			
	Equity FinanceCo	**USD 500 million**	12%
	Total	**USD 4.100 million**	
Commercial debt with potential implications on sovereign debt		*USD 610 million*	*16% NewCo*
			84% Off-grid SPV&PC

Figure 17. Our financial proposal for the 10W scenario: summary for the interval 2021-2030

6. CONCLUSION

This report has proposed a reform of the electricity distribution subsector in Uganda – including a suitable solution to the future of Umeme's current concession – that will allow achieving a reliable, affordable, and sustainable supply of electricity for all households, industries and businesses in Uganda in a reasonable timeframe – with an expected positive impact on job creation, demand augmentation, and lower tariffs – with the ultimate goal of increasing the wellbeing of the population and enabling economic growth.

Ending energy poverty is a prerequisite to end poverty. The reforms proposed in this report can decisively contribute to achieve full electrification in Uganda by 2030. This report has focused on the presentation and justification of actionable recommendations. The key components of the reform have been succinctly presented in the Executive Summary and in more detail in Chapter 4 and will not be repeated here.

The report has been written in response to the significant changes in the structure and regulation of the Ugandan power sector that have been announced since the publication of a previous report by the same author. It has been found that the main conclusions of the earlier report still hold, even when assuming that the reforms will take place. However, the changes already adopted by the GoU (i.e., REA becoming a department within the MEMD), plus the additional feedback received during a second mission, and the insights that have been obtained during the development of a business plan for a SDG 7-compatible electrification process in Uganda, have resulted in the streamlined version of the initial distribution reform proposal that is presented in this report.

The detailed business plan of the NES described in Chapter 5 has shown that, should the recommendations in this report be followed, the NES techno-economic electrification plan can be financially viable. Even an enhanced version of the plan, with a more capable solar kit for the rural residential households has been found to be financially viable.

To produce an improved version of the techno-economic plan in the NES is possible, and it could provide a more accurate assessment of the mix of electrification modes and allow more flexibility in adapting to changing priorities or input data. But we believe that engaging in this interesting activity would not modify the overall assessment on the financial viability of the plan and should not distract from the urgency of adopting decisions regarding the regulatory reform and the future of Umeme's concession.

The report draws attention to the need of considering the electrification problem in its true dimension and the urgency to launch a reform, despite the economic turbulences of the present times, because of the undoubtable benefits of a sound universal electrification. Investors are typically deterred by uncertainty that they cannot control, but that can be controlled by others, like country governments. Therefore, it is important that the GoU adopt decisions soon regarding the "power sector rebundling" and the future of Umeme's concession, as a prerequisite to attract sufficient private and public investment to the Ugandan power sector to address the reform that is proposed here.

This report has been written thinking of it as a live document, to be used as a platform for discussion, with the objective of becoming the basis for a possible agreement among the main stakeholders, and eventually resulting in the implementation of measures inspired in what is proposed here. The round of conversations in Kampala in November 2020 and again in March 2022 seemed to indicate that it is possible to reach a high-level preliminary agreement based on the major recommendations of this report. If considered convenient, the authors are available to provide clarifications or to expand on specific items included in the report.

In summary, progress in distribution reform, necessary for a sound power sector in Uganda, and to reap the benefits of full electrification of the country, requires:

i) A swift process of discussion, initiated by the GoU with the main stakeholders and development partners, resulting in the GoU defining and committing to a path of distribution reform, eliminating the current uncertainty regarding the structure and regulation of the power sector, and charging the MEMD with the mission to champion the process;

ii) An agreement in line with the proposal in this report, that guarantees an integral development of the electrification process; keeps the present managerial capabilities of the present concessionaire; extends the grid as necessary in rural areas; promotes the use of off-grid solutions where preferable and under the same regulatory conditions than the main grid; guarantees the financial viability of each efficient supply business within the national electrification plan, and of the overall plan; and attracts sufficient private and concessional financial support to achieve the goal of complete electrification by 2030;

iii) A coordinated effort by the development partners with the necessary level of ambition – in terms of volume of investment and guarantees, as well as involvement in the governance of the use of the funds – to achieve full electrification of the country within this decade.

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8. ANNEX A. THE COUNTRY CONTEXT

Uganda, officially the Republic of Uganda, is a landlocked East-Central African country with an area of 241,038 square kilometres, but the actual land area is 199,810 square kilometres. It is bordered to the east by Kenya, to the north by South Sudan, to the west by the Democratic Republic of Congo, to the south-west by Rwanda, and to the south by Tanzania. The southern part of the country includes a substantial portion of Lake Victoria, shared with Kenya and Tanzania. Uganda is in the African Great Lakes Region. Uganda also lies within the Nile Basin and has a varied but generally a modified equatorial climate.

Current Uganda's population is estimated to be 48.7 million[53] (population growth of 3.3 %, among the highest in the world, despite a reduction in fertility rates) of which 74.3 % is considered rural population, with a per capita Gross Domestic Product (GDP) of USD 878 (National Development Plan, NDP III-2021-2025).

According to a recent World Bank report,[54] Uganda's population will increase in the next ten years to over 60 million and to around 74 million by 2050, from an estimated 46 million today, and more than double to around 104 million by 2060. Of these, 70% will be working age, and half of the population will be living in urban areas. This could become a curse or a boom, the report says, depending on how the government invests resources and steers reforms in coming years. For the country to benefit from this demographic transition, Ugandans must have the skills and good health to be productive and contribute to the country's economic transformation.

Uganda's refugee population has almost tripled since July 2016 and is currently around 1.4 million, making it the largest refugee host in Africa, and third largest in the world. While its open-door refugee policy is one of the most progressive in the world with refugees enjoying access to social services, land and can move and work freely, the continued influx is straining host communities and service delivery.

8.1. ECONOMIC OVERVIEW

Uganda remains one of the poorest countries in the world, with 21.4 % of the population living on less than USD 1.25 a day (World Bank, 2017b). Uganda has achieved remarkable results in reducing poverty over the past decades, mainly driven by the agriculture sector.

Uganda's real GDP growth was recorded at 6.2 % in the fiscal year 2017/2018 (NDPIII) and 6.7 % in fiscal year 2018/2019. The main economic growth drivers were increased private sector activity, significant growth in the services sector – a double-digit increase in Information and Communication Technology (ICT) services – and recovery in agricultural growth from the previous drought seasons. Growth in manufacturing also recovered and helped industrial production grow at 3.5 %. The Ugandan economy reported strong growth in 2019, estimated at 6.3 %, largely driven by the expansion of services. Services growth averaged 7.6 % in 2019, and industrial growth 6.2 %, driven by construction and mining. Agriculture grew at just 3.8 % (Wikipedia). The Government continues to prioritise investments in public infrastructure especially roads, electricity and airports.

Agriculture is the most important sector of the economy, employing over 80 % of the work force. Coffee accounts for the bulk of export revenues. Economic growth in recent years has been constrained by the inadequacies of the infrastructure, including electric power sector infrastructure. Uganda has substantial natural resources including fertile soils, regular rainfall, recently discovered oil, and small deposits of copper, gold, and other minerals.

On the back of the devastating global pandemic, plus a locust invasion and flooding caused by heavy rains, Uganda's growth has slowed considerably in 2020. Household incomes have fallen as a result of widespread firm closures, job losses within industry and services – particularly in the urban informal sector – and a movement of labour back to farming. This threatens to reverse the gains Uganda has

[53] https://www.worldometers.info/world-population/uganda-population/

[54] Uganda Economic Update, 16th Edition. Investing in Uganda's youth. December 2020. www.worldbank.org/uganda

realised from a gradual structural transformation that shifted labour from rural to urban areas and subsistence agriculture to industrial and service activities, and which in the process supported a steady reduction in poverty over the past three decades. More worryingly, the pandemic may further hamper human capital development and the country's chances of benefiting from its demographic transition.

Uganda's real gross domestic product (GDP) growth in 2020 is projected to be between 0.4 and 1.7% compared to 5.6% in 2019. Exports, tourism, remittances, foreign direct investment and portfolio flows shrunk during the second half of FY20 due to international trade disruptions and restrictions of movement of people. This has created significant fiscal and external imbalance, and a deceleration in growth in services, primarily in real estate activities and information and communications technology.

The medium-term outlook is also not favourable for Uganda. The decline in Uganda's real GDP growth and corresponding loss of jobs could be even larger if the country were to face a more widespread pandemic and further locust invasions, as this could deter a rapid economic recovery.

8.2. DEVELOPMENT AND HUMAN CAPITAL

COVID-19 has worsened the effects of poverty and up to three million people could fall into poverty particularly in urban areas, above the currently estimated 8.7 million, threatening to reverse the gains Uganda has made from its structural transformation in recent years. Existing social protection programmes are inadequate, reaching just 3% of the population and increasing overall vulnerability to shocks.[55]

In parallel to creating jobs for the rapidly growing population, a key challenge facing Uganda's development agenda is the delivery of basic education and health services for all. The pandemic may further hamper human capital development and the country's chances of benefiting from its rapidly growing young population which needs jobs and basic services.

The World Bank report considers the population projections, and implications of these projections, without any fertility adjustments. When fertility adjustments are considered this reduces the fiscal costs of both the BaU and SDG scenarios; quite substantially when trying to achieve the SDG scenario. Key to any fertility adjustment, however, is enhancing the agency of girls and women. Educating girls, empowering women, enhancing access to reproductive health services and employing women are central to harnessing the potential benefits of the demographic transition. Of all four, however, educating girls is most important, with clear and large demonstrated positive spill overs worldwide.

8.3. FINANCING ENERGY AND OTHER SECTORS

One of the key aspects when designing the business plan for an electrification programme is not to trespass the limit of sovereign debt that the country can absorb. The World Bank report states that, despite the increasing fiscal deficits and the expansion of public debt close to 50 percent of GDP in FY21, Uganda remains at low risk of debt distress, but with heightened vulnerabilities. This is based on the April 2020 joint World Bank-IMF debt sustainability analysis. However, with total debt service (interest and principal due) expected to be above 50 percent of government revenues over the next three years, Uganda faces heightened liquidity vulnerabilities and reduced fiscal space. Moreover, a debt service-to-revenue ratio of this magnitude corresponds to ratios seen in many countries experiencing high risk of debt distress.

The energy sector must compete with other essential services, like health, education, transportation, or ICT, for the limited funds from the Government. It is, therefore, relevant to know the order of magnitude of the financial requirements in other sectors. For instance, in Uganda the annual General Government Health Expenditure (GGHE) in FY19/20 was USD703 million – 6.4 percent of the national budget and about 1.9 percent of GDP (which was about USD35.1b in 2019). The level of GGHE needs to more

[55] https://www.worldbank.org/en/country/uganda/overview The World Bank. Last Updated: Aug 12, 2020.

than double, as does the other sources of health financing, to achieve the SDG service coverage scenario and the associated volume of core resources. Since Uganda's GDP is expected to grow fast in the next decade, the projected GGHE as a percentage of GDP is expected to drop from a hypothetical 3.8 percent in 2020 (assuming universal health coverage) to 3.2 percent by 2030, both under the SDG scenario's assumptions. This would require Uganda to commit significant additional resources compared to the BaU scenario. Specifically, Uganda will need to spend 1.6 percentage points of GDP (US$914 million) more by 2030 to achieve the SDG of universal health coverage instead of simply maintaining the BaU scenario. Thus, efforts to increase health access and improve quality of health care will require a significant increase in public resources, which may be difficult to fully mobilise under current circumstances.

8.4. POLITICAL ECONOMY[56]

The relative stability of Uganda's political economy centres on the 30-year leadership of President Yoweri Museveni, who came to power as leader of the National Resistance Movement Army (NRM) in 1986, after more than two decades of war and civil strife had devastated the country. Starting in the late 1980s, President Museveni has driven economic liberalisation and market-oriented public sector reforms; initially under a 'no-party' system (1966-2005), and subsequently under a multiparty democracy. Uganda's political economy is characterised by the centralisation of political power around the president and his party, which since won the 2006, 2011, and 2016 elections, as well as strong links between political and economic elites. The stability of the current regime has allowed for steady institutional development and improvements in governance that have facilitated a strong economic growth rate and substantial developmental gains in poverty reduction.

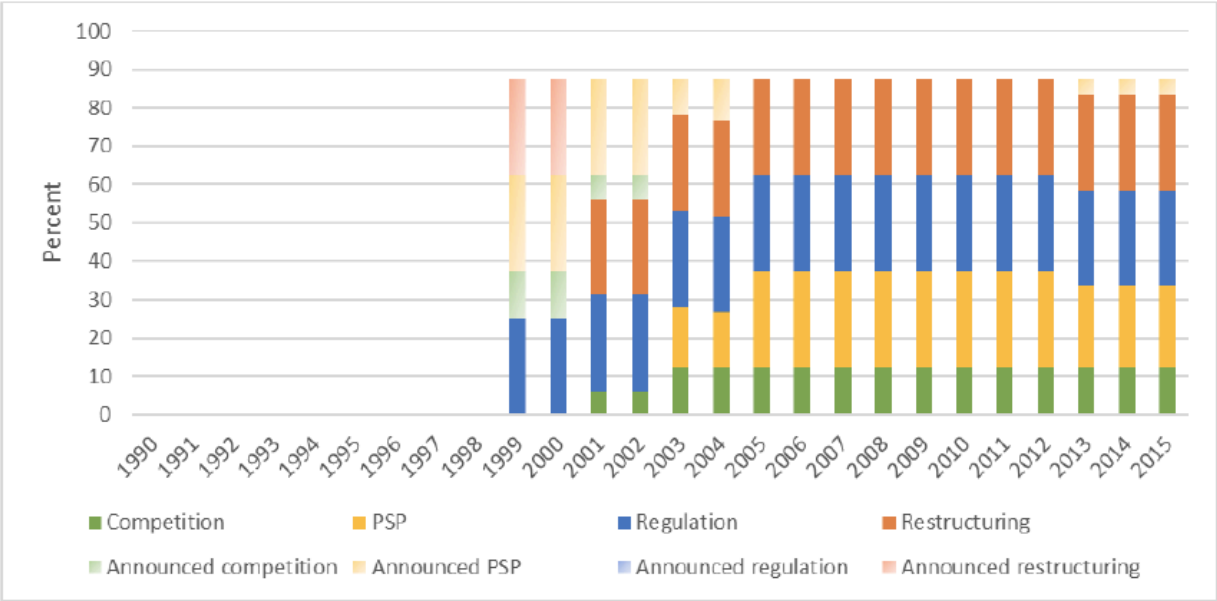
The National Electrification Strategy draft report (July 2020) states that 'while Uganda has modernised its regulatory framework in the energy sector, private sector investors still face constraints because the cost of doing business is perceived as high due to high cost of electricity and other fixed cost items, market risks, and bureaucratic and procedural constraints. Indeed, Uganda ranks in the lower 50% of countries on the Doing Business surveys by the World Bank (116/190). It is expected that government initiatives, like the land tenure reform, reform of commercial laws, procedures of registering and licensing businesses, Rural Electrification Strategy and Plan (RESP), and the full implementation of the regional common market under EAC may continue to improve this perception and improve Uganda's rating in doing business performance and lower investment risks.'

[56] Godinho, C., and Eberhard, A. (2019). Learning from Power Sector Reform: The Case of Uganda. Policy Research Working Paper 8820. http://www.worldbank.org/prwp

9. ANNEX B. NATIONAL ENERGY POLICY AND POWER SECTOR REGULATIONS

9.1. OVERVIEW

In the nineties, international donors prescribed a standard package of reforms of the power sector that included four principal components: restructuring (vertical and horizontal unbundling of power utilities); private sector participation; creation of an independent regulator; and competition in power generation. Uganda implemented comprehensively and quickly these reforms (see *Figure 17*). The 1999 Electricity Act set out plans to adopt around 85 % of the reform measures embodied in the 1990s model. Just four years later, almost 80 % had been implemented. Despite the depth and quick implementation of the reforms, the benefits were not perceived until a decade later, due to a number of difficulties, mostly related to the shortage of generation, worsened by a persistent draught, see (Godinho and Eberhard, 2019).



Source: Rethinking Power Sector Reform.
PSP = private sector participation.

Figure 18. Actual and announced reforms in Uganda, (1990–2015) (Source: Godinho and Eberhard, 2019)

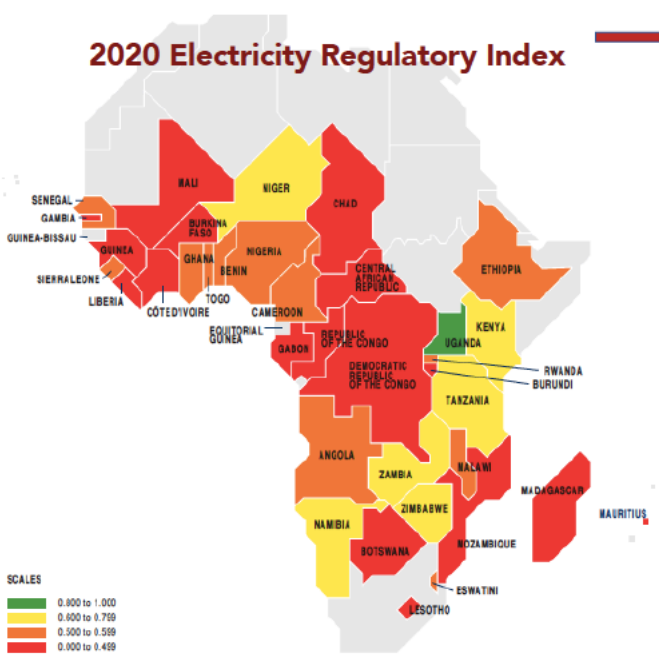
The restructuring of Uganda's power sector has been one of the most advanced in Sub-Saharan Africa. The Ugandan power sector is fully vertically unbundled into generation, transmission, and distribution segments. In generation, state owned generation assets are currently managed under a concession agreement with Eskom Uganda, while the remaining power is supplied by IPPs under PPAs. Most of the distribution network infrastructure and management is under private management, with Umeme's 20-year concession for the main distribution network since 2005 and other concessions have since been awarded for small rural networks. Uganda has high scores for restructuring and private sector participation relative to other countries in the region.[57]

Reputable institutions, like the World Bank or the African Development Bank, have recognised these achievements in their comparative evaluations and rankings. Uganda, for the third consecutive year,

[57] See http://www.esmap.org/rethinking_power_sector_reform

leads the African Development Bank's annual Electricity Regulatory Index (ERI).[58] This is a composite index that measures the level of development of electricity sector regulatory frameworks in African countries against international standards and practices. The ERI is made up of three pillars or sub-indices: the Regulatory Governance Index (RGI); the Regulatory Substance Index (RSI); and the Regulatory Outcome Index (ROI). The ERI 2020 covers 36 countries. This year, it recorded significant improvement in key regulatory indicators in some countries such as improvement in licensing frameworks and provision of transparent processes for investors' entry into the electricity sectors in certain countries.

According to the index, Uganda, along with other top performers Namibia (2), Tanzania (3), Zambia (4) and Kenya (5) have regulators with the authority to exert the necessary oversight on the sector.



Country	RGI[1]	RSI[2]	ROI[3]	ERI[4]	Rank
Uganda	0.925	0.945	0.686	0.801	1
Namibia	0.817	0.702	0.721	0.759	2
Tanzania	0.904	0.926	0.568	0.721	3
Zambia	0.690	0.687	0.622	0.655	4
Kenya	0.828	0.888	0.488	0.633	5
Zimbabwe	0.698	0.723	0.561	0.631	6
Niger	0.724	0.581	0.571	0.611	7
Nigeria	0.900	0.790	0.417	0.594	8
Angola	0.749	0.674	0.494	0.593	9
Ethiopia	0.657	0.674	0.519	0.587	10
Rwanda	0.865	0.646	0.497	0.580	11
Senegal	0.866	0.799	0.379	0.561	12
Sierra Leone	0.750	0.511	0.498	0.561	13
Benin	0.778	0.718	0.404	0.550	14
Malawi	0.698	0.635	0.453	0.550	15
Ghana	0.703	0.704	0.401	0.548	16
Cameroon	0.558	0.522	0.509	0.525	17
Togo	0.587	0.685	0.422	0.518	18
Eswatini	0.770	0.535	0.393	0.506	19
Lesotho	0.702	0.476	0.420	0.497	20
Cote d'Ivoire	0.740	0.453	0.412	0.497	21
Mali	0.708	0.498	0.323	0.441	22
Burundi	0.597	0.193	0.478	0.434	23
Guinea	0.606	0.302	0.393	0.422	24
Madagascar	0.659	0.527	0.250	0.393	25
Mozambique	0.642	0.412	0.277	0.382	26
Dem. Rep. of Congo	0.401	0.357	0.375	0.377	27
Burkina Faso	0.697	0.278	0.286	0.373	28
Botswana	0.681	0.305	0.278	0.336	29
Gambia	0.572	0.526	0.197	0.329	30
Liberia	0.644	0.239	0.184	0.285	31
Mauritius	0.691	0.444	0.135	0.277	32
Central African Republic	0.549	0.321	0.159	0.263	33
Gabon	0.508	0.253	0.165	0.250	34
Rep. of Congo	0.373	0.306	0.167	0.236	35
Chad	0.578	0.034	0.184	0.230	36
Mean	0.668	0.545	0.393	0.460	

Figure 19. Ranking of the 2020 Electricity Regulatory Index (Source: AfDB, 2020)

Another frequently quoted achievement of the Ugandan power regulation is described in a World Bank study, entitled 'Making Power Affordable for Africa and Viable for its Utilities' [59] which analysed data from 39 countries in Sub-Saharan Africa to understand what it would take to make power utilities financially viable and what factors influence the affordability of electricity for those who need it most in the region.

To what extent are costs covered by cash collection? *Figure 19* below compares the cash collected from bills sent out with the total costs of supply, broken down into operational and capital expenditures, per kilowatt hour (kWh) billed. The findings show that only the Seychelles and Uganda fully covered both operational and capital expenditures. Cash collected in 19 countries covered operational expenditures, leaving 20 with insufficient cash to cover these.

[58] https://www.afdb.org/en/documents/electricity-regulatory-index-africa-2020

[59] https://www.worldbank.org/en/topic/energy/publication/making-power-work-for-africa

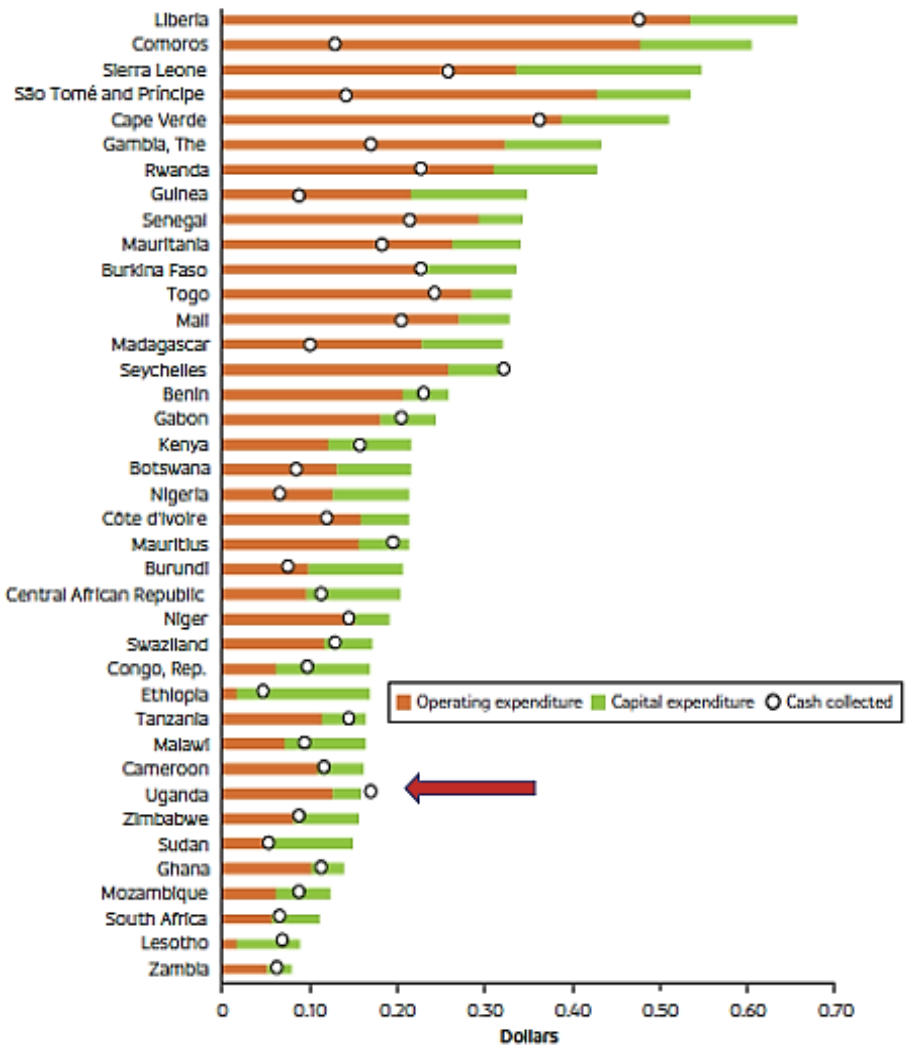


Figure 20. Comparison of electric supply costs with cash collected in 2014 dollars, per kWh billed (Source: World Bank)

It follows a portrayal of the current regulatory framework for the Ugandan power sector, which is a part of the overall energy sector, and each one of the relevant pieces of legislation will be briefly described. The following Annex C with describe the current structure of the power sector and a cursory review of each one of the segments or sub-sectors comprising it: generation, transmission with system operation, and distribution with retailing. Further annexes will examine in more depth the distribution subsector (Annex D), access to electricity (Annex E), previous proposals of distribution reform (Annex F), and a review of national energy and electrification plans (Annex G).

9.2. THE LEGAL AND REGULATORY FRAMEWORK

The power sector is guided by a legal and regulatory framework informed by a number of laws, regulations, policies and guidelines as guided by the 1995 Constitution of the Republic of Uganda (as amended). The 1999 Electricity Act provides a comprehensive legal framework to regulate the power sector, including the generation, transmission, distribution, sale, export and import of electricity in Uganda.

Pursuant to the powers given by the Act, the Minister and the Electricity Regulatory Authority has made subsidiary legislation which includes statutory instruments, regulations, orders and regulatory notices under the Electricity Act (see chapter 6 of the NES 2020 for a full account).

Apart from the enactment of the Electricity Act, the GoU has adopted policies, taken administrative actions and other interventions and reforms which have resulted in positive developments in the sector over the last twenty years. [60]

National energy policies plans for the entire power sector, or segments of it, and electrification plans have been developed, which directly impact on the Electricity Supply Industry (ESI). These are discussed in Annex G and include:

- The Uganda Vision 2040;
- Energy Policy for Uganda (2002), whose goal is '*to meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner*' and the Renewable Energy Policy (2007), which aims to increase the share of renewable energy in the national energy mix;
- The National Development Plans I, II and III. The current NDPIII covering (2020/2021 to 2024/2025);
- The ERA Least Cost Generation Plan (2016-2025);
- The UETCL Grid development plan (2018-2040);
- The REA Rural Electrification Strategy and Plan (RESP) (2013-2022), which is intended to position the rural electrification development programme on a path that will progressively advance towards achievement of universal electrification by the year 2040 and achieve a rural electrification access rate of 22% by 2021;
- The United States Agency for International Development (USAID) Off-grid strategy (2018);
- The USAID / NRECA Uganda Master Plan project prepared for REA (2019);
- National Electrification Strategy (NES) still a draft.

Several aspects of the regulatory framework are currently the subject of reform proposals. In 2015, the Cabinet approved the principles to be embodied in the Electricity Act Amendment Bill and authorised the Minister of Energy and Mineral Development to issue drafting instructions. In September 2018, the Cabinet of the GoU approved recommendations for the rationalization of Agencies, Commissions and Authorities in the country (the 2018 Cabinet Decision)[61]. The implications of these proposals will be discussed later.

The sector's mandate is also governed by other sector policies, including the Procurement Act (2003), the Gender Policy (2007), the Climate Change Policy (2015), the Public Private Partnership Act (2015), the Weights and Measures (Electricity Meters) Rules (2015), the Environment and Social Safeguards Policy (2018), and the Investment Code Act (2019).

Furthermore, the sector also draws on international and regional legal and policy frameworks to which Uganda is a party e.g., the UN SDGs (2015), the East African Community laws and policies, the SE4ALL initiative (2012), or the Paris Agreement (2016).

In this annex only the Electricity Act and some subsidiary legislation that is relevant for this report will be commented.

The 1999 Electricity Act

The Electricity Act, enacted in 1999, establishes the legal and regulatory framework to regulate the Electricity Supply Industry (ESI). It was also the basis to implement wide ranging reforms and the restructuring of the power sector in the 1990s and the early 2000s. The Electricity Act provides for (MEMD-NES, 2020):

- Separation of the policy, regulatory and operational functions of ESI under the Act;
- Establishment of an independent sector regulator, The Electricity Regulatory Authority (ERA), its composition, functions, funding and guiding principles;

[60] A comprehensive account of the pertinent legislation can be found in: (MEMD-NES, 2020).

[61] *Uganda Cabinet Meeting decisions taken on 10 September 2018*, available at http://dc.sourceafrica.net/documents/118452-Decisions-taken-during-Uganda-Cabinet-Meeting.html.

- Types of licenses, licensing procedures, amendment and revocation of licenses;
- Obligations of the Government to undertake rural electrification develop the rural electrification strategies, funding, subsidies and the rural electrification data base;
- Acquisition of land for electricity projects;
- Tariff structure and terms of supply rights and obligations of consumers;
- Offences and penalties;
- The dispute resolution mechanism under the Electricity Disputed tribunal (EDT);
- The unbundling of the Electricity utility Uganda Electricity Board into successor entities;
- Transfer of assets to the successor companies;
- Transitional provisions.

The Act allowed private sector participation in generation and, as a result, private investment has taken place. UETCL became the sole operator of the transmission system and single buyer of electricity both from the Government-owned power generation companies, and the IPPs, which currently account for over 65 % of Uganda's generation capacity.

Other players, who are not mentioned in the Electricity Act, play a significant role supporting the GoU in the electrification efforts. This includes other Government ministries and agencies such as: (i) the Ministry of Finance, Planning and Economic Development (MOFPED) or the National Planning Authority (NPA); (ii) development partners and funding agencies such as the EU, the World Bank and African Development Bank (AfDB), Power Africa, or GIZ; and (iii) diverse associations and consortia.

By virtue of the Electricity Act, the following statutory instruments have been issued:

- The Statutory Instrument 2001, no. 75. It establishes the Rural Electrification Board (REB) to manage the Rural Electrification Fund (REF) and Rural Electrification Agency as a secretariat of the REB. The REA is mandated to facilitate GoU to achieve its goal of accelerating rural electrification;
- The Electricity (Installation Permits) Regulations, 2003;
- The Electricity (Licence Fees) Regulations, 2003;
- The Electricity (Primary Grid Code) Regulations, 2003;
- The Electricity (Quality of Service Code) Regulations, 2003;
- The Electricity (Safety Code) Regulations, 2003;
- The Electricity (Tariff Code) Regulations, 2003.

Several aspects of the regulatory framework are currently the subject of reform proposals. In 2015, the Cabinet approved the principles to be embodied in the Electricity Act Amendment Bill and authorised the Minister of Energy and Mineral Development to issue drafting instructions to the First Parliamentary Counsel to draft the Electricity Act (Amendment) Bill. A draft Bill containing amendments to the Electricity Act 1999 has been proposed. The main amendments include provisions for the Electricity Regulatory Authority, Licenses and Licensees, Rural Electrification Agency, and Offences and Penalties.

Several pieces of subsidiary legislation will be commented next:

- The Electricity Isolated-grid System draft regulation;
- The Electricity Connections Policy (2018) – which aims to increase access and provide cleaner energy for Ugandans – the Guidelines for deployment of off-grid systems;
- The Electricity Quality of Service draft regulation.

Electricity isolated-grid system, Draft Regulation

The electricity isolated-grid system regulation is still a draft and for now, only a consultation paper issued in 2019. It has been prepared by the National Association of Regulatory Utility Commissioners (NARUC) and funded by the USAID, which proposes a statutory instrument that could eventually end up being approved by ERA. This regulation shall apply to:

- generating stations with a generation capacity of up to 500 kW;
- isolated grid systems where the generation capacity does not exceed 2 MW;

- and isolated grid systems that are solicited through a competitive process and not solicited through a competitive process.

All electrical supply facilities meeting any of these conditions are eligible for a certificate of exemption, which grants an exemption from the requirement to hold a license for the generation, distribution or sale of electricity for the promotion of rural electrification.

A person intending to develop and operate an isolated grid system with a generation capacity of a single grid system exceeding 2 MW shall apply to the Authority for the necessary license under the Electricity Regulations (2007). The document covers the following major topics:

- Mandatory conditions to obtain the certificate of exemption by different categories of independent generation, upgrades of generation capacity, and isolated grid systems;
- Obligations of the holders of a certificate of exemption regarding diverse technical aspects of their electrical supply facilities, which must construct, operate and maintain the authorised facilities in accordance with the applicable laws, regulations, guidelines, standards and technical codes, specifically concerning: i) design, installation and operations and management; ii) safety of the facilities; iii) metering; iv) internal connections; v) power quality, service quality and reliability; and vi) consumer management practices. All these are established in the articles of the proposed Regulation. Note that it is proposed that the grid system operators must provide 24 hour / 7 day a week power supply, and any plans to deviate from this requirement must be included in the license exemption application and in the Consumer Service Agreement to be signed with each customer. The operator must attempt to restore service after unexpected power outages in less than 24 hours;
- Regulatory determination of tariffs, tariff computation, tariff structure, application for approval of tariff, tariff adjustments and review. The application for a certificate of exemption shall include a tariff application form, which must follow the tariff calculation principles under the Act, taking into consideration capital costs, operation and maintenance costs, capital recovery, interest expenses, taxes, subsidies or grants received, and a reasonable return on equity that reflects the risks faced by the isolated grid developer. A holder of a certificate of exemption may apply to the Authority for tariff adjustment in accordance with the Act, due to changes on some prescribed factors;
- Options and conditions for interconnection to the primary grid: i) exclusivity and notice to isolated grid operator; and ii) interconnection options. A holder of a certificate of exemption shall have exclusive rights to undertake the licensed activity in the service territory. In the event of the existence of interconnection plans with the primary grid, written notice must be provided, at least six months in advance;
- Where the primary grid system is extended to an isolated grid territory, the isolated grid operator has the option of becoming a small power distributor (SPD) or a small power producer (SPP) or both simultaneously or just completely terminate its operations. Without prejudice of the chosen option, the isolated grid operator will be entitled to an economic compensation that will safeguard the investment made and the approved rate of return;
- Record keeping and reporting, dispute resolution, etc.

Electricity connections policy (ECP)

Financing and implementation for connections (2018-2027)

The Electricity Connection Policy (ECP) was introduced by the GoU to address the challenge of low connection rates that previous policies have not addressed, despite having invested considerable amounts of funds in grid extension. The Policy is meant to address the major areas that have hindered increasing electricity access, provide simple approaches that will be applied to enable faster connection to electricity, and sets out the circumstances for the provision of a connection service. The development of the policy involved a consultative process with key stakeholders.

An implementation manual (described below) provides guidelines and procedures to be adopted to achieve the objectives in the ECP.

Implementing this Policy requires developing and implementing a communication strategy to educate the public on the policy, the benefits of getting connected to electricity and its rational use to reduce bills. REA is charged of preparing a plan for its implementation.

Goals of the Electricity Connections Policy

The ECP was designed to address the major challenges that have kept electricity connections low and hence enable acceleration of connectivity throughout Uganda. Major obstacles to electricity access have been identified as: a) high connection charges; b) high house wiring costs; and c) lack of incentives for service providers to make timely and cost affordable connections. Previous policies and strategies have mainly focused on putting in place the backbone infrastructure, while electricity connections have remained unsupported. The development of the ECP was therefore necessary to address these major obstacles, accelerate national electrification and facilitate achievement of Government's access goals.

The goal of the ECP is to achieve a 60 % level of access to electricity for Uganda by 2027. More specifically, the objectives are to: (i) increase the number of connections made annually from the current average 70,000 to 300,000 connections; and (ii) increase the electricity demand on the main grid by 500 MW by 2027.

In order to achieve objective 1, the following strategies will be applied:

- Subsidise the connection charges for eligible customers existing within the low voltage distribution network. Customers will be required to cover the cost of internal wiring and inspection fees while the Government will meet all other associated charges for the connection;
- For grid densification and intensification, prioritise areas to be electrified while ensuring equitable provision of services across the country. This will involve identifying areas with high population density near or within the distribution network who can be connected under one scheme to lower the unit cost per customer. This will be subsidised for customers;
- Apply technical standards and low-cost technologies for wiring and connection such as ready boards which provide a lighting and socket for customers who are not able to wire their house;
- Use of off-grid solutions for customers located far from the grid where extension of the grid is not financially feasible. A study will be undertaken to inform the design of an appropriate approach to adopt to meet the off-grid connection targets in the ECP. Once the approach is agreed upon, it will feed into the ECP and enable achievement of 31 % off-grid of the connection target. The approach will be approved by the REB and implemented immediately;
- Enable customers to pay their contribution to the connection cost over a period. This approach will be applied later after reviewing the ECP and accumulating a critical mass of customers on the network;
- Enhance the capacity of SPs to meet the increased connection target by facilitating acquisition of connections materials, capacity building and institutional strengthening;
- In order to achieve objective 2, the following strategies will be applied:
- Provide mechanism for rebates where customers invest in infrastructure that will benefit them and other businesses and premises;
- Facilitate connection of three-phase customers through provision of credit. This will also include existing enterprises using fossil fuels such as diesel and petrol. These will be enabled to switch to clean energy;
- Promote productive use of electricity through publicity and mobilisation.

Connection Targets

The Policy targets to achieve about 1.3 million connections in the first revision cycle and an additional about 1.7 million in the rest of the Policy tenure.

The following connection approaches under the ECP will apply:

a) No Pole and Pole Connections

The policy will aim at connecting all customers within a No Pole and Pole service connection radius under the low voltage (LV) networks. The connection cost under this category will be fully subsidised. The customers will be required to wire their premises and pay inspection fees and hence get connected.

Customers that may not afford to wire their houses will be provided with a ready board solution, free of charge.

b) Grid Schemes

- Grid intensification of the distribution network to increase electricity access on the LV network in rural, peri-urban and urban areas will be required in order to meet the connection targets. This will support communities where customers require a connection within a one to six pole radius on the existing LV network. This will be implemented on a project-by-project basis. Project design will further inform project implementation;
- Grid densification will target communities within close proximity to the existing distribution grid through financing the implementation of medium and low voltage power line extensions, transformer installations and associated electricity connections. This will be implemented on a project-by-project basis. Project design will further inform project implementation.

c) Off-grid Connections

Stand-alone solar systems will as well be supported under the policy. The policy will not support them initially since they are not regulated. These are largely implemented through commercial approaches by the private sector with limited government intervention. The Government will undertake a study that will be used to inform the design of an appropriate approach to adopt to meet the off-grid connection targets in the Policy. Once the approach is agreed upon, it will feed into the Policy and enable achievement of 31 % of the connection target.

d) Three Phase Connections

The ECP will facilitate three phase connections through the provision of rebates and credit. An Energy Rebate is a framework where a consumer is compensated for approved investments in line extensions undertaken as part of customer connection installations. The compensation is undertaken by a Distribution Utility over time through offsets of monthly energy billed to the customer. The ERA guidelines on rebates will be applied.

Credit support for the three phase connections will be designed and supported through the UECCC.

The ECP Implementation Manual

An Implementation Manual was prepared to guide the implementation of the ECP and henceforth achieve its connection targets. The manual details the implementation guidelines and procedures to be adopted to achieve the objectives in the ECP.

The manual spells out implementation on the connection approaches, roles and responsibilities of the different stakeholders/institutions, eligibility criteria, disbursement mechanisms, procurement, monitoring and evaluation plans, marketing and mobilisation for connections, verification for connections, funds flow, inventory management, risk assessment and mitigation and other operations deemed necessary for the successful implementation of the ECP.

This manual is meant to be used as the reference guide for implementation of the ECP by the REA and other key implementing organisations. REA bears full responsibility for ensuring operational compliance, relevance and the manual is kept updated.

A study on electrification of remote areas using off-grid solar stand-alone systems has been developed separately. The findings will inform additional policy measures that will be included in the ECP to accelerate stand-alone solar solutions for Ugandans. The Manual will hence be amended to provide for the implementation of the approaches in the stand-alone solar system strategy.

There are a number of assumptions in the ECP that include: targeted connection numbers, projected households, connection costs, budget, funding sources and capacity for implementation among others. Significant deviation from any or some of these assumptions may result in changes to the manual. REA will make the amendments and the REB will review and approve them accordingly.

This is an adequate policy, well designed to complement the electrification process from the viewpoint of the end customer. It helps with potential customers that are close to the existing grid extension infrastructure. But it cannot help in connecting customers that are far from the existing grid or that should be supplied with off-grid solutions. Unfortunately, the GoU has run out of funds for this programme, thus

not being able to reimburse the service providers, which stopped connecting customers under this scheme, resulting in its interruption.

Guidelines for deployment of off-grid systems[62]

The Guidelines for deployment of off-grid system is an administrative document regulating: (i) the process of registration of isolated grid systems; (ii) the certificates of license exemption for isolated grid developers; and (iii) the interconnection of isolated grid systems with the primary grid, including the options for interconnection, and the calculation of the economic compensation of an isolated grid operator when the grid arrives, which depends whether this operator seeks to become a SPD or a SPP or both simultaneously, or just completely terminate its operations.

Electricity quality of service regulation[63]

The objective of this regulation is to enhance provisions of the current Quality of Service standards and provide for penalties in case of licensees' failure to comply. Not yet approved, according to the latest information received. The Solicitor General has informed that this regulation is in the final stages of enactment. This is an important piece that has been missing for too long in the regulation of distribution.

Distribution companies should be given incentives to reduce costs, but never at the expense of reducing quality of service or reliability. Explicit target with associated penalties and credits are an essential component of a sound distribution network regulatory framework, and it must be directly related to the regulated remuneration.

Other recent developments

The Ugandan Cabinet Decision of February 22nd, 2021, on "Merging and Consolidating Government Agencies, Commissions, Authorities and Public Expenditure" was made with the overall objective of eliminating structural functional duplications and wasteful expenditure. It has already led to amending the REA Statutory Instrument to include REA as a department of MEMD.

The Cabinet also approved that the Uganda Electricity Generation Company Limited (UEGCL), the Uganda Electricity Transmission Company Limited (UETCL), and the Uganda Electricity Distribution Company Limited (UEDCL) be merged into one company, to be called the "Uganda Electricity Company" (UEC), operating with one Board of Directors. We shall refer to this change as the "re-bundling of the power sector". This decision has not been activated yet and, so far, no implementation plan or additional information have been made publicly available.

The measures proposed in this report are compatible with a properly organized rebundling, where REA and UEDCL will find their place and a meaningful role to play in the MEMD and the UEC. In fact, this report has been written under the assumption that the rebundling will take place, but the report's recommendations can be easily adapted to the simpler present situation where UEDCL remains unbundled.

[62] There is no information regarding the source or the date of this document.

[63] MEMD (2020). 2020 Sector Performance Report.

10. ANNEX C. THE POWER SECTOR IN UGANDA

10.1. STRUCTURE AND INSTITUTIONS

The past two decades have witnessed major changes in Uganda's power sector, which redefined the role of the GoU as enabler for private investments and participation in the sector and established new entities. In 1999, the GoU passed a comprehensive power sector reform strategy that sought to make the sector commercially viable, reduce dependence on government subsidies, improve access to electricity throughout the country, improve operational efficiency of the sector, strengthen reliability and quality of electricity supply, and attract private investment. To implement the reforms, the GoU passed the 1999 Electricity Act, which:

- Created an independent Electricity Regulatory Authority (ERA) to regulate all sector activities; ERA's main responsibilities are licensing and setting electricity tariffs. ERA also defines and monitors technical standards within the sector and enforces adherence to the National Grid Code. It issues and monitors the licenses required to generate, transmit, and distribute power. ERA also sets and reviews feed-in tariffs for renewable energy (REFiT) generation projects between 1 and 20 MW;
- Unbundled the vertically integrated Uganda Electricity Board (UEB) into separate entities, namely the Uganda Electricity Generation Company Limited (UEGCL), the Uganda Electricity Transmission Company Limited (UETCL), and the Uganda Electricity Distribution Company Limited (UEDCL); the generation and distribution sub-sectors were opened up for private sector participation, while the GoU retained 100 % ownership and management of transmission;
- Established the Rural Electrification Board (REB) in 2001, chaired by the Permanent Secretary of the Ministry of Electricity and Mineral Development (MEMD), to oversee the implementation of rural electrification activities, with the Rural Electrification Agency (REA) serving as the secretariat the REB, to support the day-to-day operations;
- The Ministry of Energy and Mineral Development (MEMD) retained the responsibility for policy formulation in the sector and overall sector coordination and planning. The MEMD is the focal point for energy policy matters within the Ugandan government. The Act also provided for an interesting shift in jurisdiction, whereby the successor companies to the UEB were incorporated under the Companies Act – meaning that they fell under the jurisdiction of Ministry of Finance, Planning and Economic Development (MOFPED).

After the 1999 sector reforms, the electricity industry is structured as outlined in Figure 20 and the power is generated, transmitted and distributed as shown in Figure 21 below.

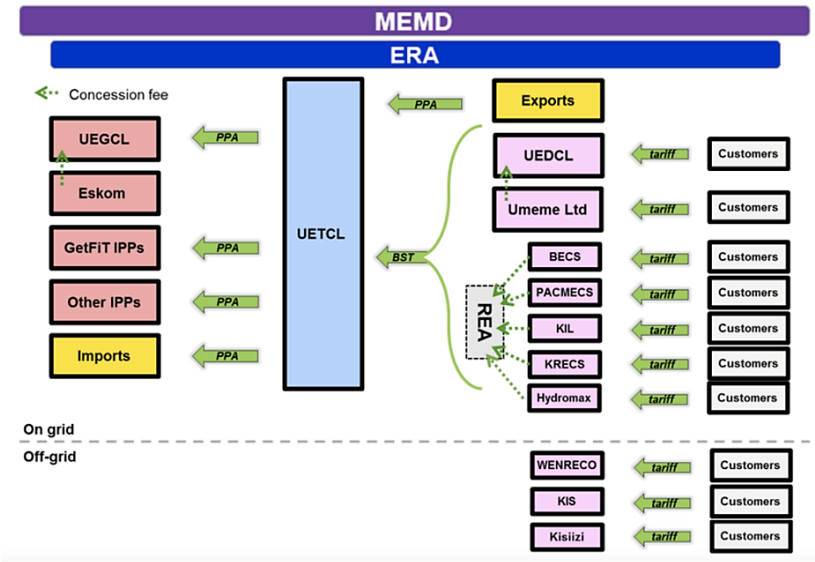


Figure 21. Structure of the electricity supply industry (Source: Ricardo, 2019)

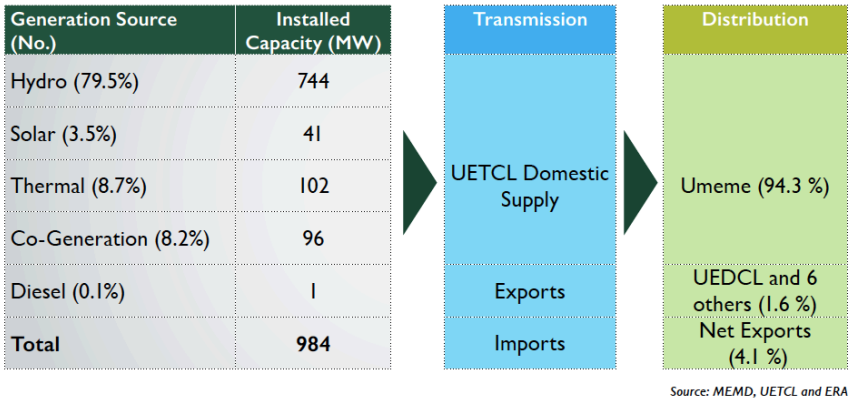


Figure 22. Bulk power flow from generation through transmission and distribution networks (Source: Umeme Annual report, 2018)

10.2. TRANSMISSION

The Uganda Electricity Transmission Company Limited (UETCL) owns, operates, develops and maintains the high voltage transmission grid (>33 kV). The grid connects power generation plants to load centres throughout the country as well as interconnection with neighbouring countries. UETCL holds the role of system operator, single bulk power purchaser and seller under the licenses given to it by the Regulator. UETCL also owns the National Control Centre, which coordinates and monitors grid operations and maintenance activities. UECTL dispatches almost all the electricity generated in Uganda (this excludes electricity generated within isolated grids, as the Electricity Act allows generators to sell directly to small energy co-operatives).

Currently, the High Voltage Transmission Grid (HVTG) comprises 150 km of 220 kV (initially operated at 132 kV), 1443 km of 132 kV, 300 m of 132 kV underground cable, 35.2 km of 66 kV high voltage transmission lines and 20 substations.

The regulatory framework for transmission investment is expected to be ready soon. The achievements of UECTL during the financial year 2019/2020, its challenges and proposed mitigation measures, are described in the 'Sector Performance Report' (MEMD, 2020).

A key responsibility of UETCL is to constantly plan and develop the HVTG. The purpose is to establish a rationale for building a robust network, improve reliability and quality of supply, which will in turn contribute towards the economic development of Uganda.

The Grid Development Plan (GDP) is a planning document that is written in line with UETCL's strategic corporate business plan, see Annex G. It details present and future transmission grid infrastructure that will support national demand growth, generation requirements and regional power trade obligations. The 2018 edition GDP is UETCL's planning reference guide for the years 2018-2040 and is meant to help operationalising Uganda Vision 40. According to (CIG, 2020) '*UETCL's Grid Investment Plan lists 74 transmission projects estimated at over $9.7 billion of investment of which $3.5 billion (36%) has been committed through public debt and grants (land compensation). The implementation of the Grid Development Plan has been constrained by limitations in finance, value chain misalignment and inadequacy of the contracting arrangements*.' and '*Other major transmission projects are at various stages of completion due to challenges of land acquisition, investment shortfall compounded by expiration of approved loans, vandalism of transmission assets and contractors' defaults. Presently, MEMD, ERA and UETCL are reviewing multiple options for mobilising private financing for transmission projects*.'

Limited investment and difficulties in the implementation of transmission projects are constraining the absorption of the excess supply, exports in particular. The MEMD *Priority and Issue Paper* (2019) estimated that this bottleneck is suppressing around 450 MW of potential short-term demand, increasing the cost of service by a further USD 0.10/kWh and the cost due to unutilised capacity by USD 125 million per year by 2023.

(CIG, 2020) signals that '*funding for transmission projects has been limited to government budget and loans from multilateral agencies. There is a need to expand the financing options for transmission projects. To attract private financing, the GoU has to dimension and share the risks which include demand, land acquisition, least cost financing and construction, especially for transmission projects. The financing option must ensure commensurate rewards, sufficient to attract private capital.*' This is in full alignment with the important World Bank study on transmission investment in SSA (World Bank, 2017b).[64]

10.3. BULK GENERATION

The Uganda Electricity Generation Company Limited (UEGCL) is the holding company for state-owned generation assets. Its main roles are:

i) to oversee the performance of Eskom Uganda and of the thermal plant at Namanve (50 MW);
ii) to negotiate and administer engineering, procurement, and construction (EPC) contracts for government/ public projects as well as all Build Own Operate Transfer (BOOT) projects, namely IPPs; and
iii) to supervise the operations and maintenance of mid-tier public projects. For public or emergency power generation projects in the past, the MEMD acted as a procurement entity, either in its own right or through the sector's parastatals.

Eskom Uganda Ltd. is a subsidiary of South Africa's utility giant, Eskom Holdings. In 2003, Eskom Uganda was awarded a 20-year concession for the operation and maintenance of UEGCL's hydropower plants (Nalubaale, 180 MW, and Kiira, 200 MW).

In 2010, the MEMD PS made a designation by letter (to ERA, not official law) that new projects over 25 MW would be taken on by the government. Meanwhile, private projects under 20 MW were being incentivised by the Renewable Energy Feed-in Tariff (REFiT), which had been developed through the 2007 Renewable Energy Policy. In this, Uganda was again a front runner in the region, one of the first countries to attract investment into small IPPs. In 2013 the Global Energy Transfer Feed-in Tariff scheme (GET FiT) was initiated, with a view to attracting small to medium renewable energy IPPs with DFI front-loaded premium payments to developers.

The EU co-funded GET-FiT programme[65] has been instrumental for the improvement of the regulatory framework. Uganda has been several times at the highest level of rankings for its renewable energy investment climate (like Bloomberg's climate scope) and it has, for the third time in a row, been ranked number 1 in the Electricity Regulatory Index (ERI) for Africa 2019[66], released by the African Development Bank, as mentioned in Annex B.

Uganda has currently sufficient electricity to meet its existing needs and is even in a situation of oversupply today. This has taken place through a mix of public (mainly Chinese funded) big hydropower plant projects[67] and of private independent power producers (IPPs) attracted by a favourable investment climate in the renewable energy sector. However, when the Karuma and Isimba plants are commissioned, the ownership structure of Uganda's generation sector will become one with a dominance of government ownership.

The installed capacity in 2020 is 1,252.4 MW and is expected to be increased by 683.5 MW by the end of 2020, with seven new projects to be commissioned (ERA,2020). Further 20 renewable energy projects are already licensed and over 25 projects are undergoing a feasibility analysis. At the same time,

[64] World Bank (2017), Linking Up- Public-Private Partnerships in Power Transmission in Africa, Washington DC. This report shows how many countries have successfully introduced private sector participation in the development, operation, and maintenance of transmission infrastructure. Privately financed transmission has been seen in emerging economies, particularly in South Asia (e.g., India, Philippines) and Latin America (e.g., Brazil, Chile, or Peru). In sub-Saharan Africa, by contrast, private-sector participation in transmission has been uncommon, although some efforts are being made in this direction.

[65] http://www.eu-africa-infrastructure-tf.net/activities/grants/get-fit-programme.htm

[66] https://www.era.or.ug/index.php/media-centre/what-s-new/286-uganda-ranked-no-1-in-the-second-africa-electricity-regulatory-index#:~:text=1%20in%20the%20Electricity%20Regulatory,International%20Standards%20and%20Best%20Practice.

[67] In 2013, right after the period of draught and power shortages, the President awarded the Karuma (600 MW) and Isimba (183 MW) public power projects to two Chinese companies (Sinohydro and CWE, respectively).

the peak demand was 723 MW in December 2019 and shows a substantial demand-supply imbalance with associated important payments of deemed energy.

The mismatch between supply and demand could increase total electricity costs by over USD 950 million per year and increase the cost of service to more than USD 0.30 / kWh, if it was all to be recovered through the tariff. The priority is clearly on increasing the demand through industrialisation, electrification of railways, connection of large loads and productive uses of electricity, in addition to massive rural electrification.

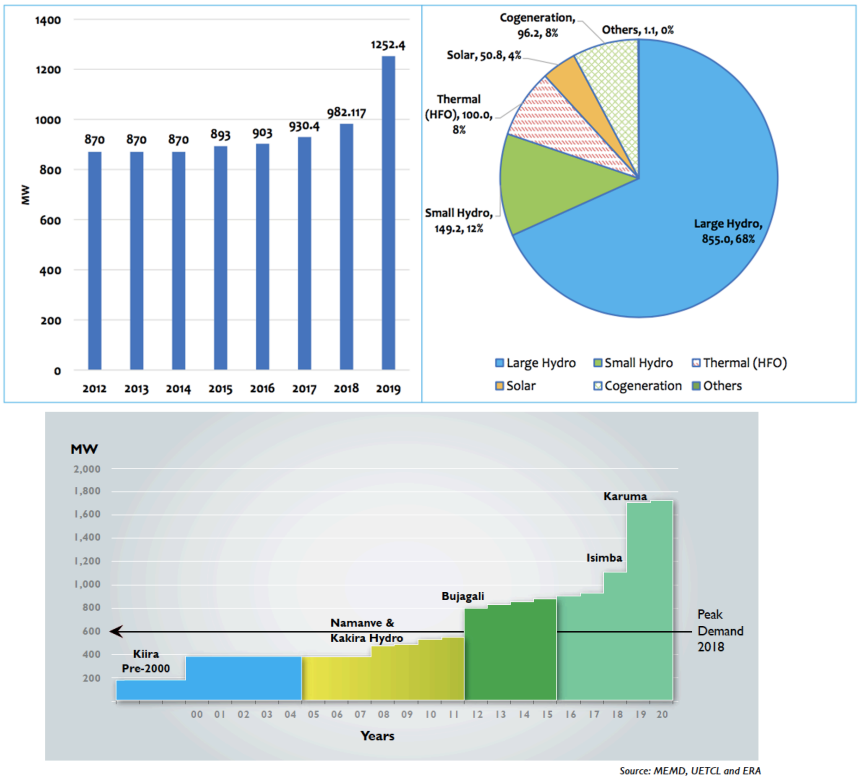


Figure 23. Evolution of installed capacity and current electricity mix (Source: ERA, 2020 and Umeme Annual report, 2018).

While a lot of investments have taken place in the generation segment, there is need to scale up investment in the other segments of transmission, distribution and rural electrification to ensure that all power generated is eventually consumed.

10.4. DISTRIBUTION

As a direct consequence of the Electricity Act 1999, the Uganda Electricity Distribution Company Limited (UEDCL) was created, unbundling it from the former vertically integrated Uganda Electricity Board (UEB). UEDCL is Uganda's holding company for state-owned distribution assets, and it both administers and supervises the private distribution concession agreement (presently held by Umeme). UEDCL also operates a small number of distribution networks in rural service territories.

The electricity sector in Uganda is regulated by the Electricity Regulatory Authority (ERA), whose mandate includes setting operating standards, sector monitoring and setting appropriate end user tariffs. As a way of improving the efficiency in the distribution of electricity, ERA split the single distributor by issuing licenses to eight new electricity distribution companies: UEDCL, Umeme Limited, West Nile Rural Electrification Company (WENRECo), Bundibugyo Electricity Cooperative Society (BECS); Kyegegwa Rural Energy Cooperative Society (KRECS); Pader-Abim Community Multi-Purpose Electric Cooperative Society (PACMECS); Kilembe Investments Limited (KIL); and Kalangala Infrastructure Services Limited (KIS).

Umeme

In 2005, Umeme, a private joint venture between Globelec (a subsidiary of CDC) and Eskom, won a tender for a distribution concession (in the end, Umeme was the only bidder) and signed a 20-year agreement, becoming the major privately owned electricity distributor in Uganda. It began its operations with responsibility over the existing urban distribution network owned by UEDCL, plus the territory within a one-mile distance of this network. Among the terms agreed to in the negotiation, it was a guaranteed 20 % rate of return for any network investments undertaken by the concessionaire. Presently, Umeme is listed on the Uganda Securities Exchange (USE) and cross listed on the Nairobi Securities Exchange (NSE). The National Social Security Fund (NSSF) that has 23 % of the shares in Umeme Limited is currently the largest shareholder. Thousands of Ugandans now have shares in Umeme.

Umeme's concession contract includes performance targets set by the ERA. Umeme has to meet these targets and thus does not have any shareholder targets. If Umeme's operational performance matches the targets set by the regulator, assuming no growth in sales volume during the retail tariff year, its annual return from operating the electricity distribution concession will be equal to a contractually allowed return on its capital investments of 20 %. This contractual return is set through the life of the concession.

The main objectives for the Umeme concession is to (i) reduce the fiscal burden by reducing system losses, increasing collection efficiency, and attracting private finance for distribution network investment; and (ii) improve service standards for existing customers. Currently, the Umeme-operated network covers 97 % of the entire electricity distribution network and extends over the major urban and peri-urban areas. Umeme has succeeded in reducing technical and commercial losses, improving performance levels, increasing the number of connections and attracting significant amounts of investment in the distribution sector.

According to Umeme 2019 financial results, customers have grown by 156 % to over 1.4 million since 2013. Energy sales have jumped by 50 % to 3,183 GWh within the same period. Energy losses have been trimmed to 16.4 % with energy collections of 99.7 % in 2019. To meet current challenges, Umeme is aligning their operations to four key priorities: increasing grid connection; increasing demand; improving reliability of supply; and more efficiencies. A cumulative USD 3.7 billion has been invested in the distribution network since 2010 (CIG, 2020).

The other concessionaires

Other distribution assets in the non-Umeme concession areas were constructed by REA and concessioned out to seven other electricity distribution service providers for operations and maintenance on a commercial basis. These rural electrification bodies were created in order to expand and reinforce the grid in rural areas since rural electrification activities are usually unattractive for private investors due to the high electrification costs resulting from lower energy consumption per capita of rural inhabitants and the fact that households tend to be dispersed over remote areas of difficult access.

One of the problems encountered in establishing concessions in some of the areas that were developed by REA has been the lack of interest shown by private investors due to the perceived high risk and uncertainty of the business. In these cases, the areas have been therefore temporarily concessioned to UEDCL on a three-year basis with the mandate of carrying out the initial development and connection of customers in order to make them commercially viable to other potential operators – if it would be possible. Note that most of the licenses awarded to distribute and supply energy by grid extension in these off-grid areas went to UEDCL itself.

These rural distribution companies are currently only responsible for the operation and maintenance of the distribution grids licensed to them, and their tariffs are meant to cover their operation and maintenance costs only. No framework is in place for covering depreciation of assets and their rehabilitation.

Off-grid electricity supply

Beyond electricity supply by connection to the main grid, it must be mentioned that the Solar Home System (SHS) solutions have indeed experienced a real success story. The level of activity, technical and commercial innovation, and growth of the SHS industry in Uganda is remarkable. Whilst there has

been some GoU support to this market - for example, by not charging value added tax (VAT) on such systems - the majority of the activity has been stimulated by a dynamic set of private organisations that have entered this market. The number of deployed mini-grids has been small so far, but there are ambitious projects by some of the development partners and companies already present and active in Uganda. Detailed information on the technologies, companies and the existing and estimated installations can be found in the reports of the Uganda Solar Energy Association (USEA) https://www.useaug.org and Uganda Off-grid Energy Market Accelerator (UOMA) https://uoma.ug and in Annexes B on regulation and E on access.

10.5. DEMAND

As at the end of 2019, there were 1,552,025 customers on the national grid, signifying an increase of 15 % from the 1,352,735 customers as at the end of 2018. About 93 % of the customers on the network were served by Umeme.

The peak system demand (including exports to Kenya and Tanzania) during the year 2018 was registered as 645 MW (in August 2018), signifying a 3 % increment, as compared to the 625 MW registered as the highest in 2017 (November 2017). This growth was mainly attributed to growth in domestic demand.

The average annual consumption per capita remains very low at 100 kWh per annum (against an average of 518 kWh in Africa) despite the significant but insufficient benefits of the reforms and achievements in the distribution sector. The Government wants to increase it to 578 kWh within the next NDPIII.

The imminent situation of oversupply is encouraging efforts to prioritise demand growth. At current projections, if adequate measures are not put in place to grow demand, there will be an excess capacity of >1,000MW by 2025. This will put significant financial pressure on the already constrained finances of the GoU if additional demand of power is not created. To absorb the excess generation capacity and reduce the financial burden of the GoU, a more aggressive and targeted demand growth strategy is of essence.

The feasible path to financially sustainable demand growth is by improving the reliability and quality of supply to existing industrial demand centers and to attract new large consumers to establish businesses in the short term. Electricity is one of the key drivers of industrial and manufacturing competitiveness.

The ‘Fix and Grow’ approach focuses on fixing the reliability needs of existing high demand customers with superior revenue prospects. According the 2019 Umeme financial results, industrial customers make up 0.2 % of the total Umeme customer base (by connections) but consume 67 % of total energy sales.

About 87 % of the surveyed factories resort to self-generation (diesel generators) for their power needs whenever outages occur. Some production lines rely on self-generation to ensure the quality of their products. Only 13 % of the factories shut down operations and wait for power from the main grid.

The NDP III has prioritised some critical projects; Agroprocessing factories; establishment of steel industry, development of 22 industrial parks including the Kabaale Oil & Gas Industrial Park. Effective coordination and sequencing of interventions among relevant agencies of government is critical to achieving these projects.

Domestic demand growth must be also developed, in particular by providing access to the large fraction of the population that does not have it. To optimise the significant investment in new subsidised connections there is need to grow the domestic demand by taking strategic actions that will encourage use of electricity in cooking, washing and other activities. The new National Local Content Bill, 2019, mandates the promotion and patronage of locally manufactured goods. This is a need for regulatory guidance on the application of the law within the UESI. The Roadmap (CIG, 2020) envisages growth in demand for local goods including power components like transformers, cables, meters etc. MFED must rollout fiscal measures to operationalise the act.

Regional interconnections for power export to neighbouring countries such as Kenya, Rwanda, Tanzania, and the Democratic Republic of Congo must be strengthened. Transmission and distribution networks must be extended and reinforced to connect and develop existing and emerging demand.

10.6. PERFORMANCE INDICATORS

The Ugandan power sector has demonstrated positive achievements across the value chain.[68] Installed generation capacity has increased from about 300 MW in 2002 to 1246 MW in 2019. Private investors are undertaking small renewable energy generation projects that will add about 200 MW by the year 2020. On the transmission side, the network has expanded from about 1,165 km in 2003 to 1,627 km in 2016, and investments targeting interconnection with neighbouring countries are also ongoing. Electricity sales nationally have doubled from 2,000 GWh in 2008 to 4,000 GWh in 2018. Energy losses in the distribution segment reduced from 38 % to 16.4 %; collection rates increased from 55 % to 99.7 %; and the private sector has invested in distribution nearly $2 billion under a cost-reflective regulatory regime.

Figure 23 below has been published by ERA and summarises some of the most important results. Note that there is still much room for improvement in terms of electricity access.

INDICATOR	2000 (Reforms)	2019 (Latest Report)	Estimate 2025 (5 Year Outlook)
Rural Electrification Rate	1.9%	18%*	60%
Urban Electrification Rate	36.1%	64%*	100%
Total Generation Capacity	181MW	1,252MW	3,000MW
Actual Generation	60MW	1,252MW	3,000MW
Generation per capita	41 Kwh	103kWh	280kWh
Distribution Losses	35.4%	16.9%	12.7%
No. of Customers	127,000	1,410,690	4,200,000
No. of Generators	3	27	40
No. of Distributors	1	9	9

Figure 24. Performance indicators (Source: ERA, 2020)

The Roadmap (CIG, 2020) has identified a lack of coordination in the definition and national scope of performance indicators Thus, the Roadmap report has developed and proposes a set of relevant, streamlined, trackable and easily understood Key Performance Indicators (KPIs), aligned with priority sector objectives. In particular, there is a need for a comprehensive reliability and quality of supply monitoring and regulatory framework to ensure effective monitoring of the set targets. Most regulatory agencies in Africa are not effectively monitoring reliability of supply. Uganda is among the few African countries with reliability targets from the regulator. However, for instance, there is presently no empirical measure of reliability status on feeders. UEDCL, as owner of the distribution networks, has responsibility to monitor performance of the concessionaires.

[68] (CIG, 2020) and (Elahi, R., 2019).

10.7. ELECTRICITY TARIFFS

The financial viability of the power sector critically depends on achieving cost-reflective tariffs. Retail tariff setting across end-consumer categories is a central piece of power sector regulation and have wide-reaching social, economic and political consequences. Tariff design must meet two main objectives: to be cost-reflective – i.e., to make sure that the cost of supply is fully recovered – and to promote an efficient socio-economic use of electricity.[69]

With ERA's powers and capabilities seemingly in line with international best practices, its legal authority over tariff setting and other regulatory functions has also been supported by strong and capable leadership.

The principles governing tariff-setting for end-user tariffs are clearly articulated in the relevant codes and are based on marginal and average costs. A significant limitation of the tariff-setting process is the absence of regulatory accounting standards to structure the submission of cost information from the regulated companies. ERA sets tariffs through a multi-year tariff setting process (of three-years duration) that is based on revenue requirements and end-user tariffs have been adjusted quarterly, adapting to a certain set of macroeconomic indexes.

Tariff regulation, as undertaken by ERA, has generally been implemented in accordance with the legal provisions of the Electricity Act. Since the start of the Umeme concession, ERA has applied tariff increases whose cumulative effect has been to increase the average tariff about threefold in Uganda shilling terms.[70]

The regulatory framework for tariffs includes a clear definition of 'cost recovery', which is limited to legitimate costs that can be regarded as prudent, used and useful, known and measurable. Thus, only efficient costs are passed through to prices and there are incentive mechanisms in place to lower transmission and distribution losses, O&M costs, as well as to improve collection rates. Regulated entities are required to submit financial information following regulatory accounting standards. However, since the regulator has not yet developed standards, International Financial Reporting Standards (IFRS) apply.

The Government of Uganda currently has subsidised payments for available capacity by the power suppliers, a legacy of emergency power deals struck during the extended supply crisis and makes capital grants to support the rehabilitation and construction of transmission assets, including those that were constructed by REA.

On the transmission side, the government subsidises UETCL's generation capacity payments and provides grants for transmission construction and rehabilitation. Weighted average interest rate on UETCL's borrowings, comprising of very concessional loans from IDA, African Development Bank (AfDB), Japanese Bank of International Cooperation (JBIC) and Agence Française de Development (AFD) is less than 1 percent.[71]

The recent report (CIG, 2020), still a draft, points at shortcomings on the present level of cost recovery of electricity production costs in Uganda and presents contradictory figures on the cost of future investment to reach universal access. These issues must be examined in greater detail in the context of the business plan firmly advocated in this report (see sections 3.2 and 4.3).

A comparative analysis

A caveat of a comparative analysis that is based on the officially published tariffs is that they may not be cost reflective, and this is the general case in SSA. Uganda is practically the only country in the SSA region where tariffs are close to being cost reflective, for grid connected customers under Umeme. In the country, the regulator has implemented substantial tariff increases whenever they were needed for

[69] Reneses, J., Rodríguez, M.P., Pérez-Arriaga, I. (2013), Electricity Tariffs: Chapter 8 in Regulation of the Power Sector (book), http://stellar.mit.edu/S/course/15/fa18/15.017/courseMaterial/topics/topic35/readings/MYTO_08_-13_Multi_Year_Tariff_Order-CLEAN1/Chapter_8._Tariffs_Reneses-Rodriguez-PArriaga.pdf

[70] In 2014, ERA introduced the quarterly Automatic Tariff Adjustment (ATA).

[71] (Godinho and Eberhard, 2019).

cost recovery. Electricity consumers have experienced cumulative nominal tariff increases of nearly threefold since the onset of the reform process (although the US dollar value of the tariff has only increased from $0.11 to $0.19).[72]

It is presented here how the tariffs in Uganda are, compare with those in a group of SSA countries: Kenya, Rwanda, Tanzania, Ethiopia, Ghana and Nigeria (Abuja distribution region). For each country, the latest available retail tariff data was collated for the various consumer groups.[73] Hypothetical cases have been identified covering four consumer categories:

a. Urban household with 60 kWh per month electricity consumption;
b. Small commercial unit with 300 kWh per month electricity consumption;
c. Small/medium industry with 25,000 kWh per month electricity consumption connected to MV-supply operating 12 hours per day, 6 days a week[74];
d. Large industry with 200,000 kWh per month electricity consumption connected to HV-supply operating 16 hours per day, 6 days a week.

For each of the above cases, the monthly expenditure on electricity is computed based on the tariff data gathered. The results are shown in *Figures 9 to 12*.[75]

A number of factors contribute to the country-level differences that are evident from the *Figures 9 to 12.* The generation fuel mix is particularly expensive across Sub-Saharan Africa. Despite the dominance of coal, hydropower and natural gas in the electricity mix (which have usually been the source of low-cost electricity in countries globally), poor management, lack of infrastructure maintenance and poor bulk power system planning – frequently with expensive take-or-pay generation contracts and a surplus of supply that cannot be exported to countries with generation deficit because of lack of transmission – lead to significantly higher electricity costs[76]. In Ghana, 40 % of take or pay contracts are not utilised and lead to a recurring annual cost of USD 500 million[77]. Uganda is in a similar situation, as it was previously described. Rwanda, for instance, has a generation mix that still relies in part on expensive petroleum fuel which adds to the cost of supply. Ethiopia, on the other hand, with a dominant inexpensive, hydro-powered electricity grid belongs to the group with the lowest tariffs across the continent for all classes of consumers. However, it must be noted that the deficit in the utility total revenue in Ethiopia is among the largest in sub-Saharan Africa[78].

Within the framework of certain regulatory principles, national regulatory authorities must select the design options that are best tailored to the local conditions. A number of countries have small first blocks with low lifeline tariffs for the domestic sector. The size of the first block varies from 15 units per month (kWh/month) in Uganda and Rwanda, to 50 units in Ethiopia, Ghana and Nigeria (Abuja), 75 units in Tanzania and 100 units in Kenya.

Tariffs for domestic consumers in all countries analysed only comprise an energy charge, apart from Ethiopia and Ghana where a fixed/service charge is also levied. Commercial and industrial consumers

[72] Factors contributing to the comparatively high tariffs in Uganda are: the stranded costs of the generation present surplus capacity, the high rate of return on investment (high now, not when it was negotiated in 2005) of Umeme's distribution assets, and the cost-reflectiveness of the electricity tariffs in Uganda.

[73] For a more comprehensive tariff review from 33 countries in SSA with data published in 2017, see https://datacatalog.worldbank.org/dataset/making-power-affordable-africa-and-viable-its-utilities.

[74] The typical cases from industry are based on assumptions made by World Bank (2017) [World Bank (2017), Electricity Tariffs for Nonresidential Consumers in Sub-Saharan Africa

https://openknowledge.worldbank.org/bitstream/handle/10986/26571/114848-BRI-PUBLIC-LWLJfinalOKR.pdf?sequence=1&isAllowed=y]

[75] Nagpal, D. and Pérez-Arriaga, I. (2020) 'Retail Tariff Comparison Across Countries in Sub-Saharan Africa'. https://www.endenergypoverty.org.

[76] https://www.usitc.gov/publications/332/journals/low_electricity_supply_in_ssa_final.pdf

[77] https://www.modernghana.com/news/1041259/ghana-paying-more-than-500million-as-excess-capac.html

[78] Trimble, Christopher, Masami Kojima, Ines Perez Arroyo, and Farah Mohammadzadeh. 2016. 'Financial Viability of Electricity Sectors in Sub-Saharan Africa: Quasi-Fiscal Deficits and Hidden Costs.' Policy Research Working Paper 7788, World Bank, Washington, DC.

face more complex tariff structures usually involving fixed and demand charges. High cross-subsidisation between domestic and industrial consumers is evident across the majority of the countries.

Despite low lifeline tariffs for low-income electricity consumers, they are often unable to benefit from available access due to high connection costs or shared meters for multiple households whose combined consumption places them in higher-priced tariff brackets[79].

All analysed countries face large electricity access deficits. Setting tariffs to globally ensure cost-recovery is a crucial first step to ensure financial sustainability of the distribution sector and to attract capital at the scale necessary to reach universal access. Application of sound regulatory principles for tariff determination to account for existing investments in the distribution sector (involving on-grid or off-grid infrastructure) is crucial. It is also critical to recognise that a hypothetical average cost-reflective tariff that applies to mostly urban customers will be insufficient to cover the high per unit cost of connecting rural population, widely disperse and with low demand per household.

Quality of service incentives

Turning to the issue of quality regulation, ERA's performance is more in line with other SSA countries in the global benchmark group – all of which are below the average. Although the 2003 Grid Code and the Quality-of-Service Code for Uganda prescribe a number of methods that can be used to derive and describe compliance to quality of service and supply standards (and the Electricity Act sets legal provisions for the regulator to enforce these standards through penalties), the impact and implementation of these codes has been somewhat limited by the lack of adequate infrastructure for remote control and monitoring systems. What's more, there are no fine for failing to meet published quality of service performance targets and related technical data is not disclosed to the public. In fact, quality of supply remains a major concern and despite ERA setting quality of supply standards, there is inadequate monitoring and enforcement.

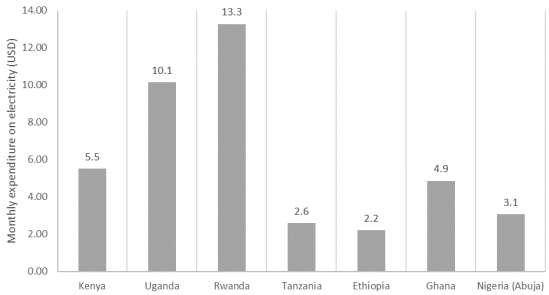


Figure 25. Comparison of electricity expenditure for domestic consumer (60 kWh per month)

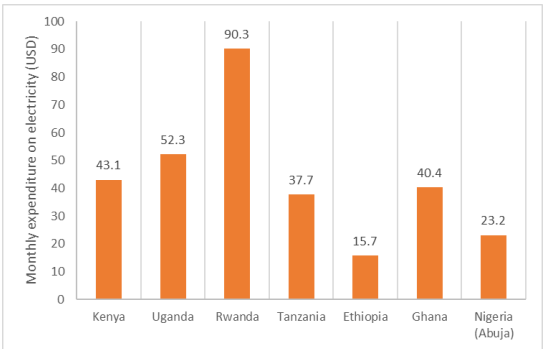


Figure 26. Comparison of electricity expenditure for commercial consumer (300 kWh per month)

[79] World Bank (2016), Making Power Affordable for Africa and Viable for its Utilities. https://openknowledge.worldbank.org/handle/10986/25091

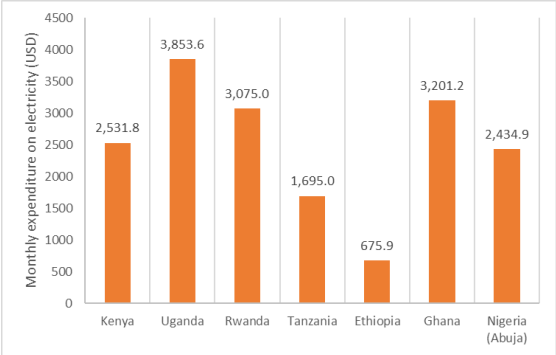


Figure 27. Comparison of electricity expenditure for small industrial consumer (25,000 kWh per month)

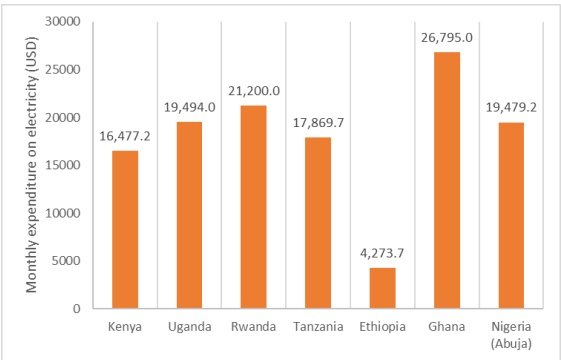


Figure 28. Comparison of electricity expenditure for large industrial consumer (250,000 kWh per month)

11. ANNEX D. DISTRIBUTION OF ELECTRICITY IN UGANDA

This annex expands on the previous one, which has presented the power sector in general terms, and focuses on three topics: (i) Umeme; (ii) other concessionaires; (iii) issues in distribution regulation and its implementation. The access issue is addressed in the next annex (Annex E).

11.1. UMEME

The current situation of the company will be presented first, followed by the description of the evolution of the concession since its creation in 2005, ending with a detailed description of the terms of the concession.

Umeme today[80]

Umeme Limited is Uganda's main electricity distribution company, distributing 97 % of all electricity used in the country. Umeme operates a 20-year electricity distribution concession from the Government of Uganda that took effect on 1st March 2005.

The distribution network comprises of distribution electrical lines at medium and low voltage (operating at 33 kV and below, down to 240 volts), substations, distribution transformers, and other network infrastructure. The second core function involves supply of electricity to customers including provision of additional products and services.

Umeme's core business activities can be summarised as follows: '*Electricity distribution that involves the operation, maintenance, upgrading and expansion of the distribution network within Uganda*'. The distribution network consists of approximately 34,146 km of low voltage, 11 kV and 33 kV network lines covering all major hubs in the country, and electricity supply and after sales service, which includes: i) connection of new customers to the distribution network: ii) meter reading, billing and revenue collections; iii) customer complaints resolution; iv) restoration of power after interruptions; v) general customer care including provision of information on services; vi) customer sensitisation on energy efficiency, energy losses and safety, and vii) marketing of available power to customers.

Umeme's administrative structure

The countrywide operations are distributed, for administrative purposes, into the following four regions under the supervision of Regional Managers and Customer Service Engineering Managers: Kampala East, Kampala West, North-Eastern, and Western regions.

All these regions are further subdivided into 25 districts under the supervision of a District Manager reporting to the Regional Manager. The Company delivers its strategic business objectives through the devolved district structure.

[80] The Umeme 2018 Annual Report presents to the shareholders and stakeholders of the Company the performance of Umeme for the year ended 31 December 2018 and highlights the prospects of the electricity supply industry for the years to come. The report reviews the key material issues and the results of the operations from the financial, economic, social, environmental and operational perspectives.

The report also covers the governance aspects in ensuring organization compliance and sustainable business operations. The scope of the report is the financial year ended 31 December 2018 and any other material developments up to the date of the publication of the report. The Board approved the Annual Report and Financial Statements on 22 March 2019.

Information from this report has been used to describe Umeme as a company, its performance, its concession agreement, and its perspectives for the future.

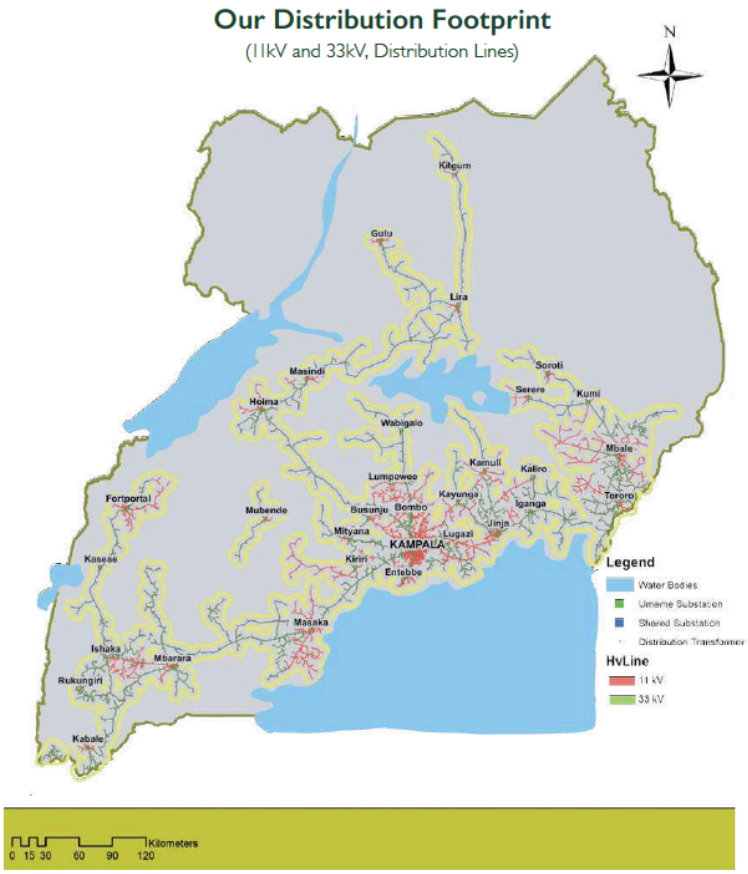


Figure 29. Distribution footprint in Uganda (11 kV and 33 kV, distribution lines) (Source: UMEME)

Key Performance Statistics

Detailed information about the performance of Umeme during its 15 years of existence and in more detail during 2018 can be found in the 2018 Umeme Limited Annual Report. The highlights of the performance of Umeme are presented below, over the 15-year period:

- Umeme has doubled the size of the distribution network to 33,146 Km of distribution lines and over 12, 523 distribution transformers at the end of 2018. In addition, the electricity distribution network is more safe, reliable and efficient.
- Customers connected to the grid have increased fourfold from 290,000 as of 2005 to 1.3 million at the end 2018. Pre-paid metering has been rolled to 950,000 of these customers, contributing 24 % of the Company's revenues.
- The distribution system is more efficient, having reduced energy losses to 16.6 % in 2018 from 38 % in 2005.
- Umeme has improved revenue collections with the 5-year collection rate averaging 99 % as of 2018, compared to 80 % at the start of the concession.
- Umeme has been innovative, implementing technologies like pre-paid metering and network automation to improve service experience.

The sector is less reliant on government subsidies, thereby self-generating cash flows to meet the cash needs of the electricity value chain. Electricity sales have increased to Ushs (Ugandan shilling) 1,600 billion in 2018 compared to Ushs 160 billion of 2005.

The electricity sales have increased to 3,011 GWh in 2018 (see Figure 29 below) compared to 1,000 GWh of 2005. This has been possible thanks to the increase in the installed generation capacity from 240 MW as of 2005 to 984 MW, mainly driven by private sector investments.

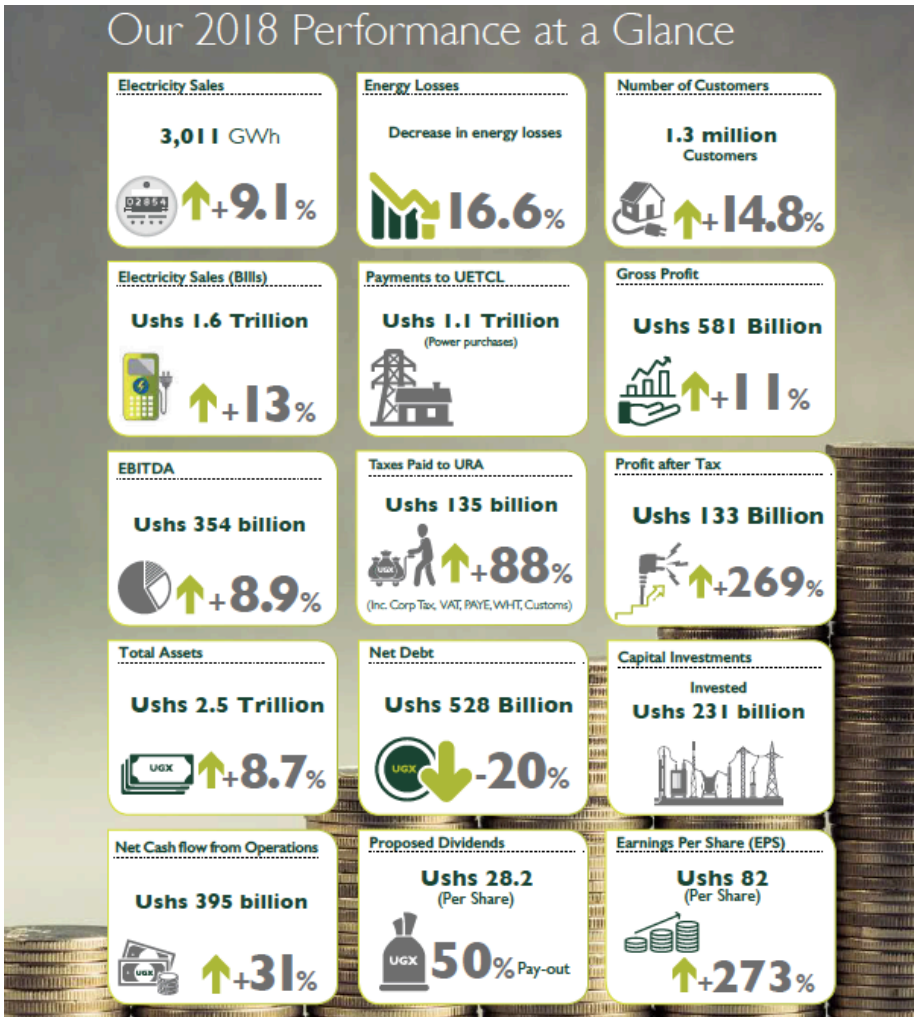


Figure 30. Umeme's performance during 2018, compared to 2017 (Source: UMEME)

Financial Performance

Umeme recovered from the 2017 regulatory write-downs, posting a strong performance for the year. Earnings Before Interest Tax Depreciation and Amortisation (EBITDA) increasing by 8.9% to Ushs 354 billion in 2018 compared to Ushs 324 billion in 2017. The Profit after tax increased to Ushs 133 billion compared to Ushs 36 billion in 2017.

During the year 2018, cash flows generated from operations were Ushs 395 billion compared to Ushs 302 billion in 2017. The cash generated was used to fund capital investments, dividends and financing obligations. In total, the capital investments implemented in the year were Ushs 231 billion (2017: Ushs 236 billion). The cumulative investments since the commencement of the Concession to 2018 stand at Ushs 2,330 billion (USD 627 million).

In 2018, the Board recommended a final dividend of Ushs 28.2 per share compared to UShs 7.6 per share of 2017. Once approved by the shareholders at the Annual General Meeting, the final dividend was paid on or about 15th July 2019.

Umeme has published results (not yet audited) for the six months period ending on June 30, 2019. These results are consistent with the trend described above.

Umeme has been able to recover the vast majority of its costs in its tariffs. It is today considered (with Seychelles) the only financially viable utility in Sub-Saharan Africa.[81]

[81] https://www.worldbank.org/en/topic/energy/publication/making-power-work-for-africa

Customer segment information

The Company is organised into one single business unit for management purposes. Management monitors the operating results of the business as a single unit for the purpose of making decisions about resource allocation and performance assessment. Segment performance is evaluated based on operating profit or loss which is measured the same as the operating profit or loss in the financial statements.

The Company's core business activities are electricity distribution and electricity supply and service after sales. Electricity distribution entails operation, maintenance and upgrading of the electricity distribution network not exceeding 33 Kilovolts (KV) within the authorised territory in Uganda. Electricity supply and service after sales that entails connection of new customers, meter reading, billing customers, revenue collection, addressing customer queries, restoration of power interruptions, general customer care, customer sensitisation on energy efficiency and marketing available power to customers. The revenue from these business activities is categorised into energy sales (billings to customers), construction income, other regulated income and other nonregulated income.

The Company's customers are categorised into domestic, commercial, medium industrial, large industrial and street lighting. The retail tariff rates are broken into categories based on the type of customer and generally charged based on relative usage levels plus a fixed monthly service charge. The ERA approved base retail tariff rates for 2018, effective as of 1 January 2018.

Regulatory Updates

New sets of tariff parameters are periodically discussed between Umeme and ERA, which are finally approved by ERA. They can include, for instance: energy losses, target bad debt rate, operating costs and working capital. The set targets are expected to be fair and reasonable, and achievable within the available resource envelope.

ERA can propose amendments to the Supply License. For instance, in the 2018 review they concerned the following items: i) definition of the reconciling amount under Power Supply Price reconciliation; ii) introduction of minimum connection targets; iii) supply reliability penalties/rewards mechanism; iv) provision of information during the transition period; and v) adjustment indexation of USD Component operating costs to international inflation.

THE ELECTRICITY END-USER RETAIL BASE TARIFFS FOR 2019 AS SET AND ANNOUNCED BY THE ELECTRICITY REGULATORY AUTHORITY

umeme
Powering Uganda

Umeme hereby informs its Esteemed Customers that on 24th December 2018, the **Electricity Regulatory Authority** notified us of the following Electricity Retail Base Tariff rates applicable for the year 2019;

Customer Category	Time of Use	2019 End-User Base Retail Tariffs
		Shs/kwh
Domestic Consumers - CODE 10.1 Low Voltage single phase supplied at 240 volts	First 15 kWh in a month	250.0
	After the first 15 kWh in a month	769.0
Commercial Consumers - CODE 10.2 Three phase low voltage load not exceeding 100 Amperes supplied at 415 volts	Peak	884.8
	Shoulder	681.1
	Off- Peak	433.9
	Average	684.8
Medium Industrial Consumers - CODE 20 Low voltage supplied at 415 volts, with maximum demand up to 500kVA	Peak	790.8
	Shoulder	608.8
	Off- Peak	388.6
	Average	613.2
Large Industrial Consumers - CODE 30 High voltage 11000 volts or 33,000 volts with maximum demand exceeding 500 kVA but up to 1,500 kVA	Peak	490.9
	Shoulder	377.9
	Off- Peak	259.1
	Average	377.7
Extra Large Industrial Consumers - CODE 40 High voltage 11000 volts or 33,000 volts with maximum demand exceeding 1,500 kVA and dealing in manufacturing	Peak	415.2
	Shoulder	319.6
	Off- Peak	225.0
	Average	311.9
Street Lighting- CODE 50	**Average**	751.1

Note:

1. The **Electricity Regulatory Authority** announced that the schedule of Electricity Retail Base Tariffs shall be applicable to all consumer bills raised based on meter readings taken in 2019 for customers on post paid billing system.
2. The Electricity Retail Base Tariffs for 2019 shall apply to electricity purchases made by our customers on the prepaid system in 2019.
3. The Electricity Retail Base Tariffs shall be subject to quarterly adjustment by the **Electricity Regulatory Authority** to reflect changes in macroeconomic cost drivers. The approved electricity tariff rates applicable for each quarter shall be duly announced and implemented by Umeme Limited.
4. The first monthly 15 kWh for the domestic customers shall be charged at a life line tariff of shs 250 per kWh.
5. Other charges such as fixed monthly charges, maximum demand charges, inspection fees, new connection charges, reconnection fees and penalties for power theft remain unchanged from 2018.
6. The Electricity Retail Base Tariff rates shall apply to the estimated unbilled consumption resulting from either power theft or any instance leading to unbilled consumption in 2019 and subject to respective quarterly adjustments.

Figure 31. Umeme 2019 retail electricity tariffs (Source: UMEME, 2019)

The past and the future[82]

Umeme was formed in 2004, when the GoU leased the Uganda Electricity Distribution Company Limited to a consortium belonging to Globeleq (56 %), a subsidiary of the Commonwealth Development Corporation (CDC) of the United Kingdom, and Eskom of South Africa (44 %). The transfer of assets did not take place until 1 March 2005. During 2006, the consortium formed by Globeleq and Eskom was restructured, with Globeleq becoming the sole owner of Umeme.[83]

The first years of managing the concession were difficult ones for Umeme.[84] Despite the extensive structural reforms of the Ugandan power sector that were effectively implemented during the early 2000s, improvements in the operational and financial performance of the sector took some time to fully materialise, partly due to the coincidence of lack of installed generation capacity due to delays in the construction of the Bujagali plant and a multi-year long drought period leading to serious power shortages, the escalating costs of generation, and the associated loosening of the performance targets that the GoU had to allow for Umeme. During this period the GoU had to provide a large volume of subsidies (about US$ 390 million) to ensure that Uganda's electricity tariffs remained comparable to those of other East African Community (EAC) countries. These circumstances understandably led some to question the Umeme's concession arrangement and the power sector was subject to much political scrutiny, in 2009 and 2012, with parliamentary commissions focusing their complaints on the 20 % return on investment, the need for stringent targets and the performance of the company. In both cases, the commissions recommended the termination of Umeme's concession.

Bujagali 250 MW hydro plant was commissioned in 2012, ending the long period of power shortages and leading to the improvement in operation and financial performance of the sector. Moreover, the expensive thermal generation that had to be dispatched to meet peak demand ceased to be needed, as well as the costly subsidies applied by the GoU to avoid passing these high generation costs to the customers. ERA raised the tariffs by 46 %, becoming close to cost reflectiveness. It introduced an Automatic Tariff Adjustment (ATA) to account for changes in fuel cost, local inflation and exchange rate fluctuations, and introduced much tighter regulatory performance targets for Umeme.

Despite the recommendations of the parliamentary commissions, the Umeme's concession survived, because of a number of reasons. In the first place, the resolute governmental support to the power sector reform. Secondly, Umeme was finally able to improve its performance starting in 2012, increasing the collection rate, bringing investment to the distribution network, – including donor funding for access programmes – resulting in success in meeting or even exceeding ERA's targets. Finally, the comprehensive legal safeguards embedded in the concession agreement were also of essence, including protection against the failure of ERA to approve tariff adjustments in accordance with the tariff methodology in the distribution and supply license, government default on payments, and the premature termination of the concession contract, afforded through escrow accounts, a World Bank Letter of Credit and Partial Risk Guarantee provided at the time of signing the contract, and, ultimately, strict legal obligations that the agreement placed on the GoU.[85]

At that favourable time, Umeme Limited was incorporated as a limited liability Company under the Companies Act, 2012 of Uganda and licensed by the Electricity Regulatory Authority under License No. 047 and No. 48 to carry on business of electricity distribution and supply under the provisions of the Electricity Act 1999, (Cap 145). Umeme was listed on the Uganda Securities Exchange and cross listed on the Nairobi Securities Exchange in November and December 2012 respectively.[86]

[82] (Godinho and Eberhard, 2019).

[83] Wikipedia.

[84] (Godinho and Eberhard, 2019).

[85] (Godinho and Eberhard, 2019).

[86] Legal ownership of Globeleq was subsequently transferred in 2009 from CDC to Actis. In June 2014, Actis ceded its majority shareholding in Umeme decreasing its stake from 60% to 14.3% through a secondary public offering on the USE and NSE. The 60% shareholding was held by Umeme Holdings Limited which was fully owned by Actis. The divested shares were acquired by about 20 new and existing institutional investors among them Investec Asset Management and National Social Security Fund

After the initial period of 2005-2012 of the power sector's stabilisation, the period from 2012 until now has seen significant performance improvements, as reported in the previous section. Some reliability problems have however been reported (Godinho and Eberhard, 2019).

Looking into the future[87]

Umeme sees the current period as one of growth, with an opportunity to double the electricity demand in order to absorb the new generation capacity. Thus, Umeme considers it is important to prioritise investments across the entire electricity supply chain from generation to distribution.

As the new regulatory period began (2019 -2025), Umeme considers that the key priorities will be on:

- Expansion of the electricity distribution grid to evacuate the additional 783 MW of generation capacity. Creation of demand and delivery of reliable and quality electricity to industrial customers shall be a priority.
- Increasing electricity penetration from current estimate of 26 % to 60 % by 2027. A total of 2 million new customers are projected to be connected to the electricity grid by 2025.
- Further efficiency gains through reduction in distribution costs per MWh, energy losses reduction and revenue collections efficiency are important elements in the tariff equation.
- Organisation capacity and human capital development is an important priority of the electricity industry. More resources shall be required to service the increased customer base.

Umeme recognises the urgency of additional investments required in the distribution network on the account of increased generation capacity and the implementation of the last mile connections programme. A well-funded and prioritised investment programme shall anchor Umeme's growth agenda.

- To further mobilise additional capital, the extension of the existing concession beyond 2025 becomes critical. Conversations between the Government and Umeme to potentially agree on terms of an extended concession have started.[88] If the process concludes with an extension of the concession under new terms, Umeme will be again able to unlock funding opportunities for long term capital to finance the Company's projected capital investments programme of USD 450 million for the next 6 years.

The terms of the concession

The Company signed various contracts with the GoU institutions and with the shareholders on 17 May 2004 to support the 20-year concession arrangement, which took effect on 1 March 2005. These agreements have since been amended a number of times. The agreements set out terms, conditions and obligations of the parties to the different contracts as follows.

Lease and Assignment Agreement (LAA)

Umeme signed a Lease and Assignment Agreement (LAA) with UEDCL for the Power Distribution Network for a period of 20 years. The LAA provides for termination of the agreement by either party, but a 'Buy-Out Amount' (as defined in the agreement) is payable to the Company by GoU. Under the LAA:

Umeme received '*possession of the assets under the concession assets but not ownership*' and thus assumed the exclusive right to use, maintain and retire the Distribution Network Assets and related systems and retransfer the assets back to UEDCL after 20 years, unless the contract is terminated before that date.

(NSSF) Uganda. As of December 2017, the company shares were held by institutional investors (72 percent) and retail investors (28 percent, of which thousands of Ugandans), with NSSF being the largest shareholder (23.20 percent). See Wikipedia https://en.wikipedia.org/wiki/Umeme. As of December 2019, the company's total assets were approximately UGX 2.542 trillion (US$692.54 million), with shareholders' equity of approximately UGX 833.52 billion (US$227.1 million).

[87] Umeme Annual Reports. https://www.umeme.co.ug/investor-relations/reports

[88] In December 2018, President Museveni instructed Irene Muloni, Uganda's Energy Minister, to begin negotiations with Umeme regarding the renewal of the energy concession, when the current contract expires in 2025. The ministry of energy, the ministry of finance and the office of the attorney general will represent Uganda during these negotiations.

Umeme is required to make monthly rental payments into an 'Escrow Account' for the assets under concession,[89] Assigned Interest and Other Rights equivalent to: debt service for loans of UEDCL; actual depreciation and interest expenses related to the portion of the assets under concession assets acquired on or after 1 January 2002; a maximum return on equity of 10 % on the asset carrying amount effective January 2009; and administration fees. Umeme will always receive the rental payments made to UEDCL, regardless of the performance of the Distribution Network assets that were taken over from UEDCL and therefore Umeme does not assume any demand risk. Umeme has, in terms of the rental payments, an unconditional right to receive cash. The right to receive cash is accounted for by Umeme as a financial asset.

Umeme has the rights and obligation to make the necessary modifications to the distribution system as deemed desirable to be in proper conduct and in accordance with the requirements of the laws of Uganda. However, UEDCL retains title to the modifications and additions from the effective date of the modification. In order for Umeme to recover its investments in the Distribution Network and earn a return through the tariff, investments need to be preapproved by ERA.

Umeme, at its sole cost and expense, is required to obtain and maintain insurance policies from insurers that are financially sound and commercially viable in Uganda. In the event of loss which prevents Umeme from performing under the Lease and Assignment Agreement, UEDCL is named as 'loss payee' under all property casualty insurance procured by Umeme to cover loss or damage to the Distribution Network.

The agreement may be terminated either by UEDCL where the Company fails to meet its obligations or by the Company where UEDCL, UETCL or GoU fail to meet their respective obligations, as specified under the original agreement or under the fourth amendment to the LAA of 28 November 2006. A buy-out amount (as defined in the agreement) is payable to Umeme.

Umeme and UEDCL are required to agree on an agent who will be a designated bank and enter into an Escrow Agreement. The parties shall open up both Ushs and US Dollar accounts. Umeme shall deposit into the Escrow Account all rent net of the administration fee component that will be paid directly to UEDCL. The GoU and UEDCL may deposit funds into the Escrow Accounts at any time. The designated bank for the Escrow account is Citi Bank London.

Support Agreement

The support agreement between Umeme and the GoU and the third amendment thereto of 28 November 2006 stipulate conditions to be fulfilled before the transfer date, during the concession period and the date for handing over the Distribution Network at the end of concession term; and the obligations of the contract parties and the mechanisms for handling disputes arising during the concession.

The GoU undertook to use its good office, upon reasonable request from the Company, to support the Company's performance of its obligations of managing the Distribution Network provided that this will not relieve the Company from fulfilling its obligations as defined in the agreement.

Power Sales Agreement (PSA)

Under the Power Sales Agreement, entered into with UETCL, and the third amendments thereto:

- The Company is required to purchase electricity declared available and delivered by UETCL. In the event the amount of electricity delivered by UETCL falls short of a pre-agreed minimum threshold, the Company is supposed to be compensated for the resultant revenue short fall as specified in the agreement.
- Although the Company may not purchase electricity from a third party or generate its own power without the prior consent of UETCL, it has the right, but not obligation, to do so in the event that UETCL is unable or failed to supply.

Escrow Agreement

[89] This rental fee that Umeme started paying as a requirement of the concession contract was cancelled by REA years ago, presumably because this cost for Umeme would have to be included in a cost reflective revenue requirement for Umeme, and therefore would be reflected in the final tariffs to the end customers.

This agreement was signed on 18 February 2005 between UEDCL and Umeme to establish an 'Escrow Account' with Citibank N.A., London, the appointed 'Escrow Agent'. The account was opened and initially funded by UEDCL and thereafter by Umeme's monthly deposit of rental payments due to UEDCL under the LAA. Although the escrow amount is exclusively owned by UEDCL, in combination with a 'Letter of Credit' facility funded by World Bank and issued by the Escrow Agent, the escrow amount will accumulate up to a predetermined amount ('the Required Amount') that would be used to compensate Umeme in the event of certain contingencies defined in the LAA and will also serve as security for government obligations under the Support Agreement. At the time of issuing these financial statements in 2019, the Escrow Account was depleted and not funded.

License for Supply and Distribution of Electricity

Umeme was granted this license by ERA to perform the necessary activities for supply of electricity within a defined geographic area in accordance with specific license conditions and pursuant to the Electricity Act, 1999. Umeme is required to adopt Prudent Utility Practices but taking into account the state of the Distribution Network and ERA providing the necessary regulatory mechanism and tariff methodology for the Company to meet its obligations pursuant to the various concession agreements.

Through the Concession, Umeme operates as the primary electricity distribution Company in Uganda, responsible for distributing electricity to Ugandan residents, commercial, industrial and government entities. Under the Concession, Umeme is also required to operate, maintain, upgrade, and expand the Distribution System within Uganda and such contiguous areas as Umeme and Electricity Regulatory Authority (ERA) may agree.

The management of the distribution system in Uganda requires Umeme to maintain and operate the distribution network; to collect revenues from customers based on the prevailing tariff set by ERA in accordance with the licenses and the privatisation agreements; to make investments in upgrading, expansion and maintenance of the assets forming the distribution network; and to return control of the distribution assets, including new investments, to UEDCL at the end of the concession.

UEDCL owns the distribution network that has been leased to Umeme under the Privatisation Agreements. Umeme purchases electricity from Uganda Electricity Transmission Company Limited (UETCL), which owns and operates the high voltage transmission network of up to 132KV. UETCL purchases electricity from several sources including: Eskom (U) Limited, operators of the Nalubaale and Kiira hydroelectric power generation stations; Bujagali Energy Limited that operates the Bujagali hydroelectric power plant; Jacobsen Elektro AS, Electro-Maxx, Tronder Power Ltd, and other smaller Independent Power Producers (IPPs).

Performance based incentive regulation

The concession is structured so that if Umeme's operational performance matches the targets used in setting the tariff, and assuming no growth in sales volume during the retail tariff year, Umeme's annual returns from operating the electricity distribution concession will be equal to a contractually allowed return on its capital investments of 20 %. This contractual return is set through the life of the concession and is not part of the tariff review. The return is on investment in capital expenditure.

The return is annual, based on the level of capital investment in USD as approved by ERA. In addition, Umeme receives all of the rewards and bears all the risks of achieving its tariff targets, including Distribution Losses, Uncollected Debt and Distribution Operation, and Maintenance Costs (DOMC). Performance above these targets results in a positive impact on the Company's profitability while performance below the targets negatively impacts profitability. The Company is incentivised to exceed its tariff targets as it receives the reward of earning additional revenues following the payment of its power supply and operating costs in accordance with the tariff methodology, but conversely there is limited protection of downside risks in circumstances where targets are not met due to underperformance. The costs related to the four set tariff parameters of distribution losses, uncollected debt, DOMC and working capital days lag are reflected in the retail tariff and thereby provide the Company baseline revenues that should just cover expenses relating to these parameters. To the extent actual operating performance is better/worse than envisaged in the tariff parameters, the Company's revenues in respect of these operating parameters will / will not cover the related expenses leading to a positive / negative impact in the overall profitability of the Company.

Other topics

Ownership, rental, and management of the network assets

The Company received possession of the concession assets but not ownership and thus assumed the exclusive right to use, maintain and retire the distribution network assets and related systems and re-transfer the assets back to UEDCL after 20 years, unless the contract is terminated before that date. Umeme also has the rights and obligation to make the necessary modifications to the Distribution Network as deemed desirable to be in proper conduct and in accordance with the requirements of the laws of Uganda. The Company also has an obligation to receive capital contributions from customers and construct and install the infrastructure paid for. ERA may also include within the tariff a component for recovery of funds from customers for financing assets that are not directly used in the Distribution Network but are necessary for the operation of the Distribution Network (non-network assets).

UEDCL retains title to the modifications and additions funded by Umeme and/or customers from the effective date of the modification. The investment made by Umeme into the Distribution Network is recovered through the tariff methodology at the agreed rate of return, as the annual capital recovery charge that is factored into the tariffs charged to the customers. Annual capital recovery charges are computed as the product of the gross total accumulated investments and weighted average depreciation rate. The investments not yet recovered through the tariff methodology at the time of transfer are to be paid to Umeme as a Buy-Out Amount. The Buy-Out Amount is computed as the gross accumulated capital investments less cumulative capital recovery charges at the time of transfer. In order for Umeme to recover its investments in the Distribution Network and earn a return, such investments need to be verified and approved by ERA. Umeme earns no profit on the construction services provided for the customer funded investments and is only allowed to recover the actual cost incurred.

IFRIC 12 is applied to the infrastructure that Umeme constructs or acquires from a third party for the purpose of the service arrangement and the existing infrastructure to which UEDCL gave Umeme access for the purpose of the service arrangement. Umeme applies the interpretation to the five categories of assets i.e., assets taken over from UEDCL, assets financed by Umeme, assets financed by customers, cash capital contributions, assets financed by customer capital contributions collected through the tariffs.

Infrastructure within the scope of IFRIC 12 is not recognised as property, plant and equipment of Umeme because the contractual service arrangement does not convey the right to control the use of the public service infrastructure to Umeme. Umeme has access to operate the infrastructure to provide the public service on behalf of Government in accordance with the terms specified in the concession contracts.

Umeme is required to make monthly rental payments to UEDCL for the concession assets taken over from UEDCL and the IDA financed modifications. Umeme recognises a liability in respect of the unfulfilled obligations it assumed in exchange for these assets. This rental payment obligation is accounted for as a financial liability measured at amortised cost. The liability is to the extent that Umeme receives cash in the tariff for rental payments made to UEDCL regardless of the performance of the Distribution Network assets that were taken over from UEDCL and therefore Umeme does not assume any demand risk.

Umeme has, in terms of the rental payments, an unconditional right to receive cash. The right to receive cash is accounted for by Umeme as a financial asset. The recovery of the investment by Umeme in the Distribution Network is dependent on the performance of the network assets over the concession period and Umeme therefore assumes demand risk with respect to this investment. Umeme recognises an intangible asset that is accounted for according to specified procedures.

Under the terms of the contractual arrangements, Umeme acts as a service provider with respect to construction or upgrading of the infrastructure (construction or upgrade services) used to provide the public service, operates, and maintains the infrastructure (operation services). Umeme accounts for revenue and costs relating to construction or upgrade services and operations services in accordance with IFRS 15.

Electricity sales

Umeme's contracts with the consumer and business customers cover the electricity sales. There is only one performance obligation, which is to stand-ready to supply electricity to the customer. The transaction price generally includes both a fixed monthly fee and a variable fee that depends on the customer tariff category as determined by ERA. The fixed and variable components are recognised based on the fees chargeable from the customer. If automated meter reading is not available, the electricity consumption between the last meter reading and end of the month is estimated. Electricity sales revenue is recognised in the financial statements net of value added tax.

Rate-Regulated Activities

The end-user tariffs approved by ERA at the beginning of each year are used as the Base Tariffs subject to quarterly adjustments for changes in the macro-economic factors of fuel prices, foreign exchange rates and inflation rates (together, 'the adjustment factors'). The tariffs are adjusted with actuals for the three macro-economic factors lagged by a quarter. Therefore, the base tariff can use actuals for the period up to 30 November. Second quarter tariffs use actuals up to 28 February; 3rd Quarter up to 31 May, and 4th quarter up to 31st August.

Other income

Other revenues include reconnection fees, meter-testing fees, inspection fees, fines and other sundry incomes. They are recognised as performance obligation to deliver electricity is fulfilled at the rates prescribed by applicable regulations or at the amounts agreed with the customers.

Intangible assets

Property, plant and equipment included in the concession arrangement from UEDCL are not recognised in Umeme's financial statements in accordance with IFRIC 12.

Under the concession agreements, Umeme received the right to access, operate and use the concession assets, charge customers for the supply of electricity, and other rights in the form of government support and assurances for a period of 20 years in exchange for the transaction fee, monthly rental payments and obligations to restore, reinforce and modify the Distribution Network.

Umeme recognised an intangible asset for the initial transaction fee i.e. the amount paid for GoU support and assurance rights. The Distribution Network restoration, reinforcement and modification costs that are funded by Umeme and meet the recognition criteria of property, plant and equipment are added to the intangible asset and in cases where they are not recoverable through the tariff they are classified under the Buy-Out-Amount (financial asset).

The Buy-Out-Amount represents capital investments by the Company in the distribution system which would not have been recovered through the tariff methodology at the end of the concession. The Buy-Out-Amount is adjustable depending on the circumstances of the Concession termination. Under the LAA, the investment in the intangible assets is recovered basing on depreciation rates of the underlying property, plant and equipment. The intangible assets are therefore amortised using the straight-line method over the useful lives of the underlying property, plant and equipment as this reflects the pattern in which the asset's future economic benefits are expected to be consumed by Umeme, i.e. recovery of the investment through capital as allowed by ERA in the tariff as part of Umeme's revenue requirement. The rates to amortise the intangible assets have been specified.

The residual values, useful lives and amortisation methods of the intangible assets are reviewed and adjusted through review and adjusting prospectively, if appropriate, of the underlying assets' residual values, useful lives and methods of depreciation at each financial year-end.

Minimum Investment Requirements

No minimum investment targets have been set for Umeme for the current and future periods, but the Company is required under the Lease and Assignment Agreement to make the necessary modifications to the distribution system as deemed desirable to be in proper conduct and in accordance with the requirements of the laws of Uganda. Given the nature of the distribution system, the expected future cost of making such modifications cannot be reliably quantified. The investments made in the Distribution Network by Umeme as at the reporting date are as disclosed.

11.2. OTHER CONCESSIONAIRES[90]

Several of the initial licenses to rural service providers have been cancelled due to poor performance and UEDCL is currently operating the distribution business of those service territories. The remaining ones are:[91]

- Wenreco, who won a concession to generate, distribute, and sell electricity in the West Nile sub-region of the Northern region of Uganda in 2003. The company owns a 1.5 MW heavy fuel electric generator and is part-owner and operator of Nyagak Power Station. Wenreco seems to be doing better than the other small concessionaires and may be viable;
- BECS was awarded the license to distribute and sell energy the Bundibugyo district, in Western Uganda;
- PACMECS was awarded the license to distribute and sell energy in Pader, Abim and Agago districts, in the North of Uganda;
- KIL was awarded the license to distribute and sell energy in the districts of Kasese, Rubirizi and surrounding areas (in the southwest of Uganda).

The technical and financial performance of most of the Service Providers is significantly lower than that of Umeme Limited and of many other utilities in the region. Some of them do not seem to have the capacity to fulfil their operational mandate in line with the terms of their license (including in key operational, system planning, financial management, business planning, and reporting areas).

Cooperatives can play an important role in the communities where they operate, and their role could be expanded to mini-grids, but in general they do not have the capacity, critical mass and 'business mindset' to secure exemplary levels of technical and financial performance. Thus, cooperative can make a useful contribution where they can be sustainable and perform well, but they cannot be scaled up to become a major contributor to electrification.

11.3. ISSUES IN THE DISTRIBUTION SEGMENT[92]

Several serious problems have been identified in the distribution segment. It is critical to address them, given the key role that distribution plays in the overall performance of the electricity supply industry.

Overlap in ownership, planning and implementation of grid extension projects

Overlapping mandates of UEDCL, REA and Umeme over service territories or roles resulted in institutional conflicts and inefficiency in the past, prior to REA becoming a department within the MEMD.

There are no fixed licensed areas defined in Uganda. Furthermore, the rural/urban definition is not clear. The RESP identifies as rural service territory all areas that lie outside of the licensed distribution territory of UMEME, defined as being the geographic area within one kilometre of its existing distribution network.

Umeme has the exclusive right to supply electricity in an area up to one-kilometre radial distance from the existing distribution lines it operates. Consequently, Umeme plans, rehabilitates and expands the grid it operates accordingly. On the other hand, the REA has been in charge of planning, developing and concessioning the distribution grid beyond Umeme's area. Experience has shown that uncoordinated planning between Umeme and REA has occurred (e.g., Umeme expanding its network close to areas or in the same areas that the REA planned to electrify). Note that, in addition, UEDCL mission statement includes the following: '*to grow other electricity distribution assets by 10% per annum'*. This objective of UEDCL, which could be revised with UEDCL merging into UEC, seemed to overlap until recently with the responsibilities of MEMD and REA in defining and implementing the rural electrification plan.

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[90] See also the section 'the small service providers' in section 3.2 'strategic considerations' of the main section of this report.

[91] The last one that has quitted is Ferdsult, which was awarded the license to distribute and sell energy in three concession areas namely: Kibale - Kyenjojo, Rukungiri - Kanungu, Masaka – Mbarara.

[92] See (Ricardo, 2020), (MEMD-NES, 2020), (CIG, 2020), (RMI, 2018) and (AF-Mercados EMI, 2017).

REA invested in grid extension with public funds, then transferred the assets to be operated and maintained to Umeme, or to the small service providers, or to UEDCL, or kept them. This created confusion between REA and UEDCL with regard to asset ownership. Note that REA was a semi-autonomous body without a legal personality, established by an Act of Parliament, and its assets were actually owned by the GoU.

There was also confusion regarding the authority of ERA over the investments performed by REA. It was therefore necessary to reorganise distribution and to clarify the mandate of the distribution stakeholders to avoid overlap between the diverse service providers whenever possible. A first step has been done integrating REA as a department within the MEMD.

Lack of an integrated vision of electrification planning

Ricardo (2019) declares *'… the need for an integrated approach towards access –whereby the legal, policy, and regulatory framework acknowledge and value the full range of technological options to provide access to electricity, including connection to the main grid, mini-grids, and solar home systems, and recognise that the selection of the most suitable option should be done on a case-by-case basis and consider financial and socio-economic criteria*.'

Embedded in the present structure of the distribution segment and the regulation is the priority given to on-grid over off-grid electrification. This is hindering adequate progress in electrification of the country. Solutions currently being implemented and planned to accelerate electricity access are not always the most efficient nor the most economic, and on-grid solutions seem to tend to be given priority over off-grid solutions in circumstances where the latter would provide a similar level of service at a lesser cost.

The failure to take a holistic view of the whole country and sector results in inefficient and ineffective deployment of resources lead to sub-optimal results. The major contributor to this problem is the separation of the territory into a large, mostly urban, concession – Umeme – supplying the better-off layer of Uganda's population plus most businesses and industries. Then, there is the poor underserved rural areas that have been concessioned to some small service providers without strong financial and technical capabilities.

Ricardo advocates for a single service provider for the entire country, although he is not explicit about the form that the new business model arrangement must take to replace Umeme's current concession.

The MEMD-NES (2020) sustains that there is limited scope of co-ordination and information sharing through working groups, which is not adequate to overcome the above problems. Donor funding is sometimes targeted to specific areas and projects which may not be necessarily in accordance with the priority scheme of the relevant institution or the country. Therefore, the report argues that there is a need to take a holistic view of the sector and the law should be amended to place over all sector planning and co-ordination under the direct control of MEMD and curb inter-institutional conflicts and rivalry.

In addition, the uncertainty on the Umeme's concession restrains investments that otherwise should be taking place.

Lack of an adequate approach to the electricity access problem

Ricardo gives a pessimistic outlook of the business-as-usual progress on electricity access: '*Total access to electricity of reasonable quality (including off-grid) would increase from around 36% in 2019*[93] *to no more than 60% by 2030 and would fall to 50% by 2040 (again driven by demographic changes and unless balanced by continuing investment).*'

Uganda has repeatedly failed to achieve its electrification targets set under the various national plans and thus, Uganda lags behind in the region in terms of the overall level of electrification. Under the 2001-2010 plans, rural electrification increased from 1 % to 5 % as against the target of 10 % and under the Second National Development Plan (NDP2) the rural electrification target is 26 % by 2022. However, two years to the end of the period, rural electrification is at 22.6 %. This level of poor performance can be partly attributed to the structural design of the concessions, with the lack of an access target for

[93] This is the assessment of (Ricardo, 2019).

Umeme. Umeme's focus on the territory close to the existing grid and the weakness of the small rural service providers.

Other factors also intervene: the lack of prioritisation of off-grid solutions; inadequate public funding; and the low affordability of many households in Uganda, who cannot afford to pay for grid electricity, essentially due to upfront costs. Efforts must be prioritised and amplified to subsidise the full range of prohibitive upfront connection costs and fees.

It should also be mentioned that the definition for 'electricity access' in the policy framework is unclear and can potentially inhibit clear policy direction. This fact risks limiting the technological options to be considered and the efficient tracking of progress.

Need to build capacity

Previous reports have found lack of capacity of the individual institutions, government agencies and licensees/operators to execute their mandate. This is attributable to budgetary constraints, under staffing, and lack of skilled staff.

Flaws in the remuneration approach to publicly managed distribution assets

As indicated before, there is a gap in the remuneration of the system rehabilitation in the non-Umeme concession areas as distribution tariffs do not contain provisions to cater for the recovery of depreciation expenses. This situation prevents funding the replacement of these facilities. No clear responsibilities and procedures for the further funding of outdated assets replacement are in place.

Reliability targets, monitoring and enforcement

Regarding reliability and quality regulation, the levels of monitoring and enforcement by UEDCL and ERA appear to be inadequate and a review of targets, data collection, corrective measures, and enhancement of the enforcing powers of ERA has been suggested (CIG, 2020). It also seems that the reliability and quality of service have not been included in the concession contract of Umeme as part of the incentive regulation component of the remuneration scheme. Regardless of the actual current performance – which in average seems to be adequate – this dimension of performance must be included in any future concession arrangement.

12. ANNEX E. ELECTRICITY ACCESS IN UGANDA

A perennial challenge of the power sector in Uganda is rural electrification. Since the early years of the sector reform, the private sector interest fell short of initial expectations[94], by which private sector investment in rural electrification would happen once the sector was liberalised, and the reforms had been implemented.

Despite a very low electrification access of 8 % in 1999, electricity access was not the focus of the reform. The shortage of generation in the 2000s and the lack of explicit access targets for Umeme resulted in slow initial progress of electrification in urban areas. The bulk supply situation changed around 2012 and progress was made in areas close to the existing grid by densification. Until recently, REA has brought public investment to advance rural electrification. The small service providers have obtained limited results in poor rural areas. High electricity tariffs and connection costs have been an important barrier to electrification. Uganda electrification strategy has been mostly grid-focused, although significant developments are taking place in the off-grid space, with a large number of private solar companies and support from the development partners. See Godinho and Eberhard (2019) for a more detailed description.

12.1. CURRENT STATUS

The statistics

The data available from different sources on the electrification rate in Uganda do not match completely. The main reason is the lack of agreement in the adoption of the criterion to define access.[95]

Only 24 % (up to 28 % for certain sources like NDP III) of the population has access to the national power grid, against an average of 42 % in Africa. These customers must be considered to have electricity access. The latest information from the IEA data base (updated in October 2020)[96] gives a rate of electrification of 28.9 % for Uganda, 47.9 % for SSA, 99.6 % for North Africa, and 90 % for the world. See the Figure 31 below.

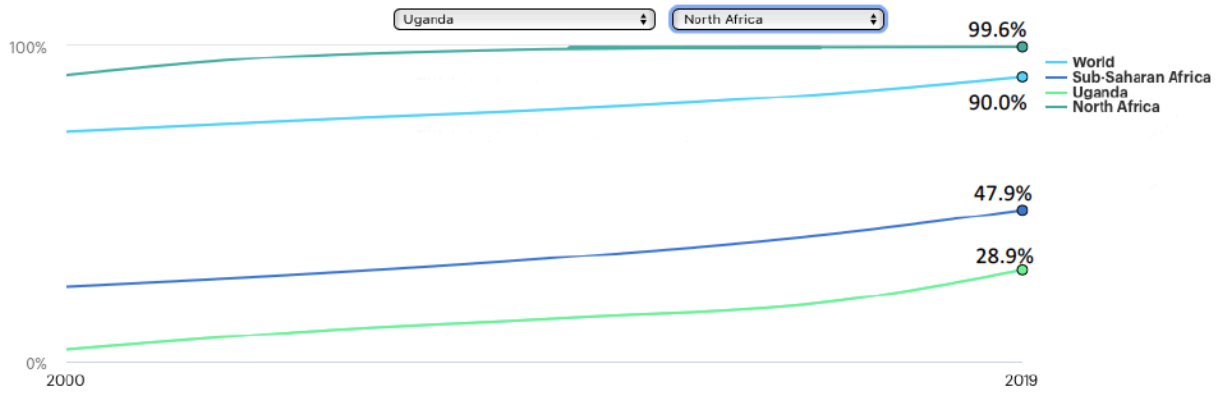

Figure 32. Proportion of population with access to electricity (Source: IEA,2000-2019)

The Off-Grid Strategy proposed by the National Rural Electric Cooperative Association (NRECA) proposes that only products that comply with the minimum definition of Sustainable Energy for All (SE4ALL) Tier-1 service to include multiple light points would be considered as providing energy access. Tier-1

[94] These expectations were undoubtedly optimistic. Rural electrification in areas with disperse and low demand is a 'low-hanging loss'. It has required subsidies anywhere in the world.

[95] See the National Electrification Strategy (NES) draft report. July 2020.

[96] IEA (2020), SDG7: Data and Projections, IEA, Paris https://www.iea.org/reports/sdg7-data-and-projections

stand-alone solar solutions available on a pay-as-you-go (PAYGo) basis (typically costing USD 5-6 per month) are currently only affordable for the top 20 % of income households (NRECA, 2018).

The documentation of the former REA did not define any minimum level of electricity service as providing 'energy access'. Some SE4ALL Tier-0 pico-solar PV lanterns and smaller SHS appear to count as 'energy access' under REA definitions of energy access and could have been included in World Bank SE4ALL database figures for Uganda.

18 million people do not have access to electricity in Uganda, corresponding to an overall electrification rate of 42.65 % in 2018 according to the World Bank[97]. Urban electrification is 57.5 % and rural is 38 % in 2018 while the population reached 42.7 million people (44.3 million in 2019 and 45.6 million today). The annualised increase in access during the period 2010-2018 has been 4%.

The Concept Project Information Document of the EASP project of the World Bank for Uganda[98] states that the national electricity access rate remains low at 26.7 % nationally and about 18 % in rural areas, which is low both by global and regional standards, for instance, when compared to other countries in the region such as Kenya (70 %) and Tanzania (33 %). The historical customer connection rate has been, on average, around 70,000 new connections annually since 2007, of which about 90 % have been made by Umeme. According to this document, the major factors that have hindered electricity access expansion relate to nature and size of concessions, incentives and capacity to meet connection targets, and affordability of service connections charges and internal wiring.

By the end of 2018, 38 % of households in Uganda had Tier 1 level access to electricity, the minimum level to be considered to have access to electricity or clean cooking, according to (Taking the Pulse, 2019).

Some governmental documents consider the overall access up to 50 %, including 27 % of access to sources of electricity other than the main grid, mainly solar systems. For the current (still a draft document) National Electrification Strategy (NES), the UBOS ERT-III 2018 household survey serves as the current electrification baseline: 50 % of households access to at least one source of electricity, broken down as follows: 24 % are connected to the national grid; 23 % own a solar lighting system or solar lantern (including tier 0); and 3 % own a SHS.

The average total electricity consumption remains very low at 100 kWh per annum against an average of 518 kWh in Africa. The Government wants to increase it to 578 kWh within the next NDPIII. There are high regional disparities in terms of electricity access. For example, according to NES, 52 % of the population is connected to the main grid in the Central Region, as opposed to a rate of 3 % only in the Northern Region.

NRECA (2018) and the Capital Development Fund of the UN (2019) estimate that only 40 % of the households spend more than USD 3 per month for energy services, while only 20 % of the surveyed population spends more than USD 5 per month. The average domestic consumption is about 30 kWh per month. At the current tariff this leads to the average consumer electricity spend of about USD 5.6 per month.

Households with an off-grid electricity supply are both within areas where the grid exists but are mainly in areas without power lines. There is a significant (but unquantified) percentage of households along existent power lines that have been unable to connect to the grid due to reasons such as high connection and wiring costs. For instance, in the Rwenzori service territory, an Output Based Aid project led to an increase in the number of households connected to the grid from about 4,000 to a little over 8,000 within 2 years. These households were along existing power lines but could not access the grid due to high connection costs. The former REA connections policy has sought (until the programme run out of funding) getting such households connected to the grid (3 million households within the 10-year period

[97] https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=UG

[98] Elahi,R. (2019). *Concept Project Information Document (PID) - Uganda Energy Access Scale-up Project (EASP) - P166685 (English)*. Washington, D.C. : World Bank Group.
http://documents.worldbank.org/curated/en/102741561002617590/Concept-Project-Information-Document-PID-Uganda-Energy-Access-Scale-up-Project-EASP-P166685

to 2027). REA estimated that there would be an additional five million new households by 2030 (ETI Consulting, 2019).

The responsibilities

The Rural Electrification Board (REB) and its secretariat, the Rural Electrification Agency (REA) were established by the Statutory Instrument No. 75 of 2001 under MEMD, although REA started functioning in 2003. The main functions of REB and REA were: to promote rural electrification access, in particular in the marginalised areas; to undertake planning of rural electrification projects; to implement GoU priority rural electrification projects; to maintain a national rural electrification database to monitor progress and establish targets for rural electrification; to enhance the available financial resources base for rural electrification through strategic fundraising; and to promote institutional sustainability of a Rural Electrification Fund (REF) (MEMD-NES, 2020).

The first Rural Electrification Strategy and Plan (RESP) 2001-2010 did not meet expectations. It tried to promote rural electrification through demand-driven, private sector proposals, including public–private partnerships, although rural electrification projects could only be viable with subsidies. REA with the REF would provide the necessary capital contributions to create conditions that would be attractive to the private sector. The underlying assumption was that rural electricity services would be able to recover all the operating costs and generate cash flow to service some, although not all, of the capital costs.

Umeme's concession started in 2005 and it limited the responsibility of the company to providing service only within one kilometre of the existing network, since at the time it was still believed that private investment could take care of rural electrification.

A second RESP 2013-2022 reacted to the difficulties of attracting commercial interest in small-scale electrification projects and increased GoU participation by publicly financing grid extensions that were leased to licensed operators. The plan took this a step further by formally offering small off-grid territorial concessions for auction.

The GoU, through REA, divided the country into 13 service territories and, as mentioned above, financed and built in them grid extension projects that were then awarded to cooperatives and local private companies – referred to as service providers – for operation. However, given the high costs of rural electrification, the small customer base and low purchasing power of rural areas, these concessions are not economically viable and may need subsidies on a permanent basis. Furthermore, most of the concessionaires lacked the capacity and resources to operate the networks effectively. Most of the rural service providers' licenses have been cancelled due to poor technical and economic performance and have been transferred to UEDCL.

Until recently, REA has extended the grid with funding from the REF and the development partners. REA transferred ownership of the assets for operation and maintenance to UEDCL or to Umeme (if within the Umeme footprint). In other cases, REA retained the ownership and leased the assets to the remaining small service providers for O&M, although, given their lack of capacity, these small operators ended up depending on REA for major maintenance, repair, or replacement activities. An additional problem is the lack of provision for rural electrification assets financed by public or donors in the rate base. This can make the sector unsustainable, as these assets may not be replaced in a timely manner as they get worn out.

Since REA was not established in the primary legislation, some areas of overlap were detected between it and other institutions like ERA, UEDCL and also Umeme, as explained in section 3.2 of the main document.

REA's grid extensions to communities did not, by themselves, lead to new customer connections, because many households do not have the money to pay the connection fee. In January 2018, the GoU approved an Electricity Connections Policy (see Annex F for a detailed description) to address the barrier of high connection cost for households and thus rapidly increase electricity access especially in areas within proximity to the existing networks. The policy aims at addressing major obstacles hindering increasing electricity access in Uganda by fully subsidising no pole and pole connections, addressing affordability of internal wiring through credit and low-cost technologies (e.g., ready boards), increasing

capacity of SPs to pre-finance connection materials, and promoting off-grid solutions through private sector participation. Regrettably, during 2020, the lack of funding has temporarily stopped the activity of this policy instrument.

REA was not a company but was part of the MEMD and lacked legal personality to own assets, contract, sue or be sued. REA had competent technical staff that has accumulated experience in rural electrification. It did not have any financial resources of its own, but it could manage funds received by REB. However, the demands for projects on REA were huge and it did not have the financial resources or capacity to meet the demand. REA's performance was frequently questioned by other agents in the sector. Ricardo, 2019, says '*When asking power sector stakeholders for their view on the current weaknesses of the distribution sector, one common answer is that REA lacks some degree of capacity to commission new infrastructure projects efficiently and at adequate standards of quality.' And 'There seems to be a problem with a lack of trained and qualified personnel in key technical, project management, construction management, financial management and planning areas of REA'*.

Despite the efforts of REA, with limited funding to subsidise expensive rural electrification, the situation was not satisfactory, as the advancement in electrification was and still is too slow. Umeme's concession was designed with a focus on loss reduction, increasing revenue collection, and provision of service around the networks inherited from the former UEB and owned by UEDCL, but it lacks access targets beyond its footprint. Achieving universal access in Uganda needs integral planning and a new electrification business and regulatory model to implement the plan.

An issue with electrification planning in Uganda is the existence of multiple and conflicting targets. The Vision 2040 projects 80 % coverage by 2040; SE4All > 9 8% by 2030; ECP 60 % by 2027; RESP 51 % by 2030, the most recent NDPIII 60 % by 2025, and the report of the National Electrification Strategy 100 % by 2030 (CIG, 2020).

An additional problem is the cost of connection for those customers whose proximity to the grid makes the connection possible. The Electrification Connection Policy (ECP) is a 10-year programme developed by the MEMD in 2018 to facilitate the access to electricity by transferring the connection fee from the households to the government (see Annex B). According to CIG (2020), about 253,000 new connections have been completed under this policy. However, the average cost of internal wiring of UGX 433,000 is still a barrier to demand by rural households. The design of the ECP assumed that funding was guaranteed, but the policy has been suspended in 2020 for shortage of funds, signalling that a more sustainable source of financing is needed. The World Bank funded EASP-1 is expected to start in 2021 and will provide funding to connect customers within proximity of the grid, without the financial burden of connection fees and internal wiring costs (CIG, 2020).

12.2. FINANCING ELECTRIFICATION

Despite significant ambition on the part of the Ugandan government – including to achieve near universal access by 2030, as stated in the National Electrification Strategy – and other positive factors such as relatively widespread access to mobile money, and a diverse range of private sector actors engaged in the space, more actual progress is needed to scale up electricity access in Uganda. There are a variety of national, publicly led efforts underway to achieve this goal, including finance facilities through the REA, as commented above, and the Uganda Energy Credit and Capitalisation Company (UECCC) to drive investment in electricity access projects. However, the rate of progress in electricity access is too slow to reach full electrification by 2030. More investment is needed in all fronts: in standalone SHS, in mini-grids, and in transmission and distribution construction to expand on-grid access in accessible regions.

Here, the economic dimension of the electrification effort will be estimated first, followed by some considerations on the sources of financing.

Estimating the cost of achieving universal access

The National Electrification Strategy draft report (MEMD-NES, 2020) presents the results of a least cost planning at national level has been performed using a geospatial planning software called GEOSIM.

(see Annex G) for details. Two electrification plans were developed: the first one was developed from scratch and the second one was based on a grid extension master plan that had been developed by NRECA for REA. Both plans need 10.1 million connections to achieve complete electrification by 2030, of which 3.4 million will be connected in both cases by densification (0.8 by grid extension in the first plan,0.3 in the second), 0.1 (0.3) connected to solar mini-grids, and 5.9 (6.1) with standalone systems. The overnight investment cost of the first plan is $5.223 billion and $4.451 billion for the second. In the first plan, 88 % of the budget is dedicated to on-grid connections (49 % to densification, 39 % to grid extension), and 12 % is dedicated to off-grid solutions (4 % solar mini-grids, 8 % standalone solutions). Note that the purchase of bulk power for grid connected customers, plus the costs of operating and maintaining the main grid and the mini-grids and providing customer service to the standalone systems will add a significant amount of OPEX to the purely investment costs, CAPEX, provided by the plans.

The report *Taking the Pulse 2019*[99] projects that, in an SDG7 scenario in Uganda, grid access would reach approximately 47 % of households, stand-alone solar 52 % and mini-grids less than 1 %.[100] In this scenario, stand-alone solar would require cumulative financing of USD 1.5 billion, in addition to affordability gap financing – used to cover the difference between total costs and non-cost-reflective tariffs – of USD 330 million. Note that this study is less 'minimalist' than the draft National Electrification Strategy and considers SHS of more capacity (at least two basic lanterns, so that each household obtains a minimum level of lighting for at least four hours per day plus phone charging, and the model considers several affordability levels).

Mini-grids would require USD 50 millions of financing. This report focuses on off-grid solutions and does not give any estimates for the overnight investment cost of grid extension, but it forecasts 4.7 million new grid connections, representing a fourfold increase in annual connections compared to recent connection trends.

The current official document on electrification is the Rural Electrification Strategy and Plan (RESP) 2013-2022. This Plan was established by the GoU to position the electrification development programme on a path that will progressively advance towards achievement of universal electrification by the year 2040, consistent with the existing policy of the Government, while ensuring the displacement of kerosene lighting in all rural Ugandan homes by 2030.

The grid electricity sector captures the majority of the energy sector's attention and funding by the GoU and also from development partners. Current rural electrification planning allocates more than 15 times more funding to on-grid solutions compared to off-grid solutions (RMI, 2018).

Sources of financing

According to *'2019 Tracking Finance'* (SEforAll, 2019)[101] actual finance for electricity access decreased significantly from an annual average of USD 657 million between 2013 and 2016, to USD 269 million in 2017. While overall finance has not increased over the past half-decade, there are some positive indicators related to domestic private investment, which reached a five-year high in 2017 of USD 145 million. Similarly, investment in 'last-mile' solutions, including mini-grids and off-grid technologies, also reached a five-year high of USD 36 million in 2017.

Moving back to *Taking the Pulse 2019*, Figure 32 below shows that the total estimated financing need towards stand-alone solar is USD 166 million annually between 2019 and 2030, compared to the USD 33.7 million in finance that flowed to solar home systems in 2017. Total mini-grid financing required by 2030 as estimated in the report is USD 51 million, or USD 4.6 million annually (a low number, consistent with the low estimated ratio of mini-grids in the electrification mix), compared with USD 1.4 million in

[99] Sustainable Energy for All (SE4ALL) (2019c). Energizing Finance: Taking the Pulse.
https://www.seforall.org/system/files/2019-11/EF-2019-TP-SEforALL-w.pdf

[100] These estimates are not too far from the results of the electrification plan in the National Electrification Strategy, which this report is taking as the reference. Despite the differences, the conclusions of the *Taking the Pulse 2019* report are useful in the debate about the sufficiency of the current electrification efforts.

[101] A similar analysis is not available yet from the National Electrification Strategy draft report.

mini-grid finance that flowed to Uganda in 2017. Achieving universal electricity access by 2030 will require considerable commitment from the GoU, public international partners, and the private sector.

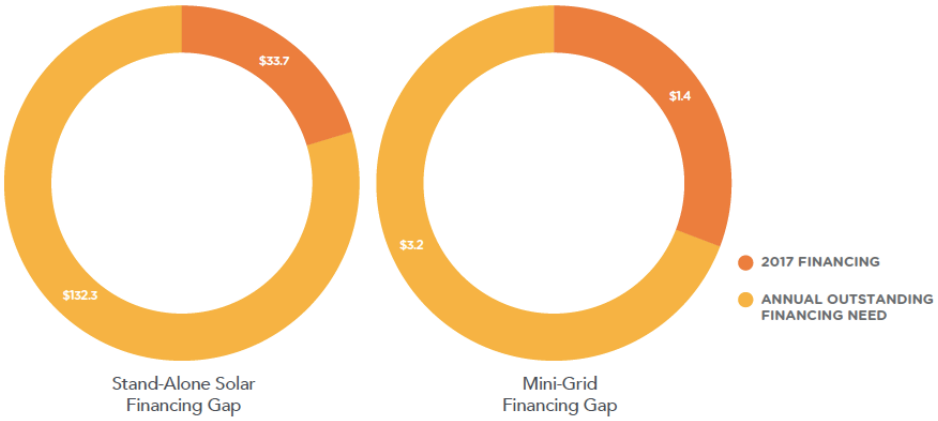

Figure 33. Annual financing gaps for stand-alone solar and mini-grid solutions in Uganda (USD million) (Source: Tracking Finance, 2019)

Off-grid investments

Investment in the off-grid stand-alone solar market has shown a steady increase since 2013 (see Figure 33 below), in alignment with the emphasis on these technologies in the Action Agenda, Uganda Vision 2040, the mission of the former REA and the overall solar sector expansion in Eastern Africa. Increased investment in mini-grid and off-grid solutions reflects a growing understanding in Uganda that such technologies represent a critical element of the expansion of electricity access, especially to last-mile communities.

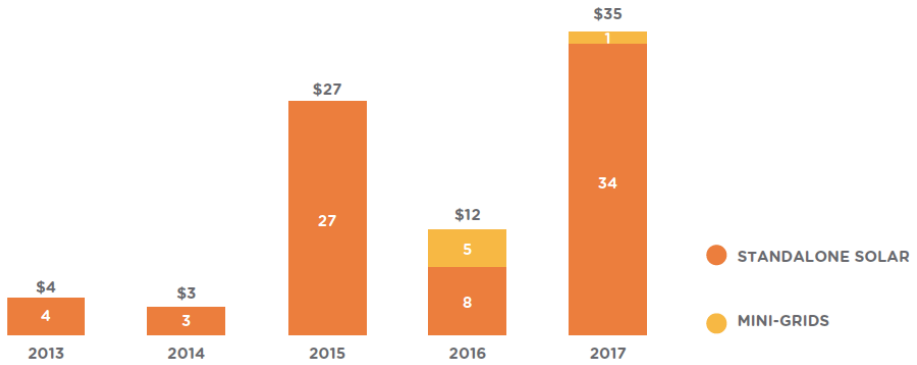

Figure 34. Finance for off-grid solutions in Uganda, 2013-2017 (USD million) (Source: Tracking Finance, 2019)

An analysis of SHS and units sold in the private sector in Uganda indicates that all operators assessed are PAYGo enabled, that operators have a wide range of system availability, and that the market has a high capacity for growth (UOMA, 2019). According to *Taking the Pulse 2019* estimates, SHS are a vital element of achieving universal energy access by 2030, as indicated above.

On-grid investments

While off-grid investment increased in 2017 as compared to the prior four-year period, distribution and transmission investment declined dramatically, from USD 241 million on average annually in 2015 and 2016 to USD 12 million in 2017. On-grid solutions play a key role in electricity access expansion, particularly due to Uganda's plentiful hydropower resources. Continued investment in distribution and transmission is critical in order to have outlets for planned generation, so a decline in investment in this sector could pose significant challenges for on-grid electricity supply.

Development partners

The GoU receives support from development partners with diverse initiatives aimed at access expansion, ranging from technical assistance to direct subsidies to the investment in new feeders, mini-grids or the deployment of standalone systems. Most recently, technical assistance examples close to the topic in this report include the National Electrification Strategy (NES) – funded by the World Bank, see (MEMD-NES, 2019) – a Diagnostic Review of the Distribution Sector – the 'Ricardo report' (Ricardo, 2019), discussed in Annex F, which recommends distribution reforms – and this report, also on the reform of the electricity distribution subsector, funded by the EU via its Delegation in Uganda.

NRECA has collaborated with the former REA in the preparation of a detailed electrification plan for the grid extension component (GoU, 2013a). GIZ funded another study, more or less at the same time, to explore in more detail the impact of the choice of the GIS-based electrification planning tool on the on-off-grid balance in the least cost electrification plan and to compare with the results of REA with NRECA.

There are many examples of direct assistance in projects by a large number of NGOs, international organisations or individual countries. A relevant example, still in the negotiation phase, is the Energy Access Scale-up Project (EASP), also funded by the World Bank, which is intended to support the country's efforts to scale up access to electricity (Elahi, R., 2019).[102]

The 2020 MOFPED's report 'Uganda's Development Partnership Review' (MOFPED, 2020) provides qualitative and quantitative information that puts in perspective the need for enhancing the level of coordination effort by international lenders and for scaling up the present amounts of funding that are typical in international cooperation today. The latest annual figure for development financing (official development assistance, ODA, and other official flows) to Uganda was $2481 million (2017), of which the members of the Local Development Partners Group (LDPG, see https://www.ldpg.or.ug) contributed $1514 million. About 8 % of this amount was devoted to the energy sector.

Regarding the level of coordination among donors and with the GoU, the report considers that '*Uganda faces a series of turning points and an opportunity. The partnership and cooperation structures that were designed during the era of budget support no longer provide the tools that GoU and other stakeholders need to maximise the benefit of external development financing to Ugandans.' It adds that, although 'the volume of development financing for Uganda has not changed much during the last decade, what has changed is that less of this support is implemented in a way that involves central GoU ministries, … and it becomes harder to find common ground, accountability and leadership*.'

Another illustrative document is the National Indicative Programme for Uganda of the 11th European Development Fund (EDF).[103] The programme scheduled an amount of €578 million for the 2014-2020 period, with main focus on transport infrastructure, food security and agriculture, and good governance. Other EU cooperation initiatives are the Instrument for Democracy and Human Rights, the Global Public Goods and Challenges Programme, the Global Climate Change Alliance, and the Instrument contributing to Stability and Peace.

The EU has also launched the EU External Investment Plan[104],. The Plan allocates €5.1 billion in EU funds to bring in new investment of over €50 billion, in various sectors. This money is being used in two ways: (i) guarantees, sharing the risks of private investors and development banks that finance development projects; (ii) blending, covering part of the costs of a development project to get it off the ground, with public and private investors financing the rest. In 2020, the Plan's guarantees have been refocused to help countries respond to the coronavirus (COVID-19) pandemic. The Plan has an energy component, focused on the deployment of renewable generation. One example is the Renewable Energy Support Programme, mainly for rural areas of Sub-Saharan Africa, which will help to develop and finance renewable energy projects of mini-grids and standalone systems. The EU would contribute €20 million, helping to raise €80 million, and the programme aims at connecting about 200,000 people and

[102] The project is structured around four main components: (1) Grid expansion and densification; (2) Off-grid market development for rural communities, refugee and host communities; (3) Off-grid electrification of health and education facilities; and (4) Technical assistance, capacity building, and project implementation support. The total cost of the project is US$ 400 millions.

[103] file:///Users/ipa/Dropbox%20(MIT)/mis%20documentos/recientes/proyectos/Pa%C3%ADses/2020-04-EU-UGANDA/002-EU%20in%20UGANDA/LINK/Uganda%20%7C%20International%20Cooperation%20and%20Development.webarchive

[104] https://ec.europa.eu/eu-external-investment-plan/about-plan_en

deploy 40 MW of renewable generation. Sound initiative but, again, more than one order of magnitude smaller than what Uganda needs to reach full electrification.

Recommendations on financing from the 2019 report 'Taking the Pulse'[105]

In order to improve the effectiveness of electricity finance, five components of change driven by government policy and shifts to the regulatory environment are recommended (for off-grid solutions):

- Structure credit that could allow additional customers to take on loans in structures, including layaway payments with trusted community groups to finance both off-grid solutions and grid connectivity and utility payment, when applicable;
- Support an enabling environment for microfinance and rural financing bodies to drive increased access to finance while maintaining financial stability and consumer protection;
- Promote PAYGo solutions and explore reduction of Government taxation on mobile money transactions to allow the solution to reach full potential and drive increased uptake by retailers and financial institutions;
- Ensure that the VAT and tariff regime in Uganda is incentivising solar product and mini-grid assembly;
- Evaluate additional funding to the UECCC which, if performing adequately, could enhance the power connection loan facility, technical assistance for power producers, the working capital facility, and risk guarantees for solar companies to drive both grid connectivity and off-grid solutions.

To further improve the financing of electricity access in Uganda, the following recommendations aim to drive private sector engagement in solutions:

- Establish additional downstream finance, in particular trade finance and working capital, to help ensure that retailers can pay for sufficient stocks of SHS and mini-grid components to drive demand and meet distribution needs;
- Continue to drive the mini-grid policy framework to guide the regulatory treatment of mini-grids, establish best practices for mini-grid technical requirements, and develop business models for connection to the national grid (UOMA, 2019);
- Increase familiarity among banks with PAYGo payment mechanisms and the use of the business model cases, which could increase use of mobile payments in electricity access financing and facilitate off-grid and mini-grid solutions when the cost of upfront systems is prohibitive for many customers;
- Improve quality testing of private sector solutions to Lighting Global Quality Standards across elements such as advertising, durability, and commitment to warranty to increase consumer confidence in electricity access products in the market and shift willingness-to-pay for such products;
- In addition to these recommendations in (IEA, World Bank, IRENA, 2019), it must be emphasised that a critical role of the DFIs in attracting private investment is to provide guarantees which can help in increasing/securing investment in the access and distribution sector.

12.3. GENERAL CHALLENGES AND RECOMMENDATIONS IN RURAL ELECTRIFICATION IN UGANDA[106]

Barriers in rural access to electricity are substantial, including insufficient capital to scale-up energy value chain businesses, low consumer awareness of electricity access solutions, high rates of poverty in rural communities and among displaced persons, relatively low willingness to pay for those solutions,

[105] These are the recommendations of the SE4All reports (SE4All and CPI, 2019a) and (SE4All, 2019c), included here since they are reasonable. They are not necessarily the recommendations of this report.

[106] These are the recommendations of the SE4All report (SE4All and CPI, 2019a), included here since they are reasonable. They are not necessarily the recommendations of this report.

and mistrust of both grid and off-grid solutions. Solutions include application of risk pooling guarantees to drive investment, increased investment in mobile payment strategies, and commitment to product standards enforcement.

According to the report *'2019 Tracking Finance',* a range of financial and social barriers exist that limit electricity access in Uganda, as it is also the case across High Impact Countries (HICs).

Obstacles related to on-grid electricity access

With regards to on-grid electricity access solutions, barriers are related to reliability of the grid, limitation of capital to achieve scale, and declines in international investment.

- Systematic grid load shedding and unreliability affect energy consumers across SSA. In Uganda, as across the region, these challenges lead to a mistrust of grid reliability. Over 30 % of Ugandan respondents to a survey on grid connectivity considered the grid as 'extremely unreliable' or 'not so reliable' (Enclude, 2014);
- Limitations exist in mobilising enough capital to scale up energy value chain businesses. In the private sector, entrepreneurs struggle to raise necessary capital to grow electrification businesses, particularly due to investor perception of risks associated with investing in small emerging-technology businesses and barriers to accessing international markets;
- A significant decline occurred in transmission and distribution investment in 2017. This decline intersects with the possibility of an oversupply of electricity and existing agreements where the country will have to pay for the electricity even if distribution or demand is not high enough. This would lead to higher costs per kW of electricity and have a negative impact on the sustainability of the sector (World Bank, 2019a).

Obstacles related to off-grid electricity access

The six key barriers to delivering off-grid solutions are:

- High rates of poverty, especially in off-grid rural regions and in refugee communities. In Uganda, almost 30 % of the households live below the poverty line, including 34 % in rural areas and 11 % in urban areas (MEMD, 2015). High poverty levels contribute to repayment capacity barriers, limited consumer awareness of available energy access products, and restricted negotiating capacity to improve consumer protections;
- Uganda has a refugee population of more than 1.3 million people who face unique energy access challenges. Uganda hosts the largest refugee population of any country in Africa and the third largest in the world (World Bank, 2017a). Uganda has relatively progressive refugee laws – refugees are able to work and access social services and have freedom of movement. Despite these factors, they face energy access barriers related to high rates of poverty, limited access to credit, and language barriers;
- There is a relatively low willingness to pay for electricity access solutions compared to the price point of these solutions. There is a relatively high level of access to mobile money; 43 % of the population has access to mobile money and 26 % of the population currently uses it (Scott, 2016). Despite this access, a willingness-to-pay analysis found that Ugandan customers are only willing to pay an average of USD 2.50 per month for energy. In high-poverty Northern Uganda, this value is even lower at just USD 1.04 per month[107]. Based on the price point of the lowest PAYGo solar home system at present, the market penetration given those willingness-to-pay averages would be just 15 % (UOMA, 2019);
- There is an inconsistent application of VAT and tariff policy. Solar products and mini-grids are VAT and tariff exempted, while product replacement and spare parts are subject to customs duties, making it difficult to set up a business to assemble and then distribute products in Uganda (OCA, 2018);
- There is a low consumer awareness and trust in decentralised electricity access solutions. Less

[107] Adjusted annual net national income per capita is USD 427.9 or USD 35.7/month, so a willingness-to-pay USD 2.50/month represents 7 % of monthly income (World Bank DataBank, 2019)

than 50 % of rural Ugandans surveyed reported knowing where to buy an off-grid solar product and those that are aware of off-grid products often mistrust the quality of these products (ODI, GOGLA, Practical Action, Solar Aid, 2016);

- There is also a lack of consumer protection. One source estimated that 60 % of portable solar lanterns in Uganda are low quality, only 15 % of retailers offer warranties for off-grid products, and only 6 % offer after sale services including maintenance and training (ODI, GOGLA, Practical Action, Solar Aid, 2016). The current willingness to pay may be influenced by low trust in quality of products sold.

Procurement aggregation.[108]

It has been proposed for discussion the centralisation of the procurement of equipment for off-grid electrification at multi-national scale, aggregating the purchasing needs of several countries, in order to take advantage of economies of scale and to reduce costs (EIB, 2020).

This aggregation of purchases sounds interesting theoretically, but in practice it might do very little to advance electrification. The benefits of reducing costs are probably very low, given the size that many of the solar companies have already reached and the advanced level of maturity of the technologies involved. Within an aggressive national off-grid electrification programme, each participant SHS company can have enough size to capture efficiencies. In any event, coordination at national level, perhaps taking advantage of a common subsidisation scheme for all solar companies, could be more than enough to saturate the economies of scale. And the government must request that subsidies are only available for duly certified products. On the other hand, the potential benefits can be offset by the issues raised by purchase aggregation: adapting to the uncertain evolving demand as it unfolds and more information is available, finding solar companies that agree on the specific product that they need, or coordinating all the stakeholders to make one large purchase.

One way to emulate the aggregation is to define very clear requirements for SHS in terms of costs, technical features, and services offered to end customers, and tie subsidies to these requirements. The solar sector in Africa is already mature and it offers nearly any type of solar system that might be needed, and many SHS companies are now large enough to benefit from significant economies of scale by themselves.[109]

12.4. UGANDA ELECTRICITY ACCESS IN THE WORLD CONTEXT

SEforAll keeps track of the 20 developing countries - referred to as the high-impact countries (HICs) - with the highest access-deficit population. Together, they are home to 80 % of those living without access to modern energy globally. Given their weight in terms of unserved populations, they jointly provide a reasonable first-order approximation for the overall energy access situation globally. They are Afghanistan, Bangladesh, China, Democratic People's Republic of Korea, Democratic Republic of Congo, Ethiopia, Ghana, India, Indonesia, Kenya, Madagascar, Mozambique, Myanmar, Nigeria, Pakistan, Philippines, Sudan, **Uganda**, United Republic of Tanzania, and Viet Nam.

Almost three-quarters of the 20 major access-deficit countries expanded electrification at a rate of more than one percentage point each year since 2010. Only eight of them, however, electrified rapidly enough to outpace population growth. These were Bangladesh, India, Kenya, Democratic People's Republic of Korea, Myanmar, Sudan, Tanzania, and Uganda.

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[108] This discussion on aggregated procurement has been written based on a discussion with Grégoire Jacquot, from MIT.

[109] Other more pressing needs for DFIs to be helpful with in the SHS space might be:

1. Development of new financing tools to finance the working capital needs of SHS companies (debt and guarantees);
2. Support the development of technical pilots and new SHS aiming to answer new types of demand, like PAYG SHS for irrigation or for medical uses;
3. Support the development of extensive demand analyses linking local needs to clearly defined SHS. Whether this will lead to aggregate purchases or financing SHS companies directly will then depend whether (i) these SHS companies do have the systems on hand (usually, they do) and (ii) the companies and the State agree on some form of subsidization model for a given level of service.

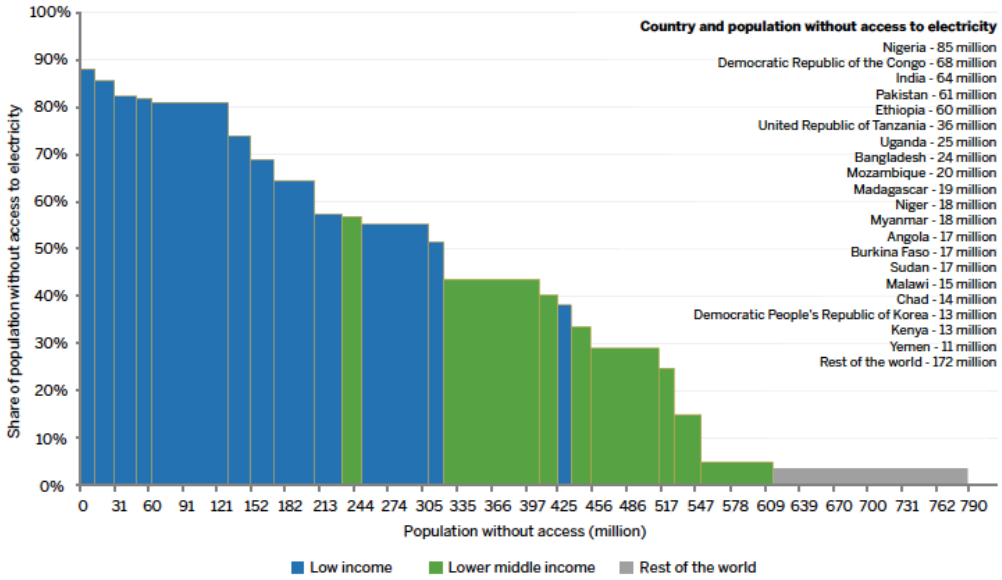


Figure 35. Share of population and total population without access to electricity, top 20 access-deficit countries and rest of the world (Source: SE4ALL, 2018)

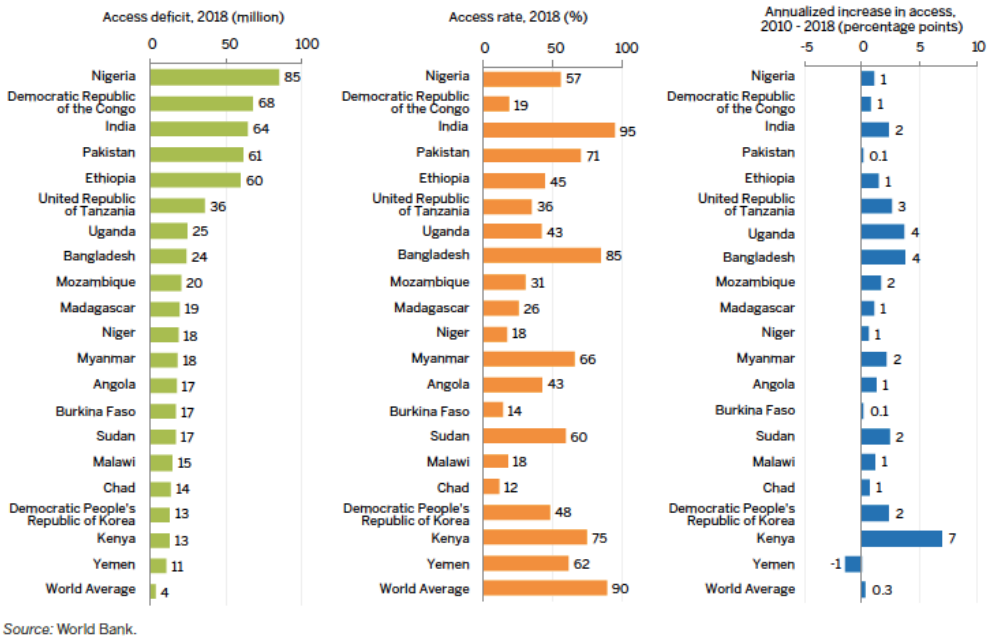


Figure 36. Electricity access in the top 20 access-deficit countries by population (Source: World Bank, 2010-2018)

12.5. GLOBAL FINANCIAL REQUIREMENTS TO ACHIEVE UNIVERSAL ACCESS

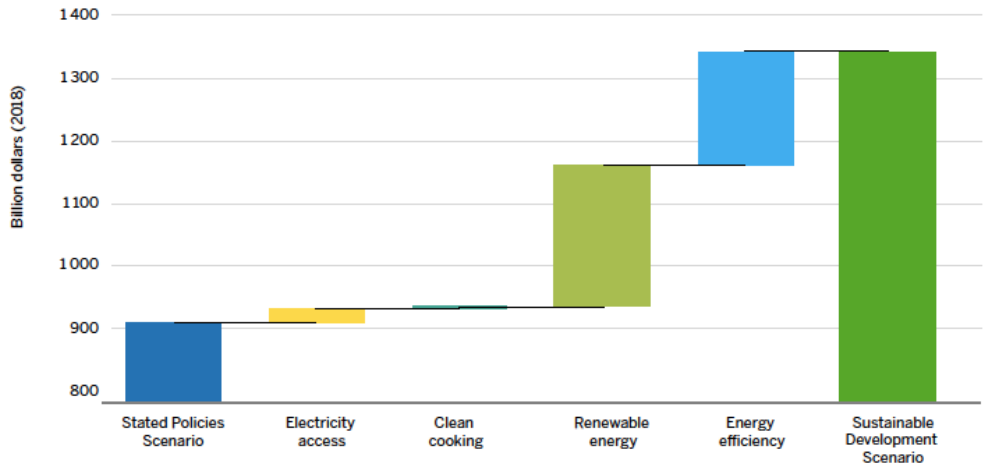
To bridge the gap and connect the remaining 620 million people projected by the Stated Policies Scenario to be without access in 2030, the connection rate would have to triple from its current level—to nearly 90 million a year between 2019 and 2030. Most of the acceleration would have to happen in Sub-Saharan Africa, as discussed in the previous paragraph. Certain countries would have to scale up efforts, notably the Democratic Republic of Congo, Niger, Nigeria, Sudan, and **Uganda**, which together are home to half of the regional population lacking access in 2030 under the Stated Policies Scenario.

Expanding access to electricity - especially for clean technologies like renewable energy mini grids and off-grid electrification - remains underfunded, especially in Sub-Saharan Africa. Financing for off-grid electrification represented just 1.2 % of total funding for energy access in 2017. Also, this rather low percentage is concentrated in just a few countries: Kenya, Tanzania, and Uganda account for more than half of this financing (SEforAll and CPI 2019).

As public financing will likely remain limited over the next few years, universal access will not be achieved by 2030 without unlocking private financing. Available public resources are best spent on measures likely to attract private sector finance and on extending access to populations living in areas unlikely to attract private financing, as well as on subsidising service for those who simply cannot afford it. Mini grid and off-grid solutions that are likely to serve much of the unelectrified population (ESMAP 2019, IEA 2019c), are often considered high-risk investments by commercial financiers. Therefore, one of the imperatives identified in the latest off-grid market trends report is to unlock financing from local commercial banks (ESMAP 2020). The so-called results-based financing - where flows are tied to delivery of services - ensures that electrification reaches the intended population. Further private efforts may depend on additional risk mitigation by public authorities and new approaches to encourage local entrepreneurs and foster access to finance. Public resources in the form of credit lines, guarantees, and working capital facilities should be used to leverage the needed private capital and mitigate risk. The strategy of the Technical Assistance Facility for Sustainable Energy (TAF) in the preparation for syndicated crowdfunding might be a viable option and route as well.

In the Sustainable Development Scenario, total energy sector investments needed to achieve all targets of SDG7 are estimated to average USD 1.36 trillion per year between 2019 and 2030 (IEA 2019a). To achieve universal access to energy would require investments of around USD 45 billion per year between 2019 and 2030. Of these investments, USD 40 billion would be required to attain universal access to electricity, or more than twice the amount observed in the Stated Policies Scenario. Significant scale-up of investment would be required in Sub-Saharan Africa, compared with that observed under current and planned policies, as it totals two-thirds of the additional investment in electricity access.

Under the Sustainable Development Scenario, the bulk of the investment required for meeting SDG7 needs to go to renewable energy and end-use efficiency, accounting for around USD 690 billion and USD 625 billion respectively. Compared to investments realised under current and planned policies, this represents an increase of almost USD 230 billion per year for renewables, principally going to renewables-based power, and of nearly USD 180 billion for efficiency, the greater part of it going to more efficient buildings and transport. These additional capital investments nonetheless conceal a different approach to financing compared with the Stated Policies Scenario; they could be achieved through a redirection of capital within the energy system. Indeed, the combination of lower energy use from efficiency investment alongside greater shares of renewables leads to a reduction of investments into fossil fuel of more than USD 220 billion per year, thereby demonstrating the economic viability of reaching the goals. All in all, the energy system would see additional annual investments limited to USD 210 billion to follow the pathway of the Sustainable Development Scenario relative to the Stated Policies Scenario.



Source: IEA 2019a.
Note: Investments under the Stated Policies Scenario include investment in the power sector and additional investments in end-use efficiency.

Figure 37. Additional annual direct investment needed to meet SDG 7 target (Source: IEA, 2019-2030)

The analysis found domestic private finance for electricity only in five countries: Bangladesh, India, Nigeria, the Philippines, and **Uganda**. The ability of these countries to mobilise private sector investments can be partly attributed to a more enabling policy and regulatory environment than those of the other HICs (GSMA, 2017). Although information available on domestic finance is not comprehensive (in particular for government budgets), domestic financing is crucial to close the energy access investment gap in all HICs.

Investment in off-grid solutions, including mini-grids, stood at USD 430 million in 2017, a marginal 12 % increase of USD 46 million compared to 2015-16. Most of these investments were in companies delivering stand-alone solar home systems, mainly enabling basic household energy access. Kenya, Tanzania, and **Uganda** alone accounted for 56 % of total off-grid investment. Almost all financing for off-grid solutions was obtained from international sources – mainly DFIs (bilateral and multilateral), private equities, and venture capitalists. Philanthropic foundations and impact investors more than doubled their off-grid investments in the 20 HICs to USD 42 million in 2017 compared to USD 18 million in 2015-16.

13. ANNEX F. PROPOSALS FOR DISTRIBUTION REFORM IN UGANDA

In the past years, the GoU has been advised from different sources and in different directions regarding the distribution sector and the electricity access:

- The EU supported the development of the 2030 Action Agenda towards universal energy access by 2030;
- The Rocky Mountain Institute Blueprint report analysed the state of the Ugandan electricity sector as of July 2017. It presents the challenges faced and provides recommendations on how to respond to them;
- AF-Mercados carried out in 2017 (for MEMD) a review of the power sector reforms in Uganda. The review of reforms covers the policy, legal, regulatory and investment aspects. The report also discusses the electricity delivery system, the institutional setting for the power sector, investment planning, loss reduction, and financing/cost reduction strategies;
- The Uganda Off-grid Energy Market Accelerator (UOMA,) funded by USAID/Power Africa, DFID and the Shell Foundation, carried out in 2018 a mapping of the Ugandan off-grid energy market;
- Ricardo Energy & Environment conducted for ERA in 2018, under the African Development Bank (AfDB) and EU funding two studies on: (i) the affordability of electricity to existing electricity users connected to the grid; and (ii) the willingness-to-pay of households not yet connected to the grid;
- The World Bank supported the development of the Electricity Connection Policy also called Free Connection Policy launched in 2018;
- USAID/Power Africa, through the NRECA, supported the former REA for the definition of the NES as well as the development of the Electricity Service Territory Master Planning;
- USAID/Power Africa, through the National Association of Regulatory Utility Commissioners (NARUC), supported ERA in its regulation responsibilities and specifically in the development of the regulatory framework for mini-grids/isolated grids in 2019;
- USAID/Power Africa supported the development of an off-grid strategy;
- The World Bank (funded by ESMAP) commissioned Ricardo Energy & Environment for the Uganda Distribution Sector Diagnostic Review and Directions for Future Reforms for Long-term Sector Development and Acceleration of Electricity Access Expansion (2019);
- The MIT, with Rockefeller Foundation's funding, started in 2019 contacts with Umeme, ERA and the MEMD exploring necessary reforms in the distribution sector for a better integrated approach and on possible new arrangements for Umeme's concession;
- Formal discussion on the renegotiation of the Umeme's concession has started. Aware of its limited footprint and impact on electricity access, and of the development of other solutions, Umeme recently partnered with Power for All around an initiative called Utility 2.0[110] aiming at revisiting the traditional utility scale approach and combining centralised and decentralised solutions of distribution;
- The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) has been advising ERA, the former REA and the MEMD on mini-grid development, licensing and regulatory framework. The pilot project co-funded by the EU has been critical for the definition of the procurement process, the necessary agreement and the set-up of tariffs. This has paved the way for a scaling up project for the development of 150 mini-grids in the country;
- The Kreditanstalt für Wiederaufbau (KfW), the World Bank, the EU, France and the AfDB were also active in the definition of the concept of grid densification using RBF mechanisms.

[110] https://www.umeme.co.ug/press-media/850

The following sections of this chapter review a representative set of these reports, whose assessments and recommendations do not always coincide, but all of them provide valuable insights into the objectives of this project.

13.1. RMI - CATALYSING ECONOMIC GROWTH THROUGH ENERGY ACCESS: UGANDA POWER SECTOR DIAGNOSTIC

The Rocky Mountain Institute (RMI) is working with the MEMD to identify and develop opportunities for Uganda's national electrification pathway in order to increase both access to electricity and economic growth. The President of Uganda, M. Museveni, asked RMI to help understand electrification needs and optimal solutions through developing case study for three representative regions. These case studies served as the basis for a broader, strategic-level national diagnostic, presented in the report being reviewed.

The report concludes that Uganda's goals are at risk due to supply-demand imbalances that will drive up costs, the insufficient focus on Transmission and Distribution (T&D) and off-grid solutions, and uncoordinated electrification strategies.

Their assessment of the situation can be summarised as follows:

A focus on grid-based generation has created a large surplus of generation capacity that will substantially increase the cost of service. Constraints in transmission and distribution limit the use of existing supply today, suppressing potential near-term demand and further increasing cost of service.

Economic growth depends critically on power use and demand stimulation, but the current focus is on supply: while installed generation capacity has grown by 140 %, domestic energy consumption per customer has fallen by 37 % from 2008 to 2016. Robust off-grid solutions are required for rapid and widespread access and rural economic development but are receiving insufficient attention and investment; current rural electrification planning allocates more than 15 times more funding to on-grid solutions relative to off-grid solutions.

The situation is exacerbated by conflicting strategies and targets that stymies coordinated progress and most effective use of scarce investment and people resources.

The solution must be based on an integrated pathway approach, which can help to avoid large tariff increases, and put the country on track to accelerate access. The first measure is to balance supply and demand more effectively with integrated resource planning to reduce total electricity costs. The critical second measure is to address the existing T&D constraints, review and coordinate T&D development plans to ensure that they, combined with demand stimulation, will reduce unutilised generation capacity and thus the cost of service. It is recommended to make use of pilot mini-grids to test and improve their commercial viability and to better understand grid integration and support opportunities. Include solar home systems in electrification plans and support the private sector to reach remote areas and lowest income customers to serve up to 50 % of the population in the near-term while the grid is under development, resulting in substantial savings in household energy expenditures. It is important to focus on demand stimulation and demand side management in on and off grid programmes to accelerate latent demand to save in cost of service further and support a transition to commercial agriculture.

The report outlines the immediate next steps to be adopted in an integrated pathway:

i. Form an executive cross-agency Steering Committee to drive an integrated pathway approach to sector investment – by consolidating all existing plans and programmes into a single timeline including funding and expected impact;
ii. Pause negotiations for additional supply, adjust the generation build-out timeline in line with T&D and demand growth, and develop robust utility planning processes to mitigate supply demand imbalance;
iii. Shift funding towards the most critical transmission and distribution investments to relieve system constraints and unlock demand growth in the next two years;

iv. Help rural network operators develop and implement operational improvement plans through a combination of technical assistance and updated regulatory incentives;
v. Use a two-phase competitive bidding process for mini-grid pilots that requires successful bidders to share a standardised set of cost and operational data with government and funders;
vi. Align stakeholders on the role and value of solar home systems as a rapid, low-cost solution in rural electrification and include in electrification planning.

RMI analysis examines some topics that deserve attention.

Distribution concessions: The structure of the distribution concessions other than Umeme's is inherently imbalanced, and it relies on commercially unviable rural networks to drive electrification. Concessions granted to rural network operators are inherently inviable due to their geographic and economic situation. Rural networks lack capacity and incentives to improve performance and reduce costs. Lack of payment discipline towards UETCL dilutes incentive to improve commercial viability by improving operations, reducing cost of service, and increasing revenue collection. Lack of human technical capacity and resources prevents networks from capturing existing opportunities to improve. Lack of vehicles, fuel and technicians to carry out inspections and deter theft is a key driver of commercial losses.

Affordability of connections: Affordability of connections remains a key challenge and is receiving significant focus from the Government. Affordability has been a key barrier, but there are significant efforts underway to remove it for majority of connections through the new free connection policy and grid densification efforts. New connections policy subsidises almost all connections but is unlikely to be a long-term solution.

Lack of support for off-grid solutions: Off-grid solutions such as SHS and mini-grids can play a vital role in Uganda's electrification. The two solutions can be complementary, and can each play an important, unique roles in reaching Uganda's electrification goals. For remote sites, or for very low and disperse demands, solar home systems and mini-grids are competitive with grid extension. Yet solar home systems and mini-grids are not receiving the focus needed to increase access and economic development.

Uganda's current electrification strategy prioritises grid-extension solutions over off-grid solutions in both targets and funding.

SE4ALL's access goals for Uganda comprise 33 % off-grid connections and 67 % on-grid.

The Rural Electrification Strategy and Plan (2013-2022) lays out an off-grid strategy with 6 % of the financing of the on-grid component.

SREP's indicative financing plan only allocates USD 21 million to its off-grid component of USD 455 million; USD 230 million is allocated for building geothermal plants.

Energy policy in Uganda does not focus on off-grid solutions: (i) there are no specific policies to support solar home systems; (ii) few end-user subsidies, no feed-in tariffs, no clarity around grid exit for mini-grids.

The Ugandan off-grid market lags its neighbours. From 2014-2015, SHS sold per million people were 7,500 in Rwanda; 9,800 in Tanzania; and 2,500 in Uganda.

Uncoordinated electrification strategies: Multiple contradictory strategy documents, unclear on implementation ownership, makes aligning efforts difficult. Good efforts are underway in the sector to increase coordination and planning, but decision making (e.g. investments and targets) needs to be clearly incorporated and effectively guided by planning.

Inconsistent targets lead to lack of clarity, inconsistent decision-making, and reactive planning. UETCL cannot effectively balance supply and demand – driving additional cost.

Lack of integrated planning and prioritisation across on-grid, off-grid, and demand-side options leads to expensive, sub-optimal investments. Lower cost solutions such as solar home systems and energy efficiency are neglected compared to grid expansion in RESP.

Strategy documents do not establish clear roles and responsibilities leading to duplicative work. No single sector plan – ERA, UETCL, and MEMD produce separate plans.

Timelines are not coordinated to address system dependencies and constraints (e.g. T&D capacity) – so investments are not phased and prioritised optimally to deliver benefits.

RMI's recommendations: To address the challenges and accelerate access and economic development Uganda should pursue an integrated approach that considers three critical goals:

1. Provide universal access to power:

- Connect households to improve livelihoods by reducing energy expenditures, saving time and labour, and enabling higher standards of living;
- Electrify existing and potential productive loads to reduce cost and enable further productivity.
- Underpin economic development;
- Consider the return on investment for any plan in terms of impact on economic growth and promoting additional demand for power;
- Deploy energy efficiency to lower costs, increasing economic benefits of productive use;
- Coordinate energy planning with economic and sector development planning;
- Ensure an economically viable power system:
- Assess and consider the full system costs of investments (e.g., capacity payments, distribution investments). Overall economic viability of the sector is critical in order for electrification to benefit consumers, enable economic growth, and contribute national development;
- Balance development of both supply and demand to ensure sufficient capacity to meet existing and potential demand with security margin, but avoid obligations for capacity payments for unutilised capacity;
- Prioritise least cost solutions (including grid, off-grid, and demand solutions) to meet each set of needs.

Four steps can be taken to mitigate the impending mismatch of supply and demand:

- Form and agree on an updated, integrated pathway approach to electrification and set up an executive cross-agency steering committee to push progress and marshal resources. Create a single sector plan and investment/implementation timeline that includes generation, transmission, distribution, off-grid, and demand-side plans, and coordinate with economic development planning from other sectors;
- Adjust timing of negotiations for additional supply and develop robust utility planning processes to mitigate supply demand imbalance. Do not sign additional PPAs or reach financial close until an Integrated Resource Plan has been completed for the grid system based on a robust demand forecast. Form a cross-agency team between ERA, MEMD, UETCL, MOF, and former REA to develop an integrated resource planning tool that will eventually be a part of any PPA assessment/approval process;
- Redirect investment to target transmission and distribution network constraints in order to evacuate power from new capacity and recover revenue. In the long-term, distribution sector structure should be re-evaluated to create balance and commercial viability;
- Focus on demand stimulation to accelerate demand growth.

Comment: The study makes very good points on the need for an integrated planning approach, as well as on facilitating investment in off-grid solutions by removing existing regulatory barriers. The report is not specific on how integral electrification planning would be achieved, although it is clear that it must consist of some least cost combination of on- and off-grid solutions, which comprise both stand-alone and mini-grid solutions. Equally important is the emphasis on fixing the distribution segment of the supply chain and in the need for economic viability of the electrification business, which must be based on a regulatory acknowledgment of the total costs incurred. However, there is a lack of specificity on the type of business model that would be necessary. It is interesting regarding the analysis of the weaknesses of the current concession agreements, other than Umeme's.

13.2. AF MERCADOS EMI - REVIEW OF THE POWER SECTOR REFORMS IN UGANDA (2017)

The report, written on February 2017, is the final one in the project 'Electricity Sector Development Project' developed by AF-Mercados EMI for the GoU, represented by MEMD, with the financing of the International Development Association (IDA).

The overall objective is to assess and document the impact of sector reforms on sector performance and propose corrective measures to improve sector performance. Thus, the key objectives of the study are:

- To review and assess progress achieved through sector reforms undertaken as mandated by the Electricity Act 1999 against Government's reform objectives, including a review of the current proposed amendments to the Electricity Act 1999;
- To review the government initiatives to increase access through implementation of the second Rural Electrification Strategy and Plan-currently in progress;
- To identify weaknesses in the reformed power sector and propose corrective actions (legal, institutional, regulatory, policy, structural, and managerial measures) to improve sector performance and enhance sustainability.

The scope of work includes an examination of the challenges facing the power sector, a review of the power sector value chain in Uganda, a detailed analysis of existing operational and regulatory systems, and a report based on this analysis with recommended improvements for Government's consideration. Here, in this review, the focus should be on electricity access and the distribution segment.

This report is a true 'Bible' of the regulation of the Ugandan power sector. It is an excellent reference source, and the author of this report agrees with most, if not all, of its contents. Unfortunately, this report does not address all the topics of the present project in the required level of depth, or it might miss some possible solutions to the present challenges. In this section, only the most relevant and pertinent conclusions will be highlighted, since some others have been already scattered in other chapters of the report.

The regulatory framework

The regulatory framework has achieved a good definition of policy, regulation and arbitration roles. The regulator ERA has a central role in the institutional setup, although, according to several reports, the sector still lacks adequate institutional and regulatory capacity and private sector feels there is still too much Government involvement in tariff setting.

One of the key objectives of the reform was to make the power sector financially viable and able to sustain itself without subsidies from the Government budget. During several years this objective was far from achieved. However, since January 2012, after an average increase of 48 % was approved as the Government phased out the subsidy that had kept the retail tariff below the costs, several tariff adjustments and associated revisions to the tariff setting formula have considerably improved the sector's financial viability. A pending issue in the case of public companies (UEGCL, UETCL, UEDCL) is the remuneration of capital, cost of debt and depreciation that should be paid according to concession agreements and have not been included in allowed revenues and tariffs. In the case of other rural distribution networks, no provisions are given for depreciation remuneration and assets replacement.

Regarding affordability of electricity, indicators show that it has improved for domestic customers since the reform. However, in most cases, poor rural households cannot afford the connection fee and the electricity costs. With this respect, a complete assessment of the affordability of the tariff would require a study on the willingness to pay by different users. Collection costs are high in areas with dispersed population and low numbers of clients. With that respect, prepaid meters are currently a common measure that is contributing to reducing losses in Uganda.

International experience shows that the following elements contribute to improve access:

- A good planning system establishing targets and defining projects and responsibilities of distribution companies in terms of 'obligation to serve';
- CAPEX subsidy from central government;
- Tariffs that ensure that distribution company covers at least OPEX;
- Cross subsidy for the poorest households.

The effectiveness of the electricity delivery system

To be able to evaluate the success in achieving the objectives of the reform, the study analysed the evolution of a large number of performance indicators.

Among the strengths of the sector value chain that have been identified lie: the increase of generation capacity, of the level of quality and reliability; the growth of distribution customers and revenue collection; the increase of operational efficiency of distribution and the decrease of distribution losses thanks to tariff incentives; the dedicated scheme for renewable resource development; the effectiveness of schemes for increasing access in rural areas; the reduction of subsidies, which increases resources for investment; the increased affordability of power tariffs; the ability to centralise wholesale purchases and benefit from economies of scale; the higher transparency provided by sector unbundling; the stability of the institutional environment that reduces of risk for investors with respect to the past decade and the opportunity that it will provide when current generation and distribution concession will end and will be renegotiated.

Some relevant weaknesses were also identified with respect to the dependence on hydrology conditions of the generation mix; the losses incurred by public companies; the possible impact that the situation of Eskom holding can have on EUL investments in Uganda; the difficulties in finding private investors for the operation of rural electrification concessions; the situation of tariffs and supply of small rural distribution areas that may affect small operator's capacity to properly operate and maintain the networks; the funding of maintenance and replacement of public assets; and the funding of rural electrification expansion and electricity access objectives.

The institutional setup of the reformed power sector and the recommended changes

The suggested changes to the current institutional framework do not consist of adding or removing any institution, but of rearranging the organisation and the competences of the existing institutions and the relationships between them.

The autonomy of the former REA has been limited by its lack of legal personality, and this affects its effectiveness in rural electrification planning and development. The report recommends that REA should acquire full legal personality and control over the Rural Electrification Fund and its sourcing. The recent decision by the GoU has adopted a very different approach to address this problem.

In the past, there have been miscoordination issues regarding the issuing of concessions and licenses and mismatches of required standards and operation oversight. A clear policy framework would enhance current coordination efforts between the former REA and ERA. Clear responsibilities of REA are proposed with respect to planning, promotion, financing and development of the rural network. Concession assignment by REA and the licensing process of ERA should run in parallel, with due regulatory oversight, initial permits and coordinated conditions for licensing and lease rentals. These recommendations are void of meaning now that REA has become a department withing the MEMD. Operation and maintenance of completed projects should be concessioned either to UEDCL or to other qualified firms.

Some potential overlaps were identified with respect to the mandate of UEDCL and those of other institutions. It is recommended that UEDCL's monitoring of Umeme shall be limited to administer those aspects of the concession agreement that do not overlap with the competences of ERA and UEDCL's stated mission '*to grow other electricity distribution assets by 10 % per annum*' should not overlap with the responsibilities of the former REA in planning and implementing rural electrification projects.

The territory is not divided into fixed distribution areas; moreover, rural/urban areas need to be clearly defined. It is recommended that in the short term the coordination of distribution and rural electrification plans should be supervised by ERA. When the current terms of Umeme's concession are going to expire, the country should be divided into fixed urban and rural areas, taking into account the administrative division of the territory.

Regarding the enforcement powers of ERA, the only significant remedy provided under the Electricity Act is currently the revocation of licenses, which would ideally be the last resort measure. It is recommended that the range of enforcement tools at regulators' disposal should be broadened, including the issuing of warnings, directions and imposition of sanctions.

Allowed revenues of UEB successor companies do not contain provisions to cater for the recovery of depreciation of assets because, according to ERA, all facilities are founded by grant or concessional

funding from the Government of Uganda. In the case of rural electrification projects, the O&M is concessioned and there are no provisions regarding rehabilitation and upgrades. It is recommended to include depreciation costs and CAPEX remuneration in the tariff in order to support future investments. The allowed revenues of rural grids (as well as transmission and generation assets) should allow rehabilitation of assets and duly reflect depreciation and remuneration of future investments.

Investment planning

No formal planning system is currently implemented as a regulation (or law) with clearly identified responsibilities, criteria and procedures, or recommendations.

The report recommends implementing a Sector Planning System that is binding, based on Government policy directions, joint for generation and transmission (see about distribution later), formalised in a systematic and transparent process, updated on a yearly basis, and open to strong stakeholders' participation. The results of the plan should inform the procurement process.

Regarding the responsibilities of the main actors, the study recommends the following:

- The MEMD should be responsible for the development, on a regular basis, of a coordinated master plan for generation and transmission, with the technical support of UETCL and in strict coordination with other key sectoral agencies;
- Umeme, and other distributors are responsible for the planning of their distribution concession and will provide all the information contained in their plans that is necessary in order to elaborate demand forecasts, optimise transmission and generation expansion and coordinate and harmonise sectoral plans;
- REA will be responsible for rural electrification planning and will provide all the information contained in its plan that is necessary in order to elaborate demand forecasts, optimise transmission and generation expansion and coordinate and harmonise sectoral plans.

Note that there is no mention to 'integrated distribution planning', as proposed for instance by the RMI report, where grid extension, mini-grids and stand-alone systems are jointly considered to arrive at a joint least cost electrification plan.

Loss reduction strategies

Distribution losses in Uganda are significantly high (19.0 %). Nevertheless, distribution losses have experienced an important reduction since the implementation of financial incentives in the tariff, decreasing from 35 % in 2007 to 19 % in 2015. Furthermore, Umeme agreed with ERA a trajectory to reduce losses to 14.7 % in 2018. In this regard, loss reduction programmes undertaken by Umeme have shown a good performance. It is proposed that Umeme considers the implementation of an ensemble of additional initiatives to be in line with international best practices.

Financing requirements and strategies to reduce costs

The analysis of financing requirements shows that the sector by itself cannot produce enough income with current tariff levels to pay for system expansion in a manner that meets access objectives and private capital remuneration at reasonable levels (e.g. 10 %). The report considers that, unless a subsidy to CAPEX coming from sources outside the sector (government, grants, donations, etc.) is received, or very soft credits are obtained, the revenues from tariffs may not be sufficient to expand the sector and meet the objectives. This is a *sine qua non* condition to attract the serious private capital that electrification needs in Uganda.

Note that a single initial CAPEX subsidy does not guarantee financial sustainability of an electrification plan, which is assumed to supply electricity indefinitely, and will have to address new CAPEX because of replacement of obsolete assets and the need to meet demand growth. Economic sustainability requires full payment of a revenue requirement that includes all efficiently incurred costs, by any electrification mode.

13.3. RICARDO ENERGY AND ENVIRONMENT. POWER SECTOR DIAGNOSTIC AND DIRECTIONS FOR REFORM REGARDING SECTOR DEVELOPMENT AND INCREASE OF ELECTRICITY ACCESS.

The association Ricardo Energy & Environment, ICEA and MRC-Consultants (Ricardo, from now on) was appointed by the World Bank in 2019 to conduct a study aimed at enhancing distribution sector efficiency and financial sustainability and accelerating electricity access through appropriate institutional reforms.

The study included (i) a diagnostic of the distribution subsector to determine the strengths and weaknesses of the current electrification approach, (ii) a series of more detailed assessments including the technical, financial and operational capacity of local stakeholders and the overall institutional and regulatory framework, and (iii) recommendations with respect to the legal, institutional, and regulatory framework to accelerate electricity access in the country, and the financial requirements to achieve access goals.

ICEA intervened on the financial aspects of the study, through the retrospective analysis of the financial performances of the various operators, and the financial analysis of the seven options for restructuring the sector that have been proposed. The results are derived from a financial model developed specifically for this study, covering the segments of electricity generation, transmission and distribution.

The main objective of the report was to answer the following question to inform future decision making by the GoU: What is the optimum distribution structural and regulatory arrangement that would lock in performance gains achieved so far in the Ugandan power sector, and propel the sector towards achievement of access targets?

Achieving the Ugandan government's policy target of 100 % electricity access by 2030 (including approximately 50 % from the main grid) would require connecting approximately 6.1 million new customers between 2019 and 2030 and a minimum of USD 5.5 billion of investment in distribution network expansion and new on-grid and off-grid connections.

The privately held firm Umeme distributes nearly 98 % of the energy that transits distribution networks and supplies 93 % of electricity customers in Uganda. Over 700,000 new domestic customers have been connected to the main grid by Umeme over the last decade, and Umeme has invested nearly USD 500 million over the same period. The technical and economic performance of other SPs is significantly worse than that of Umeme.

It seems unlikely that the current SPs will have the capacity to meet the Government's objectives. This is particularly the case for small SPs that are financially unsustainable in their current form, as is apparent from the analysis provided in the report. The current pace of efforts would soon be offset by population growth.

The report has examined the following candidate organisational structures:

1. Business as usual (BAU): Umeme or a successor will start from Umeme's license footprint. Umeme (which is currently partly present in the 13 territories) will operate in these territories in parallel with the local SP. No SP (including Umeme) could be in control of three or four territories;
2. One national distribution SP;
3. Two (inner ring + outer ring) distribution SPs;
4. Three (south, central, north) distribution SPs;
5. Four (south, central two in north) SPs;
6. Nine (inner + eight SPs);
7. Thirteen (Umeme plus twelve that use Umeme's assets in their territories).

In particular, the report rejects the BAU option, reasoning that this model is unacceptable since the current pace of the electrification process is too slow to achieve 100 % of electricity access by 2030. It also cites the performance gap between Umeme – the only profitable distribution company in SSA – and the rest of the SPs in Uganda which operate mostly in low-income rural areas where progress in achieving full electrification has been slow. The report also cites other shortcomings of the BAU model such as the overlapping functions between the former REA and UEDCL and ERA.

The report concludes that Option 2 is the most beneficial organisational structure for improving distribution sector efficiency and increasing electricity access – a single SP. It further recommends not to use a concession model (as the one presently adopted with Umeme) but a PPP.

The topic addressed in this report and its recommendations are central to the objective of the present report. Therefore, they will be commented here and discussed in much more depth in the final report, after the interviews during the mission in Kampala. Several points of view must be considered.

On concessions, ownership and the priority level given to access.

Here we argue that key aspects in the definition of Option 2-PPP are missing and should be spelled out in order to properly evaluate the key recommendation of the report. The intended business model for the single SP that would replace the present concession model is unclear.

The report reasons convincingly that the power sector structure under Option 2 – in principle preserving the original concession – is superior to the present situation (Option 1) and also to all the other options being considered. But it abandons the concession model for the national SP in Option 2 and adopts a Public Private Partnership instead, resulting in Option 2-PPP. The report fails to properly characterise the Option 2-PPP and to identify its potential shortcomings.

The original Option 2 (with a concession that is slightly modified from the present model used with Umeme) is the best model from the list of seven models. But it could be much better, and it is not clear that Option 2-PPP is the best possible alternative. Option 2-PPP, as defined in the report, lacks ambition, in particular regarding the acceleration of access, and will have a hard time attracting substantial private investment.

It must be noted that the outcome of the political economy analysis performed in the report warns against the dangers of a dominant privately-owned single SP: *'On the one side, most stakeholders were uncomfortable with the option involving one private utility operating the whole country (under a concession model). It was feared that this could result in rural areas being neglected. Some stakeholders felt that current arrangements created market inequalities, with the existing provider having access to all of the most affluent and least costly to service areas. This led to the view that since clients from rural areas are, generally, the least profitable, and rural areas are currently usually serviced by service providers, these are disadvantaged.'*

To set the record straight, it is important to realise that in the case of Umeme, the neglect of some areas is a direct consequence of the lack of clear mandate or economic incentives in the concession contract. Adequate regulation can reverse the situation. This is not an intrinsic problem of a concession model.

It is accepted that exclusive ownership of distribution assets by the private sector has no political and social support in Uganda. However, the different roles of concessionaire and owner have to be clearly distinguished. Achieving full managerial control of a distribution company by a private investor for a long period of time (e.g. 20 years) via a concession contract does not require ownership of the distribution company, as it is the case with Umeme. Partial, total or no ownership is compatible with a long-term concession.

On the definition of the Option 2-PPP and the specific adopted version of PPP in particular.

The report acknowledges (p.122) that '*Although there is no widely accepted definition for PPPs, the World Bank defines a PPP as a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance*'. These are the additional clarifications provided in Ricardo's report in regard to Option 2-PPP:

(p. 121) Option 2-PPP *'would address stakeholders' reluctance to establish a single private operator operating the whole country and therefore propel Option 2 to be the indisputable best structural option for Uganda'*.

(p. 122) *'… PPP (Public Private Partnership) model for the ownership and operation of all distribution assets where the Government (e.g., through UEDCL) would retain a majority share*.'

(p. 122) *'the Government would retain an operational role in the distribution sector whilst benefiting from private sector expertise', 'the Government would be in a better position to influence expanding access expansion in areas which are commercially challenging for the main grid'*. Note that, according to these statements, the GoU could intervene in both operational and investment decisions, with a majority share. In other words, in the ultimate instance, all final decisions are taken by the GoU.

(p.124) *'it is recommended that the mandate for distribution sector main grid asset ownership should be allocated to one SPV under a PPP model, with a majority GoU share (e.g., through UEDCL).'* Same comment.

(p. 124) *'UEDCL should retain an operational role where it would share operational responsibilities with private sector partners involved in the PPP with both owning a proportion of the SPV'.* Same comment.

(p. 122) *'… under such a model it would not necessarily be required to enter into a competitive bidding process, which by nature would be lengthy, costly, and politically challenging.'* This statement leaves many open questions. How is the private partner selected? Is it picked by the GoU? How does the GoU know which private investor is willing to enter into this deal under these conditions? The report states (p. 132) that important decisions are *'preferred procurement processes for Service Provider selection; and exit arrangements for existing Service Providers (although such providers are likely to be able to participate in future procurement arrangements, if they wish).'* Again, how will the new main SP be chosen without a competitive process? The report leaves the reader in the dark.

On the participation of private investors under the Option 2-PPP.

The report advises *'to implement Option 2 under a PPP model, with public and private sector participation, with the aim to maximise stakeholder acceptance, long-term bankability, financial returns, and to optimise the approach to servicing areas with low customer density'.* These claims will be examined next, commenting on the justifications that can be found in the report:

(p. 124) *'all SPs are anticipated to be financially sustainable, operated by the private sector, and hence have the capability to leverage funds to meet financing requirements'.* This cannot be true; a massive amount of rural electrification is pending in Uganda, and rural electrification has needed subsidies everywhere. The report continues: *'In cases where SPs identify projects which are not commercially viable (and therefore not attractive for them to finance), providers would be able to bid for some or all of the associated capital costs to be supported by REA. REA would then periodically award funding to a selection of those projects based on a set of technical, economic, and financial criteria.'* However, in a country with 20 % electrification, rural electrification should not be treated like '*in cases SPs identify projects that are not commercially viable*', as if this would be an exception. If increasing access is a priority goal for the GoU and also for the restructuring of the power sector, a systematic plan must be established. The provision of access should not be treated as an exception.

It is examined now the potential of the Option 2-PPP model to attract the large volume of private capital that is necessary to achieve full electrification in Uganda in a reasonable amount of time (i.e. by 2030, for instance).

If the requirement of public ownership of 51 % in the Option 2-PPP is meant to participate or to dominate the management of the company when the GoU/UEDCL deems necessary, it is doubtful that any serious investor will accept this condition. In other words, if the role of whatever private entity is just to invest (i.e., no concession) in a company owned and controlled by the GoU/UEDCL with a majority participation, it will be hard to get private investors interested.

The authors of the report maintain that '*the private party bears significant risk and management responsibility*'. Yet if nothing is specified regarding the executive responsibility in management control of the company by the private investors, the idea of a concession is rejected and, at the same time, it is requested that the GoU would retain a majority share in the company. What private entity is going to invest large amount of funds that are needed to extend the grid according to a least cost plan to electrify Uganda under these conditions where the GoU has majority in the operation and investment decisions?

Furthermore, a single SP will be in charge of a massive programme of rural electrification, with an intrinsic substantial deficit or viability gap, which must be covered by government subsidies (provided from the REA). This raises two concerns for the SP: (i) whether REA would be able to raise these funds; (ii) whether the viability gap will be dutifully paid by REA to the single SP on time and in full. The investor in the SP is exposed to this significant risk as well as to changes in the regulation of the distribution activity that may be enacted by ERA. Again, these considerations are presently void of meaning.

On the promotion of integration of the three electrification modes.

The report misses the potential of integrating the three electrification modes under the main SP (with exclusivity in main grid extension, but not in mini-grids and stand-alone systems) guaranteeing that nobody is left behind, which can be achieved if the main SP is the default and last resort supplier. Again, referring to the report:

Under Option 2 *'isolated mini-grids are considered separately and are not included initially within the responsibilities of the national SP in this option'.* Option 2 *'covers those activities currently undertaken by Umeme and those undertaken by mini-grids connected to the network presently operated by Umeme'.* (p. 124) *'… opportunity to increase REA's focus on mini-grids and off-grid subsectors – both of which are anticipated to continue to require some assistance from the public sector and the donor community.'* This indicates the intention of dealing with grid extension separately from mini-grids and stand-alone systems, which are not the responsibility of the main SP and must be separately funded.

(p. 127) *'the policy framework should reflect an increased focus of REA on mini-grids and off-grid solutions' and 'an integrated strategy for the sector covering both main-grid, mini-grid, and off-grid subsectors'.* This is fine, but nothing is said about the role of the main SP in participating in the definition or implementation of this strategy. It is later said in (p. 130) that *'REA would be in charge of determining (by economic analysis) which of the grid, mini-grid, or SHS solution'*, therefore REA seems to be in charge of electrification planning (which is not possible now).

(p. 130) *'For the avoidance of doubt, there is no intention that SPs should have any exclusive rights of providing electricity access (both via mini-grid and off-grid solar solutions) in their areas or that this aspect should be regulated, other than as described elsewhere in the report. This is already a vibrant and competitive market and should be driven by customer requirements and choice (with subsidies only utilised as described above).'* Note that one thing is the removal of exclusivity by the SP in a territory regarding the deployment of mini-grids or stand-alone systems, and another one leaving off-grid deployment to the market, since there will be many customers left behind, as the SPs will do cream skimming.

(p. 128) *'The regulatory framework could be amended to put more emphasis on access expansion. This could include the implementation of an incentive and output-based multi-year tariff review framework under which Services Providers are tasked to submit multi-year business* plans to meet *a set of objectives (e.g., access expansion within their footprint) and are subsequently allowed a capital expenditure allowance 'envelope' within their revenue to finance this. A cap-and-collar incentive mechanism would be set alongside this to reward SPs who have exceeded access targets and performance expectations and penalise SPs which have not met those expectations.'* This is the sound approach to remunerating the distribution activity, but in the report, it is only meant to determine the revenue requirement of the main grid subsector, not for mini-grids or stand-alone systems. The sustainability of the electrification process requires that the revenue requirements of the three subsectors are properly remunerated, and not only for the main grid.

(p. 129) *'To facilitate the implementation of such measure and mitigate risks of undue comparison with main grid retail rates, alternative tariff setting approaches inspired by those already implemented in the off-grid subsector could be explored (for example, charge mini-grid customers a daily or monthly rate, rather than a per kWh charge).'* In most countries, all customers within the same category pay the same. Charging more to rural customers, which happen to be typically poorer, and hiding this measure, by adopting for them a different tariff format, does not seem elegant or fair.

(p. 130). '*It would be beneficial for the sector to sustain the fast growth of the off-grid solar home system market.*' This is fine, but too 'bland'. If the final goal is to achieve complete electricity access, then more energetic measures must be adopted, making sure that there is a default provider (the main SP) and that nobody is left behind.

13.4. CIG - ROADMAP FOR CATALYTIC POWER SECTOR TRANSFORMATION (RCPT) (2020 – 2025)

Recognising the criticality of power to the development of all sectors of the economy, the Roadmap for Catalytic Power Sector Transformation (RCPT or 'the Roadmap', still a draft report, version of September 2020) is an ensemble of measures to be performed by entities related to the power sector, whose purpose is to bridge the existing capacity gaps in the delivery of reliable electricity to more Ugandans, and to increase productive use of electricity to achieve the national development goals. The RCPT aims to stimulate the sector to coordinated action, in alignment with the National Development Plan (NDP III).

The Roadmap has identified and seeks to address the following challenges: uncoordinated planning of projects; difficulty in acquisition of land and wayleaves for the construction of infrastructure projects; delayed implementation of projects; constrained transmission and distribution network; existence of latent demand vs surplus supply; poor power reliability; low access to electricity; lack of affordable tariffs; and inferior quality of equipment on the network.

The Roadmap has focused on these four objectives: (i) improve reliability of supply; (ii) sustain the financial viability of the sector; (iii) improve access to electricity; and (iv) improve human capacity of the sector. It has identified a total of 18 measures to address these four objectives, which are listed below.

Improving reliability of supply.

- Monitor compliance of the regulatory framework for reliability and quality of service;
- Develop and implement an industrial power demand growth strategy;
- Complete outstanding operational targets;
- Strengthen grid and network integrity and reliability;
- Develop and implement domestic demand growth strategy;
- Update Power Sector Investment Plan;
- Increase penalties for vandalism and energy theft.

Sustaining financial viability of sector.

- Implement effective investment planning;
- Incentivise private investment in the transmission network;
- Clarify GoU strategy on ownership and management of key sector organisations;
- Market shortfalls and dislocation of investment plan.

Improving access to electricity.

- Clarify definition of access to electricity;
- Improve Electricity Connection Policy implementation;
- Develop a coordinated and collaborative National Electrification Strategy;
- Remove bottleneck to Right of Way acquisition.

Improving capacity of sector.

- Fill approved vacancies;
- Medium term capability building and knowledge transfer;
- Establish a national power training institute.

The Roadmap also includes two cross cutting components: developing robust sector wide communication strategy and delivery of the agreed targets.

It has developed a set of relevant, streamlined, trackable and easily understood KPIs, aligned with priority sector objectives.

It recognises the MEMD as the coordinator of the power subsector. The Roadmap recommends the CEO roundtable (chaired by the Minister and comprising of the CEOs of all the main power sector organisations) as a new institutional arrangement to steer the strategic direction and coordination of the sector.

The detailed descriptions of these recommendations can be consulted in the original document (CIG, 2020). Those on demand growth, reliability of supply, and the transmission and distribution networks are very relevant to the topic of this report and have been mentioned in the corresponding sections.

Without justification, when commenting the recommendations of the Ricardo report, just reporting others' opinions, the Roadmap states that '*… most stakeholders prefer the three-service area option. There was general consensus among stakeholders that the present arrangement was not sustainable*.' The Roadmap does a much better job with other topics.

Attention should be drawn to two figures that may raise some concern. It is taken as a given that an objective of the roadmap is to reach 60 % electrification by 2027, which in practice means giving up the goal of universal access by 2030 (contrary to what is proposed in the current NES draft report). The second figure is the high estimated cost (USD 2.9 billion) of investments that will be required to improve the reliability of the existing distribution network. Good reliability of supply is necessary for industries, businesses, and customer satisfaction, and it is a prerequisite for any sound electrification plan. But it happens to be expensive, and it has to be included in the total cost of the plan.

14. ANNEX G. NATIONAL ENERGY PLANS

As it is shown in this annex, there are numerous electricity development plans for the Ugandan power sector, some of them for just one segment – like generation or transmission – others encompassing the entire energy sector – more than just electricity – while others are focused on electricity access.

In general, despite the comprehensiveness of the ensemble of plans, there is a need to strengthen coordination (specifically between different segments) according to some analysis on this subject: [111] '*Plans are not being adhered to and non-competitive procurement practices are still in use … Currently, the main planning document for Uganda's electricity sector – the Power Sector Investment Plan (2009-2030) – has no regulatory or legal standing, has not been officially updated since MEMD approved the plan in 2011, and does not seem to have been used as a guide for sector investment decisions.*' However, the MEMD has a Joint Sector Working Group, which is responsible for the coordination of the activities of all the players in the market and conducts an annual review.

This annex briefly reviews key aspects of the major development plans that include the power sector, with the focus on the national electrification plans. Here the plans are presented more or less following the time when they were made public, starting by the oldest ones. Thus, the ones with most interest are presented at the end of the annex.

14.1. UGANDA VISION 2040

In 2007, the Cabinet of the GoU approved the National Vision Statement of: '*A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years*'[112]. The National Planning Authority (NPA), working with other governmental institutions and stakeholders, developed Uganda Vision 2040 to operationalise this Vision Statement, which was officially launched in 2013. The 30-year vision is to be implemented through three 10-year plans and six 5-year National Development Plans (NDPs).

Energy Infrastructure is one of the seven overarching enabling sectors that underpin the Uganda Vision 2040. The other six enabling sectors are: ICT, Financial Sector, Health Sector, Human Resources (Education), Governance and Transport. ICT, the financial sector, health, education and transport all require suitable and reliable energy availability to be able to effectively contribute towards Vision 2040.

The Vision 2040 is conceptualised around strengthening the fundamentals of the economy to harness the abundant opportunities around the country. This involves changing from a predominantly low income to a competitive upper middle-income country within 30 years. It is envisaged that the country will graduate to the middle-income segment by 2017 and reach a per capita of USD 9,500 by 2040.

The identified opportunities include oil and gas, tourism, minerals, ICT business, abundant labour force, geographical location and trade, water resources, industrialisation and agriculture, among others, that are to date considerably under-exploited. Achieving the transformational goal will thus depend on the country's capacity to strengthen the fundamentals including infrastructure Science, Technology, Engineering and Innovation (STEI); land use and management; urbanisation; human resource; and peace, security and defence.

To achieve this vision, the average real GDP growth rate will have to be consistent at about 8.2 % per year, translating into total GDP of about USD 580.5 billion with a projected population of 61.3 million in 2040.

Key vision strategies:

- Review the architecture of Government's service delivery system to act as a unit, to exploit synergies and deliver public services efficiently and effectively;

[111] (Godinho and Eberhard, 2019).

[112] https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/UGANDA%29%20Vision%202040.pdf

- Direct Government's investment in strategic areas to stimulate the economy and facilitate private sector growth;
- Pursue an urbanisation policy for better urban systems that enhance productivity, liability and sustainability;
- Pursue policies aimed at advancing in the areas of innovation, technology and science, engineering, human resource development, public sector management, and private sector development;
- Develop and implement a National Innovation System that will help in initiating, importing, modifying and diffusing new technologies;
- Front-load investments from the GoU in infrastructure targeting areas of maximal opportunities with focus on oil, energy, transport and ICT;
- Accelerate industrialisation through upgrading and diversification to effectively harness the local resources, offshoring industries and developing industrial clusters along the value chain;
- Develop and nurture a national value system by updating the national service programme to change mindsets and promote patriotism and national identity.

The vision will be implemented in accordance with existing and future agreements, standards and protocols within the framework of regional integration.

14.2. THE 2002 ENERGY POLICY

The Government has implemented the first Energy Policy for Uganda in 2002 as the primary guiding document for the country's energy sector. The energy sector is directly linked to other sectors of the economy and generally provides their lifeblood. The sector is a major contributor to national development and Government revenues, and its performance impacts the performance of other sectors.

The broad objectives of the Energy Policy for Uganda were to: establish the availability, potential and demand of various energy resources; increase access to modern affordable and reliable energy services; improve energy governance and administration; stimulate economic development; and manage energy-related environmental impacts. Other key focus areas were to harmonise sector activities; integrate resource planning by addressing both demand side and supply side issues; ensure compatibility with global and regional policies; develop the necessary regulatory framework; build capacity of the sector; and promote private sector participation.

The GoU has made significant achievements on the objectives set out in the policy, which include increased electricity generation capacity from 317 MW (2002) to 1,182 MW (May 2019) resulting in a supply/demand surplus; increased electricity access from 5 % (2002) to 43 % (2019); reduction in electricity losses from over 35 % (2002) to 17.4 % (2017); dominance of renewable energy in the national energy mix; enabling environment for private sector investments; increased energy sector contribution to the national GDP; increased efficiency initiatives in the biomass sub-sector; liberalisation and improved sector regulation; increased awareness of environmental compliance; and enactment of various legislation and policy instruments to improve sector governance.

Despite the achievements, the Government recognises the considerable efforts still required to achieve the targets of the SDGs and Vision 2040. Key gaps in the Energy Policy have been identified, as explained below.

- The 2002 policy needed a stronger focus on biomass as the primary energy source in order to curb inefficient use and related environmental degradation;
- The policy also had limited consideration for off-grid energy solutions, climate change mitigation actions and emergency thermal power generation during the energy crisis. Additional provisions for financing, communication and Monitoring and Evaluation were required;
- There have been important market changes in the energy sector since 2002. The electricity sub-sector has shifted from generation capacity shortages between 2002 and 2012 to the current anticipated surplus of power generation compared to demand. The Government is now focused on the development of domestic demand and regional power trade. Other changes in

market orientation include a progression from primarily private sector led growth to PPPs, and increased public financing of sector developments aimed at increasing affordability;

- Uganda's population has grown steadily since 2002 and the country is ranked as having the second youngest population in the world according to the United Nations (2015). Energy plans and targets have to be aligned with the changes in national demographics to ensure effective and equitable energy service delivery over the next decade.

The revised Energy Policy aims to have a stronger focus on gender and climate change mainstreaming in sector activities. Considerations for occupational health and safety mainstreaming will likewise be important.

14.3. THE 2019 DRAFT ENERGY POLICY

The Energy Policy 2002 has presided over important sector reforms, achievements and technological advancements. The 2019 revised Energy Policy[113] aims to consolidate these achievements, align the policy framework with recent international, regional and national developments and commitments, and ensure that the Government is well positioned to address the new and emerging socio-economic challenges of the energy sector in the coming decade. It is currently being debated at the Parliament and covers the following sub-sectors: Renewable Energy, Clean Cooking, Electrical Power, Rural Electrification and Access, Energy Efficiency and Conservation, Nuclear Energy and selected cross cutting issues. Petroleum is covered under the National Oil and Gas Policy (2008), currently under review, and related statutory instruments.

According to it, the following are the key issues that the energy sector is currently facing:

- Low levels of access to affordable and modern energy services;
- Constrained economic development due to inadequate energy sector investments;
- Unreliable energy supply infrastructure;
- Environmental degradation due to unsustainable use of biomass energy resources;
- Inefficient use of energy;
- Inadequate technical capacity and lack of integrated planning;
- Vulnerability to climate change;
- Insufficient public awareness.

In response to these challenges, the draft Energy Policy proposes a portfolio of measures addressing each one of them. It follows the set of measures that are proposed for the power sector in general, and electricity access in particular.

14.4. MID-TERM REVIEW OF UGANDA'S NDP-2 AND EVALUATION OF NDP-1

The purpose of this report is to carry out the final evaluation of the National Development Plan 1 (NDP-1), the mid-term evaluation of NDP-2, and provide inputs to the development of NDP-3 and the ten-year development plan for the country covering NDP-3 and NDP-4. The specific objectives of the project are to:

- Assess progress made against the NDP-1 and NDP-2 objectives in the energy sector and identify the corresponding lessons learned;
- Identify evidence-based, justified and detailed short-term NDP-2, medium-term NDP-3 and longer-term (second ten years development plan) adjustments and actions.

[113] https://www.energyandminerals.go.ug/site/assets/files/1081/draft_revised_energy_policy_-_11_10_2019-1_1.pdf

The critical focus for this Uganda Energy Sector diagnostic study revolved around identifying, describing and summarising forward looking priorities for government and development partners' energy sector interventions in Uganda.

This energy sector diagnostic study covers one of the 14 themes/sectors that are part of the evaluation of NDP-1 and the mid-term review of NDP-2. The energy sector diagnostic study's purpose is to:

- Provide an analysis of the progress made against NDP-1 and NDP-2 objectives and targets;
- Make recommendations on how existing energy sector programmes can be better targeted over the rest of the NDP-2 planning period; and
- Chart a way forward for the NDP-3 and for the second ten-year planning period, both starting in 2020/2021.

The core guiding questions are the following:

- What are the GoU and development partners doing in the energy sector?;
- How efficient, effective, sustainable and well targeted were/are they in promoting and delivering future focused energy supply and end-use energy efficiency, across the major key energy forms, for rural and urban households, and for business, industry and transport users?;
- What can best be done to improve energy supply, increase the use of renewable energy options, and to enhance energy end-use efficiency for Uganda in the future?;
- To what extent have the energy sector interventions contributed to the wider priorities and needs of Uganda during NDP-1 and NDP-2?;
- To what extent were the primary objectives of NDP-1 and NDP-2 in enhancing electricity supply and increasing grid and grid-equivalent electrification and energy access achieved?;
- Were the institutional frameworks, financing and other support, priorities and coordination efforts effective in promoting appropriate energy sector developments? If not, what could be done better in the future?;
- Should the specific activities that have been developed and implemented during NDP-1 and NDP-2 be continued in NDP-3 and the upcoming 2020-2030 10-year NDP? If not, what can be done better?

Progress made against NDP-1 and NDP-2 energy objectives and targets

The main focus of NDP-1 and NDP-2 energy sector investment has been on expanding grid electricity generation capacity, some focus on Transmission and Distribution (T&D) system expansion, and a focus on expanding grid connections to additional households (only in NDP-2).

Biomass: Probably 90 % of the Government and development partner attention has been on the 1.4 % of overall energy use that the electricity grid accounts for. Biomass comprises around 90 % of energy supply in Uganda and is the nearly exclusive form of energy used for cooking in both rural and urban households. However, the development attention and funding support for biomass in Uganda is inversely related to its energy use, sustainability, gender and pollution importance. Proven and commercially available Improved Cook Stoves and more energy efficient charcoal production are major potential intervention areas that need a much greater future focus.

Power generation capacity to drive economic development: The NDP-1 baseline power generation capacity was 596 MW in 2010 (409 MW of hydropower, 17 MW of grid-connected sugar cane bagasse cogeneration, and 170 MW of thermal generation capacity) at the start of the NDP-1 planning period. The NDP-1 generation capacity targets were 3,885 MW in 2015, 8,601 MW in 2020, 14,670 MW in 2030, 31,252 MW in 2035, and 41,738 MW in 2040.

The NDP-2 baseline power generation capacity had increased to 850 MW in 2013. The target NDP-2 generation capacity was 2,500 MW in 2020 (with 2025 MW in 2018 and 2325 MW in 2019) and the plan was still to prepare for the achievement of the 'required' 41,738 MW by 2040. The NDP-2 stated objective was to '*increase power generation capacity to drive economic growth*' by developing hydropower energy, geothermal energy sources, and thermal power plants.

In practice, in August 2018, actual installed capacity was 855 MW of hydropower and some co-generation, plus 100 MW of oil-fired dry-year backup. Actual peak demand was around 600 MW in August

2018. Note that any power generation system needs spare capacity of at least the largest single generating unit to cover scheduled and unscheduled maintenance (e.g. spinning reserve equal to the largest single generating unit online at any time). In addition, nearly every hydro based power generating system is constrained by water storage limits somewhere in the system.

The 800 MW of new power generation capacity that is expected to come on stream by early 2020 will be surplus to Uganda's internal needs for 5-12 years. Power interconnectors are in place or soon to be in place with Uganda's neighbouring countries. However, it is not clear how much power exports the neighbouring countries will actually take. There is also a lack of sufficient transmission capacity in Uganda to move the major new power capacity to suitable loads within Uganda, even though new loads do not currently exist to the degree required.

The NDP-1 results very significantly undershot the ambitious (and much higher than actual demand) power generation targets, and NDP-2 will also clearly undershoot its power generation targets. However, this can be argued to be a good thing as the excess generating hydro capacity at the end of NDP-2 would otherwise be even larger than the 100 % excess capacity, with even greater unusable surplus electricity generating capacity.

Expansion of electricity transmission grid network: An extra 312 km of transmission lines was achieved in NDP-1, versus the target of an extra 1,450 km of lines. There was no specific NDP-2 stated plan for expansion of the electricity grid network.

Electricity Access: NDP-1 did not have any specific energy access strategy or targets. The NDP-2 energy access target was stated to be an increase in the proportion of households accessing power from the national grid from 14 % in 2015 to 30 % in 2020 (18 % in 2018 and 25 % in 2019).

The 30 % on-grid electricity access target for 2020 at the end of the NDP-2 period would seem very ambitious and has not been achieved. However, a 30 % electricity rate might be achieved by 2020 if all forms of electricity access are considered, as the rate for all forms of electricity access was estimated to be 26.7 % in 2016. They key in the discrepancy lies in the definition of SE4ALL Tier-1 as being the minimum level of 'energy/electricity access' accepted by the Ugandan Government. The report argues for considering pico-solar (Tier-0) as an acceptable electrification technology to meet SDG7.

Other objectives: Of the four energy sector objectives in NDP-2, the sector activities actually mainly focused on construction of small and large hydropower plants and construction of substations and power transmission lines. The aspects of promoting alternative sources of energy and building capacity in the energy sector and improving the policy and legal framework were not given much emphasis.

The report is particularly critical regarding the last objective mentioned above. There appears to be a general lack of coordination and integration between the Uganda government agencies' numerous plans and targets. There are also at least 30 off-grid programmes and initiatives underway by a range of development partners. And finally, there is limited, if any, publicly available integrated supply and T&D-demand balances and planning and coordination information. Even now, with a large surplus of electricity generation capacity, there appears to be no integrated plan on how this capacity will be transmitted and distributed to new loads[114], where the loads are expected to be, what is needed to make the new loads actually happen, and who is responsible. This goes beyond the energy sector to the sectors that this new electricity supply is supposed to enable such as agro possessing, manufacturing, etc. In addition, there is a major issue in finding agreement on the definition of energy access and what 'energy access' requires.

Overall evaluation. Overall Assessment of NDP-1 Final Results:

The NDP-1 strategies and activities were overall relevant to the energy needs of Uganda, as they focused on: increasing grid generation capacity; increasing T&D capacity; improving energy efficiency; promoting renewable energy; improving policy, legal and institutional frameworks; building capacity; and they were mostly aligned with SDG-7. However, there was no focus on increasing energy access, and a lack of alignment with a human-rights based approach for the 75 % of Uganda households relying on biomass for cooking or on kerosene/paraffin lamps for lighting.

[114] See the UETCL-GRID DEVELOPMENT PLAN (2018– 2040), also commented in this report.

Overall evaluation. NDP-2 Period Mid-Term Results:

The NDP-2 strategies and activities are overall relevant to the energy needs of Uganda, as they focus on increasing grid generation capacity; increasing T&D capacity; increasing energy access; improving energy efficiency; promoting renewable energy; improving policy, legal and institutional frameworks; building capacity; and were mostly aligned with SDG-7. Compared to NDP-1, there was a new focus on increasing energy access with quantitative targets. There was still a lack of alignment with a human-rights based approach for the 75 % of Uganda households relying on biomass for cooking or on kerosene/paraffin lamps for lighting.

Looking into the future: proposed NDP-2 adjustments, and strategies and priorities for NDP-3 and the 10-year NDP

The report concludes that electricity supply seems to have a suitable institutional structure, tariffs are broadly cost reflective, a suitable household lifeline tariff is in place, and generation capacity is now in a healthy surplus.

The following key issues arise out of this Uganda energy sector NDP-1 and NDP-evaluation/diagnostic study for the NDP-3 and the long-term (10 year) NDP, as follows:

Major new generation capacity should now be delayed until its need is imminent. When the new hydropower plants come on stream around 2019-2021, Uganda will move to having a significant surplus of electricity generating capacity. The use of gas (associated to the new oil fields in Western Uganda) for power generation and not for other high priority uses should be re-evaluated in light of Uganda's upcoming major electricity generation surplus. Solar PV is already a lower cost generation option compared to new hydro generation in Uganda. It is recommended that the Government and development partners prioritise their future new generation option to focus on solar PV, either on the customer side of the meter or utility scale projects with a utility, or other users, as the off-taker. It is also recommended that the grid code be examined to ensure that customers are, by right, able to connect to the grid for self-use.

The development and supply of new industrial loads to use the generation surplus is therefore now a high priority in the electricity grid sector. Encouragement of new large industrial loads done with the new 2019 tariffs is a timely and sensible development.

The electricity grid sector priority now is the expansion of T&D capacity, to remove bottlenecks and to reduce technical losses. Low cost 'no-pole' grid extensions are worth continuing even for extremely low-electricity usage rural homes if the cost is low enough. Grid extensions should be prioritised to where sufficient loads exist in market centres and for commercial and industrial loads.

The expanded use of solar mini-grids should be continued for suitable niche applications where there are sufficiently concentrated and/or significant loads. The report considers that current development partner plans in this mini-grid area appear to be sufficient for their market potential in Uganda.

The report recommends postponing the present focus on SE4ALL Tier-1 minimum levels for SHS since it is holding back the provision of basic lighting and phone charging to low income and low energy use rural households, which comprise around 50 % of all households. High quality solar lanterns and smaller capacity SHS would be a transition technology on the road to eventual full electrification and would complement ongoing grid expansion, enhanced mini-grid supply, and Tier-1 and above SHS for more affluent households, for productive use applications, and for rural schools and health clinics.

To finish, the report recommends no kerosene/paraffin use and near universal pico-solar and SHS electricity supply by the end of NDP-3 (2025). This is estimated to be a viable option, with funding needs around USD 50 million for 4 million pico-solar or SHS' at USD 10 support per system plus programme costs. Suitable quality[115] Tier-0 pico-solar and SHS systems are already available in Uganda, with large numbers of private sector suppliers, and suitable distribution networks and battery replacement systems already in place.

[115] Suitable Tier-0 quality pico-solar and SHS certification is already available via the existing World Bank supported Lighting Global quality assurance certification scheme.

14.5. THIRD NATIONAL DEVELOPMENT PLAN (NDPIII) 2020/2021 - 2024/2025

The NDPIII is the third in a series of six NDPs that will guide Uganda in delivering the aspirations mentioned in Uganda Vision 2040. The NDPIII aims at increasing household incomes and improving the quality of life of Ugandans through sustainable industrialisation for inclusive growth, employment and sustainable wealth creation.

NDPIII consolidates the achievements of the previous NDP. It defines the broad direction for the country and sets key objectives, interventions and targets for sustainable socioeconomic transformation of Uganda. NDPIII came into force as the country was experiencing the effects of the COVID-19 pandemic. It has therefore laid out short and medium-term interventions to address the effects of the pandemic and the recovery of the country. Uganda will focus on the 'real economy' to support faster economic recovery and provide protection against such crises.

NDPIII has been designed with a regional and global development outlook. The key regional and global agenda informing the plan include Africa Agenda 2063, Agenda 2030, EAC 2050 and other development frameworks. For example, the Africa Continental Free Trade Area, which is likely to spur increased interest for foreign direct investment and open new markets for Ugandan products. The plan takes into account the challenges and threats posed by the regional and global trends including climate change, regional conflicts leading to large scale population movements and loss of markets, cyber security, terrorism, epidemics, and brain drain stymying innovation, research and entrepreneurship capacity.

To comprehensively develop the 'real economy' and address the 13 strategic bottlenecks adopted by the African Union, NDPIII has laid out 18 Programmes to promote a coordinated approach to achievement of the development objectives. Specifically, the sustainable energy programme will increase access and consumption of clean energy.

At the end of the five-year period, the following key results are expected to be achieved by the sustainable energy programme:

- Increased electricity consumption per capita from 100 kWh to 578 kWh;
- Reduction in the cost of electricity to USD 5 cents for all processing and manufacturing enterprises;
- Increased households with access to electricity from 38 % to 60 %;
- Reduction in the share of biomass energy used for cooking;
- Increase in transmission capacity and enhanced grid reliability.

The cost of energy reduced from 9 cents and 16 cents in FY2012/13 to 8 cents and 9.8 cents for extra-large and large industries by September 2018, respectively. However, it is still higher than the target of 5 cents per unit and the cost is a further burden on both investors and private consumers. The cost is even higher for medium industrial consumers at 15.6 cents for a unit and for commercial consumers (cottage industries) at 17.5 cents per unit. This renders most such industries uncompetitive which is deeply problematic as small-scale cottage industries are the engines of growth and job creation in most economies in Africa and generate quicker returns to local communities.

There is a need to revisit the development approach, particularly the role of the Government in the development process. Under NDPI and NDPII, Government relied on market forces and the power of competition to bring down interest rates, the cost of electricity, the cost of ICT services, and direct investment in strategic areas of the economy. However, the cost of electricity remains above the targeted 5 cents per unit for all consumer categories.

In order to attract private investment into the power sector, the Government must introduce a quasi-market approach. First, it is needed to increase efficient and planned participation in the economy in order to direct development. Industrial policy and the construction of a developmental state needs to be central to NDPIII. In doing so, the Uganda government needs to actively implement strategies aimed at unlocking investment in strategic areas of the economy such as agroindustrialisation, manufacturing, minerals, oil and gas as well as ICT. All of these have huge potential, but none of these sectors can be left to the market forces alone.

The increased role of the State is a new element in NDPIII compared to the previous ones. Whereas, in the previous NDPs the private sector was assumed to drive growth, the role of the State in guiding and facilitating development will be strengthened in order to fully exploit the quasi market and Public-Private Partnership (PPP) approaches in development under NDPIII. In this case, the Government will invest either wholly or jointly with the private sector and the communities in strategic enterprises in order to spur growth in a balanced manner across the country.

An increased investment in fundamentals (Human Capital Development, Transport, Energy and ICT) is needed to bridge the gaps between what is needed to exploit Uganda's development opportunities and what is currently available. In Energy, focus will be on increasing access, to electricity, improving reliability of the network through, among others, investing more in evacuation and transmission of the electricity being generated to areas where it can be used like in industrial parks and zones.

14.6. ERA - THE LEAST COST GENERATION PLAN (2016-2025)

Background

Energy Policy and Renewable Energy Policy: In 2002, the GoU developed its comprehensive Policy on Energy. The objectives of the Energy Policy were to:

- Establish the availability, potential and demand of the various energy resources in the country;
- Increase access to modern affordable and reliable energy services as a contribution to poverty eradication;
- Improve energy governance and administration;
- Stimulate economic development;
- Manage energy-related environmental impacts in addition to the 2007 Renewable Energy Policy, developed by the Ministry of Energy.

The main objective of this policy was to increase the use of modern renewable energy so that its proportionate use increases from the then 3.8 % to 61 % of the total energy consumption by the year 2016. The key objectives in this policy included:

- To maintain and improve the responsiveness of the legal and institutional framework to promote renewable energy investments;
- To establish an appropriate financing and fiscal policy framework for investments in renewable energy technologies;
- To promote research and development, international cooperation, technology transfer and adoption of standards in renewable energy technologies;
- To use biomass energy efficiently so as to contribute to the management of the resource in a sustainable manner;
- To promote the sustainable production and utilisation of biofuels;
- To promote the conversion of municipal and industrial waste to energy.

Since January 2013, time when the last Least Cost Generation Plan (LCGP) was developed, no amendment has been made on these policies.

Electricity infrastructure plans: There has been concerted effort to develop and update the electricity related plans. In 2010, the GoU developed and published a comprehensive '*Power Sector Investment Plan*' covering up to 2035. Since then, other studies have been conducted like *Grid Development Plan* by UETCL, *Regional Power System Master Plan* and *Grid Code Study* by JICA and a study on *Integrating Nuclear Power in Generation Capacity Plan* by MEMD, among others.

In 2013, ERA developed a LCGP in line with its functions as stipulated in the Electricity Act 1999, '*To advise the Minister responsible for energy on the least cost projects*'. This Plan was shared with players in the electricity sub-sector including MEMD, UETCL and the Ministry of Finance, Planning and Economic Development (MOFPED). The purpose of the LCGP was to derive forward looking least cost

electricity supply options that can satisfy the projected demand over a given time. The Authority intended to continuously update this plan every year in order to reflect any changes since the last LCGP was published.

While deriving the 2013 - 2018 Plan, a number of assumptions were made on the forecast of demand and the estimated commissioning dates of the generation plants as a basis for the Plan. In light of the latest actual system demand and generation reported by UETCL for the year 2013, 2014 and 2015, this sought to review the assumptions and revise any changes that have taken place in the electricity industry since January 2013, when the last LCGP was developed. It is against this background that further, a new 10 year least cost generation plan from 2016 to 2025 was developed. The overall objective of this plan is to update the current 5-year (2013-2018) LCGP to a ten-year (2016-2025) plan.

The least cost generation capacity expansion plan (LCGP)

An update of the LCGP has been undertaken covering a ten-year period (2016-2025). The update involved review of the load forecast in light of changed parameters, commissioning dates for committed projects, costs of generation plants, transmission and distribution system investment requirements.

On-grid demand forecast: In the update of the plan, demand was forecasted at distribution level using an econometric method for Commercial, Medium Industry and Large Industry customer categories. A bottom-up approach was used for domestic customer category using the end-user method. A Base Case, Low Case and High Case scenario were developed for sensitivity analysis. The resultant demand forecast was 6.5 %, 3.6 % and 12 % growth rate in energy demand for the Base Case, Low Case and High Case scenarios respectively. This growth rate is lower than the projection in the 2013 LCGP of 10 %, 5 % and 14 % for Base Case, Low Case and High Case respectively.

Rural Electrification: The 2013 LCGP followed the forecast output of the report in the Power Sector Investment Plan (PSIP)[116] for the same year period 2013 to 2018 and only corrected for an observed upward bias: the total number of customers would increase from 10,000; 5,000; 15,000 for Base Case, Low Case and High Case respectively in 2008 to 250,000; 456,668 and 618,290 in 2012. This forecast was based on the 2002-2012 Rural Electrification Plan. However, this number of connections was not achieved. The non-achievement of customer growth targets was addressed in the RESP 2013-2022.

The RESP 2013-2022 was developed in 2013 with the intention of increasing the number of customers by up to 130,000 per year. If the plan is fully implemented with all the funding requirement accessed, an additional 6 MW of demand is expected to be realised. This additional demand will help to reduce the expected excess generation capacity in LCGP.

The PSIP forecasted energy consumption of mini-grids and off-grids to grow from 3.69 GWh in 2008 to 126 GWh by 2014. However, comparison with actual sales by mini-grids and off-grids shows that the PSIP forecast was ambitious. Review of the PSIP forecast assumptions revealed that the driver of the over estimation was the number of new connections in 2014, which was assumed to be 278,000, yet the actual connections were only 35,690.

Projected electricity supply 2016-2025: Since the development of the last LCGP in 2013, some projects commissioned, upgraded their generation or started construction. A number of energy supply options were considered including Hydro, Peat, Solar PV, Bagasse Cogeneration, Wind and Natural Gas. The report shows the list of committed and candidate plants that were considered as possible sources of generation. These plants include those that were licensed and are under construction, those already

[116] In 2010, MEMD appointed Parsons Brinckerhoff Africa (Pty) Ltd (together with Sunshine Projects as sub-consultant) to provide consultancy services for the PSIP under the Uganda Power Sector Development Operation contract. The development of the proposed PSIP involved a series of inter-related studies comprising forecasting of the demand for electricity, development of the least cost generation, transmission and distribution plans that would be required to reliably serve the demand and the costing, timing and financing plan. The report containing the proposed base case scenario PSIP and several sensitivity analyses is dated January 2011.

constructed but awaiting evacuation as well as those under feasibility study from various technologies. More than 80 % of the generation will come from hydropower, either large hydro and mini-hydro.[117]

In the demand supply balance, a large unutilised generation capacity is observed for the Base, Low and High Case scenarios. The excess capacity increased from about 120 MW in 2016, to a range of 1,200 MW and 2,300 MW in 2025, for the Low Case to the High Case Scenario.

Given the projected excess generation, there is need for a concerted effort to stimulate demand either within the country or explore options for exporting power to the neighbouring countries as Rwanda, the Democratic Republic of Congo and South Sudan. In order to increase the demand, there is need for investments in the distribution and transmission systems, to improve the quality of service and supply (especially for industrial consumers to absorb the expected additional generation). This can be done through reduction of network congestion and grid extension to increase the uptake.

Policymakers may also need to explore possibilities of rescheduling the construction of some large generation plants to avoid redundant capacity. In the same vein, a review of the Energy Policies is important to align the recent developments with the Policy Direction for the electricity generation. Further, there is need to fast track the implementation of the RESP 2013-2022, to increase connections of rural consumers. This will facilitate the uptake of power on the national grid.

Network investments to unlock demand: To address the projected demand constraint, there is a need to make investment in the infrastructure both at distribution and transmission level. This will improve the quality of supply, increase the supply capacity or facilitate exports.

The required investment is subdivided into the distribution and transmission infrastructure. Over the next ten years, it is estimated that USD 1.27 billion and USD 1.2 billion will be needed for transmission and distribution respectively. This is in addition to the required funding for implementation of the RESP.

14.7. UETCL - GRID DEVELOPMENT PLAN (2018-2040)

The Uganda Electricity Transmission Company Limited (UETCL) owns, operates, develops and maintains the high voltage transmission grid. The grid connects power generation plants to load centres throughout the country as well as interconnection with neighbouring countries. UETCL also owns a National Control Center, which coordinates and monitors grid operations and maintenance activities.

Currently, the High Voltage Transmission Grid (HVTG) comprises 150 km of 220 kV (initially operated at 132 kV), 1443 km of 132 kV, 300 m of 132 kV underground cable, 35.2 km of 66 kV high voltage transmission lines and 20 substations.

A key responsibility of UETCL is to constantly plan and develop the HVTG. The purpose is to establish a rationale for building a robust network, improve reliability and quality of supply, which will in turn contribute towards the economic development of Uganda.

The Grid Development Plan (GDP) is a planning document that is written in line with UETCL's strategic corporate business plan. It details present and future transmission grid infrastructure that will support national demand growth, generation requirements and regional power trade obligations. The GDP is a strategic document in UETCL's overall planning process and thus must be communicated to all major stakeholders. The plan, which covers a period of 23 years, identifies and justifies new grid investments. It is reviewed and updated annually to reflect latest information on Government policy and strategies. It is also an input to the company's financial projections and annual budget.

Objectives of the GDP

- The main objectives of the GDP are:

[117] There are three existing large Hydro Projects; Kiira (180 MW) and Nalubale (200 MW), managed by Eskom Uganda Limited and Bujagali HPP (250 MW), located on the Nile River. All the future large hydro projects are also located on the Nile River. The committed projects include Karuma (600 MW), Isimba (183MW), Ayago (840 MW) and Agago-Achwa (83 MW). In addition, the other candidate plants include Oriang 392 MW and Kiba 600 MW. 22 projects can be classified as small hydropower projects, with a combined installed capacity of 548 MW.

- To give an outlook of the future power system of Uganda;
- To present the HVTG investment requirements to meet forecasted demand;
- To detail the new generation development projects over the planning horizon and their associated evacuation infrastructure;
- To identify power transmission investment requirements to mitigate anticipated system constraints;
- To form a basis for the company's financial projections, multi-year tariff and multi-year budget.

The GDP presents results of technical analyses for various investments to meet the national demand and power exchange obligations. The technical analysis derived from power system studies form a basis for determining technical feasibility of the proposed projects. The results from the technical analysis are used to determine the grid investment plan and the associated cost estimates which culminate into financial projections. The environmental and social impact assessments are carried out before implementation of each individual project as required by the National Environment Management Authority. The 2018 edition GDP is UETCL's planning reference guide for the years 2018-2040.

The results from the above analyses indicate high capital investment requirements over the period 2018-2025. This is mainly attributed to the numerous generation plants that are to be commissioned during this period and the corresponding power evacuation transmission lines and substations. In order to absorb the new generation capacity, several grids, substations extensions and reinforcements are to be implemented in the same period.

Methodology of the GDP

A scenario-based approach has been adopted for the 2018 GDP-update. Three scenarios have been considered as follows:

- *Base Case Scenario.* The main assumptions for this scenario include the observed historical demand growth trends, growth projections of the Gross Domestic Product, distribution connection strategies and regional power trade projections, implementation of loss reduction strategies and the need to address constraints that have created suppressed demand in the past;
- *NDPII Scenario.* This scenario is designed to implement the second NDP launched in March 2015. The planning horizon of this scenario was five years from 2015 to 2020;
- *Vision 2040.* Uganda Vision 2040 provides development paths and strategies to operationalise Uganda's Vision statement which is '*A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years*'. It aims at transforming Uganda from a predominantly peasant and low-income country to a competitive upper-middle income country.

The load forecast conducted for the Base, NDPII, and Vision 2040 scenarios for the period 2018-2040 was based on projected growth of gross domestic product, population and new electricity connection, regional power trade obligations and power transmission and distribution losses. Power system constraints (as observed in the day-to-day operation of the network) were considered in the power system analysis. These include quality of supply, equipment loading, system reliability and availability.

Generation expansion planning was based on the implementation timelines for power plants under construction and those planned (licensed, with or without executed power purchase agreements). The demand-supply balance analysis for each respective scenario recommended the timing of additional required generation capacities.

Power system studies and analysis were carried out on eight system models. The results formed the basis for determining the grid investment plan that details the technically feasible projects with their respective cost estimates and timing.

Financial requirements

To ensure that the future electricity needs of the nation are satisfied, there is a need to have major capital investments in the power sector. Such investments comprise generation plants, transmission lines and expansion of the distribution network.

By the end of the planning period and upon successful implementation of the plan, the grid shall have a total additional length of about 13,030 km, 55 additional substations and 17,229 MVA additional transformation capacity. The Table 1 and Figure 37 below summarise the financial requirements for the year 2040 (end of the planning exercise) and the annual and cumulative investment requirements for each year of the planning period.

It can be observed, from the GDP process, that there are numerous grid projects that have to be implemented in the first five years of the planning horizon. It is therefore necessary to prioritise these projects as a means of allowing special attention to the most critical ones. The projects have been categorised as follows:

- Power evacuation projects;
- Projects leading to industrial growth;
- Regional interconnection projects.

Table 2. Summary of Estimated Financial Requirements Grid Expansion until 2040 (Source: UETCL)

Project Category	Estimated Cost (Billion UGX)	Estimated Cost (x1000USD)
Power Evacuation Projects	5,856.82	1,602,303
Re-investment Projects	1,921.66	525,727
System Expansion Projects	7,106.62	1,944,222
Regional Interconnection Projects	2,816.51	770,539
Total Grid Re-investment Requirement	17,701.61	4,842,791

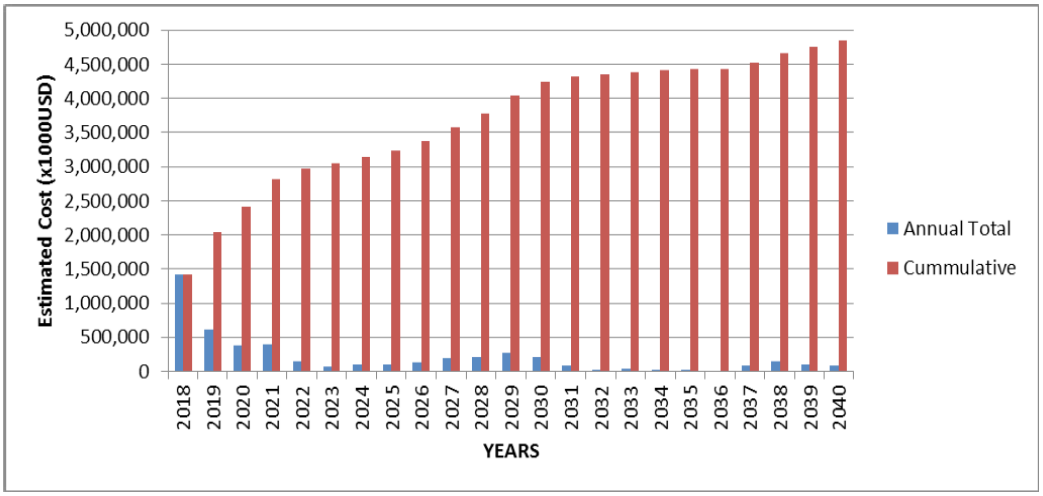


Figure 38. Grid development plan investments 2018-2040 (Source: UETCL)

Due to the nature of the projects and the environment in which UETCL operates, identification of key stakeholders is a prerequisite for the successful implementation of this GDP. Further still, the key stakeholders need to create a conducive environment for the survival of UETCL as a self-sustaining organisation without collapsing under a debt burden. It is worth mentioning that, in the list of stakeholders that is provided in the document, private investors are not mentioned.

The GDP considers that 'Strategic and Business' risks (listed below) are high:

- Failure to adequately commit and invest in the grid due to limitations/budget constraints;
- Failure to obtain alternative financing for capital and grid investment to meet future energy/power demands;
- Unfavourable forms of financing could put the company in a poor financial situation;

- Uncertainty on currency exchanges;
- Possibility of not meeting future demand;
- Inadequate harmonisation of plans with other utilities.

We consider that these risks are mostly related to financing, notably the failure to attract private investment. The considered mitigation actions include the obvious measure of applying cost recovery tariffs. Does it take into consideration progress in access? How will transmission expansion be financed? In most SSA countries governments are the major or only investors in transmission, but experiences in other parts of the world show that this is not necessary. This would liberate public funds for other purposes where they are more needed. Public financing of transmission also invites to lower the revenue requirement of transmission as an opaque tariff subsidisation method.

14.8. REA - RURAL ELECTRIFICATION STRATEGY AND PLAN (RESP) (2013-2022)

In July 2013, the Cabinet of Uganda approved the new RESP 2013 - 2022. The overall objective of this plan is to '*position the electrification development programme on a path that will progressively advance towards achievement of universal electrification by the year 2040, consistent with the existing policy of the Government, while ensuring the displacement of kerosene lighting in all rural Ugandan homes by 2030'*. The Government's RESP for the period 2013-2022 is the second comprehensive RESP, following the one which was published in 2001 covering the period 2001-2010 but whose official expiry time was 2012 due to delayed implementation.

The RESP for 2001-2010 did not meet the expectations. The plan anticipated growing rural electricity access ten-fold, from the estimated 1 % in rural population access to 10 %. However, rural access increased by less than 5 %. Over 400 grid extension projects, large and small, were undertaken but with consumer service connections rates often well below planned levels. Whereas the goal of the RESP was to connect 400,000 new consumers, only a fraction of this number was achieved. Of 80,000 projected solar PV installations, 7,000 were actually installed under Government-sponsored projects.

According to the RESP, 'the *Electricity Act of 1999 shall be amended to reconstitute the REF as an integral part of the REA as an autonomous authority of the Government, subject to the general fiduciary oversight and direction of the REB. The newly defined REA will be under the general policy supervision of the Minister of Electricity. Following the revisions to the Law, the Statutory Instrument pertaining to the formulation of the REA will be amended to reconstitute the REA as an autonomous authority. In addition, the amended Act shall establish a new definition for rural electricity and energy services and further establish that rural electric service concessions will encompass geographically defined, permanent service territories for which on-grid and off-grid electricity services shall be authorised and licensed by the ERA. Tariff-making policy and procedures pertaining to the financing of service providers' capital expenditures and enforcement of service providers' responsibilities to extend electricity service on the 'area coverage' rule shall be included in a revised regulatory framework'*.

The policies and structures adopted to implement the RESP 2013-2022 are summarised in Table 3 below (obviously, those referring to the former REA must be reconsidered):

Table 3. RESP 2013-2022 (Rural Electrification Strategy and Plan covering the period 2013-2022)

1. The Government will assume greater responsibility for planning, financing and overall management of the rural electrification sector
Government will absorb the major commercial and financial risk for rural electrification development and thus remove a critical obstacle to the investment in the sector.
2. Rural Electrification shall be implemented on a model of scaled, multi-technology electricity service territories comprising the entire rural territory of the country
This model shall be the basis for all rural electrification planning, project Rural Electrification Strategy and Plan 2013-2022 development and planning, electricity service concessions, financing, supervision and support. This policy is to increase the commercial viability of rural electrification investments in a shorter timeframe, paving the way for the ordered in-flows of capital financing in a rational and sequenced pattern.
3. Planning and management for all rural electrification sector programs and investment resources will be centralized in the REA
REA shall be reconstituted as an autonomous entity of the Government, along with granting of sufficient policy and administrative decision-making authority to the Rural Electrification Board to guide and oversee the REA. All rural electrification funding resources will be consolidated in the Rural Electrification Fund, under the fiduciary authority of the REB and the administrative management of the REA.
4. Rural electrification services and infrastructure shall be managed by duly licensed non-governmental concession holders
Similar to the current scheme, also the plan considers assistance to reduce concession holders' commercial risk in developing demand and performing their planning responsibilities. Under their concession licenses, these operators will be responsible for ensuring that service is offered widely on an "area coverage" basis to all eligible applicants in their service territories according to service territory expansion plans developed and regularly updated with REA's direct involvement as the basis for receiving REF financing support.
5. Off-grid electrification services comprising energy service technologies not dependent on the national grid shall, preferably, be planned, offered and furnished to eligible consumers in the service territories in tandem with on-grid electrification services
These include islanded community-based mini-grids and solar PV systems. The solar PV program may be implemented as REA-sanctioned projects proposed by solar PV providers or under customer aggregation schemes facilitated or owned by the on-grid service providers and directly financed by REA to improve program planning and implementation scale
6. Capital financing for infrastructure development for electric distribution-based investment shall be furnished under a system of long-term leasing and financing contracts with the electric distribution licensees
The financing will cover both the capital cost of the distribution infrastructure construction and the major cost of consumer service connections, in order to lower the financial barrier to widespread household service connections. Off-grid solar PV electrification investment may be financed under a combination of REA grants and microfinance agencies lending directly to consumers or directly by REA under tripartite financing agreements with the on-grid service providers and solar PV companies.
7. The cost of wholesale power to rural concession licensees may be discounted on a needs-test basis in order to make on-grid rural electricity service more affordable
Otherwise, electricity pricing shall be determined and approved by the ERA according to the operating costs of each licensed concession holder including system operating and administrative expenses and approved capital expenditure recovery.
8. Investment in small distributed power generation facilities as local sources of supply will be given increased priority and enhanced support
When the central grid cannot meet the power demand of the rural service providers, special rules and regulations will be provided concerning licensing power projects and wholesale power contracting to allow rural electric service providers to purchase directly from such facilities or to engage directly in small-scale power investment for their own consumption needs
9. New emphasis will be given to building organizational and professional competencies through technical assistance and training
This will be provided by REA working with its partnering agencies. Such support shall extend to rural service providers as to government and private sector participants in the rural electrification programme

14.9. USAID - OFF-GRID STRATEGY (2018)

An off-grid strategy was drafted with support of United States Agency for International Development (USAID) in 2018. Over the past 15 years as from 2003, the number of private companies offering stand-alone solar services has increased dramatically to over 200 service providers in April 2018, with about 300,000 households having Tier 1 stand-alone solar solutions and other non-grid electricity sources. In contrast, far fewer companies are engaged in mini-grid service. There are just eleven operational mini-grids in Uganda that serve approximately 4,000 households and a variety of key commercial and small industrial customers.

The off-grid strategy timeline coincides with SE4ALL commitments over an implementation period spanning 2018 to 2030. It is broken into three phases, with Phase 1 (2018-2022) as the focus of this document. It has adopted the following mandatory minimum definition of access: Tier 1 minimum level of service, with multiple light points and capable of delivering four hours of energy services over a 24-hour period.

The off-grid strategy presents standards that establish a baseline level of quality, durability, and truth in advertising to protect consumers across different technologies. It proposes an aggressive open market approach for stand-alone solar for households that is compatible with achieving universal access by 2030. In practical terms, this means that the private sector is expected to significantly increase the pace of energy access delivery through 2022, and that additional resources will be required for the private sector to do so. This would entail a particular emphasis on consumer awareness, working capital, and incentives to promote geographic inclusion and expansion. The strategy is built upon an aggressive mini-grid growth scenario underpinned by structural considerations. 25 % of the sites identified under the REA Master Plan will be developed during Phase 1, with REA undertaking site investigations to de-risk developers, and providing a transparent financing framework whereby tariffs are set, and CAPEX / Operation & Maintenance (O&M) costing is subject to competitive bidding (obviously, the recommendations referring to the former REA must be reconsidered).

Phase 1 activities will therefore focus on detailed data collection/analysis to accurately determine the state of public facility electrification, audits of facilities to identify electrification needs and optimal interventions; and installation, operations, and maintenance contracts focused on sustainability.

Under this aggressive open market approach, SHS penetration will reach 30 % by 2030 and will require at least USD 81 million in investment capital. The aggressive scenario forecasts a 40 % annual growth rate of off-grid investment that when combined with growth of grid connections will result in 55 % access by 2022.

The financing requirements for Phase 1 of the off-grid strategy can be broken down into stand-alone solar for household electrification (USD 84.6 million) and mini-grid segments (USD 16.4 million), with a grand total of USD 101.0 million.

Regarding affordability, the study shows considerable variance in energy expenditures and willingness to pay across the different Ugandan household segments. Tier 1 stand-alone solar solutions made available on a PAYGo basis (typically for USD 5-6 per month), are currently affordable to at least the top income quintile.

The assessment of the report regarding the financial requirements of the off-grid strategy is that: i) the sales growth estimated for Phase 1 that result in penetration of 12.4 % is therefore feasible without encountering significant affordability issues; and ii) achieving universal access may require some sort of consumer-facing subsidies in later years of the strategy and should be closely monitored during implementation.

This appears to be overly optimistic. One may wonder why Uganda is currently not moving towards universal access.

14.10. USAID - UGANDA MASTER PLAN PROJECT, PREPARED BY NRECA (2019).

Background

REA was established in 2003 to oversee expansion of rural electric coverage throughout Uganda. The GoU formulated the first phase of the RESP that employed a combination of grid and off-grid expansion activities to provide service to rural communities. After the first ten years of RESP implementation, REA, the World Bank and other development partners reviewed progress and determined that a fundamental shift in programme approach was necessary. The result was a decision to subdivide Uganda into thirteen rural electric service territories, and to promote electrification service expansion by establishing service providers that would be responsible for large-scale electrification coverage in each of these service areas. The revised RESP for 2013-2022 aimed to increase rural electric access to 26 % of the rural population over this period. Electrification rates might differ depending on the source used. Uganda has 42.65 % overall electrification rate 2018 according to the World Bank[118], representing 18.2 million persons without access in 2018. Urban electrification is 57.5 % and rural is 38 % in 2018 while the

[118] https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=UG

population reached 42.7 million people in the same year (44.3 million in 2019 and 45.6 million today). The 38 % rural electrification is higher in 2020 and certainly exceeds RESP-targets of 26 % by 2022. Other sources, however, state that this target has not been met.

The service territories defined in the RESP II (see Figure 38 below) are large geographic areas defined by REA that were thought to have the potential of reaching self-sufficiency through energy sales.

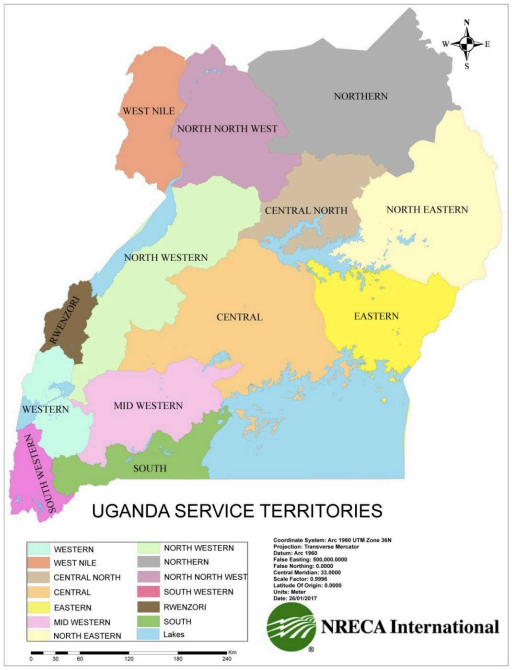


Figure 39. Map of Uganda service territories (Source: NRECA International, 2019)

The business model that inspired this strategy was the territorial concession defined for WENRECO in the early 2000's.[119] USAID agreed to support implementation of the RESP process by sponsoring master planning for each of the thirteen service territories. USAID assigned this responsibility to NRECA International that had worked with REA to revise the RESP. This effort resulted in a Master Plan for each one of the service territories for the period 2018-2027 (NRECA International, 2019).

Only one territory – the South Service Territory (SST) – has been chosen here as an example to describe the electrification plan.

Description of South Service Territory

The SST covers a land area of 10,914 square kilometres, some 100 kilometres to the southwest of Kampala. It is served by approximately 2,000 km of primary roads and secondary roads. The territory is home to approximately 2.1 million people living in 460,000 households. Major population centres include Maska and Rakai. The topography is mostly mountainous particularly in the western region of

[119] In 2003, WENRECO, through competitive bidding, won a concession to generate, distribute, and sell electricity in the West Nile sub-region, consisting of eight districts and home to an estimated 2.3 million people. The company owns a 1.5 MW heavy fuel electric generator and is part-owner and operator of the Nyagak I Power Station. WENRECO is the implementer and co-founder of the West Nile Rural Electrification Project, which was initiated in 2013. The project targeted electrification of 30 health centers, 60 schools, 250 businesses, and 6,000 households between 2013 and 2015. Funding for the project was provided by the government of Uganda, KfW, WENRECO, and the Energy Facility Pooling Mechanism. WENRECO operates as an islanded generation-distribution grid supplied by a hydroelectric generation facility serving approximately 15,000 residential and commercial consumers in a land area of 10,792 square kilometers. Prior to the date that the WENRECO concession was awarded, this area was served by the former UEB and served less than 1,500 consumers through a high-speed diesel power plant. Establishing the larger service territory and agreeing to terms of the concession that included joint investment in a hydroelectric facility, a vastly expanded 33 kV distribution network and a rapid increase of service connections led to significant expansion of coverage.

the service territory. Availability of adequate rainfall, moderate temperature and fertile soil characteristics has resulted in significant agricultural productivity; among other crops, it is a leading producer of bananas and coffee in Uganda. About 72 % of the total household's primary income is based on subsistence farming.

Two service providers are currently engaged in provision of electricity service to consumers in the SST. Umeme operates approximately 770 km of medium voltage lines, serving Masaka town and western part in Rukungiri district. UEDCL operates approximately 700 km of 33 kV rural distribution systems and serves approximately 7,100 as of 2017. Between Umeme and UEDCL only approximately 17 % of all households are served through grid service. Masaka district has the highest electrification rate in the territory with 37 % while only 11% of the households in Isingiro district have electrification access.

UEDCL has provided service through a management agreement with the former REA to serve clients connected to electric distribution infrastructure financed by REA in the SST. Going forward, REA intended to engage in a competitive bidding process through which private companies will be invited to bid on the SST. The service provider selected in this competitive process will serve existing and future consumers connected via the expansion plan described in this document.

Grid extension

Achieving full electrification coverage in the SST will require intensification of existing grid infrastructure, significant expansion of medium and low voltage grid resources, and expansion of off-grid service to areas that cannot be economically served by the grid. Grid intensification involves extending service connections from the low voltage network to consumers that in close geographic proximity to distribution service. Grid extension is the process of building new medium voltage infrastructure to communities and housing clusters that do not yet have access to the interconnected electricity system. Off-grid areas, on the other hand, can be served by a combination of mini-grids and SHS. All these modalities of service expansion are evaluated in this SST business plan.

Taken together, these activities will result in significantly increasing the number of served consumers in the SST between 2018 and 2027, as well as the electricity sales. Unit consumption data for tariff categories is based on historic electricity sales and results from surveys about the willingness to pay. Consumer growth is expected to increase from approximately 7,800 consumers at the end of 2017 to around 109,500 by 2027. The majority of the consumers will be added by the identified grid expansion projects (newly defined or previously identified by REA) and also by the customer intensification work over existing distribution transformers. Electricity consumption will grow by a factor of almost ten over the same period, from around 5.9 GWh in 2017 to 44.4 GWh by 2027.

In addition to the approximately USD 16.65 million needed to complete REA expansion investments, SST grid expansion, SST intensification investments and network reinforcement result in overall distribution infrastructure investment requirements of USD 58.01 million. Adding non-distribution infrastructure investment (vehicles, tools, equipment, etc.) the total capital investment requirements for the SST is estimated at USD 76.41 million between 2018 and 2027.

Off-grid areas in the SST

Many communities and housing clusters remain too far from the grid or are too small to be economically connected via conventional grid extension. For these communities and housing clusters, mini-grid and stand-alone solar solutions are considered the most viable alternatives to grid service. It was assumed that off-grid solutions will not be managed by the SST service provider; they will be owned and operated by distributed renewable energy service providers. NRECA considered that mini-grid service is a specialised business requiring knowledge of construction and operation of renewable energy systems, which argues for managing this programme through third-party, mini-grid operators.

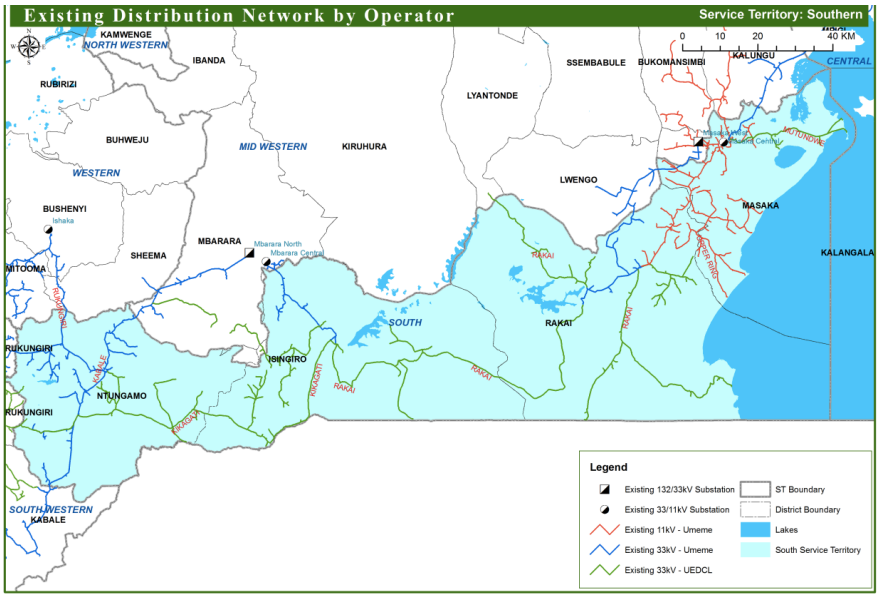


Figure 40. Map of the Southern service territory (Source: REA)

Satellite imagery was used to locate and evaluate housing clusters for purposes of identification and evaluation of grid expansion and mini-grid project opportunities. Mini-grids were assumed to be most often viable when they serve approximately more than 50 households, given the economics of small, isolated system operation. The mini-grid technology considered in this analysis included solar-battery charging systems, distributing power over a low voltage distribution network.

The project identification process resulted in identifying and evaluating 29 mini-grids in the territory with a total of 2,400 households. Most of the housing clusters are located in Ntungamo and Isingiro districts. Using estimates of penetration rates from the willingness to pay surveys, the number of consumers who are likely to be served by these mini-grids is approximately 2,882 by the tenth year. Mini-grids were ranked based on the increasing capital cost per consumer.

We consider that Geographic Information Systems (GIS)-based computer tools represent the state-of-the-art today in electrification planning, and it is good news that this approach has been adopted by USAID and the former REA, with the technical support of NRECA in Uganda. The method that has been used perhaps relies too much on simple heuristic rules. A more advanced approach could have been adopted[120], that might lead to a different mix of solutions. Sensitivity analysis and comparison with other approaches is therefore advisable. However, in comparison with most other countries in SSA, it is an important first step to count with a comprehensive national plan that includes all three modes of electrification.

Financial analysis

A financial model was developed to evaluate the financial performance of the SST service provider over a ten-year period from 2018 to 2027. The financial analysis evaluates costs and revenues associated with existing and future operations, and it includes current and planned infrastructure expansion. Revenue requirements include capital recovery charges taking into consideration the nature of the grants-in-aid from REA to the service providers, staff to administer, maintain and operate the electric distribution system and conduct repairs and expansion activities in accordance with the license requirements for the SST.

The financial analysis includes costs and revenues associated with grid service only. Mini-grid projects and the consumers they may serve have not been included in it, given that they will more likely be served by mini-grid operators that are independent of the SST service provider.

[120] See (GIZ, 2020).

We are concerned because this approach seems to ignore that electrical supply with mini-grids and stand-alone systems almost universally requires subsidies, which have to be borne by the GoU in some way. Therefore, these subsidies must be estimated and included in the overall business plan for the electrification of the country. If off-grid solutions are left to private initiative and donor support, many potential customers that must be supplied off-grid, according to the plan, will be left behind, and the expectations of the plan will not be achieved.

The financial projection for the SST service provider uses the current UEDCL tariff schedule, wholesale electricity purchase costs, and the customer and electricity consumption forecast including grid expansion and intensification activities in the territory. Based on the results of the financial analysis, working capital needs for the service provider are estimated as the amount of cash needed to cover any annual cash operating deficit for the planning horizon. The financial analysis covers the initial ten years.

The analysis estimates that the cash flow from operations is always positive, thus the service provider would not require subsidies to cover operating deficits over the period. The net present value of the net cash flows during the ten-year period, using a 10 % discount rate and no subsidies for operation, results in a profit of USD 4.95 million.

The financial analysis assumes the distribution infrastructure investment for the SST will initially be financed as a grant-in-aid for all materials and labour through REA. For its part, the service provider will be required to finance non-distribution capital expenditures that represent the cost of vehicles, tools, spare parts, IT systems, and other business-related requirements, as well as to finance working capital and pre-operating costs.

We consider that the assumption that all initial capital expenses will be covered either by REA as a grant (most of them, i.e., the ones strictly related to the distribution network) or the service provider without expectation of recovery (the non-distribution capital costs) is overly optimistic for an aggressive electrification plan. This financial approach would make sense with a much slower electrification pace. The financial plan also ignores the additional needs of CAPEX (capital expenditures) as future demand grows, and existing assets need replacement.

Increasing the density of consumers in the SST while ensuring these consumers pay for the service will have the greatest impact on overall financial performance for the service provider. The ten-year financial analysis shows that expanding the system but failing to increase the number of legal consumers at a higher rate and reduce current electricity losses levels would eventually result in the need for either a subsidy or a tariff adjustment to compensate for higher operating costs than revenues from electricity sales.

We consider that significant reduction of commercial losses – i.e., theft and non-paid electricity bills – can only be achieved with universal and sound metering and provision of a service with a satisfactory level of reliability. Both conditions have significant associated costs, and they also need adequate customer engagement practices, all of which must be included in the electrification plan.

14.11. GIZ-SOUTHERN TERRITORIES[121]

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), with technical support from the MIT/Comillas Universal Energy Access Laboratory,[122] has performed a GIS analysis to compare results with the Rural Electrification Masterplan (REMP) of the former REA, arriving to the conclusion that the potential for the use of mini-grids in rural electrification in Uganda is much higher than the one determined in REMP. GIZ concludes that the scattered nature of settlements in Uganda limits the population that will be reached by the grid, and that off-grid solutions, and mini-grids in many cases, must play a major role in increasing electricity access.

[121] GIZ (2020). Market potential of mini-grids in Uganda. Slide presentation.

[122] https://universalaccess.mit.edu/#/main

14.12. THE WORLD BANK UGANDA ENERGY ACCESS SCALE-UP PROJECT (EASP)[123]

The objective of the Project is to increase access to energy in Uganda. The proposed project will increase access to electricity for households, commercial, and industrial users, as well as public institutions in the rural, peri-urban and urban areas through on-grid and off-grid solutions. The project will also increase access to clean energy cooking services by supporting private sector enterprises promoting efficient and clean cooking solutions. The project will also support interventions to increase access to clean, affordable, and reliable energy services in refugee areas.

The project is structured around four main components: (1) Grid expansion and densification; (2) Off-grid market development for rural communities, refugee and host communities; (3) Off-grid electrification of health and education facilities; and (4) Technical assistance, capacity building, and project implementation support. The total cost of the project is US$ 400 million.

To augment the ongoing access expansion initiatives, the proposed Energy Access Scale-up Project (EASP) will support the country's efforts to scale up access to electricity for households including for refugee and host communities, industrial parks and commercial enterprises, health and education facilities, as enshrined in Uganda's Vision 2040 and other policy documents. The project will build on earlier engagements in the sector to directly support the expansion and strengthening of the electricity network, and scale-up of service connections in areas within the network reach, as well as increase access to off-grid electricity and clean coking services in areas outside the network footprint and in refugee settlements and their host communities. The project will strengthen the institutions and operational capacity of the Health, Safety and Environment Unit (HSEU) at the MEMD to ensure smooth implementation of the project by the various implementing agencies under the project. Technical assistance support would be also provided to the ERA to introduce new regulations if needed to ensure private sector participation to increase electricity access, both in grid and off-grid areas.

According to the latest available information in November 2020, the project has not started yet. It still is in a negotiation phase between the GoU and the World Bank. This is an important project, which will have a substantial impact on the well-being of many Ugandans. However, once more, it is not part of a more ambitious and comprehensive plan directly aiming at full universal electrification for 2030 or earlier, not leaving anybody behind, as the proposal in this report tries to achieve.

14.13. NATIONAL ELECTRIFICATION STRATEGY (NES) (07/04/2020)[124]

The National Electrification Strategy (NES) is a key element in MEMD's mandate to update and consolidate the multiple strategy papers related to access to electricity, and is very relevant for the present study. The NES has been commissioned by the MEMD and being undertaken by Innovation Energie Développement (IED, France). The NES Draft report is only studied here, which is the second deliverable of this consultancy project.

The development of the NES is a key element in MEMD's mandate to update and consolidate the multiple strategy papers related to access to electricity. In accordance with the Terms of Reference, the Electrification Strategy development is based on close cooperation and coordination with the MEMD as well as a continuous consultation and interaction with the stakeholders active in national electrification efforts. The NES is expected to provide MEMD with an up-to-date software for planning and implementation of the national electrification, including a consolidated GIS data base developed by the consultant.

[123] Elahi,R. (2019). *Concept Project Information Document (PID) - Uganda Energy Access Scale-up Project (EASP) - P166685 (English).* Washington, D.C. : World Bank Group.

http://documents.worldbank.org/curated/en/102741561002617590/Concept-Project-Information-Document-PID-Uganda-Energy-Access-Scale-up-Project-EASP-P166685

[124] IED - Innovation Energie Développement (July 2020). National Electrification Strategy (NES) for Uganda. Grid Extension & Reinforcement Project (GERP) | PROJECT ID NO: P133305. Draft report. Funded by the World Bank.

The NES takes into consideration technical, institutional, policy, regulatory, legal, and financial aspects, covering a 10-year period from 2021 to 2030, with a target of achieving an overall access to electricity of 100 % considering the minimum service level of Tier 1 as per the SE4ALL multi-tier access definition.

The NES will also aim at increasing productive use of electricity and energy efficiency amongst consumers. The scope of work encompasses the preparation of a GIS database of relevant layers and a geospatial estimated least-cost electrification options analysis for use by the Ugandan government. The NES will be used to rationalise investments and maximise their socio-economic impacts.

As it was described in Annex E, the current electrification status in Uganda differs according to sources and service level. For the NES, the UBOS ERT-III 2018 household survey serves as the current electrification baseline: 50 % of households access to at least one source of electricity, broken down as follow: 24 % are connected to the national grid; 23 % own a solar lighting system or solar lantern (including tier 0); and 3 % own a SHS.

The topics addressed by the NES draft report are: '*the current electrification situation, the analysis of the institutional framework, the analysis of electrification policies and strategies with international benchmark, the analysis of the legal and regulatory framework, a technological review, the analysis of the capital investment strategies and control mechanisms, the least cost electrification planning approach and methodology, the new consolidated GIS, and the development of the NES with first results of the simulations.'*

Analysis of the electricity institutional framework

The overall recommendation of the NES regarding the electricity institutional framework is that the informal working relationships between stakeholders need to be formalised in the law and MEMD should be given a clear responsibility to co-ordinate planning and implementation of key projects in the sector.

Analysis of policies and electrification strategies

The NES also reviews and comments the previous reports on policies and electrification strategies – in particular the REMP and the Distribution Sector Diagnostic Review Study – and it adds its own recommendations. The NES concludes that both reports *'lack a holistic approach encompassing for example a clear definition of access, a consolidated overview of the electrification status of each settlement, overlaps in distribution network, omission of areas where the population is scattered, omission of the business viability issues of mini-grids, omission of densification activities, etc. Overall, while there is a rich basis of information and analysis from previous strategy papers and studies, the information and recommendations remain highly fragmented and are not supported by a robust action plan and investment scheme to assist with implementation. The NES addresses all the issues identified*.'

The NES also reviews and analyses successful international electrification strategies and it highlights the following factors for success: '*applying a reduced household connection fee that is proportionate to household monthly income, strong political commitment, fast-paced extension of the grid, potential role of mini-grids in sparsely populated areas, priority of targeting public facilities and productive uses, deployment of ready-to-use switchboards, introduction of appliance efficiency standards, deployment of prepaid meters.*'

Analysis of the legal and regulatory framework

The NES has analysed the impacts of the current legal and regulatory environment of the electricity sector. It follows a list of the reflections and recommendations that are relevant for the segment of distribution and electricity access in particular.

- Regarding the definition of minimum access, 'tier 1 level should be considered for distributed solutions or as a temporary solution pending graduating to a higher level. This level is indeed too low to affect meaningful level of social and economic transformation and is incompatible with upper middle-income status Uganda aspires to (as set in the Vision 2040);'
- Regarding the lack of coordination of the several agents, and the need to take a holistic view of the sector: 'MEMD should take responsibility for sector planning and co-ordination of project implementation. This should be formalised in the law;'
- Regarding the power sector structure, it is welcomed the recommendation to have one, two or three distributors in the country with service obligation to communities in a licensed territory.

Also, where a licensee fails to provide a service within a reasonable time, other operators should be licensed to fill in the gaps and provide on or off grid solutions. But it is missed here the requirements of default and last resort provision, which were presented in section 3.1 of the main report, and that are necessary to guarantee universal access;

- Regarding small distribution licensees, their existence is still considered necessary by the development partners, in particular. There should be provisions for capacity building for them and for addressing the operational constraints that they have to face. A few small operators have performed well, such as cooperatives like KREPKS. It is considered that the market for off-grids such as mini-grids and SHS should be open to competition so as to attract new technology and innovation. An additional advantage is that renewable energy, which is often adopted for these projects, would attract donor financing. Small operators should be confined to those areas that the main distributor is unable to serve within a reasonable time for whatever reasons; thus, before licensing a small operator for some territory, the main distributor should be given the right of first refusal. We consider that this is all fine, but it is meant for small scale electrification, and it does not address the massive investment, operation and maintenance costs that are necessary to electrify the entire territory of Uganda sustainably;
- Regarding licensing procedures, competition should be encouraged in the procurement of large projects, or small ones packaged together;
- Regarding tariff setting for end-customers in rural areas, tariffs must be standardised using targeted subsidies that allow for financial viability for private investors, both in off-grid and on-grid areas. There should be tariff cross subsidisation within customers in the same category;
- Regarding the encouragement of demand growth, productive uses of electricity should be given priority over domestic uses through tariff incentives and more subsidies; and a multi-sectoral approach to empower communities must be adopted;
- Regarding the role of UECCC in the mobilisation of funds for electricity projects, the NES proposes that it should be formalised in the law. We point out that UECCC so far has never managed the volume of funds that are necessary for universal rural electrification;
- Regarding distribution assets for rural electrification, funded by the GoU or donors, the ownership should correspond to UEDCL, to ensure the sustainability of the sector;
- Regarding the lack of commensurate instruments against breach of license conditions, ERA should be given executive powers to enforce sanctions with fines and penalties. ERA should also adopt light handed, simplified and flexible regulation for small operators in rural electrification and incentives to attract new technologies and innovative ways of service delivery.

The NES draft report suggests that the topics above should be considered in the process initiated by the GOU to amend the Electricity Act.

Technological review and analysis

The report reviews the current on-grid and off-grid technologies. After an international benchmark of low-cost technology options, it is concluded that the Single-wire earth return (SWER) technology is not suitable in Uganda.

Analysis of capital investment strategies & control mechanisms.

The NES draft report evaluates the pros and cons of the three basic approaches to financing electrification projects: (i) government owned projects, (ii) private owned projects with commercial risk and minimal government risk-taking, and (iii) public-private partnership (PPP) with shared risks and ownership.

In general terms, it is concluded that the electrification policies that have been proposed so far do not include clear financial plans. Since the electrification of rural areas is not commercially viable and therefore requires heavy subsidies, a clear financing plan is needed to match the needs with the sources so that any electrification project can make financial sense. We consider that this is an obvious but critically important conclusion. It follows a summary of other topics covered by the report, with which we do not always agree.

Regarding grid extension, intensification and densification, the report points out that distribution networks are usually managed by a single operator to ensure their stability, although distribution can be split among several operators. Privately-funded grids require a mature energy market and, while this is not the case private players can undertake heavy investments through a PPP. Cost efficiency can be achieved through competitive tendering.

Regarding mini-grids, their commercial viability remains a challenge in areas where demand and household budgets are limited, and require cheap, long term financing to fund their large upfront costs. Local communities should get involved in mini-grids financing and operations, and the development of productive uses shall be supported through appliance financing. It is finally indicated that generation and distribution activities may be separated in mini-grids and that, again, PPPs can foster investment in mini-grids.

For stand-alone systems, it is essential that the government control the quality of products. Micro-finance institutions or PAYGo operators could undertake the up-front investment of the systems, or the GoU could make use of dedicated financial instruments. Successful deployment of the technology critically depends on consumers' trust. The NES draft report considers that the standalone systems are commodities, to be purchased, and it concludes that their financing differs much from the project-based electricity supply with mini-grid or grid extension. It seems to ignore the interesting possibility of energy-as-a-service, which has been successfully implemented in many countries, including Uganda.[125]

We highlight the following useful takeaways from the review of international best practices in the NES draft report:

i) a financially stable national utility company facilitates the subsidisation of non-profitable electrification activities;
ii) grid extension is critical to allow the absorption of surplus generation capacity;
iii) UECCC could act as the central credit provider of consumer microfinancing programmes;
iv) cooperatives encourage a culture of collective responsibility through engagement and ownership by the local populations;
v) enforceable quality standards for the products sold in Uganda is absolutely necessary to create consumer confidence and for the involvement of microfinancing institutions;
vi) electrification of productive sectors must be prioritised and can help in obtaining additional financing;
vii) associations, like of solar companies, can be useful to pools risks and leverage on economies of scale when providing financing.

Least cost electrification planning approach and methodology.

Least cost planning at national level has been performed using a geospatial planning software called GEOSIM. The following steps have been followed:

- Creation of a consolidated villages database. Combining satellite imagery with demographic projections, in the absence of recent census data at village level, the population of the 44,032 villages in Uganda was estimated. Using satellite night images and transformer data from distribution companies and RRA the electrification status of each village was guessed. IED estimated that 22,787 villages – or 52 % – will be electrified via the interconnected grid, or an isolated or mini-grid by 2021;
- High level population analysis. Zones where electrification will have a high socio-economic impact are identified. The number of required connections over the period 2021-2030 to achieve at least universal tier-1 is estimated to be 10.1 million. Distances from the existing MV grid have been used by GEOSIM. The vast majority of connections (84 %) are located in already electrified villages (densification) or in areas within 5 km of the existing grid. UMEME and UEDCL account for 75 % of the total required connections;

[125] See https://fres.nl

- Power system analysis. Mini-grids can be developed in suitable sites with hydroelectric potential. Grid dimensioning and transformer selection is based on best assumptions about estimated demand;
- Test electrification scenarios. Two electrification scenarios have been developed. One (base case 1A) is based on the analysis performed by the NES consultant with the GEOSIM software, using an on grid/off grid boundary limit of 15 km. The other (base case 1B) is based on the former REA grid extension master plan; all other zones are considered off-grid.

Summary of the results of scenario 1A:

The *Table 3* below sums up the main figures of this electrification plan: total number of connections (10.1 million), total budget ($5,223 million) and the per unit connection costs for each electrification mode. 88 % of the budget is dedicated to on-grid connections (49 % to densification, 39 % to grid extension), and 12 % is dedicated to off-grid solutions (4 % solar mini-grids, 8 % standalone solutions).

The national weighted average cost per connection is $ 350; note that 5.9 million customers out of 10.1 million would be supplied with very basic and unexpensive solar systems (3W, just for phone charging and a couple of lights for a few hours) which is questionable whether they qualify for having 'electricity access'.

Mini-hydro mini-grids are not included in the plan, since they are too expensive. Solar mini-grids with storage and back-up diesel are used for off-grid electrification of 342 villages with more than 1000 inhabitants, otherwise individual solar systems. Solar standalone systems with a per unit cost of about $10,000 have been used to electrify 278 public infrastructure points and productive uses.

Table 4. Main figures of the electrification plan – Scenario 1A (Source: NES, 2020)

Total	Total	Densification	Grid extension	Solar mini-grids	Standalone solar systems
Connections (million)	**10.1**	3. 4	0.8	0.1	5.9
Investment ($ million)	**5,223**	2,557	2,037	213	413
Costs per connection ($)	**350**	760	1,402	1,999	70

Summary of the results of scenario 1B:

The table below sums up the main figures of this electrification plan: same total number of connections (10.1 million), total budget ($4,451 million) and the per unit connection costs for each electrification mode. 75 % of the budget is dedicated to on-grid connections (57 % to densification, 18 % to grid extension), and 25 % is dedicated to off-grid solutions (14 % solar mini-grids, 11 % standalone solutions).

The national weighted average cost per connection is $ 331; note that 6.1 million customers out of 10.1 million would be supplied with very basic and unexpensive solar systems (3W, just for phone charging and a couple of lights for a few hours) which is questionable whether they qualify for having 'electricity access'.

Mini-hydro mini-grids are not included in the plan, since they are too expensive. Solar mini-grids with storage and back-up diesel are used for off-grid electrification of 753 villages with more than 2000 inhabitants located over 3 km from the proposed REA MV grid extensions, otherwise individual solar systems. Solar standalone systems with a per unit cost of about $10,450 have been used to electrify 4,860 public infrastructure points and productive uses.

Table 5. Main figure of the electrification plan – Scenario 1B (Source: NES, 2020)

Total	Total	Densification	Grid extension	Solar mini-grids	Standalone solar systems
Connections (million)	**10.1**	3.4	0.3	0.3	6.1
Investment ($ million)	**4,451**	2,557	804	615	476
costs per connection ($)	**331**	760	1,365	1,848	70

Both electrification plans meet the minimum requirements, although both make extensive use of very basic tier 0-1 solar systems without any differentiation between households, only based on their topological situation. Key public infrastructures are also electrified. Scenario 1A relies more on grid extension and scenario 1B more on mini-grids and standalone solar systems. Scenario 1B is less expensive, since it defers some necessary grid extension to the period beyond 2030.

The NES consultant considers that the mini-grid targets (342 mini-grids in 1A and 753 mini-grids in 1B) are ambitious objectives, both with regard to public and private stakeholders' capacity to implement mini-grids in Uganda. This judgment could be disputed.

The next step in this process is for the NES consultant to wait for a decision by the MEMD for one of the two options, to move to a more detailed evaluation of the selected scenario.

15. ANNEX H. THE BUSINESS PLAN

The business plan that is presented in this report has been developed using a "financial model", i.e., an analytical tool to support this kind of exercise. This tool has been built using an Excel spreadsheet, representing the financing strategy for the distribution segment of the Ugandan power sector during the period 2021 to 2040, with the complete electrification of the country by 2030 as described in the NES. Developing scenarios based on this tool requires some external assumptions/inputs – e.g., demand growth, cost of solar panels or batteries, or price of wholesale energy – and also needs the provision of some strategic inputs – e.g., the trajectory of annual CAPEX and OPEX in the electrification plan, the evolution of tariffs to the end customers, or the proposed blend of grants, equity, and debt to finance distribution during the period. Then the tool delivers the corresponding financial statements and the key outputs, which the financial planner must use to evaluate the viability of the financial plan and to adjust the strategic inputs in an iterative process, trying to achieve the best possible outcome, hopefully a viable business plan.

The business plan presented in this report ("Reference Business Plan") and its conclusions hence depend on these external and strategic assumptions. Sensitivity analysis can be performed to understand the impact of inputs and assumptions on the viability of the financial plan.

Storyline and assumptions

It follows a description of the key assumptions used to build the Reference Business Plan. They are embedded in the storyline of the proposed regulatory and business model approach, and they are organized by time periods (initial situation 2021-2022, electrification effort 2023-2030, and financial stabilization 2031-2040) and by topic: investment, ownership, and operation and maintenance.

Investment

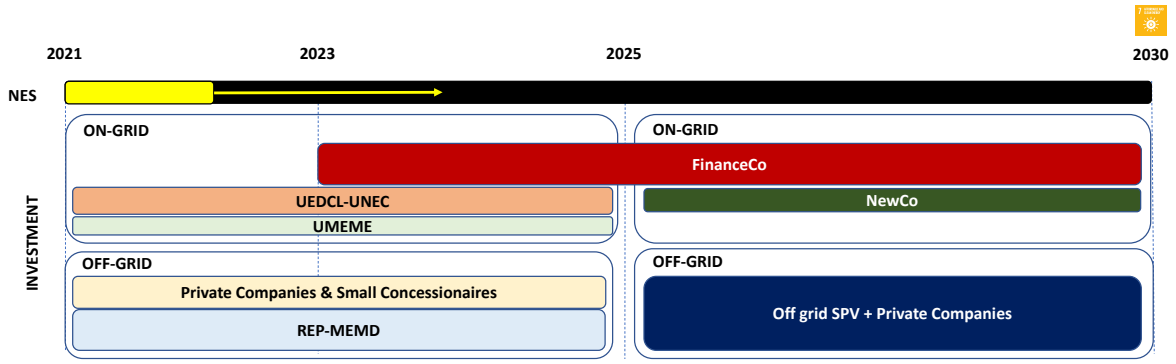


Figure 41. The institutional and business model layers: the investment perspective

<u>2021-2022</u>

We have assumed that although the national target is to meet the levels of investment and necessary connections set by the NES, this target has not been completed in 2021, nor does it appear that it will be met in 2022. Based on the current investment levels presented in the financial statements, we have estimated that only 20% of the NES target has been or will be fulfilled in both years. Therefore, we have allocated the rest of the necessary connections evenly over the rest of the period, so that 100% electrification is achieved by 2030. This means a step change from approximately 190,000 new connections in 2022 to 1.14 million connections in 2023.

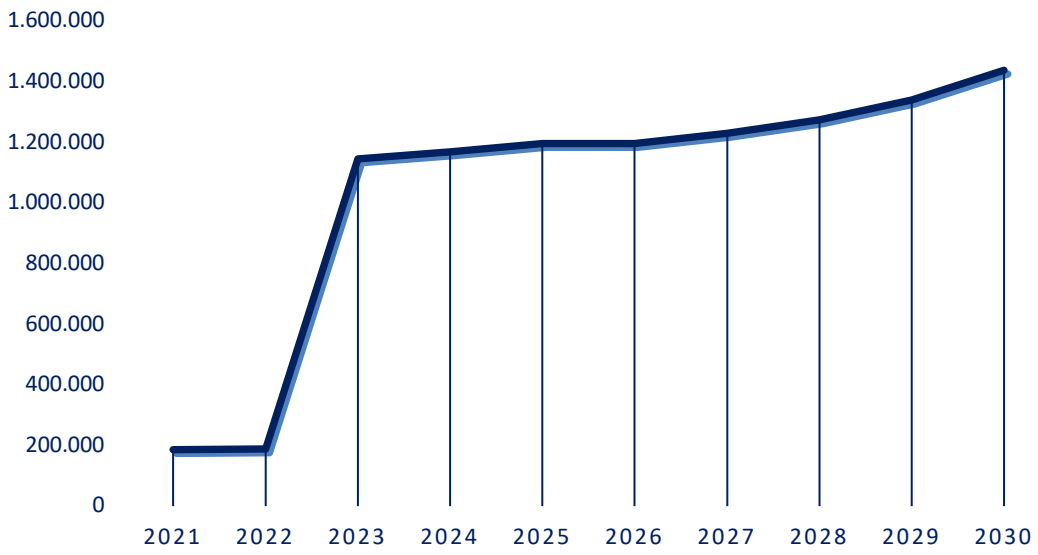


Figure 42. Number of new connections per year following the NES

2023-2030

From 2023 until the end of the current concession, FinanceCo is assumed to provide the financing to Umeme (and after 2025, to NewCo) to make the EPC of the new on-grid connections dictated by the NES within Umeme's footprint (since Umeme cannot invest by political decision during this time interval in its current footprint).

After 2025, NewCo will be able to make a small fraction of the on-grid investments established by the NES. These investments correspond to critical network infrastructures requested by NewCo and approved by ERA after consultation with UEDCL-UEC.

UEDCL (probably a department within the vertically integrated public company UEC) will be responsible for inspecting and verifying the activities and compliance with the objectives imposed on NewCo and providing technical advice to MEMD. It will have no legal personality or consumers.

Investments in off-grid solutions will be made by the aggregate of private companies and small concessionaires and the REP within MEMD (until 2025). Subsequently the off-grid space will be filled by private companies, including the newly SPV which, in its role of off-grid default provider and last resort provider, will ensure full compliance with the NES objectives.

2031-2040

Once 100% electrification is achieved, new investments are only necessary to address population and consumption growth, plus CAPEX replacement according to the specific D&A (depreciation and amortization) schedule.

Ownership

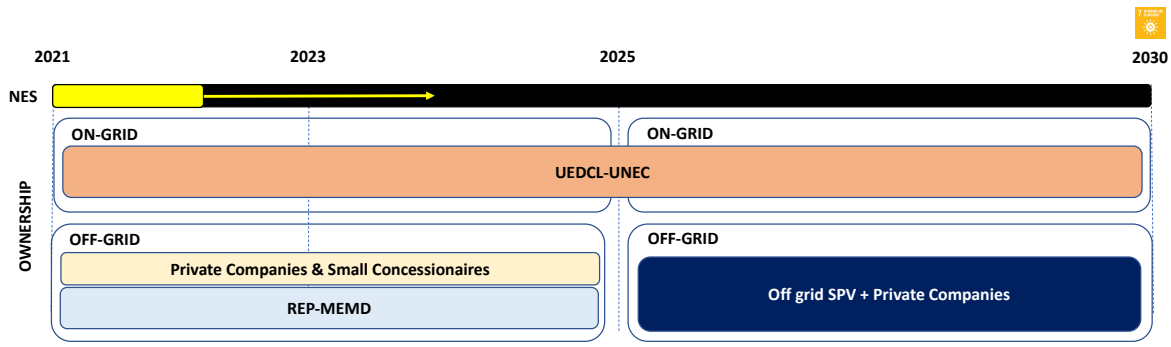


Figure 43. The institutional and business model layers: ownership of the assets

2021-2040

Existing and new on-grid assets will belong to UEDCL initially. With the rebundling, all of them would belong to the vertically integrated company UEC. In addition, UEC would inherit the on-grid assets and customers of the small concessionaires as their license expires. After 2025, NewCo will operate and maintain these assets and will inherit the customers.

Because we assume on-grid distribution will continue under a concession model, with a new format and contracting conditions but in principle with the same company shareholders, the buy-out of Umeme's investments residual value will not be required. Neither the concessionaire, NewCo, nor FinanceCo would own any physical distribution assets, as UEC would own them.

New off-grid assets will belong to private companies. Any existing publicly owned off-grid assets will be transferred to private companies under conditions to be specified.

Operation and Maintenance

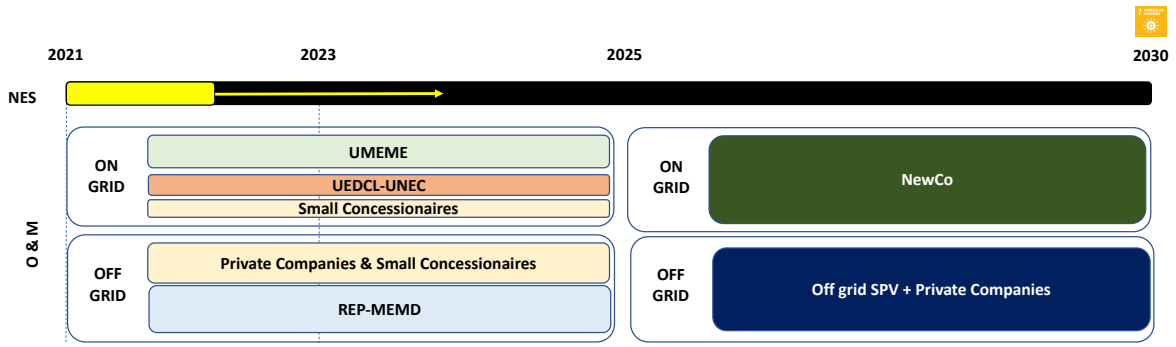


Figure 44. The institutional and business model layers: Operation and Maintenance

2021-2024

During this period, the O&M of on-grid consumers will be carried out by Umeme, UEDCL, and the small concessionaires, as a continuation of the present situation. Off-grid activities and customers will also continue as they are now.

2025-2040

In 2025, UEDCL-UEC will transfer all consumers under its operation to NewCo. Therefore, NewCo will operate and maintain the consumers and assets under UEDCL-UEC in 2025 until the end of the new concession.

- In addition to the assumptions concerning the construction of the model, we have made estimates of **external inputs** based on market information:
  - Based on the most up-to-date information from the IMF, we have obtained GDP's growth and USD and USh inflation trajectories for the 2021-2040 period. Additionally, we have obtained the corporate taxes and population and demand growth projections from market reports by contrasting them with the different companies in the sector;
  - Cross-checking with the information provided within the NES, we have obtained the AO&M cost data for each technology, the depreciation and amortization schedule of the assets, and finally, the technical losses and bad debt provisions;
  - The value of the upstream cost of energy obtained from the NES and Umeme's financial statements has been verified with the Regulatory Authority, and the most recent tariff schedule has been obtained.
- The following key **strategic inputs**, have been assumed:
  - The NES has set the annual investment and new connections targets as we have described above. We have respected the CAPEX and OPEX values specified in that document, and the decision to deploy 3W solar kits in the reference scenario;.

- Our baseline scenario involves inputs to be negotiated, such as the ROI for NewCo - Zone A, ROI for NewCo - Zone B, and the ROI for off-grid solutions. Until 2025, Umeme's ROI is 20%, but we have introduced 12% for NewCo in the reference scenario after 2025 and also for the aggregated off-grid developers. Sensitivity analysis can be made, and the effect on the business plan of different values of ROI can be evaluated;
- Additionally, a procurement fee (%) of the NES to be paid to Umeme and then to NewCo has been introduced, equivalent to 5% for all the investments to be made in zone B, the cost of which is paid by FinanceCo;
- The tariffs remain at their current value, i.e., they are not adjusted for inflation during the period 2021-2040;
- All the concessional debt and associated interests are repaid in full by 2040, as shown in Figure 44. The capital structure will consist entirely of equity at that time, as it is typical at the end of the concession contract periods.

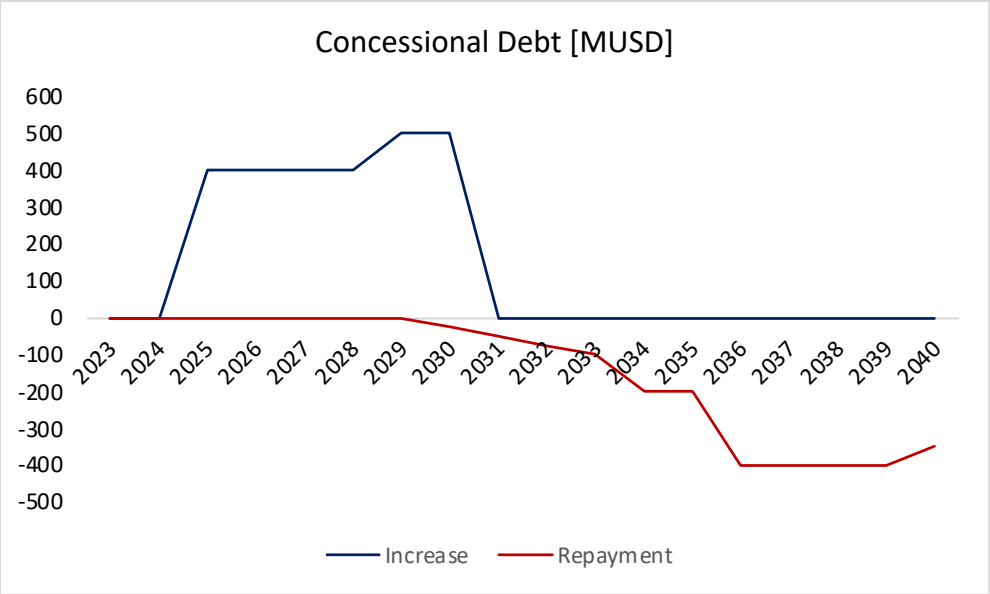


Figure 45. Use and repayment of the concessional debt

The data

Key strategic inputs

<u>Capex trajectory</u>

The network roll-out, the associated investment costs incurred in any given year, and the connection of all consumers are assumed to take place proportionally throughout the year. A mid-year convention is adopted for additional CAPEX and new customers (the same assumption is considered for the upstream energy cost, O&M, and administrative expenses).

- *Period 2021/2030 - Network deployment to connect the remaining additional customers so that universal access can be achieved by the end of 2030 following the NES;*
- *Period 2031/2040 - Capex to cope with population and consumption growth and replacement CAPEX as required by specific D&A schedule.*

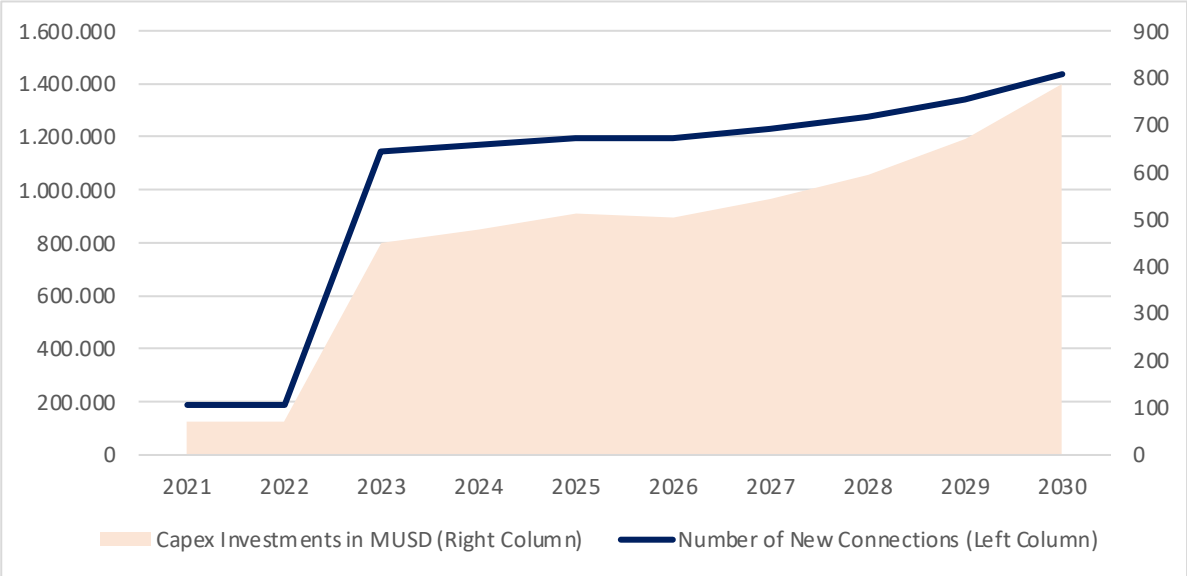


Figure 46. Capex and new connections trajectory

Tariffs

The current tariffs set by the regulator for each type of customer (residential, commercial, or industrial) are used. Mini-grid customers are charged at the same tariff as grid consumers. Isolated system users are charged the average rural household energy consumption equivalent (USD 12/year).

- *Commercial and Industrial customers Tariff: No increase on the currently regulated tariff;*
- *Non-C&I Tariff: No increase on the currently regulated tariff;*
- *Pass-through of wholesale energy costs: In addition to inflation, tariffs could be subject to a pass-through scheme of the cost of energy reduction for all end customers tariffs for the 2031/2040 period. Due to the lack of data, there is no trajectory for the energy cost (it is the same value for the whole period). Therefore, tariffs do not decrease in value due to a reduction in the cost of energy.*

Grid Extension/Densification	Residential Tariff	INPUT	747,50	Q1 2022 values in USHs/kWh
	Lifeline - First 15 Units (Ush/kWh)		250,00	Q1 2022 values in USHs/kWh
	Energy units between 16 – 80 (Ush/kWh)		747,50	Q1 2022 values in USHs/kWh
	Energy units between 81 – 150 (Ush/kWh)		412,00	Q1 2022 values in USHs/kWh
	Energy Units above 150 (Ush/kWh)		747,50	Q1 2022 values in USHs/kWh
	Industrial Tariff	INPUT	400,00	Q1 2022 values in USHs/kWh
	Commercial Tariff	INPUT	597,10	Q1 2022 values in USHs/kWh
Minigrids	Residential Tariff	INPUT	747,50	Same as On-grid Customers
	Industrial Tariff	INPUT	-	
	Commercial Tariff	INPUT	-	
SAS	Type A	INPUT	12,00	Rural Household Energy Consumption USD
	Type B	INPUT	-	

Figure 47. Value of the tariffs applied in the model

Financing characteristics and constraints

- *Grants: Grant revenues are based on DFIs funds to the Government linked to the deployment of the CAPEX. Recognized in the P&L proportionally to the percentage of annual CAPEX over total CAPEX. No repayment of the Grants is introduced in the model;*
- *Concessional debt: six years of grace period; 2% interest rate;*
- *Commercial debt: No grace period; 8% of interest rate.*

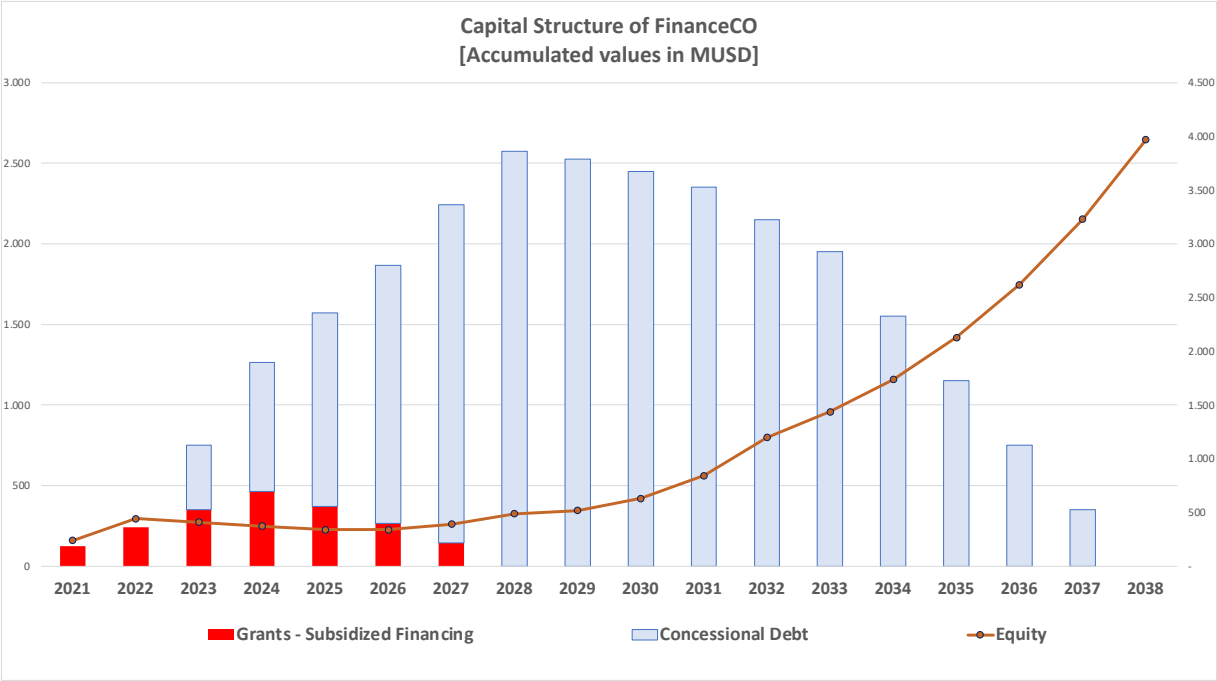


Figure 48. FinanceCo capital structure evolution

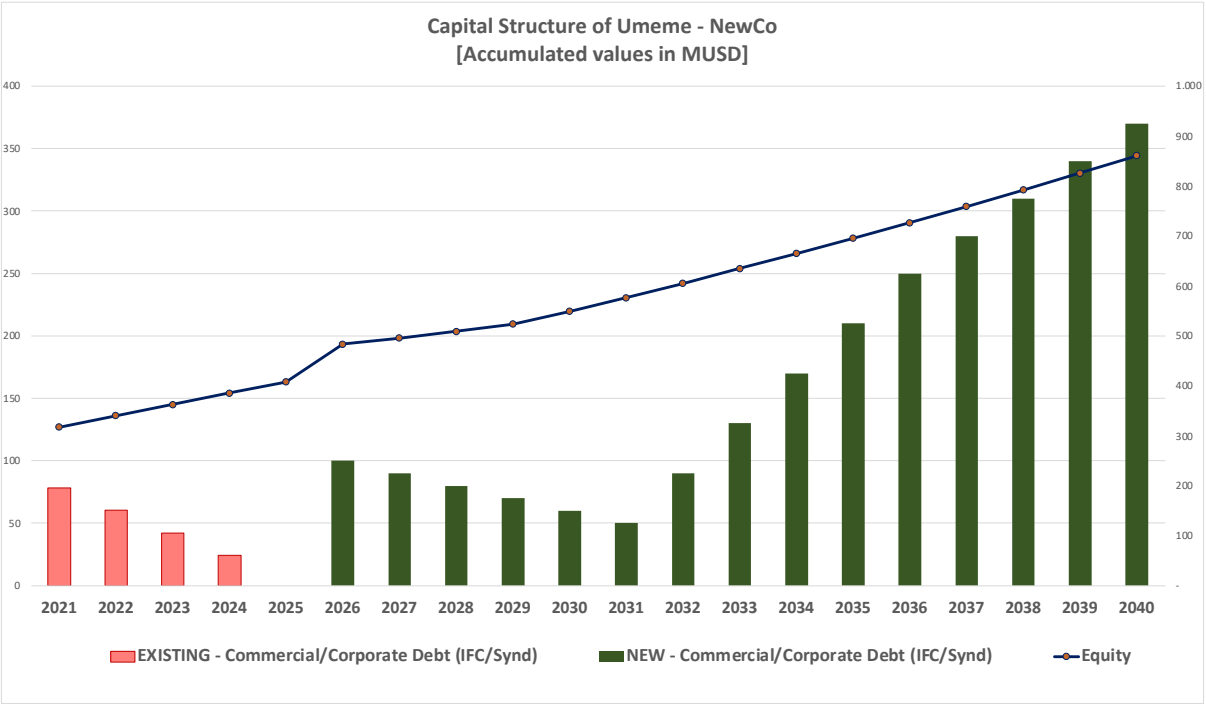


Figure 49. Umeme – NewCo capital structure evolution

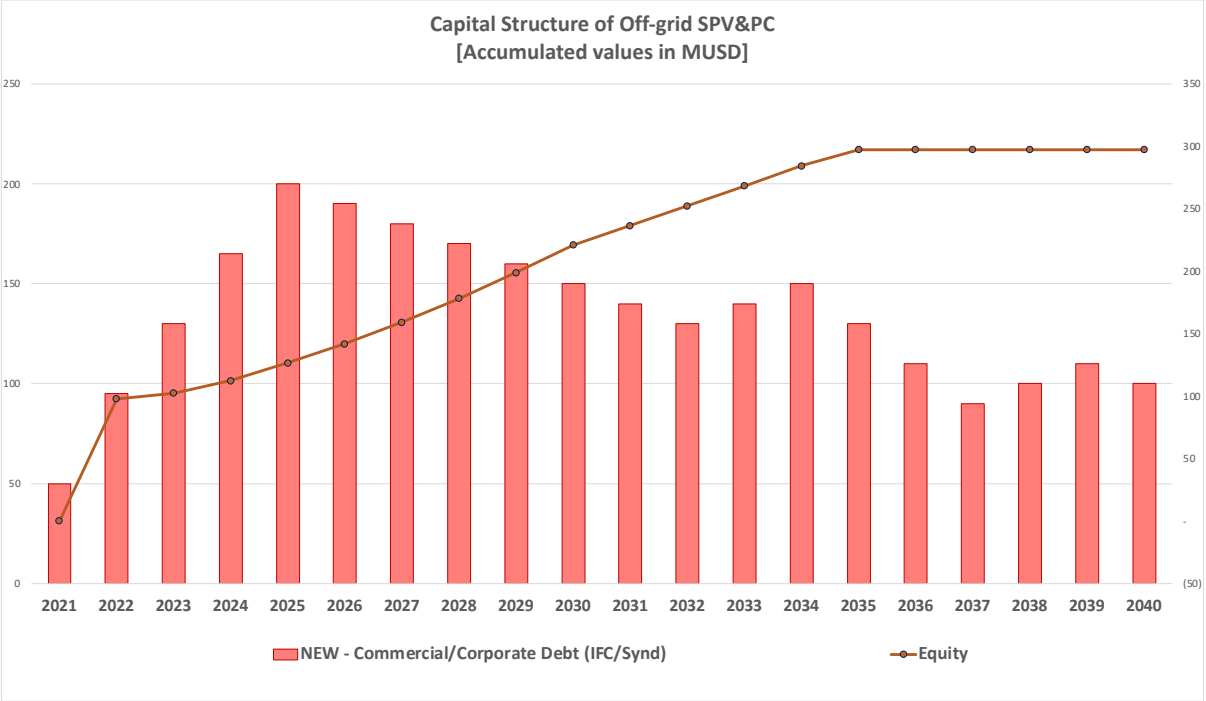


Figure 50. Off-grid SPV&PC capital structure evolution

External inputs based on market information

<u>Macroeconomic inputs</u>

- *Corporate tax rate*: 30%;
- Figure 50 shows the trajectories of the expected values of GDP growth, USD inflation and USH according to IMF data.

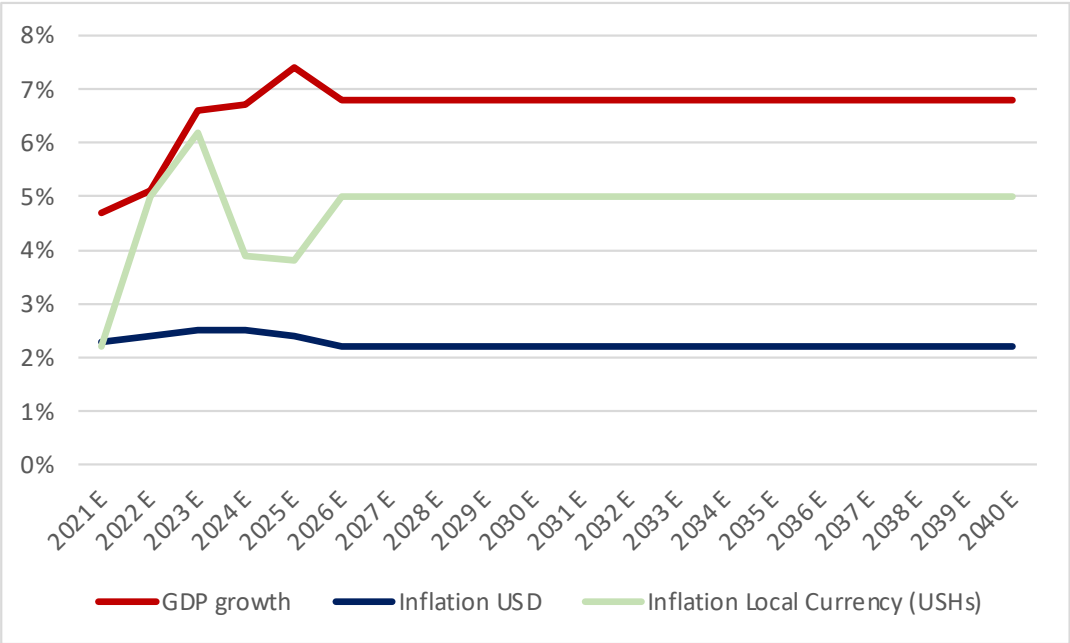


Figure 51. Expected GDP, USD inflation and USH inflation trajectories

<u>Population increase</u>

- *2021-2030: The electrification plan is being implemented under the expected population in 2030;*
- 2031-2040: Both rural and urban rates of growth are 3.3%.

Demand increase per customer

- Increasing current demands (from UMEME and UEDCL) with GDP+2% until 2025 and interpolating to match domestic and commercial consumers with the NES projection in 2030. There is no projection of industrial consumer demand for 2030 and is therefore projected following GDP+2%;
- After 2030 it continues to increase with growth equal to GDP+2%.

Depreciation and amortization

The depreciation expenses regarding CAPEX A (the existing distribution network) are introduced to the model and depreciated according to the values established in the financial statements. CAPEX B (corresponding to the electrification plan) has the depreciation periods. In both cases, the asset is replaced with its consequent investment at the end of its life period.

- *Extension:*
  - *100% CAPEX: 25 years*
- *Densification:*
  - *100% CAPEX: 25 years*
- *Mini-grids:*
  - *70% CAPEX: 25 years*
  - *12% CAPEX: 15 years*
  - *18% CAPEX: 10 years*
- *Standalone systems:*
  - *100% CAPEX: five years*

Operating Costs

- *Upstream energy cost is equivalent to USD 0,084 /kWh per energy consumed/year for the full period. Provided by the regulator or the financial statements;*
- *The O&M cost is estimated as a percentage of CAPEX incurred;*
- *Bad Debt provision is estimated as a percentage of tariff income (2%);*
- *The administrative expenses (customers/billing) are estimated as a specific value USD/year/client increased with inflation.*

The model

In the remaining pages of this annex, we provide the financial statements of the companies that compose the proposed structure of the sector. The companies are:

- FinanceCo;
- The aggregated off-grid private companies (mini-grids and standalone systems) and the SPV;
- Umeme first and then and NewCo.

The following financial statements are attached for each of the companies:

- Profit and loss (P&L): The P&L statement refers to a financial statement that summarizes the revenues, costs, and expenses incurred during a specified period. These records provide information about a company's ability or inability to generate profit by increasing revenue, reducing costs, or both;
- Balance sheet: The balance sheet refers to a financial statement that reports a company's assets, liabilities, and shareholder equity at a specific point in time. Balance sheets provide the basis for computing rates of return for investors and evaluating a company's capital structure.

In short, the balance sheet is a financial statement that provides a snapshot of what a company owns and owes, and the amount invested by shareholders;

- Cash flow statements: A cash flow statement is a financial statement that provides aggregate data regarding all cash inflows a company receives from its ongoing operations and external investment sources. It also includes all cash outflows that pay for business activities and investments during a given period;
- Projections: We provide the expected projections during 2021-2040 for the CAPEX, depreciation, equity, working capital, and debt repayment.

FINANCIAL STATEMENTS

FinanceCo

- **P&L**

P&L			FinanceCo			New Concession Agreement														
			2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
	Revenues	mUSD	**88**	**99**	**107**	**142**	**186**	**251**	**337**	**424**	**375**	**467**	**574**	**728**	**869**	**1.000**	**1.185**	**1.396**	**1.635**	**1.908**
	% Growth	%	*0,0%*	*12,1%*	*8,7%*	*32,1%*	*31,1%*	*35,2%*	*34,4%*	*25,6%*	*(11,6)%*	*24,8%*	*22,9%*	*26,8%*	*19,4%*	*15,0%*	*18,5%*	*17,8%*	*17,2%*	*16,7%*
	Revenues (exGrants)	mUSD	*12*	*16*	*18*	*55*	*91*	*146*	*217*	*280*	*375*	*467*	*574*	*728*	*869*	*1.000*	*1.185*	*1.396*	*1.635*	*1.908*
	% Growth	%	*0,0%*	*39,9%*	*8,8%*	*208,8%*	*66,1%*	*60,5%*	*48,6%*	*29,2%*	*33,7%*	*24,8%*	*22,9%*	*26,8%*	*19,4%*	*15,0%*	*18,5%*	*17,8%*	*17,2%*	*16,7%*
REVENUES	**ROI Adjustment Payment**	mUSD	12	16	18	55	91	146	217	280	375	467	574	728	869	1.000	1.185	1.396	1.635	1.908
	% Growth	%	*0,0%*	*39,9%*	*8,8%*	*208,8%*	*66,1%*	*60,5%*	*48,6%*	*29,2%*	*33,7%*	*24,8%*	*22,9%*	*26,8%*	*19,4%*	*15,0%*	*18,5%*	*17,8%*	*17,2%*	*16,7%*
	Other revenues	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% Revenues	%	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	% Growth	%	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	Grants	mUSD	76,5	82,5	89,6	87,0	94,9	105,2	120,7	143,8	-	-	-	-	-	-	-	-	-	-
	% Revenues	%	*86,8%*	*83,5%*	*83,5%*	*61,4%*	*51,1%*	*41,9%*	*35,8%*	*33,9%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	% Growth	%	*0,0%*	*7,8%*	*8,6%*	*(2,9)%*	*9,1%*	*10,9%*	*14,7%*	*19,2%*	*(100,0)%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
COST OF SALES	**Provisions for bad debt**	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% Growth	%	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	% Revenues	%	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	Gross margin	mUSD	**88**	**99**	**107**	**142**	**186**	**251**	**337**	**424**	**375**	**467**	**574**	**728**	**869**	**1.000**	**1.185**	**1.396**	**1.635**	**1.908**
	Growth	%	*0,0%*	*12,1%*	*8,7%*	*32,1%*	*31,1%*	*35,2%*	*34,4%*	*25,6%*	*(11,6)%*	*24,8%*	*22,9%*	*26,8%*	*19,4%*	*15,0%*	*18,5%*	*17,8%*	*17,2%*	*16,7%*
	% Revenues	%	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*	*100,0%*
	Subsidies for the Off-grid SPV&PC	mUSD	(37)	(65)	(93)	(108,8)	(122,1)	(127,5)	(133,3)	(139,7)	(145,7)	(150,4)	(156,1)	(162,1)	(168,0)	(170,6)	(173,0)	(176,4)	(180,2)	(184,1)
	Growth	%	*0,0%*	*77,3%*	*42,7%*	*16,9%*	*12,3%*	*4,4%*	*4,5%*	*4,8%*	*4,3%*	*3,3%*	*3,8%*	*3,8%*	*3,6%*	*1,6%*	*1,4%*	*2,0%*	*2,2%*	*2,2%*
	% Revenues	%	*(41,8)%*	*(66,1)%*	*(86,7)%*	*(76,8)%*	*(65,8)%*	*(50,8)%*	*(39,5)%*	*(33,0)%*	*(38,9)%*	*(32,2)%*	*(27,2)%*	*(22,3)%*	*(19,3)%*	*(17,1)%*	*(14,6)%*	*(12,6)%*	*(11,0)%*	*(9,6)%*
	EBITDA	mUSD	**51**	**34**	**14**	**33**	**64**	**124**	**204**	**284**	**229**	**317**	**418**	**566**	**702**	**830**	**1.012**	**1.219**	**1.455**	**1.724**
	EBITDA (ex-Grants)	mUSD	(25)	(49)	(75)	(54)	(31)	18	83	140	229	317	418	566	702	830	1.012	1.219	1.455	1.724
	% Revenues	%	*58,2%*	*33,9%*	*13,3%*	*23,2%*	*34,2%*	*49,2%*	*60,5%*	*67,0%*	*61,1%*	*67,8%*	*72,8%*	*77,7%*	*80,7%*	*82,9%*	*85,4%*	*87,4%*	*89,0%*	*90,4%*
	% Revenues (exGrants)	%	*(216,1)%*	*(300,6)%*	*(425,1)%*	*(98,7)%*	*(34,4)%*	*12,6%*	*38,5%*	*50,1%*	*61,1%*	*67,8%*	*72,8%*	*77,7%*	*80,7%*	*82,9%*	*85,4%*	*87,4%*	*89,0%*	*90,4%*
	D&A	mUSD	(14)	(28)	(44)	(59)	(76)	(95)	(116)	(141)	(147)	(154)	(160)	(167)	(174)	(181)	(188)	(195)	(203)	(211)
	% Revenues	%	*(15,3)%*	*(28,5)%*	*(40,9)%*	*(41,9)%*	*(41,0)%*	*(37,7)%*	*(34,4)%*	*(33,4)%*	*(39,4)%*	*(32,9)%*	*(27,9)%*	*(22,9)%*	*(20,0)%*	*(18,1)%*	*(15,9)%*	*(14,0)%*	*(12,4)%*	*(11,1)%*
	EBIT	mUSD	**38**	**5**	**(30)**	**(26)**	**(12)**	**29**	**88**	**143**	**82**	**163**	**258**	**400**	**528**	**649**	**824**	**1.024**	**1.252**	**1.513**
	% Revenues	%	*42,9%*	*5,5%*	*(27,7)%*	*(18,6)%*	*(6,7)%*	*11,5%*	*26,1%*	*33,7%*	*21,8%*	*35,0%*	*45,0%*	*54,9%*	*60,7%*	*64,9%*	*69,5%*	*73,4%*	*76,6%*	*79,3%*
	Financial Income	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Financial Expense	mUSD	-	-	(4)	(12)	(20)	(28)	(37)	(47)	(51)	(50)	(48)	(45)	(41)	(35)	(27)	(19)	(11)	(4)
	EBT	mUSD	**38**	**5**	**(34)**	**(38)**	**(32)**	**1**	**51**	**96**	**31**	**114**	**210**	**355**	**487**	**614**	**797**	**1.005**	**1.241**	**1.509**
	EBT (ex-Subsidies, ex-Grants)	mUSD	**(39)**	**(77)**	**(123)**	**(125)**	**(127)**	**(104)**	**(70)**	**(48)**	**31**	**114**	**210**	**355**	**487**	**614**	**797**	**1.005**	**1.241**	**1.509**
	% Tax rate	%	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*
	Taxes	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	(145)	(184)	(239)	(301)	(372)	(453)
	Cumulative tax losses	mUSD	(39)	(116)	(239)	(364)	(492)	(596)	(666)	(713)	(683)	(569)	(359)	(4)	-	-	-	-	-	-
	Net Income	mUSD	**38**	**5**	**(34)**	**(38)**	**(32)**	**1**	**51**	**96**	**31**	**114**	**210**	**355**	**342**	**430**	**558**	**703**	**869**	**1.057**
	% Revenues	%	*42,9%*	*5,5%*	*(31,4)%*	*(27,1)%*	*(17,5)%*	*0,4%*	*15,1%*	*22,7%*	*8,2%*	*24,3%*	*36,6%*	*48,7%*	*39,3%*	*43,0%*	*47,1%*	*50,4%*	*53,1%*	*55,4%*

- **Balance sheet and cash flow statement**

BS		2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
Non-current assets	mUSD	**324,5**	**660,9**	**1.012,9**	**1.338,0**	**1.681,2**	**2.051,5**	**2.468,8**	**2.963,1**	**2.965,8**	**2.967,2**	**2.967,4**	**2.966,2**	**2.963,6**	**2.959,7**	**2.954,2**	**2.947,2**	**2.938,7**	**2.928,5**
PP&E	mUSD																		
Intangibles	mUSD	324,5	660,9	1.012,9	1.338,0	1.681,2	2.051,5	2.468,8	2.963,1	2.965,8	2.967,2	2.967,4	2.966,2	2.963,6	2.959,7	2.954,2	2.947,2	2.938,7	2.928,5
Other fixed assets	mUSD																		
Current assets	mUSD	**36,8**	**23,4**	**148,1**	**297,6**	**227,1**	**152,5**	**165,6**	**98,6**	**76,5**	**113,7**	**223,9**	**379,7**	**421,7**	**326,6**	**322,6**	**421,9**	**638,5**	**1.038,2**
Cash and equivalents	mUSD	35,4	21,4	145,9	290,9	215,9	134,5	138,9	64,1	30,3	56,1	153,1	289,9	314,5	203,3	176,5	249,8	436,9	803,0
Other financial assets	mUSD																		
Trade receivables	mUSD	1,4	2,0	2,2	6,7	11,2	18,0	26,7	34,5	46,2	57,6	70,8	89,8	107,2	123,3	146,1	172,0	201,6	235,3
Inventories	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other current tax assets	mUSD																		
Total Assets	mUSD	**361,3**	**684,3**	**1.161,0**	**1.635,6**	**1.908,3**	**2.204,0**	**2.634,5**	**3.061,7**	**3.042,3**	**3.080,9**	**3.191,3**	**3.345,9**	**3.385,4**	**3.286,3**	**3.276,8**	**3.369,1**	**3.577,2**	**3.966,8**
Total Shareholders' Equity	mUSD	**237,8**	**443,2**	**409,5**	**371,1**	**338,6**	**339,5**	**390,6**	**486,7**	**517,3**	**630,9**	**841,3**	**1.195,9**	**1.435,4**	**1.736,3**	**2.126,8**	**2.619,1**	**3.227,2**	**3.966,8**
Share capital & treasury shares	mUSD	200,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0
Share premium	mUSD																		
Retained earnings	mUSD	37,8	5,4	(33,7)	(38,4)	(32,5)	0,9	51,1	96,1	30,6	113,6	210,3	354,6	239,5	300,9	390,5	492,3	608,1	739,6
Reserves	mUSD	-	37,8	43,2	9,5	(28,9)	(61,4)	(60,5)	(9,4)	86,7	117,3	230,9	441,3	795,9	1.035,4	1.336,3	1.726,8	2.219,1	2.827,2
Long term liabilities	mUSD	**123,5**	**241,1**	**751,5**	**1.264,5**	**1.569,7**	**1.864,5**	**2.243,8**	**2.575,0**	**2.525,0**	**2.450,0**	**2.350,0**	**2.150,0**	**1.950,0**	**1.550,0**	**1.150,0**	**750,0**	**350,0**	-
Deferred tax liabilities	mUSD																		
Grants	mUSD	123,5	241,1	351,5	464,5	369,7	264,5	143,8	-	-	-	-	-	-	-	-	-	-	-
LT financial liabilities	mUSD	-	-	400,0	800,0	1.200,0	1.600,0	2.100,0	2.575,0	2.525,0	2.450,0	2.350,0	2.150,0	1.950,0	1.550,0	1.150,0	750,0	350,0	-
Short term liabilities	mUSD	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
Trade payables	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other short term liabilities	mUSD																		
Other tax liabilities	mUSD																		
ST financial liabilities	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Provisions	mUSD																		
Total Liabilities	mUSD	**361,3**	**684,3**	**1.161,0**	**1.635,6**	**1.908,3**	**2.204,0**	**2.634,5**	**3.061,7**	**3.042,3**	**3.080,9**	**3.191,3**	**3.345,9**	**3.385,4**	**3.286,3**	**3.276,8**	**3.369,1**	**3.577,2**	**3.966,8**
Check		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Cash Flow		2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
EBITDA (ex-Grants)	mUSD	(25,2)	(49,0)	(75,4)	(54,0)	(31,2)	18,4	83,5	140,4	229,0	317,1	418,4	566,3	701,5	829,7	1.011,9	1.219,1	1.455,2	1.724,1
- Taxes	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	(144,9)	(184,2)	(239,1)	(301,4)	(372,3)	(452,8)
+/- Change in WC	mUSD	(1,4)	(0,6)	(0,2)	(4,6)	(4,5)	(6,8)	(8,7)	(7,8)	(11,7)	(11,4)	(13,2)	(19,0)	(17,4)	(16,1)	(22,8)	(26,0)	(29,6)	(33,6)
Operating Cash Flow	mUSD	**(26,6)**	**(49,5)**	**(75,5)**	**(58,6)**	**(35,7)**	**11,6**	**74,7**	**132,6**	**217,4**	**305,6**	**405,2**	**547,3**	**539,3**	**629,3**	**750,1**	**891,7**	**1.053,3**	**1.237,7**
Capex	mUSD	(338,0)	(364,5)	(396,0)	(384,4)	(419,3)	(465,0)	(533,3)	(635,7)	(150,1)	(155,1)	(160,2)	(165,5)	(171,0)	(176,6)	(182,4)	(188,5)	(194,7)	(201,1)
Investing Cash Flow	mUSD	**(338,0)**	**(364,5)**	**(396,0)**	**(384,4)**	**(419,3)**	**(465,0)**	**(533,3)**	**(635,7)**	(150,1)	(155,1)	(160,2)	(165,5)	(171,0)	(176,6)	(182,4)	(188,5)	(194,7)	(201,1)
Cash Flow from Assets	mUSD	**(364,6)**	**(414,0)**	**(471,5)**	**(443,0)**	**(455,0)**	**(453,3)**	**(458,6)**	**(503,1)**	**67,2**	**150,5**	**245,0**	**381,8**	**368,3**	**452,7**	**567,6**	**703,3**	**858,6**	**1.036,6**
Financial Income	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial Expense	mUSD	-	-	(4,0)	(12,0)	(20,0)	(28,0)	(37,0)	(46,8)	(51,0)	(49,8)	(48,0)	(45,0)	(41,0)	(35,0)	(27,0)	(19,0)	(11,0)	(3,5)
Debt repayment	mUSD	-	-	-	-	-	-	-	(25,0)	(50,0)	(75,0)	(100,0)	(200,0)	(200,0)	(400,0)	(400,0)	(400,0)	(400,0)	(350,0)
Debt increase	mUSD	-	-	400,0	400,0	400,0	400,0	500,0	500,0	-	-	-	-	-	-	-	-	-	-
Grants/Sub-debt financing	mUSD	200,0	200,0	200,0	200,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dividends	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	(102,6)	(129,0)	(167,4)	(211,0)	(260,6)	(317,0)
+/- Capital Increase/Reduction	mUSD	200,0	200,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing Cash Flow	mUSD	**400,0**	**400,0**	**596,0**	**588,0**	**380,0**	**372,0**	**463,0**	**428,3**	**(101,0)**	**(124,8)**	**(148,0)**	**(245,0)**	**(343,6)**	**(564,0)**	**(594,4)**	**(630,0)**	**(671,6)**	**(670,5)**
Cash movement	mUSD	**35,4**	**(14,0)**	**124,5**	**145,0**	**(75,0)**	**(81,3)**	**4,4**	**(74,9)**	**(33,8)**	**25,8**	**97,0**	**136,8**	**24,7**	**(111,2)**	**(26,8)**	**73,3**	**187,0**	**366,1**
		-																	
Cash BoP	mUSD		35,4	21,4	145,9	290,9	215,9	134,5	138,9	64,1	30,3	56,1	153,1	289,9	314,5	203,3	176,5	249,8	436,9
Cash movement	mUSD	35,4	(14,0)	124,5	145,0	(75,0)	(81,3)	4,4	(74,9)	(33,8)	25,8	97,0	136,8	24,7	(111,2)	(26,8)	73,3	187,0	366,1
Cash EoP	mUSD	35,4	21,4	145,9	290,9	215,9	134,5	138,9	64,1	30,3	56,1	153,1	289,9	314,5	203,3	176,5	249,8	436,9	803,0

- **Projections**

Projections		2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
PP&E - Capex																			
Capex investments from Annual Accounts	mUSD																		
Impairments - acelerated D&A	mUSD																		
Capex investments from OECD	mUSD																		
Capex	mUSD	338	364	396	384	419	465	533	636	150	155	160	166	171	177	182	188	195	201
% Revenues	%	*383,6%*	*369,1%*	*369,0%*	*271,3%*	*225,7%*	*185,2%*	*158,1%*	*149,9%*	*40,1%*	*33,2%*	*27,9%*	*22,7%*	*19,7%*	*17,7%*	*15,4%*	*13,5%*	*11,9%*	*10,5%*
PP&E - BoP	mUSD	-	324,5	660,9	1.012,9	1.338,0	1.681,2	2.051,5	2.468,8	2.963	2.966	2.967	2.967	2.966	2.964	2.960	2.954	2.947	2.939
+ Capex	mUSD	338,0	364,5	396,0	384,4	419,3	465,0	533,3	635,7	150	155	160	166	171	177	182	188	195	201
- Divestiture	mUSD																		
- D&A	mUSD	(13,5)	(28,1)	(43,9)	(59,3)	(76,1)	(94,7)	(116,0)	(141,4)	(147)	(154)	(160)	(167)	(174)	(181)	(188)	(195)	(203)	(211)
PP&E - EoP		324,5	660,9	1.012,9	1.338,0	1.681,2	2.051,5	2.468,8	2.963,1	2.966	2.967	2.967	2.966	2.964	2.960	2.954	2.947	2.939	2.929
Working Capital Calculations																			
Working Capital																			
+ Trade receivables	mUSD	1	2	2	7	11	18	27	35	46	58	71	90	107	123	146	172	202	235
+ Inventories	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Trade payables	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital	mUSD	1	2	2	7	11	18	27	35	46	58	71	90	107	123	146	172	202	235
Variation	mUSD	***1***	***1***	***0***	***5***	***4***	***7***	***9***	***8***	***12***	***11***	***13***	***19***	***17***	***16***	***23***	***26***	***30***	***34***
Working Capital Days																			
Trade receivables - Days of revenues	Days	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Inventories - Days of COGS/Distrib costs	Days	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Trade payables - Days of COGS/Distrib costs	Days	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Equity Schedule																			
Equity - BoP	mUSD	-	238	443	409	371	339	340	391	487	517	631	841	1.196	1.435	1.736	2.127	2.619	3.227
+/- Capital Increase/Reduction	mUSD	200	200		-	-	-	-	-	-	-	-	-	-	-				
+/- Change in Equity/Net income	mUSD	38	5	(34)	(38)	(32)	1	51	96	31	114	210	355	342	430	558	703	869	1.057
- Dividends (% Net Income)	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	103	129	167	211	261	317
Equity - EoP	mUSD	238	443	409	371	339	340	391	487	517	631	841	1.196	1.435	1.736	2.127	2.619	3.227	3.967
Financial debt repayment																			
1. Calculation of Long Term financial debt																			
Grants - Subsidized Financing																			
BoP	mUSD	-	123,5	241,1	351,5	464,5	369,7	264,5	143,8	-	-	-	-	-	-	-	-	-	-
+ Increase	mUSD	200,0	200,0	200,0	200,0	-	-	-	-				-	-	-				
- Realisation (% capex)	%	9,6%	10,3%	11,2%	10,9%	11,9%	13,1%	15,1%	18,0%										
- Realisation	mUSD	(76,5)	(82,5)	(89,6)	(87,0)	(94,9)	(105,2)	(120,7)	(143,8)										
EoP	mUSD	123,5	241,1	351,5	464,5	369,7	264,5	143,8	-	-	-	-	-	-	-	-	-	-	-
Interest rate LT	**0%**																		
LT Financial expense	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Concessional Debt																			
BoP	mUSD	-	-	-	400,0	800,0	1.200,0	1.600,0	2.100,0	2.575,0	2.525,0	2.450,0	2.350,0	2.150,0	1.950,0	1.550,0	1.150,0	750,0	350,0
+ Increase	mUSD	-	-	400,0	400,0	400,0	400,0	500,0	500,0	-	-	-	-	-	-	-	-	-	-
- Repayment	mUSD	-	-	-	-	-	-	-	(25,0)	(50,0)	(75,0)	(100,0)	(200,0)	(200,0)	(400,0)	(400,0)	(400,0)	(400,0)	(350,0)
EoP	mUSD	-	-	400,0	800,0	1.200,0	1.600,0	2.100,0	2.575,0	2.525,0	2.450,0	2.350,0	2.150,0	1.950,0	1.550,0	1.150,0	750,0	350,0	-
Interest rate LT	**2%**																		
LT Financial expense	mUSD	-	-	4,0	12,0	20,0	28,0	37,0	46,8	51,0	49,8	48,0	45,0	41,0	35,0	27,0	19,0	11,0	3,5

The aggregated off-grid private companies and the SPV

- **P&L**

								New Concession Agreement														
					FinanceCo																	
P&L			2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
	Revenues	mUSD	**5**	**11**	**44**	**80**	**116**	**140**	**162**	**176**	**190**	**204**	**216**	**224**	**233**	**242**	**252**	**259**	**265**	**274**	**282**	**292**
	% Growth	%	0,0%	112,0%	288,1%	84,1%	45,0%	20,6%	15,4%	8,4%	8,0%	7,8%	5,7%	3,6%	4,0%	4,1%	4,0%	2,7%	2,6%	3,1%	3,2%	3,3%
	Revenues (exGrants)	mUSD	5	11	44	80	116	140	162	176	190	204	216	224	233	242	252	259	265	274	282	292
	% Growth	%	0,0%	112,0%	288,1%	84,1%	45,0%	20,6%	15,4%	8,4%	8,0%	7,8%	5,7%	3,6%	4,0%	4,1%	4,0%	2,7%	2,6%	3,1%	3,2%	3,3%
REVENUES	**Tariff Income - Energy**	mUSD	1	2	7	15	23	32	40	48	56	65	70	73	77	80	84	88	92	97	102	108
	% Growth	%	0,0%	50,1%	234,3%	120,6%	55,1%	35,3%	25,9%	20,7%	17,2%	14,8%	8,7%	4,3%	4,6%	4,7%	4,8%	4,9%	5,0%	5,1%	5,2%	5,3%
	Average residential Tariff	USD/kWh	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208
	% Growth	%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	n° Residential Customers	million	0,1	0,2	0,9	1,6	2,3	3,0	3,7	4,4	5,1	5,7	5,9	6,1	6,3	6,5	6,7	7,0	7,2	7,4	7,7	7,9
	% Growth	%	0,0%	99,6%	300,5%	75,1%	43,0%	28,9%	22,5%	18,4%	15,5%	13,5%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%
	Subsidies	mUSD	4	9	37	65	93	109	122	128	133	140	146	150	156	162	168	171	173	176	180	184
	% Growth	%	0,0%	133,4%	300,1%	77,3%	42,7%	16,9%	12,3%	4,4%	4,5%	4,8%	4,3%	3,3%	3,8%	3,8%	3,6%	1,6%	1,4%	2,0%	2,2%	2,2%
COST OF SALES	**Upstream Cost of Energy**	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	%Growth	%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	% Revenues	%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	Distribution costs (O&M)	mUSD	(1)	(3)	(10)	(23)	(36)	(48)	(58)	(68)	(79)	(91)	(99)	(103)	(108)	(114)	(120)	(126)	(133)	(139)	(147)	(155)
	% Growth	%	0,0%	198,9%	239,2%	123,5%	57,5%	32,2%	20,8%	17,9%	15,8%	14,3%	8,8%	4,6%	5,0%	5,4%	5,4%	5,1%	4,9%	5,1%	5,3%	5,3%
	% Revenues	%	19,2%	27,1%	23,7%	28,8%	31,2%	34,2%	35,8%	39,0%	41,8%	44,3%	45,6%	46,1%	46,5%	47,1%	47,7%	48,9%	49,9%	50,9%	52,0%	52,9%
	Provisions for bad debt	mUSD	(0)	(0)	(0)	(0)	(0)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	% Growth	%	0,0%	50,1%	234,3%	120,6%	55,1%	(100,0)%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	% Revenues	%	(0,5)%	(0,4)%	(0,3)%	(0,4)%	(0,4)%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	Gross margin	mUSD	**4**	**8**	**33**	**57**	**80**	**92**	**104**	**107**	**110**	**114**	**117**	**121**	**124**	**128**	**132**	**132**	**133**	**134**	**136**	**137**
	Growth	%	0,0%	91,6%	306,7%	71,6%	39,9%	16,0%	12,5%	3,1%	3,0%	3,1%	3,1%	2,8%	3,2%	3,0%	2,8%	0,4%	0,5%	1,0%	1,1%	1,2%
	% Revenues	%	80,3%	72,5%	76,0%	70,9%	68,4%	65,8%	64,2%	61,0%	58,2%	55,7%	54,4%	53,9%	53,5%	52,9%	52,3%	51,1%	50,1%	49,1%	48,0%	47,1%
A,D,M CO'STS	**Administrative Expenses (Customers/Billing)**	mUSD	(0)	(0)	(0)	(1)	(1)	(1,5)	(1,7)	(1,9)	(2,2)	(2,4)	(2,7)	(2,8)	(3,0)	(3,1)	(3,3)	(3,5)	(3,7)	(3,9)	(4,1)	(4,3)
	Growth	%	0,0%	197,9%	245,3%	127,1%	60,5%	28,6%	14,3%	13,3%	12,6%	12,2%	8,7%	5,6%	5,6%	5,6%	5,6%	5,6%	5,6%	5,6%	5,6%	5,6%
	% Revenues	%	(0,6)%	(0,8)%	(0,7)%	(0,9)%	(1,0)%	(1,1)%	(1,1)%	(1,1)%	(1,2)%	(1,2)%	(1,2)%	(1,3)%	(1,3)%	(1,3)%	(1,3)%	(1,3)%	(1,4)%	(1,4)%	(1,5)%	(1,5)%
	EBITDA	mUSD	**4**	**8**	**33**	**56**	**78**	**91**	**102**	**105**	**108**	**111**	**115**	**118**	**121**	**125**	**128**	**129**	**129**	**130**	**132**	**133**
	EBITDA (ex-Grants)	mUSD	4	8	33	56	78	91	102	105	108	111	115	118	121	125	128	129	129	130	132	133
	% Revenues	%	79,7%	71,7%	75,3%	70,0%	67,4%	64,7%	63,1%	59,9%	57,0%	54,5%	53,1%	52,7%	52,2%	51,6%	51,0%	49,8%	48,7%	47,6%	46,6%	45,6%
	% Revenues (exGrants)	%	79,7%	71,7%	75,3%	70,0%	67,4%	64,7%	63,1%	59,9%	57,0%	54,5%	53,1%	52,7%	52,2%	51,6%	51,0%	49,8%	48,7%	47,6%	46,6%	45,6%
	D&A	mUSD	(2)	(4)	(18)	(31)	(45)	(55)	(64)	(66)	(67)	(69)	(72)	(75)	(78)	(81)	(85)	(85)	(86)	(87)	(88)	(89)
	% Revenues	%	(42,1)%	(39,4)%	(40,8)%	(38,9)%	(38,5)%	(38,9)%	(39,8)%	(37,5)%	(35,6)%	(33,8)%	(33,5)%	(33,7)%	(33,7)%	(33,6)%	(33,6)%	(33,0)%	(32,5)%	(31,8)%	(31,1)%	(30,3)%
	EBIT	mUSD	**2**	**4**	**15**	**25**	**34**	**36**	**38**	**39**	**41**	**42**	**42**	**42**	**43**	**44**	**44**	**43**	**43**	**43**	**44**	**44**
	% Revenues	%	37,6%	32,4%	34,5%	31,1%	28,9%	25,8%	23,3%	22,4%	21,5%	20,7%	19,7%	18,9%	18,5%	18,0%	17,4%	16,8%	16,2%	15,9%	15,5%	15,2%
	Financial Income	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Financial Expense	mUSD	(2)	(6)	(9)	(12)	(15)	(16)	(15)	(14)	(13)	(12)	(12)	(11)	(11)	(12)	(11)	(10)	(8)	(8)	(8)	(8)
	EBT	mUSD	**(0)**	**(2)**	**6**	**13**	**19**	**21**	**23**	**25**	**28**	**30**	**31**	**32**	**32**	**32**	**33**	**34**	**35**	**36**	**35**	**36**
	EBT (ex-Subsidies, ex-Grants)	mUSD	**(4)**	**(11)**	**(31)**	**(52)**	**(74)**	**(88)**	**(99)**	**(102)**	**(106)**	**(110)**	**(115)**	**(119)**	**(124)**	**(130)**	**(135)**	**(137)**	**(138)**	**(141)**	**(145)**	**(148)**
	% Tax rate	%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	Taxes	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cumulative tax losses	mUSD	(4)	(15)	(46)	(98)	(172)	(260)	(360)	(462)	(568)	(678)	(792)	(911)	(1.035)	(1.165)	(1.301)	(1.437)	(1.575)	(1.716)	(1.861)	(2.009)
	Net Income	mUSD	**(0)**	**(2)**	**6**	**13**	**19**	**21**	**23**	**25**	**28**	**30**	**31**	**32**	**32**	**32**	**33**	**34**	**35**	**36**	**35**	**36**
	% Revenues	%	(0,1)%	(19,3)%	13,8%	16,4%	16,3%	14,7%	14,2%	14,4%	14,5%	14,6%	14,3%	14,1%	13,9%	13,2%	12,9%	13,1%	13,2%	13,1%	12,6%	12,3%

- **Balance sheet and cash flow statement**

BS		2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
Non-current assets	mUSD	**16,6**	**30,3**	**125,3**	**207,9**	**280,1**	**302,0**	**314,8**	**327,3**	**339,2**	**351,7**	**353,6**	**352,8**	**358,8**	**362,8**	**365,0**	**361,6**	**358,4**	**361,7**	**365,5**	**370,3**
PP&E	mUSD																				
Intangibles	mUSD	16,6	30,3	125,3	207,9	280,1	302,0	314,8	327,3	339,2	351,7	353,6	352,8	358,8	362,8	365,0	361,6	358,4	361,7	365,5	370,3
Other fixed assets	mUSD																				
Current assets	mUSD	**33,6**	**163,0**	**108,7**	**73,1**	**52,4**	**37,9**	**33,9**	**32,1**	**32,6**	**34,3**	**39,2**	**46,5**	**67,4**	**90,3**	**82,2**	**66,6**	**50,9**	**58,6**	**66,0**	**52,6**
Cash and equivalents	mUSD	33,3	162,5	107,0	69,4	46,5	30,0	24,2	20,6	19,2	18,9	22,4	29,0	49,0	71,1	62,0	45,3	28,6	35,2	41,4	26,6
Other financial assets	mUSD																				
Trade receivables	mUSD	0,2	0,3	0,8	1,9	2,9	3,9	4,9	5,9	6,9	8,0	8,7	9,0	9,4	9,9	10,4	10,9	11,4	12,0	12,6	13,3
Inventories	mUSD	0,1	0,3	0,8	1,9	3,0	3,9	4,8	5,6	6,5	7,4	8,1	8,5	8,9	9,4	9,9	10,4	10,9	11,5	12,1	12,7
Other current tax assets	mUSD																				
Total Assets	mUSD	**50,2**	**193,3**	**234,1**	**281,0**	**332,5**	**339,8**	**348,7**	**359,4**	**371,8**	**386,0**	**392,7**	**399,2**	**426,2**	**453,2**	**447,2**	**428,2**	**409,2**	**420,3**	**431,6**	**422,8**
Total Shareholders' Equity	mUSD	**(0,0)**	**97,8**	**102,4**	**112,2**	**126,5**	**142,0**	**159,2**	**178,1**	**198,8**	**221,1**	**236,5**	**252,3**	**268,4**	**284,4**	**297,4**	**297,4**	**297,4**	**297,4**	**297,4**	**297,4**
Share capital & treasury shares	mUSD	-	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Share premium	mUSD																				
Retained earnings	mUSD	(0,0)	(2,2)	4,5	9,9	14,3	15,5	17,2	19,0	20,6	22,4	15,4	15,8	16,1	16,0	13,0	-	-	-	-	-
Reserves	mUSD	-	(0,0)	(2,2)	2,4	12,2	26,5	42,0	59,2	78,1	98,8	121,1	136,5	152,3	168,4	184,4	197,4	197,4	197,4	197,4	197,4
Long term liabilities	mUSD	**50,0**	**95,0**	**130,0**	**165,0**	**200,0**	**190,0**	**180,0**	**170,0**	**160,0**	**150,0**	**140,0**	**130,0**	**140,0**	**150,0**	**130,0**	**110,0**	**90,0**	**100,0**	**110,0**	**100,0**
Deferred tax liabilities	mUSD																				
Grants	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LT financial liabilities	mUSD	50,0	95,0	130,0	165,0	200,0	190,0	180,0	170,0	160,0	150,0	140,0	130,0	140,0	150,0	130,0	110,0	90,0	100,0	110,0	100,0
Short term liabilities	mUSD	**0,2**	**0,5**	**1,7**	**3,8**	**6,0**	**7,9**	**9,5**	**11,2**	**13,0**	**14,9**	**16,2**	**16,9**	**17,8**	**18,8**	**19,8**	**20,8**	**21,8**	**22,9**	**24,1**	**25,4**
Trade payables	mUSD	0,2	0,5	1,7	3,8	6,0	7,9	9,5	11,2	13,0	14,9	16,2	16,9	17,8	18,8	19,8	20,8	21,8	22,9	24,1	25,4
Other short term liabilities	mUSD																				
Other tax liabilities	mUSD																				
ST financial liabilities	mUSD	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Provisions	mUSD																				
Total Liabilities	mUSD	**50,2**	**193,3**	**234,1**	**281,0**	**332,5**	**339,8**	**348,7**	**359,4**	**371,8**	**386,0**	**392,7**	**399,2**	**426,2**	**453,2**	**447,2**	**428,2**	**409,2**	**420,3**	**431,6**	**422,8**
Check		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Cash Flow		2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
EBITDA (ex-Grants)	mUSD	4,2	8,1	32,8	56,2	78,4	90,8	102,2	105,2	108,2	111,3	114,7	117,8	121,5	125,0	128,4	128,8	129,2	130,3	131,6	133,0
- Taxes	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+/- Change in WC	mUSD	(0,1)	0,1	0,0	0,0	0,1	(0,1)	(0,2)	(0,2)	(0,1)	(0,1)	(0,0)	(0,0)	0,0	0,0	0,0	0,0	(0,0)	(0,0)	(0,0)	(0,0)
Operating Cash Flow	mUSD	**4,1**	**8,1**	**32,8**	**56,2**	**78,5**	**90,8**	**102,0**	**105,0**	**108,0**	**111,2**	**114,7**	**117,8**	**121,5**	**125,0**	**128,4**	**128,8**	**129,1**	**130,3**	**131,6**	**132,9**
Capex	mUSD	(18,8)	(18,1)	(112,8)	(113,8)	(117,0)	(76,5)	(77,3)	(78,3)	(79,4)	(81,7)	(74,1)	(74,7)	(84,5)	(85,4)	(86,8)	(82,0)	(82,9)	(90,3)	(91,5)	(93,2)
Investing Cash Flow	mUSD	**(18,8)**	**(18,1)**	**(112,8)**	**(113,8)**	**(117,0)**	**(76,5)**	**(77,3)**	**(78,3)**	**(79,4)**	**(81,7)**	**(74,1)**	**(74,7)**	**(84,5)**	**(85,4)**	**(86,8)**	**(82,0)**	**(82,9)**	**(90,3)**	**(91,5)**	**(93,2)**
Cash Flow from Assets	mUSD	**(14,7)**	**(10,0)**	**(80,0)**	**(57,6)**	**(38,5)**	**14,3**	**24,7**	**26,7**	**28,6**	**29,6**	**40,5**	**43,1**	**37,0**	**39,6**	**41,6**	**46,8**	**46,3**	**40,0**	**40,0**	**39,7**
Financial Income	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial Expense	mUSD	(2,0)	(5,8)	(9,0)	(11,8)	(14,6)	(15,6)	(14,8)	(14,0)	(13,2)	(12,4)	(11,6)	(10,8)	(10,8)	(11,6)	(11,2)	(9,6)	(8,0)	(7,6)	(8,4)	(8,4)
Debt repayment	mUSD	-	(5,0)	(5,0)	(5,0)	(5,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(20,0)	(20,0)	(20,0)	(10,0)	(10,0)	(10,0)
Debt increase	mUSD	50,0	50,0	40,0	40,0	40,0	-	-	-	-	-	-	-	20,0	20,0	-	-	-	20,0	20,0	-
Grants/Sub-debt financing	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dividends	mUSD	-	-	(1,5)	(3,3)	(4,8)	(5,2)	(5,7)	(6,3)	(6,9)	(7,5)	(15,4)	(15,8)	(16,1)	(16,0)	(19,6)	(33,8)	(35,0)	(35,8)	(35,5)	(36,0)
+/- Capital Increase/Reduction	mUSD	-	100,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing Cash Flow	mUSD	**48,0**	**139,2**	**24,5**	**19,9**	**15,6**	**(30,8)**	**(30,5)**	**(30,3)**	**(30,1)**	**(29,9)**	**(37,0)**	**(36,6)**	**(16,9)**	**(17,6)**	**(50,8)**	**(63,4)**	**(63,0)**	**(33,4)**	**(33,9)**	**(54,4)**
Cash movement	mUSD	**33,3**	**129,2**	**(55,5)**	**(37,7)**	**(22,8)**	**(16,5)**	**(5,8)**	**(3,6)**	**(1,4)**	**(0,3)**	**3,5**	**6,5**	**20,1**	**22,0**	**(9,1)**	**(16,6)**	**(16,7)**	**6,6**	**6,2**	**(14,8)**
Cash BoP	mUSD	-	33,3	162,5	107,0	69,4	46,5	30,0	24,2	20,6	19,2	18,9	22,4	29,0	49,0	71,1	62,0	45,3	28,6	35,2	41,4
Cash movement	mUSD	33,3	129,2	(55,5)	(37,7)	(22,8)	(16,5)	(5,8)	(3,6)	(1,4)	(0,3)	3,5	6,5	20,1	22,0	(9,1)	(16,6)	(16,7)	6,6	6,2	(14,8)
Cash EoP	mUSD	33,3	162,5	107,0	69,4	46,5	30,0	24,2	20,6	19,2	18,9	22,4	29,0	49,0	71,1	62,0	45,3	28,6	35,2	41,4	26,6

- **Projections**

Projections		2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
PP&E - Capex																					
Capex investments from Annual Accounts	mUSD																				
Impairments - acelerated D&A	mUSD																				
Capex investments from OECD	mUSD																				
Capex	mUSD	19	18	113	114	117	76	77	78	79	82	74	75	84	85	87	82	83	90	92	93
% Revenues	%	*355,4%*	*161,3%*	*258,6%*	*141,8%*	*100,5%*	*54,5%*	*47,7%*	*44,6%*	*41,9%*	*40,0%*	*34,3%*	*33,4%*	*36,3%*	*35,3%*	*34,4%*	*31,7%*	*31,2%*	*33,0%*	*32,4%*	*32,0%*
PP&E - BoP	mUSD	-	16,6	30,3	125,3	207,9	280,1	302,0	314,8	327,3	339,2	352	354	353	359	363	365	362	358	362	366
+ Capex	mUSD	18,8	18,1	112,8	113,8	117,0	76,5	77,3	78,3	79,4	81,7	74	75	84	85	87	82	83	90	92	93
- Divestiture	mUSD																				
- D&A	mUSD	(2,2)	(4,4)	(17,8)	(31,2)	(44,8)	(54,6)	(64,4)	(65,9)	(67,5)	(69,1)	(72)	(75)	(78)	(81)	(85)	(85)	(86)	(87)	(88)	(89)
PP&E - EoP		16,6	30,3	125,3	207,9	280,1	302,0	314,8	327,3	339,2	351,7	354	353	359	363	365	362	358	362	366	370
Working Capital Calculations																					
Working Capital																					
+ Trade receivables	mUSD	0	0	1	2	3	4	5	6	7	8	9	9	9	10	10	11	11	12	13	13
+ Inventories	mUSD	0	0	1	2	3	4	5	6	7	7	8	8	9	9	10	10	11	11	12	13
- Trade payables	mUSD	(0)	(1)	(2)	(4)	(6)	(8)	(10)	(11)	(13)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Working Capital	mUSD	0	0	(0)	(0)	(0)	(0)	0	0	0	1	1	1	1	1	0	0	1	1	1	1
Variation	mUSD	*0*	*(0)*	*(0)*	*(0)*	*(0)*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*(0)*	*(0)*	*(0)*	*(0)*	*0*	*0*	*0*	*0*
Working Capital Days																					
Trade receivables - Days of revenues	Days	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Inventories - Days of COGS/Distrib costs	Days	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Trade payables - Days of COGS/Distrib costs	Days	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Equity Schedule																					
Equity - BoP	mUSD	-	(0)	98	102	112	126	142	159	178	199	221	237	252	268	284	297	297	297	297	297
+/- Capital Increase/Reduction	mUSD	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+/- Change in Equity/Net income	mUSD	(0)	(2)	6	13	19	21	23	25	28	30	31	32	32	32	33	34	35	36	35	36
- Dividends (% Net Income)	mUSD	-	-	2	3	5	5	6	6	7	7	15	16	16	16	20	34	35	36	35	36
Equity - EoP	mUSD	(0)	98	102	112	126	142	159	178	199	221	237	252	268	284	297	297	297	297	297	297
Financial debt repayment																					
1. Calculation of Long Term financial debt																					
NEW - Commercial/Corporate Debt (IFC/Synd)																					
BoP	mUSD	-	50,0	95,0	130,0	165,0	200,0	190,0	180,0	170,0	160,0	150,0	140,0	130,0	140,0	150,0	130,0	110,0	90,0	100,0	110,0
+ Increase	mUSD	50,0	50,0	40,0	40,0	40,0	-	-	-	-	-			20,0	20,0	-	-	-	20,0	20,0	-
- Repayment	mUSD		(5,0)	(5,0)	(5,0)	(5,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(20,0)	(20,0)	(20,0)	(10,0)	(10,0)	(10,0)
EoP	mUSD	50,0	95,0	130,0	165,0	200,0	190,0	180,0	170,0	160,0	150,0	140,0	130,0	140,0	150,0	130,0	110,0	90,0	100,0	110,0	100,0
Interest rate LT	8%																				
LT Financial expense	mUSD	2,0	5,8	9,0	11,8	14,6	15,6	14,8	14,0	13,2	12,4	11,6	10,8	10,8	11,6	11,2	9,6	8,0	7,6	8,4	8,4

Umeme - NewCo

- **P&L**

	P&L		Historical Data					FinanceCo			New Concession Agreement															
			2018 H	2019 H	2020 H	2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
	Revenues	mUSD	400	479	446	444	457	508	584	665	781	949	1.149	1.389	1.678	1.952	2.199	2.476	2.788	3.139	3.534	3.977	4.476	5.037	5.667
	% Growth	%	0,0%	19,7%	(6,9)%	-0,5%	3,1%	11,2%	14,9%	13,9%	17,6%	21,4%	21,1%	20,9%	20,8%	16,4%	12,6%	12,6%	12,6%	12,6%	12,6%	12,6%	12,5%	12,5%	12,5%
	Revenues (exGrants)	mUSD	400	479	446	444	457	508	584	665	781	949	1.149	1.389	1.678	1.952	2.199	2.476	2.788	3.139	3.534	3.977	4.476	5.037	5.667
	% Growth	%	0,0%	19,7%	(6,9)%	-0,5%	3,1%	11,2%	14,9%	13,9%	17,6%	21,4%	21,1%	20,9%	20,8%	16,4%	12,6%	12,6%	12,6%	12,6%	12,6%	12,6%	12,5%	12,5%	12,5%
REVENUES	**Tariff Income - Energy**	mUSD	400	479	446	444	457	508	584	665	781	949	1.149	1.389	1.678	1.952	2.199	2.476	2.788	3.139	3.534	3.977	4.476	5.037	5.667
	% Growth	%	0,0%	19,7%	(6,9)%	-0,5%	3,1%	11,2%	14,9%	13,9%	17,6%	21,4%	21,1%	20,9%	20,8%	16,4%	12,6%	12,6%	12,6%	12,6%	12,6%	12,6%	12,5%	12,5%	12,5%
	Average residential Tariff	USD/kWh	-	-	-	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208	0,208
	% Growth	%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
	n° Residential Customers	million	-	-	-	1,4	1,6	1,9	2,4	2,8	3,6	4,1	4,7	5,4	6,2	6,4	6,6	6,8	7,0	7,2	7,5	7,7	8,0	8,2	8,5
	% Growth	%	0,0%	0,0%	0,0%	0,0%	0,0%	30,8%	24,8%	21,0%	26,2%	15,4%	14,4%	14,0%	14,0%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%	3,3%
COST OF SALES	**Upstream Cost of Energy**	mUSD	(244)	(319)	(317)	(296)	(284)	(311)	(351)	(395)	(456)	(538)	(633)	(746)	(880)	(1.012)	(1.137)	(1.278)	(1.436)	(1.614)	(1.814)	(2.039)	(2.292)	(2.576)	(2.895)
	%Growth	%	0,0%	30,5%	(0,5)%	(6,6)%	(4,3)%	9,5%	13,1%	12,5%	15,3%	18,0%	17,7%	17,8%	18,0%	15,0%	12,4%	12,4%	12,4%	12,4%	12,4%	12,4%	12,4%	12,4%	12,4%
	% Revenues	%	(61,1)%	(66,6)%	(71,2)%	66,8%	62,0%	61,1%	60,2%	59,4%	58,3%	56,7%	55,1%	53,7%	52,4%	51,8%	51,7%	51,6%	51,5%	51,4%	51,3%	51,3%	51,2%	51,1%	51,1%
	Distribution costs (O&M)	mUSD	(12)	(8)	(12)	(12)	(12)	(18)	(33)	(50)	(70)	(87)	(107)	(129)	(155)	(173)	(181)	(189)	(198)	(206)	(215)	(224)	(234)	(243)	(253)
	% Growth	%	0,0%	(31,9)%	47,4%	(2,3)%	(2,4)%	57,7%	76,1%	54,9%	38,0%	25,8%	22,5%	20,6%	20,0%	11,6%	4,7%	4,6%	4,5%	4,4%	4,3%	4,2%	4,1%	4,1%	4,0%
	% Revenues	%	0,0%	(0,1)%	0,1%	2,7%	2,6%	3,6%	5,6%	7,6%	8,9%	9,2%	9,3%	9,3%	9,2%	8,9%	8,2%	7,6%	7,1%	6,6%	6,1%	5,6%	5,2%	4,8%	4,5%
	ROI Adjustment Payment	mUSD	-	-	-	-	-	(12)	(16)	(18)	(55)	(91)	(146)	(217)	(280)	(375)	(467)	(574)	(728)	(869)	(1.000)	(1.185)	(1.396)	(1.635)	(1.908)
	% Growth	%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	39,9%	8,8%	208,8%	66,1%	60,5%	48,6%	29,2%	33,7%	24,8%	22,9%	26,8%	19,4%	15,0%	18,5%	17,8%	17,2%	16,7%
	% Revenues	%	0,0%	0,0%	0,0%	0,0%	0,0%	2,3%	2,8%	2,7%	7,0%	9,6%	12,7%	15,6%	16,7%	19,2%	21,3%	23,2%	26,1%	27,7%	28,3%	29,8%	31,2%	32,5%	33,7%
	Provisions for bad debt	mUSD	-	-	-	(2)	(2)	(3)	(3)	(3)	(4)	(5)	(6)	(7)	(8)	(10)	(11)	(12)	(14)	(16)	(18)	(20)	(22)	(25)	(28)
	% Growth	%	0,0%	0,0%	0,0%	0,0%	3,1%	11,2%	14,9%	13,9%	17,6%	21,4%	21,1%	20,9%	20,8%	16,4%	12,6%	12,6%	12,6%	12,6%	12,6%	12,6%	12,5%	12,5%	12,5%
	% Revenues	%	0,0%	0,0%	0,0%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%	0,5%
	Gross margin	mUSD	143	152	116	133	160	165	181	198	198	228	257	290	354	383	402	422	412	433	486	509	533	557	583
	Growth	%	0,0%	5,8%	(23,4)%	14,2%	20,1%	3,4%	9,6%	9,7%	(0,3)%	15,2%	12,7%	12,8%	22,3%	8,1%	5,1%	5,0%	(2,4)%	5,2%	12,2%	4,7%	4,7%	4,6%	4,6%
	% Revenues	%	35,9%	31,7%	26,1%	29,9%	34,9%	32,4%	30,9%	29,8%	25,3%	24,0%	22,3%	20,9%	21,1%	19,6%	18,3%	17,0%	14,8%	13,8%	13,8%	12,8%	11,9%	11,1%	10,3%
ADM COSTS	**Administrative Expenses (Customers/Billing)**	mUSD	(46)	(49)	(48)	(48)	(49)	(57)	(74)	(92)	(116)	(142)	(167)	(194)	(225)	(248)	(260)	(272)	(254)	(268)	(313)	(329)	(345)	(361)	(379)
	Growth	%	0,0%	6,3%	(2,1)%	0,0%	1,2%	17,5%	29,1%	24,7%	25,9%	22,2%	17,0%	16,4%	16,2%	10,1%	4,8%	4,8%	(6,5)%	5,4%	16,9%	4,9%	4,9%	4,9%	4,9%
	% Revenues	%	(11,6)%	(10,3)%	(10,8)%	(10,9)%	(10,7)%	(11,3)%	(12,7)%	(13,9)%	(14,9)%	(15,0)%	(14,5)%	(14,0)%	(13,4)%	(12,7)%	(11,8)%	(11,0)%	(9,1)%	(8,5)%	(8,9)%	(8,3)%	(7,7)%	(7,2)%	(6,7)%
	EBITDA	mUSD	97	103	68,9	85	111	107	107	106	81	85	90	96	129	135	142	150	158	165	173	180	188	196	204
	EBITDA (ex-Grants)	mUSD	97	103	68	85	111	107	107	106	81	85	90	96	129	135	142	150	158	165	173	180	188	196	204
	% Revenues	%	24,3%	21,4%	15,3%	19,1%	24,2%	21,1%	18,2%	15,9%	10,4%	9,0%	7,8%	6,9%	7,7%	6,9%	6,5%	6,1%	5,6%	5,3%	4,9%	4,5%	4,2%	3,9%	3,6%
	% Revenues (exGrants)	%	24,3%	21,4%	15,3%	19,1%	24,2%	21,1%	18,2%	15,9%	10,4%	9,0%	7,8%	6,9%	7,7%	6,9%	6,5%	6,1%	5,6%	5,3%	4,9%	4,5%	4,2%	3,9%	3,6%
	D&A	mUSD	(28)	(33)	(38)	(40)	(40)	(40)	(40)	(40)	(41)	(43)	(45)	(48)	(50)	(53)	(55)	(57)	(60)	(62)	(65)	(67)	(70)	(73)	(76)
	% Revenues	%	(7,0)%	(6,9)%	(8,5)%	(8,9)%	(8,6)%	(7,8)%	(6,8)%	(5,9)%	(5,3)%	(4,5)%	(3,9)%	(3,4)%	(3,0)%	(2,7)%	(2,5)%	(2,3)%	(2,1)%	(2,0)%	(1,8)%	(1,7)%	(1,6)%	(1,5)%	(1,3)%
	EBIT	mUSD	69	69	30	45	71	68	67	66	40	42	45	48	79	82	88	93	98	103	108	113	118	123	128
	% Revenues	%	17,3%	14,5%	6,7%	10,1%	15,6%	13,4%	11,5%	10,0%	5,1%	4,5%	3,9%	3,5%	4,7%	4,2%	4,0%	3,7%	3,5%	3,3%	3,1%	2,8%	2,6%	2,4%	2,3%
	Financial Income	mUSD	4,6	4,8	5,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Financial Expense	mUSD	(18)	(16)	(13)	(7)	(6)	(4)	(3)	(1)	(4)	(8)	(7)	(6)	(5)	(4)	(6)	(9)	(12)	(15)	(18)	(21)	(24)	(26)	(28)
	EBT	mUSD	56	58	22	38	66	64	64	65	36	35	38	42	73	78	82	84	86	88	90	92	94	97	99
	EBT (ex-Subsidies, ex-Grants)	mUSD	56	58	22	38	66	64	64	65	36	35	38	42	73	78	82	84	86	88	90	92	94	97	99
	% Tax rate	%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	Taxes	mUSD	(17)	(17)	(7)	(11)	(20)	(19)	(19)	(20)	(11)	(10)	(11)	(13)	(22)	(23)	(25)	(25)	(26)	(26)	(27)	(28)	(28)	(29)	(30)
	Cumulative tax losses	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Net Income	mUSD	39	41	15	27	46	45	45	46	25	24	27	30	51	54	57	59	60	61	63	64	66	68	69
	% Revenues	%	9,8%	8,5%	3,5%	6,0%	10,0%	8,8%	7,7%	6,9%	3,2%	2,6%	2,3%	2,1%	3,1%	2,8%	2,6%	2,4%	2,2%	2,0%	1,8%	1,6%	1,5%	1,3%	1,2%

- **Balance sheet and cash flow statement**

BS		2018 H	2019 H	2020 H	2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
Non-current assets	**mUSD**	**308,3**	**303,4**	**340,3**	**340,2**	**340,2**	**340,1**	**340,0**	**340,0**	**380,9**	**423,9**	**469,8**	**521,0**	**580,8**	**622,8**	**664,6**	**705,8**	**746,6**	**786,9**	**826,6**	**865,8**	**904,4**	**942,5**	**980,0**
PP&E	mUSD																							
Intangibles	mUSD	308,3	303,4	340,3	340,2	340,2	340,1	340,0	340,0	380,9	423,9	469,8	521,0	580,8	622,8	664,6	705,8	746,6	786,9	826,6	865,8	904,4	942,5	980,0
Other fixed assets	mUSD																							
Current assets	**mUSD**	**140,1**	**219,9**	**188,0**	**171,9**	**174,7**	**184,7**	**198,3**	**207,0**	**354,4**	**330,0**	**306,4**	**282,2**	**264,4**	**264,2**	**313,1**	**365,7**	**422,4**	**483,5**	**549,5**	**610,9**	**678,3**	**752,4**	**833,7**
Cash and equivalents	mUSD	69,7	133,9	97,9	110,1	112,9	115,9	118,7	115,8	247,0	200,7	151,1	96,1	41,4	6,4	24,0	41,5	58,9	75,8	92,2	97,9	102,8	106,7	109,2
Other financial assets	mUSD																							
Trade receivables	mUSD	49,3	59,1	55,0	36,5	37,6	41,8	48,0	54,6	64,2	78,0	94,4	114,1	137,9	160,4	180,7	203,5	229,2	258,0	290,5	326,9	367,9	414,0	465,8
Inventories	mUSD	21,1	26,9	27,1	25,4	24,3	27,1	31,6	36,6	43,2	51,4	60,8	71,9	85,1	97,4	108,3	120,6	134,3	149,7	166,8	186,0	207,6	231,7	258,7
Other current tax assets	mUSD																							
Total Assets	**mUSD**	**448,4**	**523,2**	**528,3**	**512,1**	**514,9**	**524,8**	**538,3**	**547,0**	**735,3**	**753,9**	**776,2**	**803,2**	**845,1**	**887,0**	**977,6**	**1.071,5**	**1.169,0**	**1.270,4**	**1.376,1**	**1.476,7**	**1.582,8**	**1.694,9**	**1.813,7**
Total Shareholders' Equity	**mUSD**	**313,7**	**354,4**	**369,8**	**383,1**	**406,1**	**428,4**	**450,9**	**473,8**	**549,0**	**561,1**	**574,5**	**589,3**	**615,0**	**642,3**	**670,9**	**700,3**	**730,4**	**761,1**	**792,4**	**824,6**	**857,6**	**891,5**	**926,2**
Share capital & treasury shares	mUSD	-	-	-	-	-	-	-	-	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
Share premium	mUSD																							
Retained earnings	mUSD	39,3	40,8	15,4	13,3	22,9	22,3	22,5	22,8	25,2	12,2	13,4	14,8	25,7	27,2	28,7	29,4	30,1	30,7	31,4	32,1	33,0	33,9	34,7
Reserves	mUSD	274,3	313,7	354,4	369,8	383,1	406,1	428,4	450,9	473,8	499,0	511,1	524,5	539,3	565,0	592,3	620,9	650,3	680,4	711,1	742,4	774,6	807,6	841,5
Long term liabilities	**mUSD**	**92,5**	**115,1**	**96,3**	**78,3**	**60,3**	**42,3**	**24,3**	**-**	**100,0**	**90,0**	**80,0**	**70,0**	**60,0**	**50,0**	**90,0**	**130,0**	**170,0**	**210,0**	**250,0**	**280,0**	**310,0**	**340,0**	**370,0**
Deferred tax liabilities	mUSD																							
Grants	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LT financial liabilities	mUSD	92,5	115,1	96,3	78,3	60,3	42,3	24,3	-	100,0	90,0	80,0	70,0	60,0	50,0	90,0	130,0	170,0	210,0	250,0	280,0	310,0	340,0	370,0
Short term liabilities	**mUSD**	**42,2**	**53,8**	**54,2**	**50,7**	**48,6**	**54,1**	**63,1**	**73,2**	**86,3**	**102,8**	**121,7**	**143,9**	**170,1**	**194,8**	**216,7**	**241,2**	**268,6**	**299,3**	**333,6**	**372,1**	**415,2**	**463,4**	**517,5**
Trade payables	mUSD	42,2	53,8	54,2	50,7	48,6	54,1	63,1	73,2	86,3	102,8	121,7	143,9	170,1	194,8	216,7	241,2	268,6	299,3	333,6	372,1	415,2	463,4	517,5
Other short term liabilities	mUSD																							
Other tax liabilities	mUSD																							
ST financial liabilities	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Provisions	mUSD																							
Total Liabilities	**mUSD**	**448,4**	**523,2**	**528,3**	**512,1**	**514,9**	**524,8**	**538,3**	**547,0**	**735,3**	**753,9**	**776,2**	**803,2**	**845,1**	**887,0**	**977,6**	**1.071,5**	**1.169,0**	**1.270,4**	**1.376,1**	**1.476,7**	**1.582,8**	**1.694,9**	**1.813,7**
Check		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Cash Flow		2018 H	2019 H	2020 H	2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
EBITDA (ex-Grants)	mUSD	97,1	102,5	68,0	84,5	110,6	107,4	106,5	105,7	81,2	85,5	90,1	95,9	128,9	134,8	142,3	149,9	157,5	165,1	172,8	180,5	188,2	195,9	203,7
- Taxes	mUSD	(16,9)	(17,5)	(6,6)	(11,4)	(19,7)	(19,1)	(19,3)	(19,6)	(10,8)	(10,4)	(11,5)	(12,7)	(22,0)	(23,4)	(24,6)	(25,2)	(25,8)	(26,3)	(26,9)	(27,5)	(28,3)	(29,0)	(29,8)
+/- Change in WC	mUSD	(28,2)	(3,9)	4,3	16,8	(2,2)	(1,4)	(1,7)	(1,6)	(3,0)	(5,5)	(7,0)	(8,6)	(10,6)	(10,2)	(9,3)	(10,6)	(11,9)	(13,5)	(15,3)	(17,2)	(19,5)	(22,0)	(24,9)
Operating Cash Flow	mUSD	**52,0**	**81,1**	**65,7**	**89,9**	**88,7**	**86,9**	**85,5**	**84,5**	**67,4**	**69,5**	**71,7**	**74,6**	**96,3**	**101,2**	**108,5**	**114,2**	**119,8**	**125,3**	**130,6**	**135,7**	**140,4**	**144,9**	**149,1**
Capex	mUSD	(61,8)	(28,3)	(74,9)	(39,5)	(39,5)	(39,5)	(39,5)	(39,5)	(82,2)	(86,0)	(91,1)	(98,7)	(110,1)	(94,6)	(96,6)	(98,5)	(100,4)	(102,4)	(104,5)	(106,6)	(108,9)	(111,2)	(113,5)
Investing Cash Flow	mUSD	**(61,8)**	**(28,3)**	**(74,9)**	**(39,5)**	**(39,5)**	**(39,5)**	**(39,5)**	**(39,5)**	**(82,2)**	**(86,0)**	**(91,1)**	**(98,7)**	**(110,1)**	**(94,6)**	**(96,6)**	**(98,5)**	**(100,4)**	**(102,4)**	**(104,5)**	**(106,6)**	**(108,9)**	**(111,2)**	**(113,5)**
Cash Flow from Assets	mUSD	**(9,8)**	**52,8**	**(9,2)**	**50,4**	**49,3**	**47,4**	**46,1**	**45,1**	**(14,8)**	**(16,5)**	**(19,4)**	**(24,2)**	**(13,8)**	**6,6**	**11,9**	**15,7**	**19,4**	**22,9**	**26,1**	**29,0**	**31,5**	**33,8**	**35,6**
Financial Income	mUSD	4,6	4,8	5,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial Expense	mUSD	(17,67)	(15,9)	(13,1)	(7,0)	(5,5)	(4,1)	(2,7)	(1,0)	(4,0)	(7,6)	(6,8)	(6,0)	(5,2)	(4,4)	(5,6)	(8,8)	(12,0)	(15,2)	(18,4)	(21,2)	(23,6)	(26,0)	(28,4)
Debt repayment	mUSD	-	-	(18,8)	(18,0)	(18,0)	(18,0)	(18,0)	(24,3)	-	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(20,0)	(20,0)	(20,0)	(20,0)
Debt increase	mUSD	92,5	22,5	-	-	-	-	-	-	100,0	-	-	-	-	-	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
Grants/Sub-debt financing	mUSD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dividends	mUSD	-	-	-	(13,3)	(22,9)	(22,3)	(22,5)	(22,8)	-	(12,2)	(13,4)	(14,8)	(25,7)	(27,2)	(28,7)	(29,4)	(30,1)	(30,7)	(31,4)	(32,1)	(33,0)	(33,9)	(34,7)
+/- Capital Increase/Reduction	mUSD	-	-	-	-	-	-	-	-	50,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financing Cash Flow	mUSD	**79,5**	**11,4**	**(26,8)**	**(38,3)**	**(46,5)**	**(44,4)**	**(43,2)**	**(48,1)**	**146,0**	**(29,8)**	**(30,2)**	**(30,8)**	**(40,9)**	**(41,6)**	**5,7**	**1,8**	**(2,1)**	**(5,9)**	**(9,8)**	**(23,3)**	**(26,6)**	**(29,9)**	**(33,1)**
Cash movement	mUSD	**69,7**	**64,3**	**(36,0)**	**12,2**	**2,8**	**3,0**	**2,9**	**(3,0)**	**131,2**	**(46,3)**	**(49,6)**	**(55,0)**	**(54,7)**	**(35,0)**	**17,6**	**17,6**	**17,3**	**17,0**	**16,4**	**5,7**	**4,9**	**3,9**	**2,5**
Cash BoP	mUSD	-	69,7	133,9	97,9	110,1	112,9	115,9	118,7	115,8	247,0	200,7	151,1	96,1	41,4	6,4	24,0	41,5	58,9	75,8	92,2	97,9	102,8	106,7
Cash movement	mUSD	69,7	64,3	(36,0)	12,2	2,8	3,0	2,9	(3,0)	131,2	(46,3)	(49,6)	(55,0)	(54,7)	(35,0)	17,6	17,6	17,3	17,0	16,4	5,7	4,9	3,9	2,5
Cash EoP	mUSD	69,7	133,9	97,9	110,1	112,9	115,9	118,7	115,8	247,0	200,7	151,1	96,1	41,4	6,4	24,0	41,5	58,9	75,8	92,2	97,9	102,8	106,7	109,2

- **Projections**

Projections		2018 H	2019 H	2020 H	2021 E	2022 E	2023 E	2024 E	2025 E	2026 E	2027 E	2028 E	2029 E	2030 E	2031 E	2032 E	2033 E	2034 E	2035 E	2036 E	2037 E	2038 E	2039 E	2040 E
PP&E - Capex																								
Capex investments from Annual Accounts	mUSD	61,8	28,3	74,9																				
Impairments - acelerated D&A	mUSD	0,0	0,0																					
Capex investments from OECD	mUSD	0,0	0,0																					
Capex	mUSD	61,8	28,3	74,9	39	39	39	39	39	82	86	91	99	110	95	97	98	100	102	104	107	109	111	114
% Revenues	%	*15,4%*	*5,9%*	*16,8%*	*8,9%*	*8,6%*	*7,8%*	*6,8%*	*5,9%*	*10,5%*	*9,1%*	*7,9%*	*7,1%*	*6,6%*	*4,8%*	*4,4%*	*4,0%*	*3,6%*	*3,3%*	*3,0%*	*2,7%*	*2,4%*	*2,2%*	*2,0%*
PP&E - BoP	mUSD	274,3	308,3	303,4	340,3	340,2	340,2	340,1	340,0	340,0	380,9	423,9	469,8	521,0	581	623	665	706	747	787	827	866	904	942
+ Capex	mUSD	61,8	28,3	74,9	39,5	39,5	39,5	39,5	39,5	82,2	86,0	91,1	98,7	110,1	95	97	98	100	102	104	107	109	111	114
- Divestiture	mUSD																							
- D&A	mUSD	(27,9)	(33,2)	(37,9)	(39,5)	(39,5)	(39,5)	(39,5)	(39,5)	(41,2)	(43,1)	(45,2)	(47,5)	(50,3)	(53)	(55)	(57)	(60)	(62)	(65)	(67)	(70)	(73)	(76)
PP&E - EoP		308,3	303,4	340,3	340,2	340,2	340,1	340,0	340,0	380,9	423,9	469,8	521,0	580,8	623	665	706	747	787	827	866	904	942	980
Working Capital Calculations																								
Working Capital																								
+ Trade receivables	mUSD	49	59	55	36	38	42	48	55	64	78	94	114	138	160	181	204	229	258	290	327	368	414	466
+ Inventories	mUSD	21	27	27	25	24	27	32	37	43	51	61	72	85	97	108	121	134	150	167	186	208	232	259
- Trade payables	mUSD	(42)	(54)	(54)	(51)	(49)	(54)	(63)	(73)	(86)	(103)	(122)	(144)	(170)	(195)	(217)	(241)	(269)	(299)	(334)	(372)	(415)	(463)	(517)
Working Capital	mUSD	28	32	28	11	13	15	16	18	21	27	34	42	53	63	72	83	95	108	124	141	160	182	207
Variation	mUSD	***28***	***4***	***(4)***	***(17)***	***2***	***1***	***2***	***2***	***3***	***6***	***7***	***9***	***11***	***10***	***9***	***11***	***12***	***14***	***15***	***17***	***19***	***22***	***25***
Working Capital Days																								
Trade receivables - Days of revenues	Days	45	45	45	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Inventories - Days of COGS/Distrib costs	Days	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Trade payables - Days of COGS/Distrib costs	Days	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Equity Schedule																								
Equity - BoP	mUSD	209	248	289	304	317	340	363	385	408	483	495	509	524	549	577	605	635	665	695	727	759	792	826
+/- Capital Increase/Reduction	mUSD	-	-	-	-	-	-	-	-	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+/- Change in Equity/Net income	mUSD	39	41	15	27	46	45	45	46	25	24	27	30	51	54	57	59	60	61	63	64	66	68	69
- Dividends (% Net Income)	mUSD	-	-	-	13	23	22	23	23	-	12	13	15	26	27	29	29	30	31	31	32	33	34	35
Equity - EoP	mUSD	248	289	304	317	340	363	385	408	483	495	509	524	549	577	605	635	665	695	727	759	792	826	861
Financial debt repayment																								
1. Calculation of Long Term financial debt																								
EXISTING - Commercial/Corporate Debt (IFC/Synd)																								
BoP	mUSD	-	92,5	115,1	96,3	78,3	60,3	42,3	24,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+ Increase	mUSD	92,5	22,6	0	-	-				-														
- Repayment	mUSD			(18,8)	(18,0)	(18,0)	(18,0)	(18,0)	(24,3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EoP	mUSD	92,5	115,1	96,3	78,3	60,3	42,3	24,3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest rate LT	8%																							
LT Financial expense	mUSD	17,67	15,9	13,1	7,0	5,5	4,1	2,7	1,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEW - Commercial/Corporate Debt (IFC/Synd)		19,10%	13,79%																					
BoP	mUSD				-	-	-	-	-	-	100,0	90,0	80,0	70,0	60,0	50,0	90,0	130,0	170,0	210,0	250,0	280,0	310,0	340,0
+ Increase	mUSD						-	-	-	100,0	-		50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
- Repayment	mUSD						-	-	-	-	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(10,0)	(20,0)	(20,0)	(20,0)	(20,0)
EoP	mUSD	-	-	-	-	-	-	-	-	100,0	90,0	80,0	70,0	60,0	50,0	90,0	130,0	170,0	210,0	250,0	280,0	310,0	340,0	370,0
Interest rate LT	8%																							
LT Financial expense	mUSD	-	-	-	-	-	-	-	-	4,0	7,6	6,8	6,0	5,2	4,4	5,6	8,8	12,0	15,2	18,4	21,2	23,6	26,0	28,4

16. ANNEX I. SUSTAINABLE ENERGY FOR SOME

"Sustainable Energy for Some", an article by Professor Vijay Modi, Columbia University, May 31, 2022.

https://mailchi.mp/e647f8b1a284/sustainable-energy-for-some?e=f72f8fc757

Last week I visited the slums of Kampala, Uganda, while on my way to the Sustainable Energy for All Forum in Kigali. I wanted to see with my own eyes the conditions in the slums when it comes to energy and water. It is well known the world over that while grinding poverty is hard enough, having to pay exorbitant prices for services and consumables makes it a lot worse. It could be a choice between buying milk or paying for light, primary education or charcoal. I found the residents of these slums having to obtain electricity, cooking fuels, water and sanitation services through informal unsafe poorer quality arrangements that cost them several multiples of what they should. These services are already provided to others in the city a stone's throw away. With very high population densities in the slums and their being already adjacent to existing utility infrastructure, the cost of provisioning services should be much lower than that for those with larger property sizes or those in rural settings.

Dr. Pasquine Ogunsanya who runs a health clinic serving the most vulnerable, took me around to interview some of the residents living in a slum by the sides of a railway track, a stone's throw from Alive Medical, a clinic she runs in Namuwongo. The residents in the Namuwongo slum make their home in unplanned semi- permanent houses made of scraps, straw, and mud without toilets. These have been put up by those who saw a profitable enterprise in investing in a shack that can pay back in rent in just a few years- building on land that they do not own. Without sanitation and good drainage systems, many residents without toilets pollute the trenches or surrounding areas since one must pay to use the community toilets. Heavy rains come with flooding worsening their living conditions.

I talked to the few families we visited with my own narrow lens of the cost, quality, and reliability of services such as lighting, water, cooking, cost of credit - topics that I study. But it was hard not to miss the larger backdrop of precarious livelihoods, poverty, poor health, and vicious cycle of debt from COVID-19, with families raising a new generation without decent education, amidst increasing sexual and gender-based violence during the most formative years of life. Unfortunately, these are conditions are not unique to Namuwongo. Nearly half of Kampala lives in slum dwellings.

During my daytime visit I primarily saw women and children at home. A 60 sq. ft. (6 sq. meter) space without a kitchen, a sink, a bathroom, or a water tap rents for $20/month, without the right to complain about a dangerously leaning mud-straw wall or holes in the tin roof. It is on take it or leave it terms. Per sq. ft., the rent is only slightly lower, perhaps half that of a rental unit in Kampala that is solidly built, has a kitchen, a bathroom and toilet, and is connected to utility infrastructure and services. A ceiling-mounted lightbulb and a mobile phone were the only electrical appliances visible. For this electricity they paid a flat monthly charge of $3.50 regardless of how much you used. The landlord who supplies this electricity is charging what works to be about $1 per unit of electricity, about 5 times what the Uganda or US utility would charge. What is ironic is that Uganda currently has excess electricity supply. Only about 60% of the contracted supply is being utilized. And the country is paying for that unused excess supply. The technical jargon for this unused but paid for portion is deemed energy.

The slum dwellers pay roughly $5 a month to obtain drinking water, which is purchased from middlemen. This is for two to three 15 to 20-liter plastic containers jerrycans of water a day. They bring these to be filled up at a location controlled by a middleman who in turns has access to a metered public tap. For every 1000 liters or 270 gallons that they might consume over a month (my family consumes that much in a day), they pay nearly two times the cost of pristine water delivered by pipe to my home in New York City. It is 30 times what the utility in my parent's hometown in India charges where costs of labor, distribution and water quality might be similar. Costs to produce electricity or procure natural gas have common reference points across the globe given their sources are internationally traded. Not so with water. The cost of physical volumes of water is low in countries blessed with plenty of water, and much of water pricing in the global north is the cost of sewage collection, treatment and disposal, a provision that is missing for the residents of slums anyway.

The residents rely almost exclusively on charcoal for cooking fuel supplemented by scraps of scavenged wood, such as from discarded wooden furniture, doors, scaffolding etc. They pay roughly $15/month for about 30 kg of charcoal, an absurdly high energy burden (what you pay for energy as a fraction of your income) given their income levels- but they have no other alternatives. The health and environmental externalities aside, if one adjusts for the lower efficiency of their stove compared to a gas stove, they pay about three times per MMBtu (a measure of how much heat a fuel can deliver when burnt) of cooking energy compared to those in my hometown in Western India, where piped gas is delivered to every home, supplied by a private company that in turn obtains commercially-priced imported liquefied natural gas from a trunk gas pipeline. There might be other cost-effective approaches as well, perhaps electric cooking using the surplus power that Uganda has. I saw numerous electric cooking appliances targeted for the poor on display at the Kigali conference.

Economists have argued that slums make it possible for those escaping rural poverty to make a go at the economic opportunities that cities offer. But that leap, also implies dire choices, a cramped dozen sq. ft. per person. While the word slum itself has come to mean informality, transitory living, lack of services and all the negative associations of crime and poor health- it is society itself that is to a large degree making that prophecy come true. We may wait decades to create the millions of urban housing units that Uganda needs. But it is unacceptable to deny the residents the most basic services as enshrined in the Sustainable Development Goals. We can debate what comes first: governance, community mobilization, NGO support, forcing landlords to provide tenancy protection, requiring landlords to make investments, evicting both landlords and tenants entirely. These debates are place specific and for sure there were many unresolved historical and colonial legacies or political expediencies. The debates go on for decades since informality is very profitable. The current landlords are engaged in a profitable enterprise, without public oversight that a utility would have. There is money to be made in private service provision to the poor.

As an engineer, I see the need for a more direct approach that requires utilities to provide services to everyone, even those without a formal street address, a formal rental contract, or even without a structural wall on which to mount an electric meter. It is the role of engineers to design around these constraints. My narrower engineering perspective is that energy, water, and sanitation provision, are public services and hence governments need to forcefully intervene and, if needed, provide upfront subsidies to make it happen. They do so for other city populations and increasingly for smaller towns and rural villages as well.

It is not satisfactory to require the poor to organize themselves in co-operatives or come up with their own community-based solutions or make do with self-financed decentralized options such as rainwater harvesting or solar lanterns or locally produced briquettes, waste to energy solutions or composting toilets. All fine ideas and all power to the poor if that is what works for them today. But these are solutions for those who have access to capital and the time to invest in cutting-edge innovations. Slums in densely populated cities need utility services provided through corporate technological and management heft, just like the rest of urban populations.

When technological innovations such as water reuse, or decentralized solar/battery systems become proven, affordable, and reliable- that is when those approaches might sense for the slums. For now, we need to deploy what we know how to make it work- simply bring services in form of a utility wire or a pipe to your abode, however humble that abode is. This might not be cost effective for the rural poor, and indeed off-grid or decentralized systems make sense in those settings. Yet, given how small a space slum residents occupy and their proximity to existing infrastructure, the cost of providing these services to them is a small fraction of what it takes to serve the urban middle class or the rural poor. There is no reason to wait. It may be costly or not feasible to build a private toilet for each dwelling unit. In that case, clean public toilets are both technologically and financially feasible in urban settings with backend sewage pipes and central treatment facilities. Yes, they will need public funds to maintain and operate.

The East Africa region has massive (compared to their own anticipated consumption for years to come) fossil fuel resources, both liquid and gas. Pipelines for oil (from Uganda to coast through Tanzania) and the other way for gas will start to be built shortly. Contracts are being awarded as we write this. If all

goes well, government budgets, fuel and financing will not be in short supply. What could be in short supply is our commitment to the poor.

It is absurdly expensive to be poor. Living informally in a settlement by the railroad track means you are forgotten, hidden, and left to yourself. In some countries you could be forced to relocate to just make the city look clean and pretty. When former President Trump visited my hometown in India, walls were quickly put up by the local government along the road he would drive by so that the slum dwellers would be hidden away. And this was when he was on the way to make a quick stop from the airport to visit the Gandhi Ashram, where Gandhi lived with the outcasts of society, precisely to provide them dignity and visibility.

There was no way for me to express any emotion to those I met, who, despite their most desperate conditions, had hope in their eyes and were trying to look ahead. The tears had to wait until I came back to a luxury hotel few minutes away. Kampala, the capital of Uganda, located on rolling hills, by Lake Victoria- the source of the Nile, is one of the most beautiful cities I have ever visited. On the morning of my visit, an intense thunderous tropical downpour had given way to bright sunshine. Surrounded by lush greenery, blessed with ample rain, sun, and fertile soil- it was hard to imagine why hundreds of thousands in Kampala are having to pay an arm and a leg for cooking fuel, water, sanitation, and light. Their consumption levels are so low, they are probably the most sustainable denizens on earth- but for them, affordable energy and water are a dream.

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17. ANNEX J. MEETINGS DURING THE TWO MISSIONS TO KAMPALA

It follows the list of the meetings maintained during the two missions to Kampala, indicating the date, the people in the meeting and their institution.

First mission

All meetings took place during the month of November 2020.

Mon-2. Ludovic Durel (EU Delegation, Operations Adviser).

Tues-3. Kamu Karekaho (AfDB, Power Sector Consultant).

Tues-3. Moses Murengezi (MEMD, Advisor to Chairman, Energy and Mineral Sector Working Group) and Ludovic Durel.

Tues-3. Georg Grüner (KFW).

Wed-4. Moses Murengezi.

Wed-4. Carlos de Abajo (Finance expert, Bank of America in Madrid).

Wed-4. Raquel de la Orden (IFC, Washington).

Thu-5. Selestino Babungi (Managing Director, Umeme), Blessing Nshaho (Chief Corporate and Regulatory Officer, Umeme), and Mbaga Tuzinde (Head of Commercial Regulation, Umeme).

Thu-5. Romain Legrand (AFD).

Fri-6. Oscar Ankunda (Power Africa) Meeting was cancelled.

Fri-6. Wrap-up of the week with Ludovic Durel and Pavlos Evangelidis (EU Delegation).

Fri-6. Whitney Pailman (University of Cape Town).

Sun-8. Grégoire Jacquot (Researcher, MIT)

Mon-9. Daniel Willette (Engie Energy Access).

Tues-10. Meeting with UEDCL, led by Paul Mwesigwa (Managing Director) and with attendance of Abdon Atwine, Esther Naikoba, Protaze Tibyaknura, Martin Bogere, Michael Taremwa, Dorothy Mubiru, Fred Wamala, Laurn Bamanya, and Nicholas Hiire.

Tues-10. Meeting with ERA, with participation of Isaac Kinhonnhi, M. Mbaziira, and Catherine Kamya.

Tues-10. Carlos de Abajo.

Wed-11. Meeting with GIZ, with participation of Markus Francke, Franziska Abila-Roetzer, Moses Kakooza, and Veit Goehringer.

Wed-11. Review meeting with Moses Murengezi and Ludovic Durel.

Thu-12. Meeting with UETCL, with participation of Valentine Katabira, Boneventura Buhanga, Rachel Arinda, Daniel Okello, George Rwabajungu, Abdon Atwine, Kayiwa Collins, Bridget Nabagereka, and Fredrik Gubala.

Thu-12. Crystal Mugimba (Uganda Off-grid Energy Market Accelerator, UOMA).

Thu-12. Paul Mwesigwa (MD, UEDCL).

Thu-12. Riccardo Ridolfi (Umeme, Member of the Board).

Fri-13. Blessing Nshaho (Umeme, Chief Corporate & Regulatory Officer).

Fri-13. Meeting with REA, with participation of Joan Mutiibwa (CEO, REA), Benon Bena (Manager Off-Grid Renewable Energy development, REA), Deborah Nantume, Sylvia Birungi, Connie Kodet.

Sat-14. Carlos de Abajo.

Mon-16. Sumaya Mahomed (Utility 2.0).

Mon-16. Meeting with Equatorial Power, with participation of Dario Fallara and Abishek Bharadwaj.

Mon-16. Meeting with UECCC, with participation of Michael Rutalo; Roy Baguma cannot join.

Mon-16. Meeting with the World Bank, with participation of Raihan Elahi (Lead Energy Specialist, WB) and Federico Querio (Senior Energy Specialist).

Mon-16. Riccardo Ridolfi and members of the MIT/Comillas team of the author of the report.

Tues-17. Brian Tahinduka (Stanbic).

Tues-17. Ludovic Durel.

Tues-17. Rachael Rwomushana (Ministry of Justice and Constitutional Affaires).

Wed-18. Oscar Ankunda (Power Africa).

Wed-18. Meeting with Ministry of Finance, Planning and Economic Development, with participation of Charles Byaruhanga (Development Finance Advisor), Paul Mwanja (Assistant Commissioner), and Benjamin Alezu Ayiseni.

Wed-19. Alex Wanume (WINCH).

Wed-19. Presentation to the Group of Development Partners.

Thu-20. Christopher Vauthier (Engie Energy Access).

Thu-20. Usamah Kaggwa (Senior Energy Officer, MEMD).

Thu-20. James Baanabe ('Power Sector Roadmap' delivery Lead, CIG Uganda).

Thu-20. Meeting with Umeme was cancelled.

Thu-20. Gillian-Alexandre Huart (CEO, Engie Energy Access).

Mon-23. Joyce Nkuyahaga (CEO, Uganda Solar Energy Association).

Mon-23. Moses Murengezi and Ludovic Durel.

Tues-24. Ziria Tibalwa (CEO, ERA).

Tues-24. Moses Mwase (Executive Director, Privatisation Unit, MOFPED). Meeting finally had to be postponed.

Tues-24. Meeting with GIZ, with participation of Markus Francke, Franziska Abila-Roetzer, Moses Kakooza, and Veit Goehringer.

Tues-24. Quentin Peries-Joly (Engie Energy Access).

Tues-24. Grégoire Jacquot (MIT).

Wed-25. Ziria Tibalwa (CEO, ERA).

Wed-25. Meeting at the MEMD, with Robert Kasande (Permanent Secretary, MEMD), Cecilia Nakiranda Menya (Commissioner, Electric Power Department), Moses Murengezi, and Ludovic Durel.

Wed-25. Moses Mwase (Executive Director, Privatization Unit, MOFPED).

An additional meeting with the Foundation of Rural Energy Services (FRES), with participation of Marc van Niekerk and Joselyn Muslime, was postponed to Thursday December 3rd. A few other meetings, including a detailed presentation of the final report to the Development Partners took place virtually during the months that followed the first mission, until it was finally delivered in June 2021.

Second mission

All meetings took place in Kampala from March 21st to April 1st, both included.

Mon-21. Moses Murengezi (MEMD, Advisor to Chairman, Energy and Mineral Sector Working Group) and Jesus Gavilan (EU Delegation, Operations Adviser).

Mon-21. Selestino Babungi (Managing Director, Umeme), and Blessing Nshaho (Chief Corporate and Regulatory Officer, Umeme).

Tues-22. Paul Mwesigwa (UEDCL, Managing Director) and Bonniface Barongo (Head Human Resource and Administration).

Tues-22. Daniel Willette (Engie Energy Access).

Tues-22. Sumaya Mohamed (Utility 2.0).

Wed-23. Meeting at the MEMD with Moses Murengezi, Cecilia Nakiranda Menya, and Bridget Nabagereka.

Wed-23. Meeting at GIZ with Moses Kakooza, David Otieno and Veit Goehringer.

Thu-24. Sumaya Mohamed (Utility 2.0) and Isaac Mufumbiro (Umeme).

Thu-24. Meeting at ERA with Ziria Tibalwa (CEO), Geofrey Okoboi (Director of Economic Regulation), and other professionals.

Fri-25. Riccardo Ridolfi (Umeme, member of the Board; CEO of Equatorial Power).

Satur-26. Benon Mutambi (former CEO of ERA).

Mon-28. Meeting at MEMD with Irene Bateebe (Permanent Secretary).

Tues-29. Meeting at the Ministry of Finance, Planning and Economic Development, with participation of Charles Byaruhanga (Development Finance Advisor), Gideon Gariyo, and Benjamin Alezu.

Tues-29. Virtual meeting with the World Bank, with participation of Raihan Elahi (Lead Energy Specialist), Federico Querio, and Paul Mukibi.

Wed-30. Meeting at MEMD with Bridget Nabagereka, Isaac Kinhonhi (ERA, Principal Economist), and other professionals to review the business plan.

Wed-30. Meeting at Umeme with Selestino Babungi (Managing Director, Umeme), and Blessing Nshaho (Chief Corporate and Regulatory Officer, Umeme) to review the business plan.

Thu-31. Meeting at the EU Delegation for a hybrid presentation of the draft proposal to the Development Partners.

Fri-1. Meeting at UECCC with Specioza Kimera Ndagire (Managing Director), and "Roy Nyamutale Baguma (Head Transaction Execution).

An additional virtual meeting took place on April 7th with GIZ, with participation of Cornelia Penzel, Daniela Moritz, David Otieno, and Milton Edimu.