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PRIVATE INVESTMENT IN TRANSMISSION IN AFRICA

11TH, 12TH AND 13TH, MARCH 2024

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PRIVATE INVESTMENT IN TRANSMISSION IN AFRICA

March 11, 12 & 13, 2024

Could common sense & sound regulation enable private investment in power transmission in Africa?

Ignacio Pérez-Arriaga

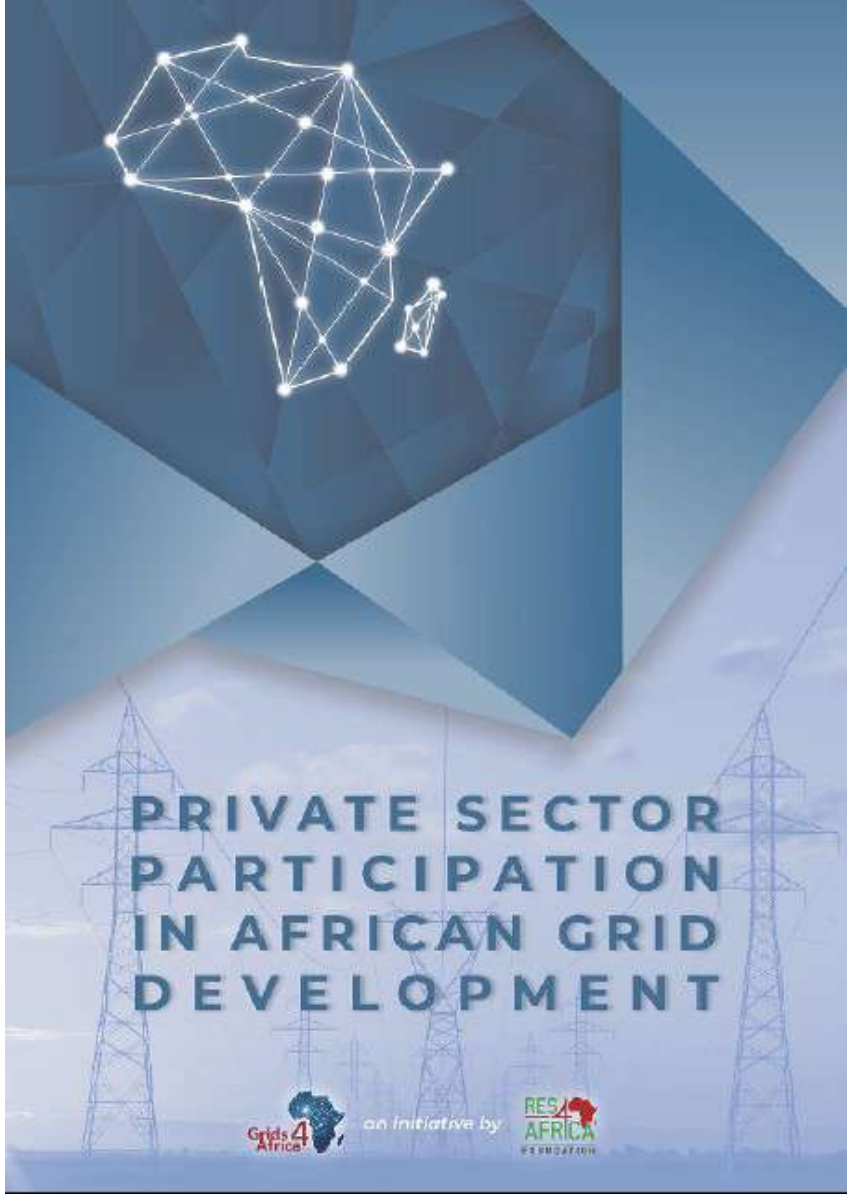
Interim Director of African School of Regulation & Florence School of Regulation, EUI

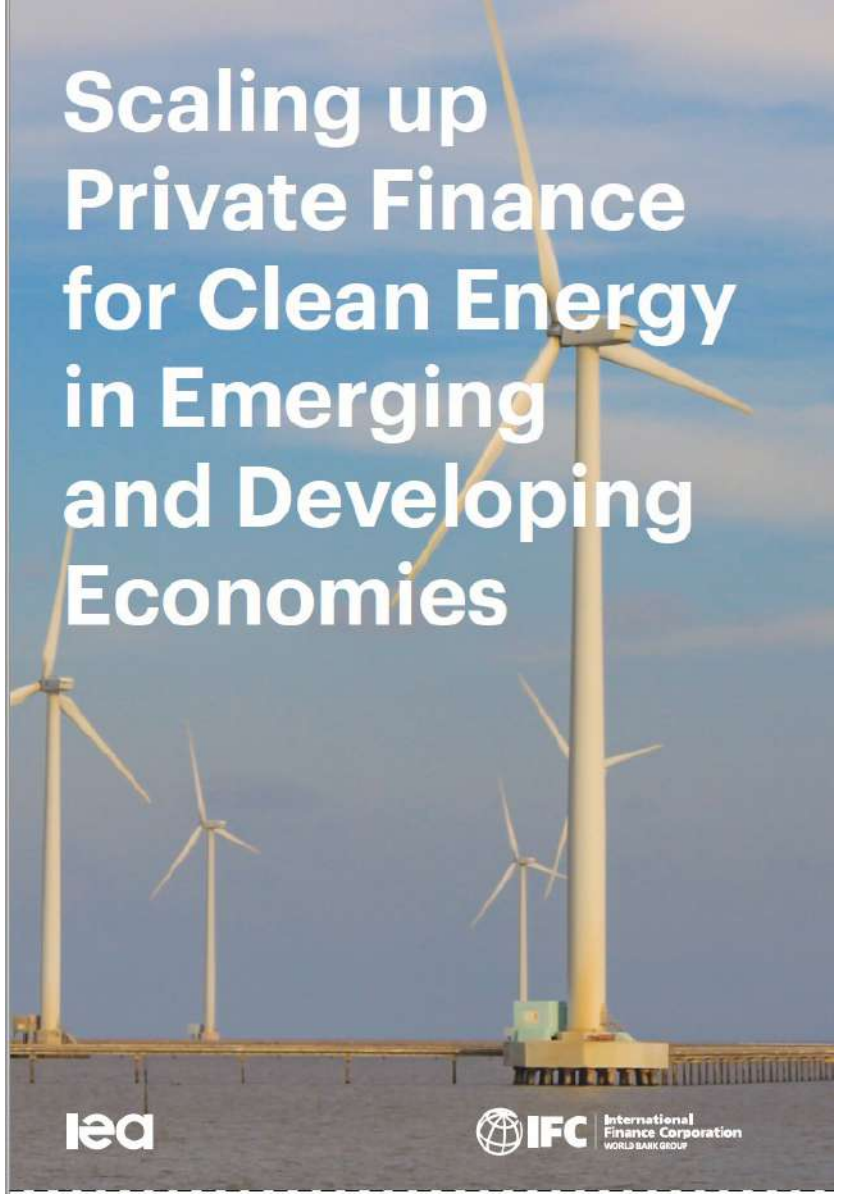
Institute for Research in Technology (IIT), Comillas University

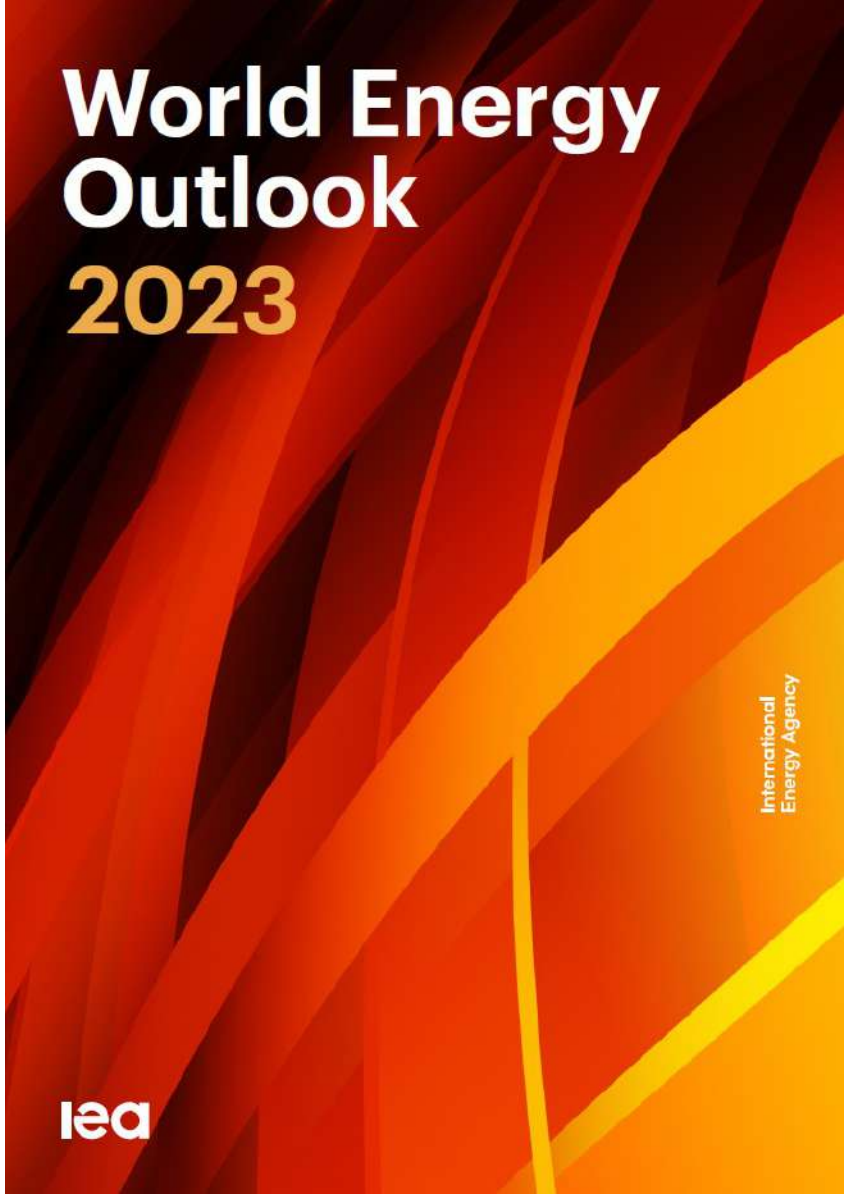
Sloan School of Management, MITEI & CEEPR, MIT

The evidence is overwhelming, that there is no private investment in transmission in Africa

(although some recent initiatives might start to change this)



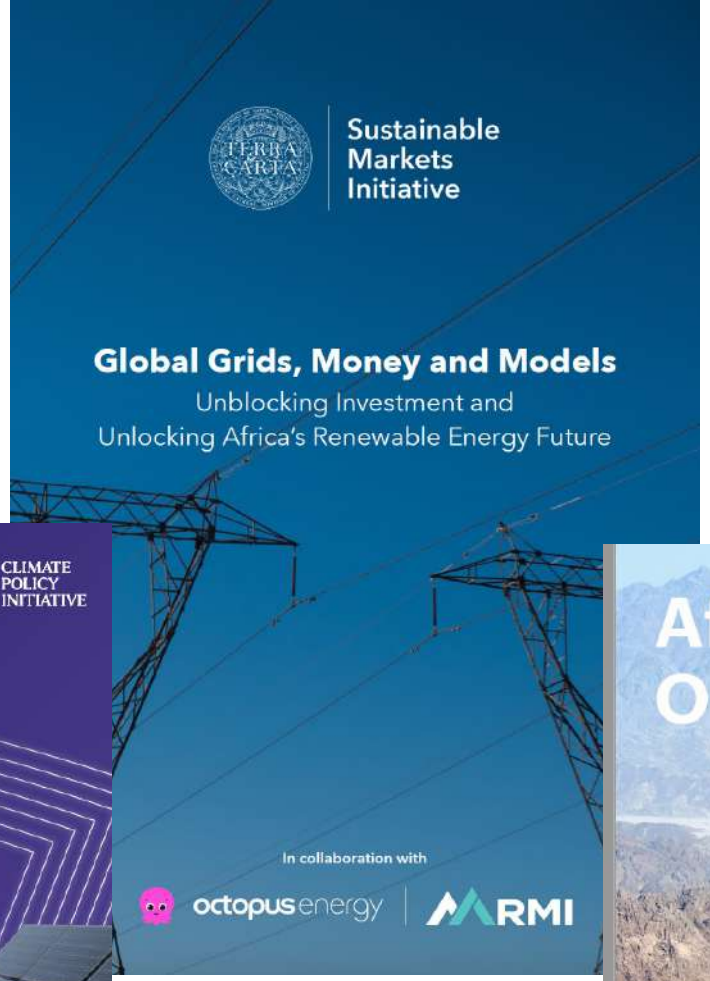


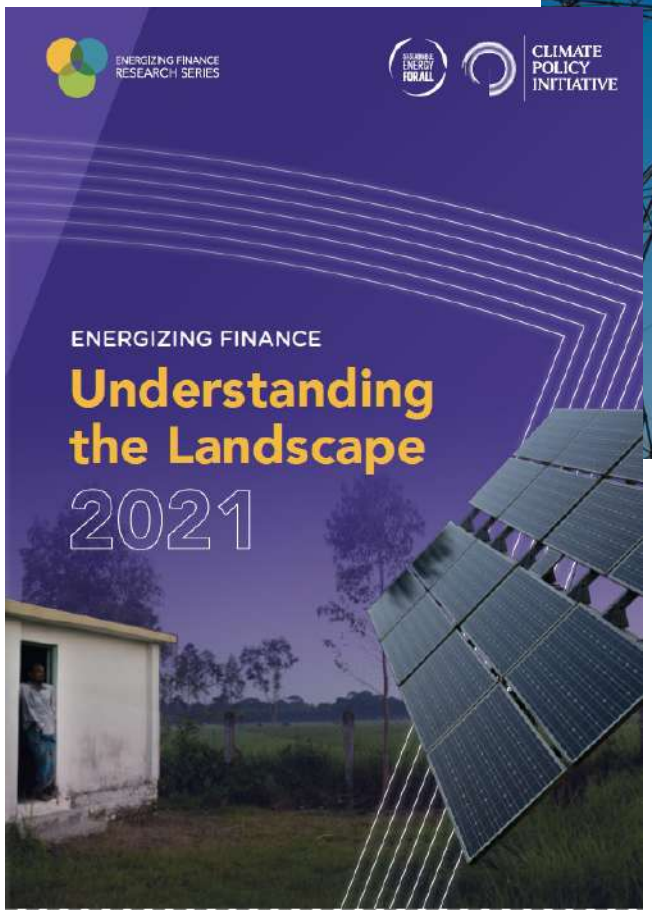


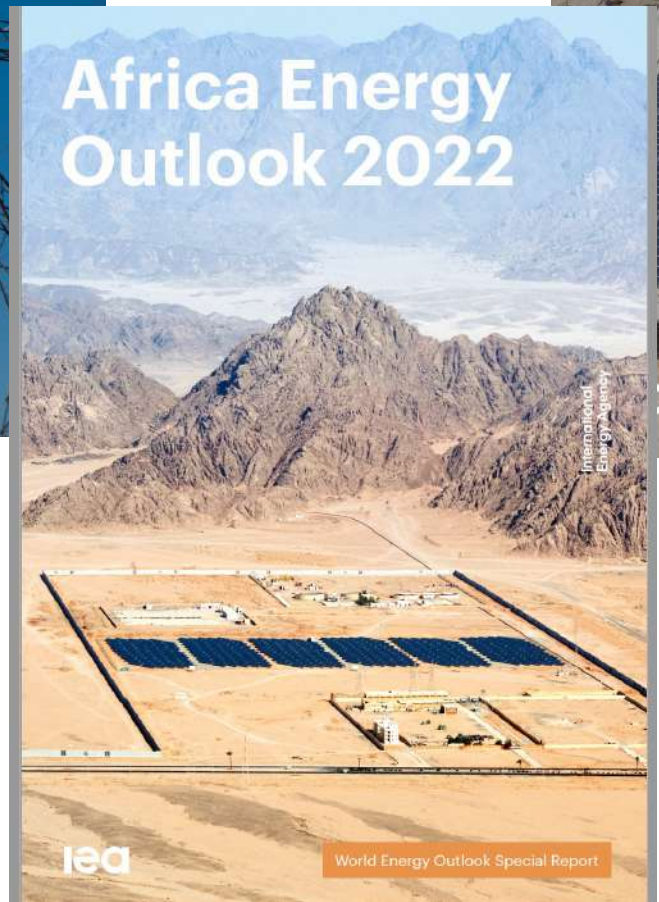
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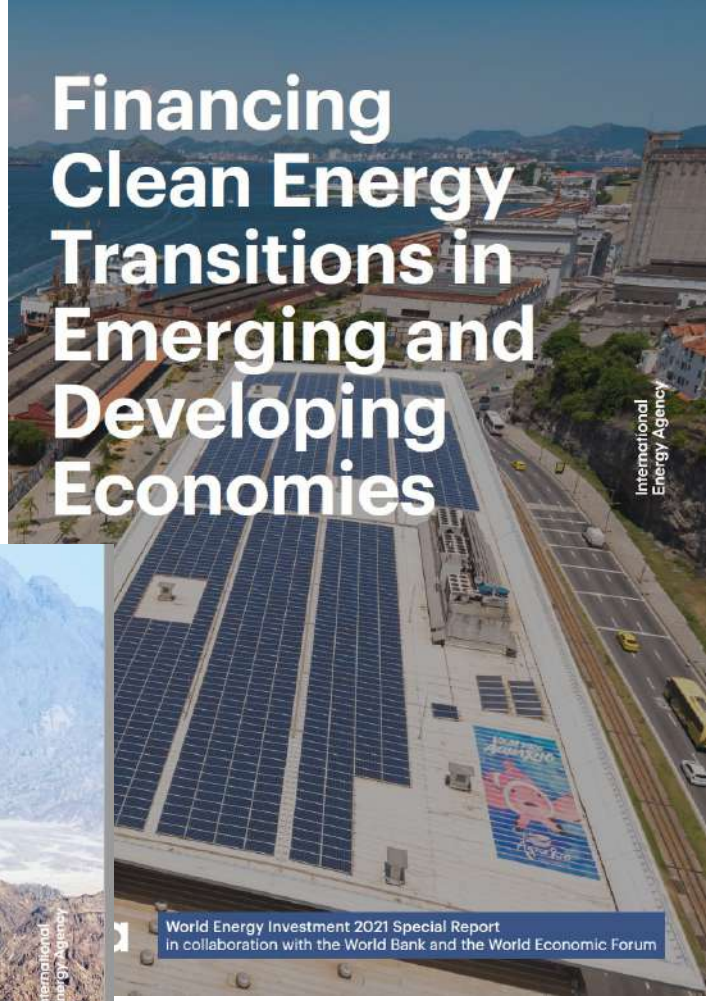
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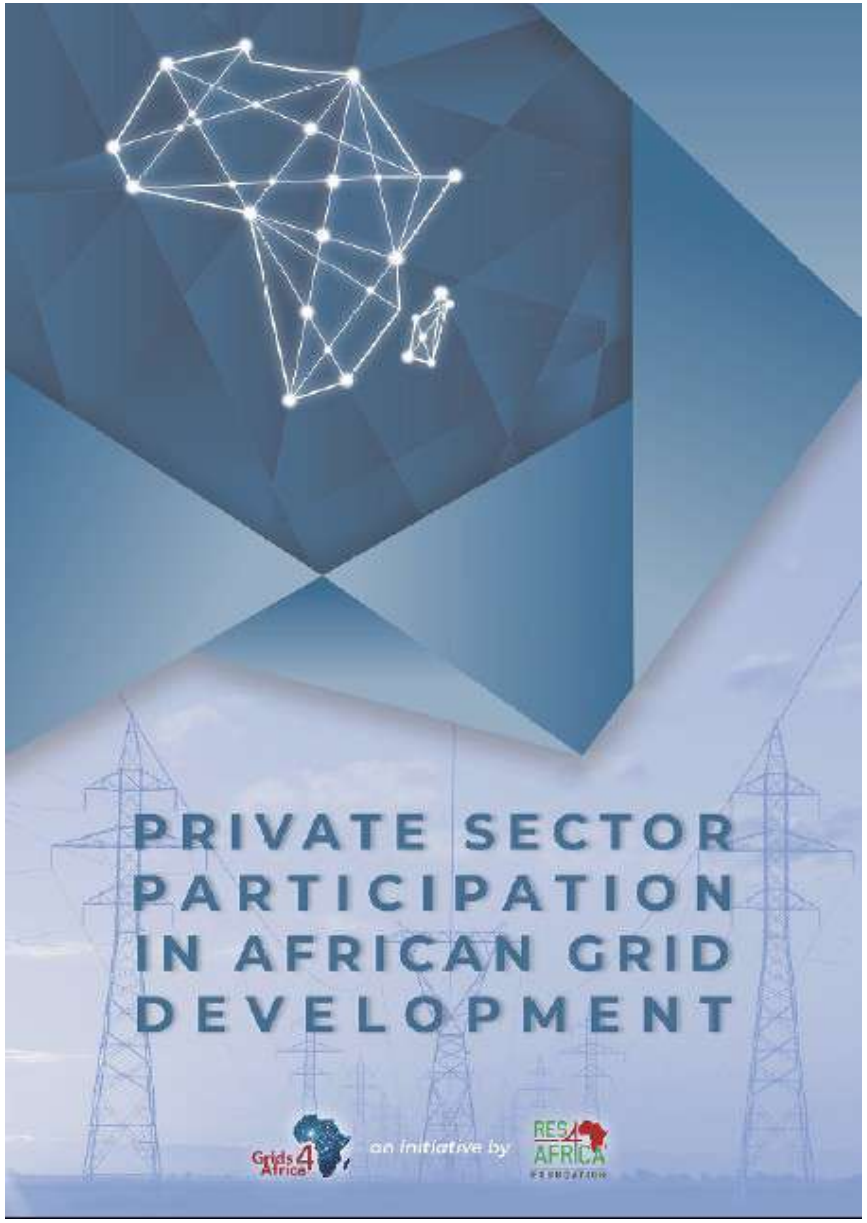
https://www.iea.org/reports/world-energy-outlook-2023


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Unblocking Investment and
Unlocking Africa's Renewable Energy Future
In collaboration with
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RMI

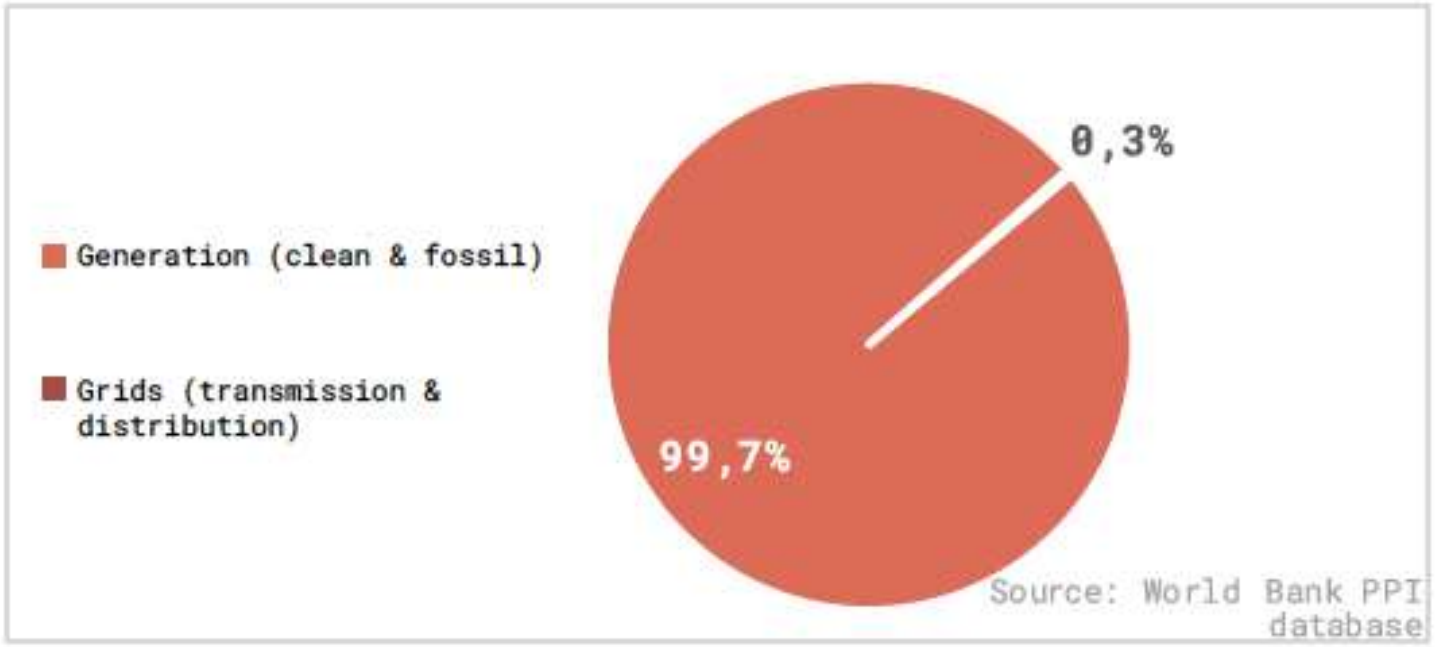

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in collaboration with the World Bank and the World Economic Forum



The percentage of private investment in African electricity networks is negligible



Private investments in the electricity sector over 2010-20 (% share of total) for a sample of 10 African countries: Algeria, Ethiopia, Ghana, Kenya, Morocco, Senegal, South Africa, Tanzania, Uganda, Zambia

https://www.res4africa.org/calendar-news/79po1jnb8nbasjvf3s8x8bnogbhff4

Resorting to private investment is inevitable

The **critical nature of transmission infrastructure** to the overall function of the power system cannot be overstated. Transmission is a linchpin for decarbonisation.

Africa has fewer **kilometres of transmission lines per person** than any other region in the world.

Historically, **grid projects in sub-Saharan Africa have been made by state-owned utilities**, mostly funded by governments through DFIs, and underwritten with **sovereign guarantees.**

There is currently a **need for significant additional investment** in transmission on the African continent. This need is **unlikely to be met through the existing sources of funding** for the sector.

Transmission contributes a relatively small part of the overall cost of the sector value chain, but needs to move in tandem with additions to generation capacity

Private investment may adopt several business models, some of which may be difficult to implement in most African countries

Business models to facilitate private investment in transmission

- **Whole-of-network concessions**.
- **Independent transmission projects** (ITPs)
- **Privatisations** (a sell of shares by a government in a state-owned utility or transmission company) &
- **Merchant** lines

These are archetype-like models, which can be adapted & implemented across a large variety of circumstances.

Models for private investment in transmission

1. **Indefinite privatizations** provide ownership of the transmission network to a private company, usually through a trade sale or public flotation of a government-owned transmission business. The private owner has the *exclusive right (and obligation) to develop new transmission in its area of operation*.

2. **Whole-of-grid concessions** provide *similar rights and responsibilities to privatizations, but for a shorter period*. In most cases, the government implements this business model with a *competitive tender of the concession* and enters a concession contract with the winning bidder.

Models for private investment in transmission

3. **Independent Transmission Projects (ITPs)** provide the rights and obligations associated with *a single transmission line, or a package of a few lines*. In most cases the government implements this business model by *tendering a long-term contract*, with payment dependent on the availability of the line.

4. **Merchant investors** *build and operate a single transmission line* ("merchant line"), typically a High Voltage Direct Current (HVDC) line. The merchant investor benefits from moving power from low-price regions to high-price regions. Merchant lines are a *private initiative* and are not initiated by the government. There are very few of them, for good reason.

The main topic be discussed in this conference was NOT to privatise or concession the entire national networks, but to attract private investment to key transmission projects & to reinforce the networks piecemeal

The present situation of transmission in most African utilities does NOT suggest to privatise or concession the entire national networks, but to attract private investment to key transmission projects and to reinforce the networks piecemeal, as with the ITP business model

The ITP model – Definition

- The **ITP** typically involves the construction and maintenance of **a single transmission line or a package** of transmission lines **under a long-term contract**, generally between the state-owned utility that is responsible for transmission and the (private) project company that is established to undertake the project.
- **The contract** typically defines the economic **payment model**, and the **roles and responsibilities** for the new infrastructure, including ownership, construction, maintenance and financing responsibilities.
- These contracts can be structured as **transmission service agreements (TSA)** but may also take other forms such as lease or line concession agreements.
- An IPT is typically used for the development of greenfield assets, but the same concept can be used for the **refurbishment of existing transmission assets**.

The ITP business models

- Build-Own-Operate-Transfer (BOOT), is the most common format successfully implemented in Latin America and Asia.
- Build-Own-Transfer (BOT)
- Build-Own-Operate (BOO)

ITP models vary by degree of ownership and maintenance obligations.

In all ITP models the private party assumes the construction and financing risk.

The return on investment expectations, as well as the cost of financing, will increase the more the project company bears risks that condition its repayment.

The ITP business models

NOTE: "**Operation**" here refers to the specific **maintenance activities** required to ensure that a transmission line and other associated infrastructure are available to be used when specified, i.e., just "maintenance" & **nothing to do with "System operation"** which is carried out by the transmission utility or the transmission system operator (TSO) on a whole network basis and involves system control, operation of transmission infrastructure and dispatch of generation facilities.

Therefore:

- **ITP does not cause loss of security or control of the network**, because the owner of the ITP asset has no control on the operation of the power system,
- The **scheduling of the maintenance** of the ITP facilities should be made (or authorized at least) by the system operator, considering the whole network needs
- The **remuneration of the ITP infrastructure should not depend on its flows or its losses**, which are beyond the control of the ITP owner.
- The remuneration of the ITP infrastructure must have a component associated to the performance of the asset, **linked to its availability**.

The ITP business models – BOOT

- **Build-Own-Operate-Transfer (BOOT)**
  - The TSA specifies that the project company has a responsibility to **maintain and operate** the transmission infrastructure **for a period** after the assets are constructed, before **transferring ownership and O&M obligations back** to the transmission utility.
  - A portion of the annuity payment may be conditioned on the transmission infrastructure meeting predefined KPIs.
  - Is the most common format successfully implemented in Latin America and Asia.

The ITP business models – BOT

- **Build-Own-Transfer (BOT)**
  - **Once the assets are constructed, the project company must transfer the ownership** of assets to the transmission utility upon project completion.
  - O&M for the transmission infrastructure is not the project company's responsibility and will most likely fall to the transmission utility.
  - **The annuity payment must not depend on the transmission assets' performance**, because the project company is not responsible for asset maintenance or operation.

The ITP business models – BOO

- **Build-Own-Operate (BOO)**
  - The TSA grants the project company the right to build and maintain the transmission infrastructure. **It is necessary to define the end conditions** (length? new payment? ownership transfer? buy-out?)
  - A portion of the annuity payment may be conditioned on the transmission infrastructure meeting predefined KPIs.

The ITP model and the demand risk

- **The project company does not take demand risk (volume or price), or utilisation of transmission infrastructure risk, since the system operator will determine how, when, and by what means the grid is managed and electricity is dispatched.**
- Therefore, the simplest way of structuring TSA payments is as a fixed return on investment amortised over the term of the TSA, structured as a **service charge with scheduled payment dates**.
- This type of **annuity** defines the revenue stream by which investors and lenders can recover their respective capital injections, which should lower lenders' cost of capital and investors' return expectations.
- When the transaction is structured appropriately, **the annuity payment becomes the key criterion for selecting the winning bidder** (assuming that competitive bidding is used).

The ITP model – The enabling environment

- Countries who are familiar with the process and requirements of IPPs are likely to have the capacity and relevant experience to enable IPTs.
- The regulator or other relevant authority must be able to grant a transmission license to the project company.
- However, there may be a legal prohibition on private companies owning and operating transmission infrastructure.
  - It is possible to circumvent this restriction while still using the ITP instrument.*
  - Otherwise, the country's regulation must be amended.
- The regulator is responsible for monitoring compliance with the license conditions , including approval of the payment model and the implications related to meeting the KPIs, but not reviewing complex tariffs as with IPPs.

(*) With the BOT model.

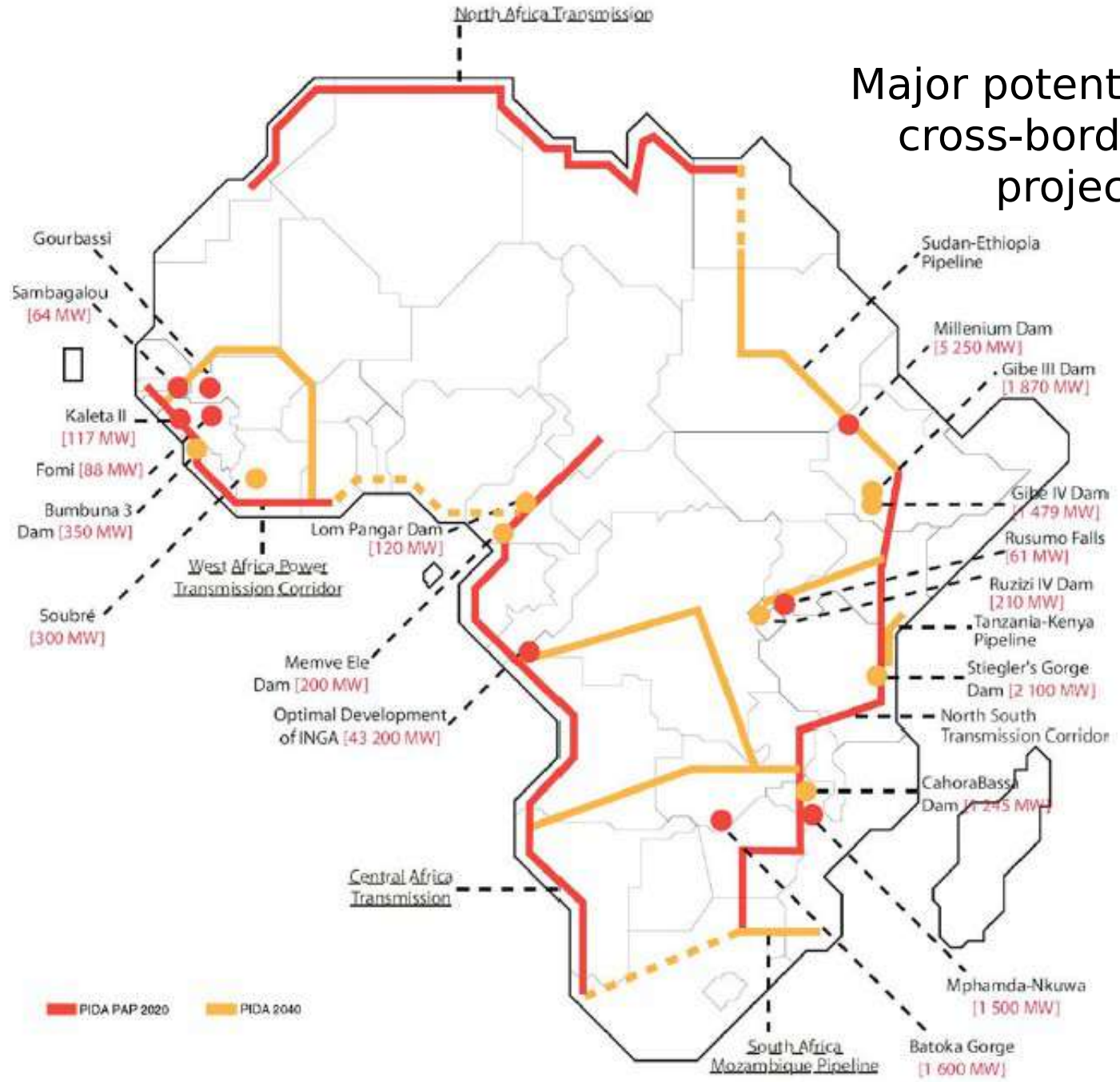


The African Continental Master Plan (CMP)

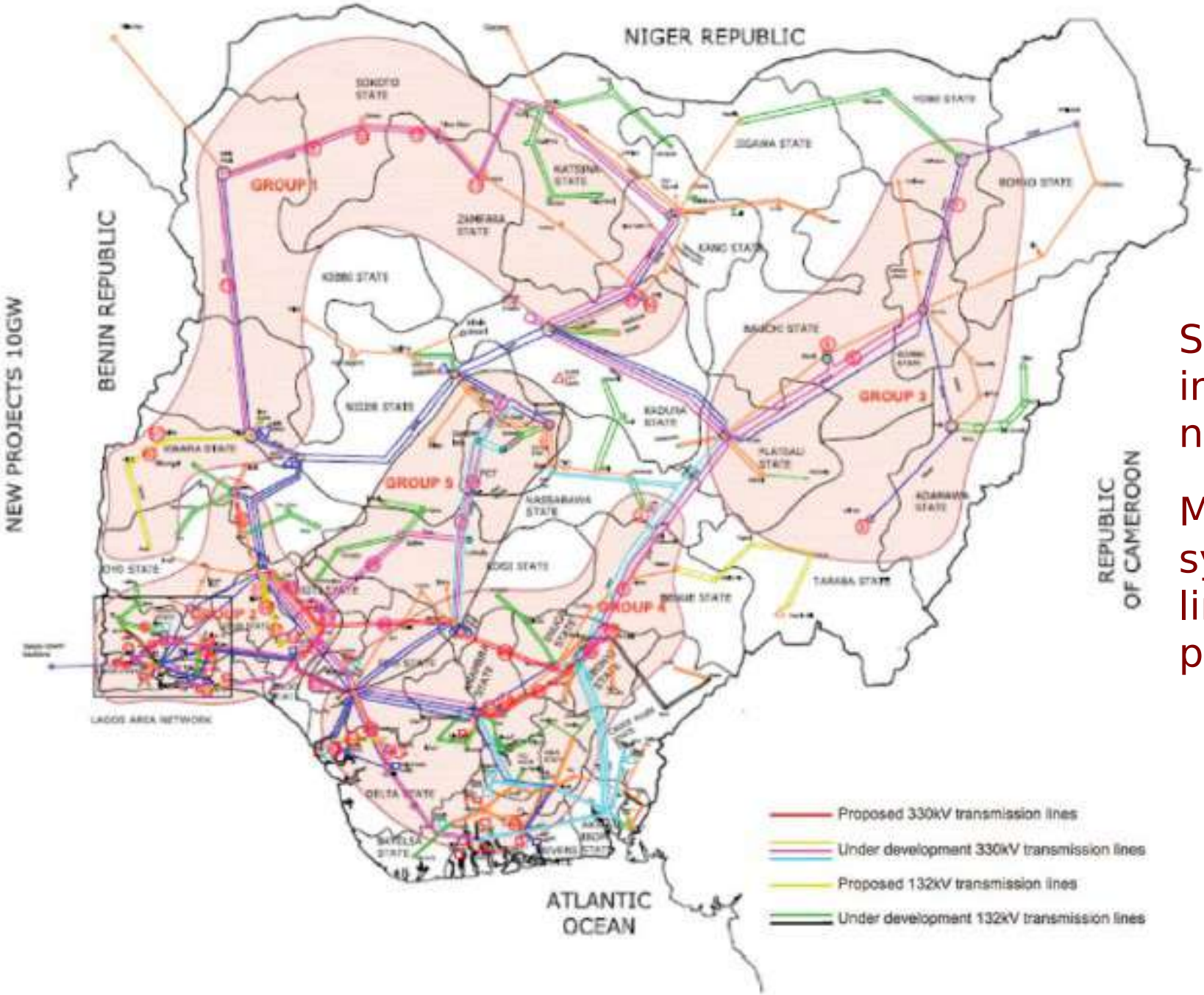
https://nepad.org/continental-master-plan

The CMP will provide a roadmap for the eventual integration of the continent through the establishment of a sustainable integrated continental power transmission network, in the context of the African Union's Agenda 2063.

Major potential generation and cross-border transmission projects in Africa



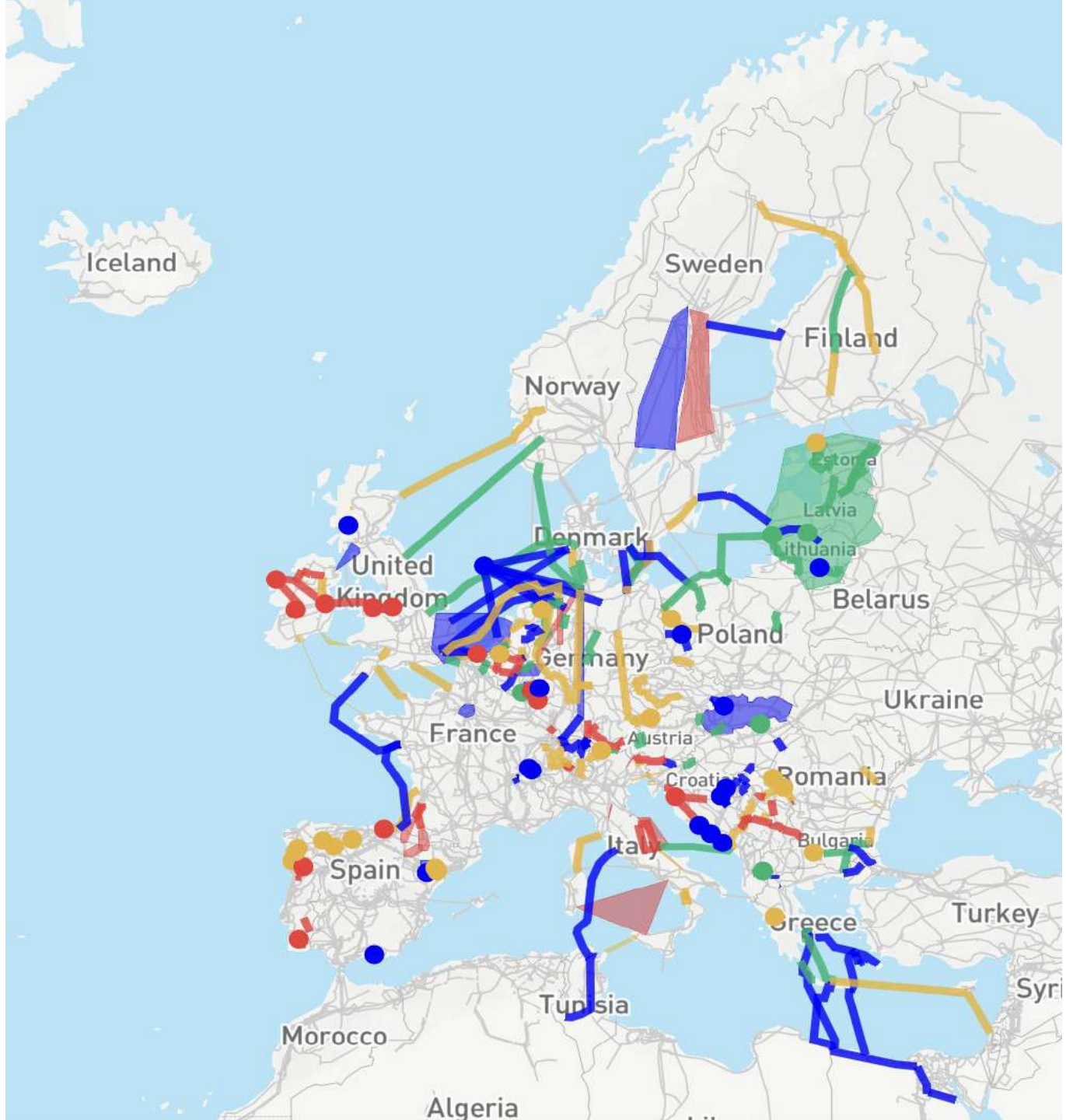
Source: Figures sourced from African Development Bank (2013), Annex 1.



Significant transmission investments are also necessary at national level.

Map of Nigeria's transmission system, showing transmission lines being developed and proposed.

Source: Transmission Company of Nigeria, "Appraisal of Transmission Projects," (2014), (pers. comm. with Patricia Mong, November 17, 2016).



The EU association of System Operators ENTSO-E Ten Year Network Development Plan (TYNDP) is developed every other year.

TYNDP 2022 identified 141 transmisión projects and 23 storage projects.

These projects receive priority administrative treatment and subsidies of different kinds.

How to make transmission attractive to private investment?

The **primary constraint on private investment** is not the lack of the availability of capital.

The key constraint is, rather, the ability to access that funding through market **regulations and project structures that provide the predictable operating conditions and revenue** that are fundamental to any commercial investment.

It is difficult to prioritise and justify transmission projects when **transmission costs are not clear and transparently allocated** within the sector.

And **this is exactly what is happening in Africa**, which is not learning from the successful experiences around the world, including in developing countries.

How can regulation help?

The challenge of power sector regulation

- The challenge (& the beauty) of power sector regulation resides in the necessary contribution of several activities with very different regulatory characterization & treatment
  - Centralised generation
  - **Transmission**
  - Distribution
  - Retail or commercialization
  - Distributed energy resources
  - System Operation
  - Market Operator (Power exchange)

Characterisation of the transmission activity

- The activity of transmission of electricity is an **infrastructure activity**
  - Deploy pylons, wires, insulators, breakers, transformers, substations, communications and protections.
  - Maintain & keep these assets in good operating condition most of the time, during their economic lifetime.
- And **nothing else**
  - **Secure and centralised operation of the power system is the responsibility of the System Operator**, not of the network owners.
  - There is **no reason to impede having multiple owners of transmission assets** in the same national transmission system.

Characterisation of the transmission activity

- The activity of transmission of electricity is a **natural monopoly**
  - Large economies of scale
  - Rights of way make very difficult to have multiple providers
  - Very large market power
  - Locational electricity prices are inadequate to cover the costs of transmission
- Therefore, **the transmission activity must be regulated as a natural monopoly, with remuneration based on the cost of service** *(or the outcome of an auction deciding who will build a new line or substation)*
  - Uniform annuities covering CAPEX & OPEX for the economic lifetime of the assets. Thus, a low risk, boooring activity, adequate to create an assets class, meant for patient, risk-averse investors like pension funds.

Is the current regulation of transmission helping?

Current transmission regulation creates unnecessary risks in transmission remuneration

- Regulation must try to **avoid unnecessary financial risks** *(which have negative consequences on the cost of capital)* to a natural monopoly activity like transmission, subject to regulation
  - The next slide offers a list of actions – mostly with origin in **flawed regulation** – that create unnecessary risk *(therefore perfectly avoidable)* in the remuneration of the distribution activity

Flawed regulation creates investment risks

These are frequent **unnecessary regulatory risks** in the remuneration method

- **Revenues that depend on transactions or volume of utilization**, instead of the actually incurred costs, or standards, or results of an auction
- **Regulatory updates of the historical rate base**, based on “replacement costs”, “market value”, or other creative methods
- **Failure in ring fencing the transmission revenue requirement** in the revenues obtained from the end customer tariffs
- **Flawed cost allocation methods** that lead to opposition to pay charges that are considered unfair
- **Frequent re-calculation of transmission charges** or changes in methodology
- Performance-based **incentives that go beyond the equipment failure**
- Uncertainty in remuneration **beyond the economic life** of the transmission asset

How to make transmission attractive to private investment?
Summary

- **Transmission must be treated as a regulated monopoly**, avoiding to introduce unnecessary risk for investors
- Do not make transmission remuneration depend on the volume of flows or of wheeling charges, **just use cost-of-service**
  - Cost-of-service could be competitively determined by an auction
  - Reduce other risks (e.g., rights-of-way acquisition) a priori by the government
  - Add availability incentives, but not others that are for the system operator
- The transmission cost is essentially a fixed cost. **Ring-fence the annuity** & recover it from the regulated end customer tariffs
  - Transmission owner must refinance the decoupling in time of debt service & regulated revenue requirement
- Establish **clear & stable transmission cost allocation rules**
  - This is particularly relevant for cross-border trade in regional markets

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Wrap-up
Open issues and key lessons learned

Ignacio Pérez-Arriaga
Interim Director of African School of Regulation & Florence School of Regulation, EUI
Institute for Research in Technology (IIT), Comillas University
Sloan School of Management, MITEI & CEEPR, MIT

Outline

- Confirmation of what we already know
- Review what experts have dared to say on days 1 & 2
- Then, why private investment is not happening?
- What are the consequences of ”seeing the light”?
- How to address the identified open issues / difficulties?

We have confirmed what we already knew…

We have confirmed that …

- **T is critical** for the power systems to perform well
- There is practically **no private investment in T** in Africa
- **Much more investment** is needed in **T** …

  most of which must be private investment
- Private investment needs **predictability** in that the **cost-of-service** *(including an attractive return on investment)* will be paid
  - This requires correct, transparent & stable regulation

During days 1 & 2, experts have dared to say that…

This is what experts said…

- The **ITP approach makes sense** & it seems the only reasonable way to go
  - for **critical projects**
  - for a gradual **piecemeal development** of an entire network
- Ryan's principles
  - IPT does not cause loss of **security** or control of the network
  - IPT can be implemented under **any regulation**
  - ITP is similar to well-known **IPP model**
  - **Predictable** revenues

Why is it not happening now?

It is not happening because…

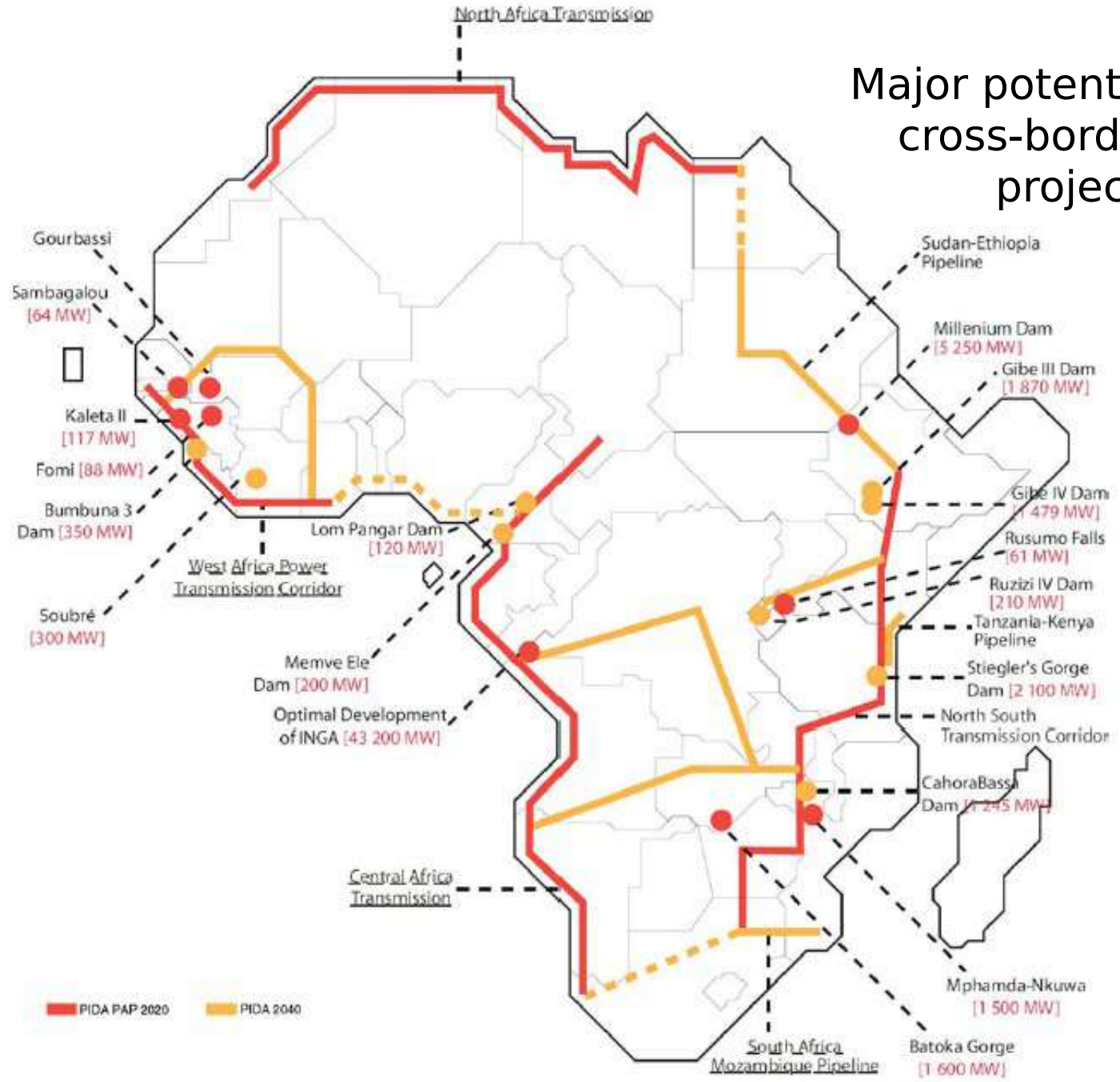
- … **decisionmakers** *(& their consultants)* **do not understand T**
  - They think that its nature is to buy & sell, being paid for how much **T** transports → mindset to be abolished
- In fact, **T consists in deploying long-lived infrastructure assets & keeping them in good operational condition**
  - **T is a natural monopoly** that must be regulated
- Once this is understood, **courage is needed** to change the mindset & face the consequences

What are the consequences of understanding T?

What to do with one or a few national T projects?

- **STEP1**. Define the physical asset that is needed
- **STEP2**. Define a long-term **T** service contract & conduct an auction *(in general better than a bilateral deal)* to find the firm offering the least annual revenue requirement for the contract duration
- **STEP3**. Give priority to the payment in STEP2 from the revenues collected in the tariff paid by end customers
  - Note that the cost of one T project adds a small fraction to the total T cost which is about 10% of the tariff.
  - The project does not need to be “viable”. Wrong mindset.
  - This is a measure of the commitment of the Government & regulator, with no impact on sovereign debt.

Major potential generation and cross-border transmission projects in Africa



Source: Figures sourced from African Development Bank (2013), Annex 1.

What to do with a cross-border T project?

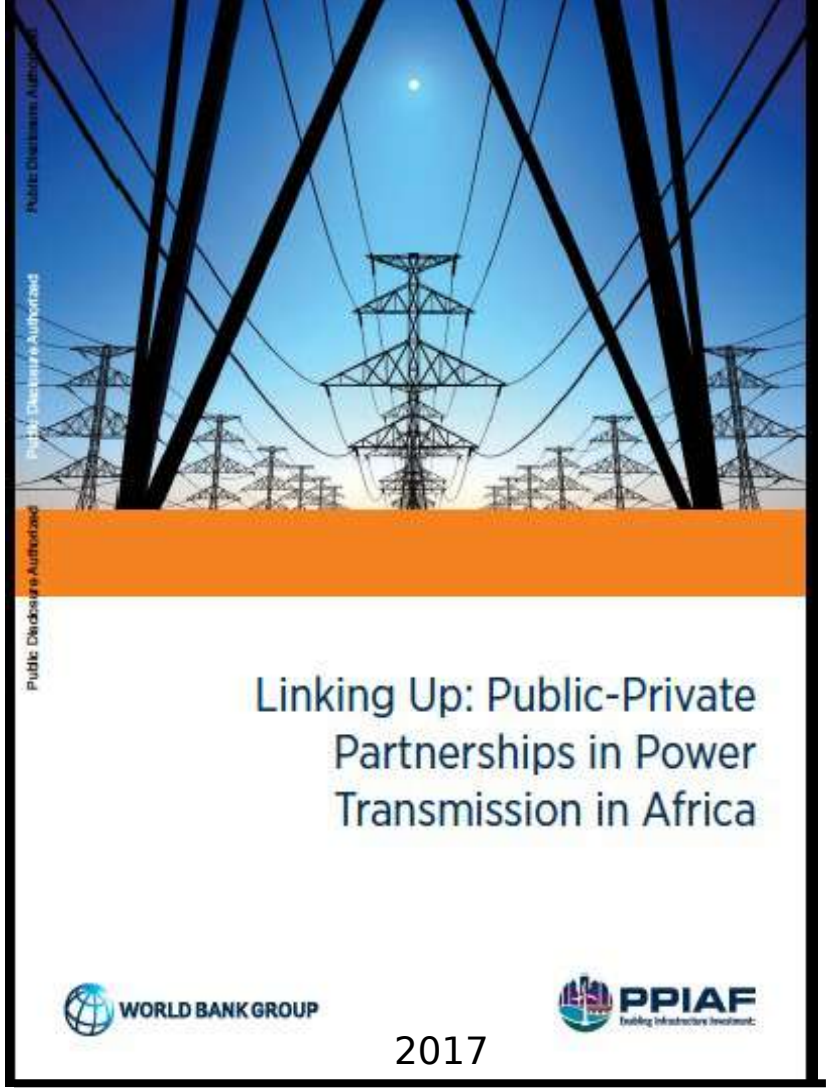
- **STEP1**. Define the physical asset that is needed
- **STEP2**. Define a long-term **T** service contract & conduct an auction *(in general better than a bilateral deal)* to find the firm offering the least annual revenue requirement for the contract duration
- (new) **STEP3**. Countries adopt a method (including negotiation) to split the annuity among them (e.g. 17% country A, 43% country B & 40% country C
- **STEP4**. In each country, give priority to the payment established in STEP3 from the revenues collected in the tariff paid by end customers in that country.
  - There is no need to harmonise the regulations of the countries.
  - This is a measure of the commitment of the Government & regulator of each country, with no impact on sovereign debt.

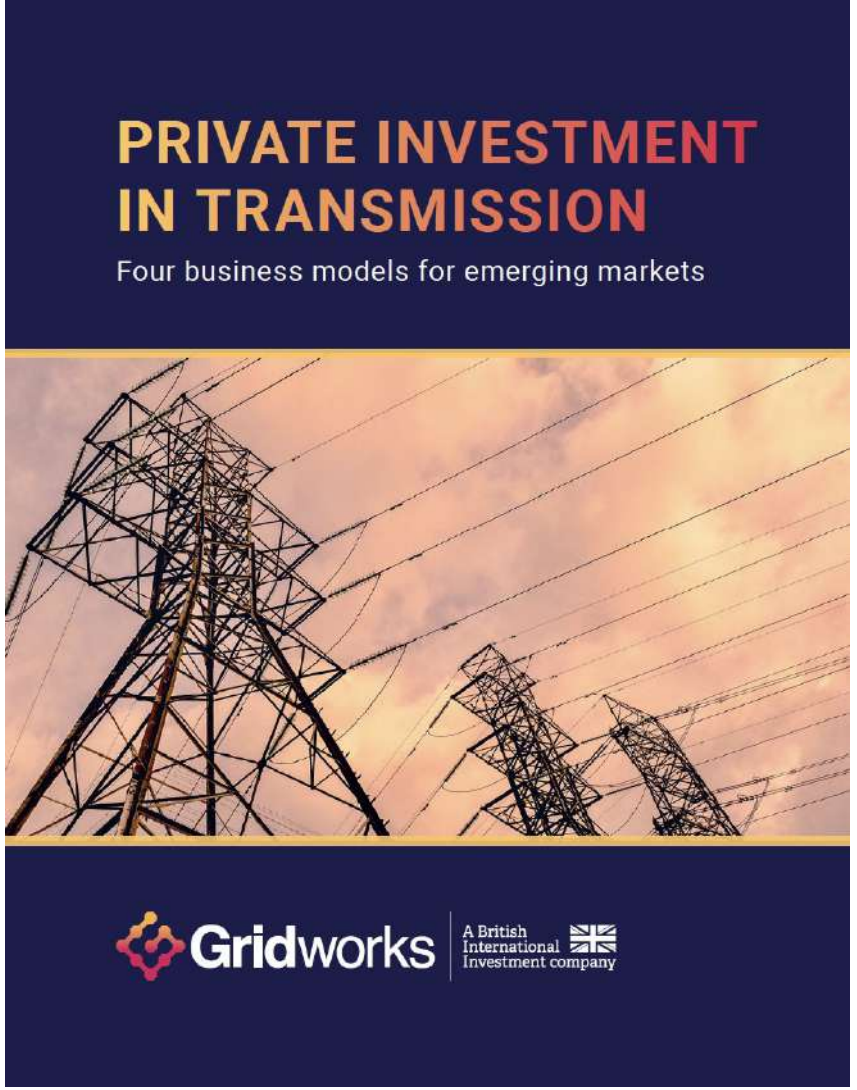
Some difficulties that were identified

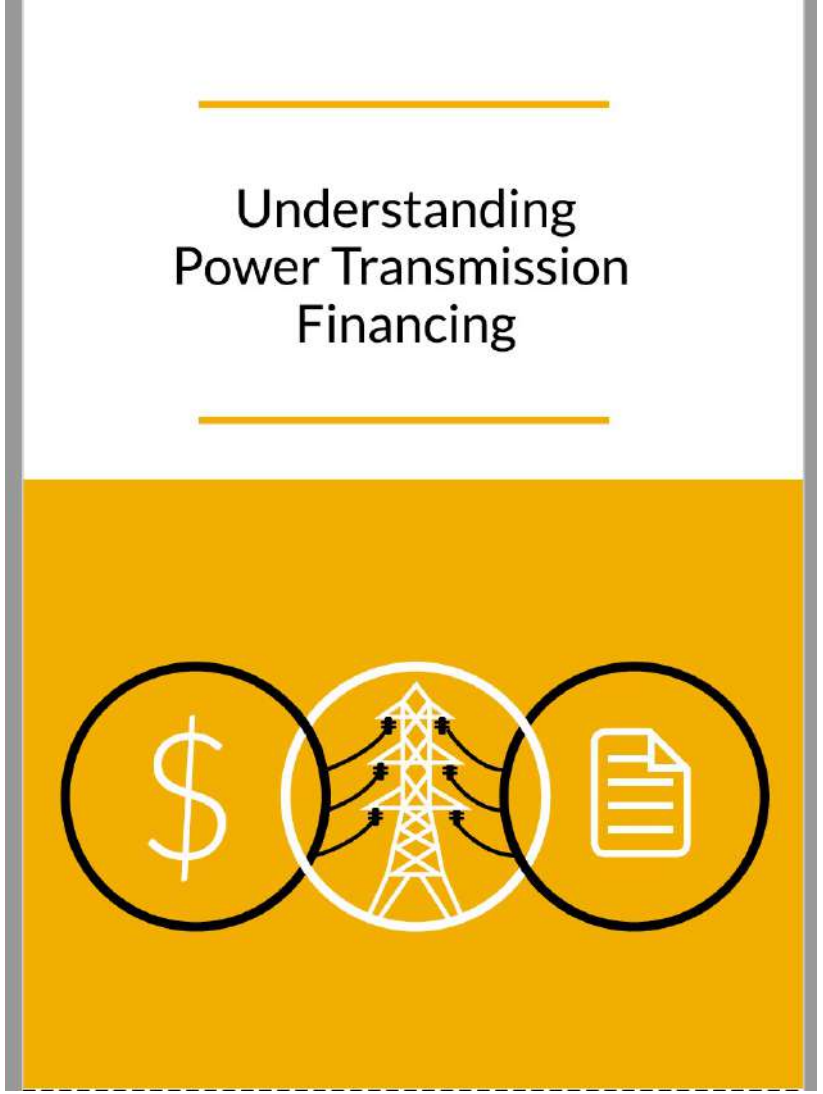
Can these difficulties be overcome?

- Guarantee that the necessary fraction of the revenues from end consumer tariffs will be **ringfenced** for this purpose.
- The organisation of the **auctions**, if adopted.
- Accounting for several non-trivial implementation topics that are common to all other approaches *(rights-of-way, environmental permits, etc.)*

And for details…







https://www.worldbank.org/en/topic/energy/publication/linking-up-public-private-partnerships-in-power-transmission-in-africa

https://gridworkspartners.com/wp-content/uploads/2023/05/Investment-in-Transmission-Gridworks.pdf

https://cldp.doc.gov/sites/default/files/2021-10/Understanding_Transmission_Financing.pdf

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