EASTERN AFRICA POWER POOL REGIONAL TRADE CONFERENCE
Mombasa, December 9-11, 2024

Private sector participation in (regional) transmission network development.

International experience from PPP in Transmission – What works, what doesn't?

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Some questions

- What prevents private investment in transmission in Africa when it is happening elsewhere, in developed and developing countries?
- Is private investment in transmission tantamount to privatisation?
- Are there operational or security of supply risks associated with private investment in transmission?
- Is the "wheeling mindset" appropriate for today's national and regional transmission networks and electricity trading?
- Can transmission investment be made a low-risk business, attractive even to pension funds?
- Is there a simple, well-proven approach to share the cost of cross-border transmission?

Outline

- Private investment in transmission in Africa
- Making transmission attractive to private investment
  - Can regulation help?
  - A mindset change: transmission as regulated infrastructure: The ITP business model
- Transmission cost allocation
  - At national level
  - At regional level
- In a nutshell

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The evidence is overwhelming: There is no private investment in transmission in Africa

(although some recent initiatives might start to change this)

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

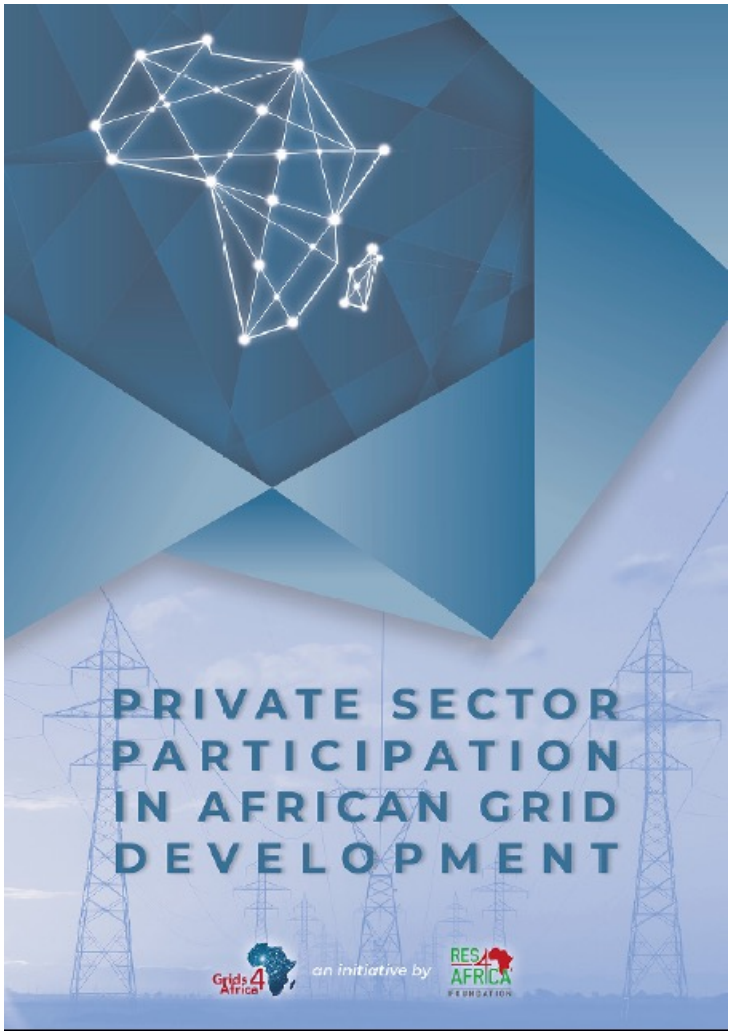
Africa has fewer **kilometres of transmission lines per person** than any other region in the world.

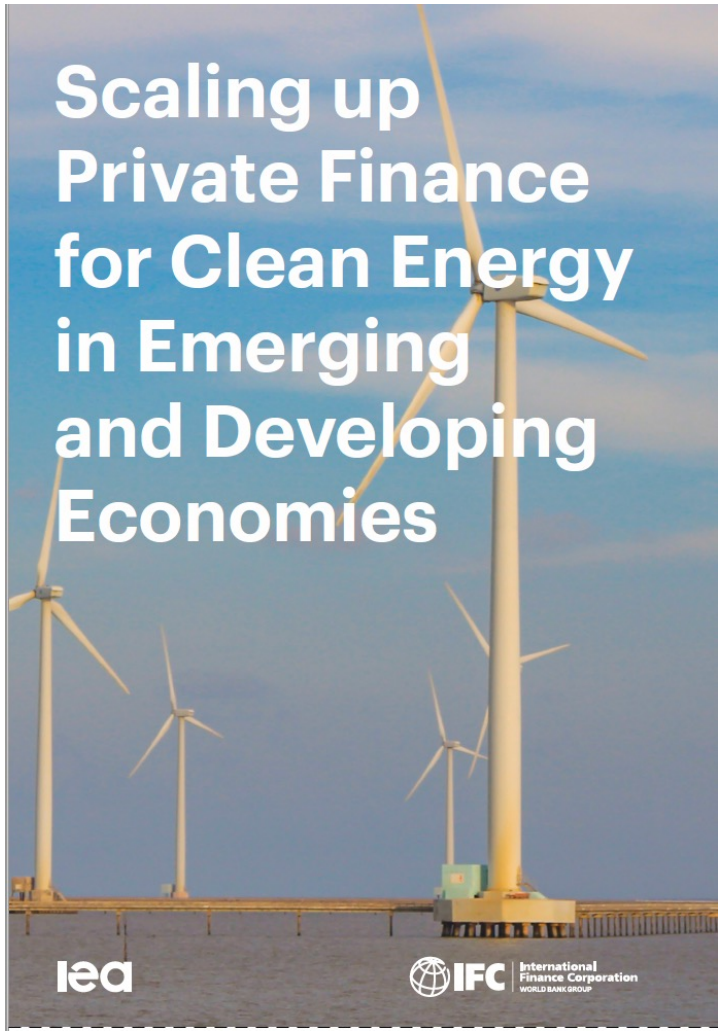
Historically, **grid projects in sub-Saharan Africa have been made by state-owned utilities**, mostly funded by governments through DFIs, and underwritten with **sovereign guarantees.**

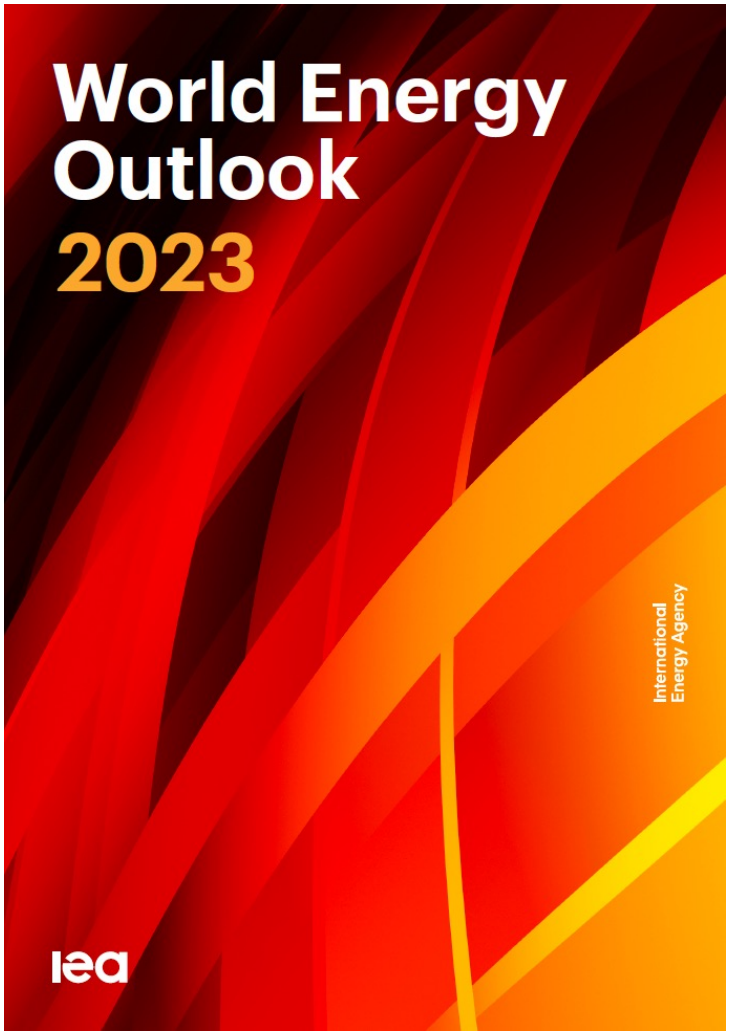
There is currently a **need for significant additional investment** in transmission on the African continent. This need is **unlikely to be met through the existing sources of funding** for the sector.

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

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







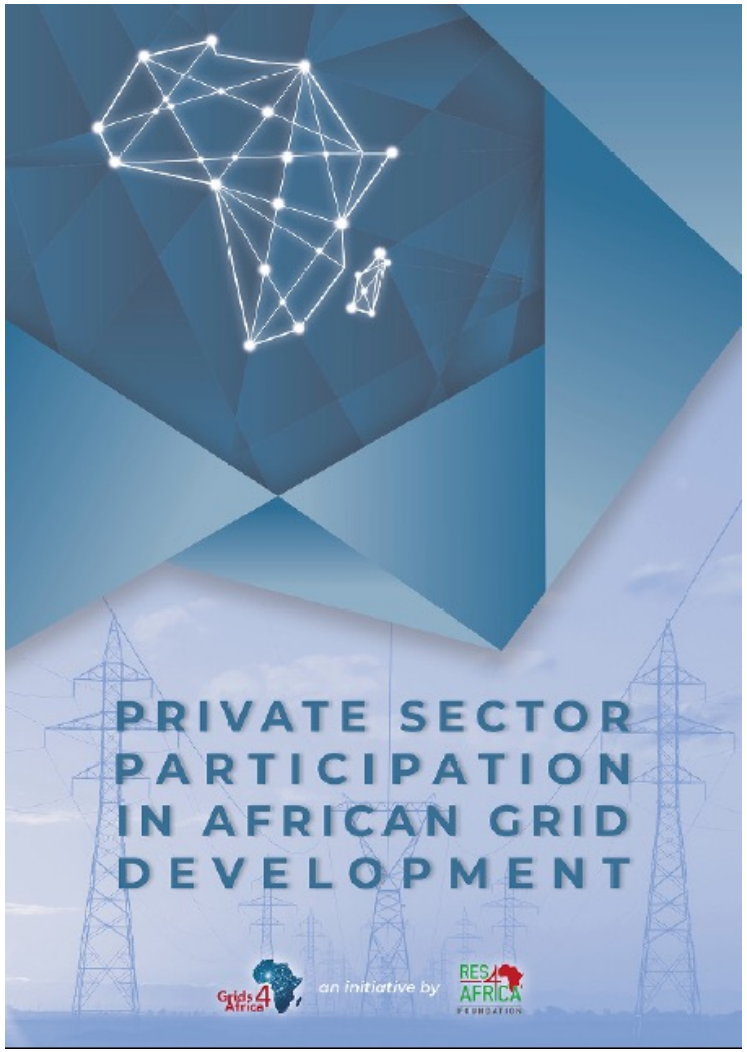
https://www.res4africa.org/calendar-news/79po1jnb8nbasjvf3s8x8bnogbhff4
https://www.iea.org/reports/scaling-up-private-finance-for-clean-energy-in-emerging-and-developing-economies
https://www.iea.org/reports/world-energy-outlook-2023

Transmission, which **contributes a relatively small part of the overall cost of the sector value chain**, needs to move in tandem with additions to generation capacity and demand growth.

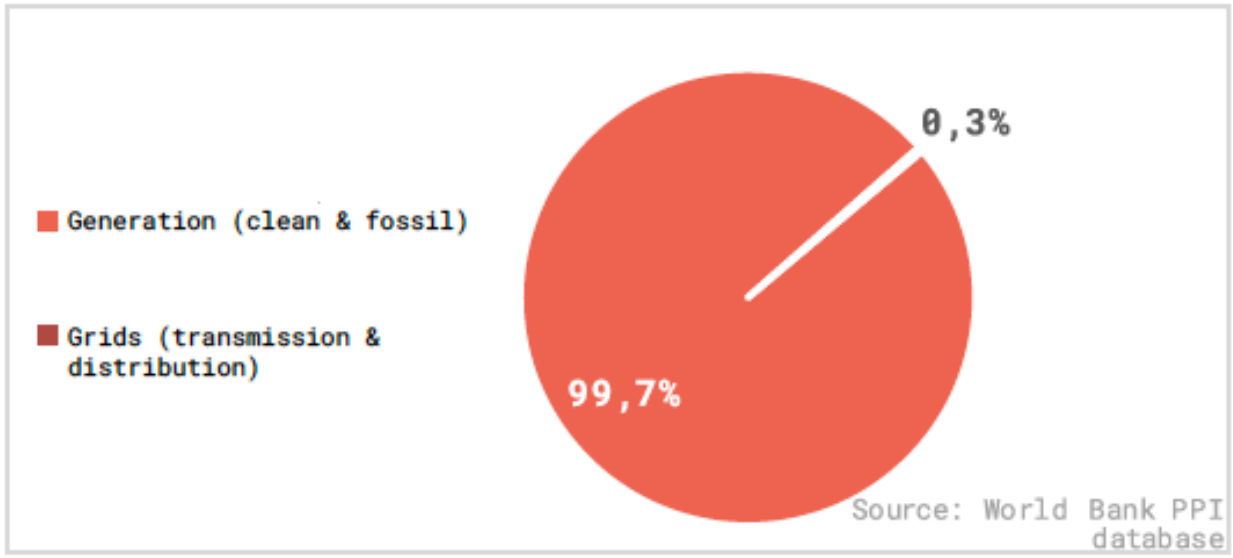
Transmission lines reduce overall costs by ensuring economies of scale in generation; creating access to cost-efficient sources of generation; reducing the reserves needed to ensure security of supply; and supporting the integration of renewables into the energy system.

Even so, transmission remains a **neglected** part of the sector value chain **by private investment**.

Presently almost all transmission investment in Africa is financed by state-owned enterprises.



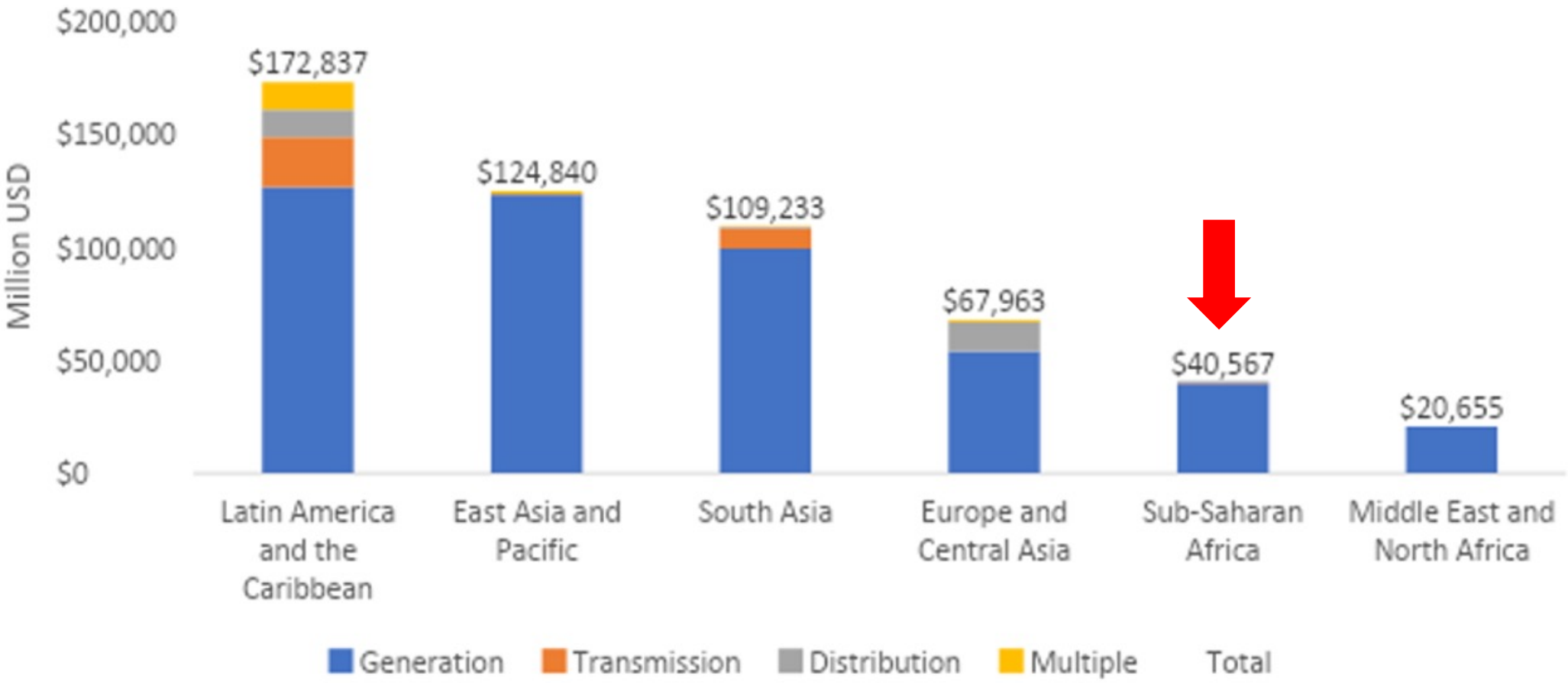
The percentage of private investment in African electricity networks is negligible



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

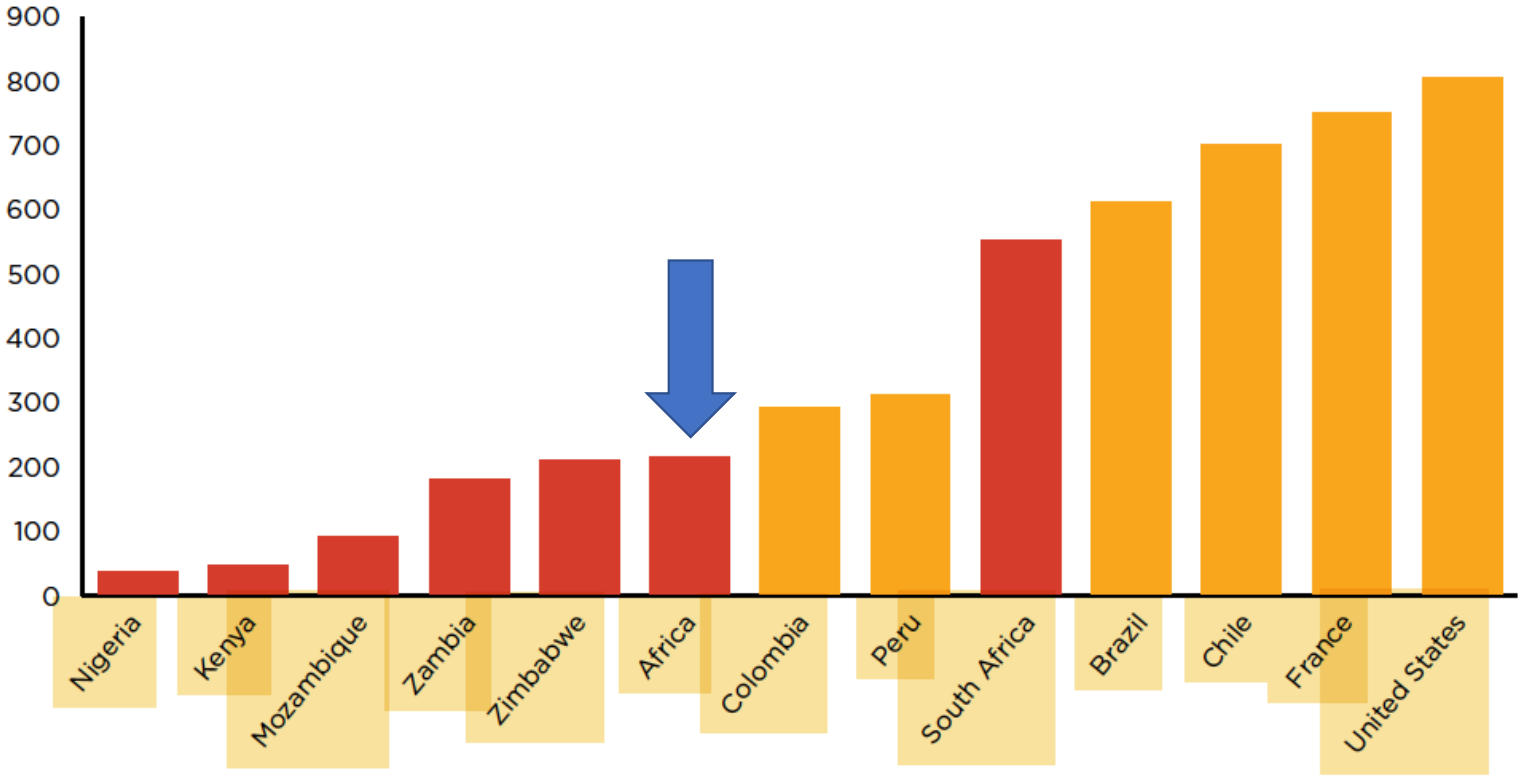
Almost no private capital has been invested in transmission 2010-2020



Slide provided by Chris Flavin, CEO, Gridworks

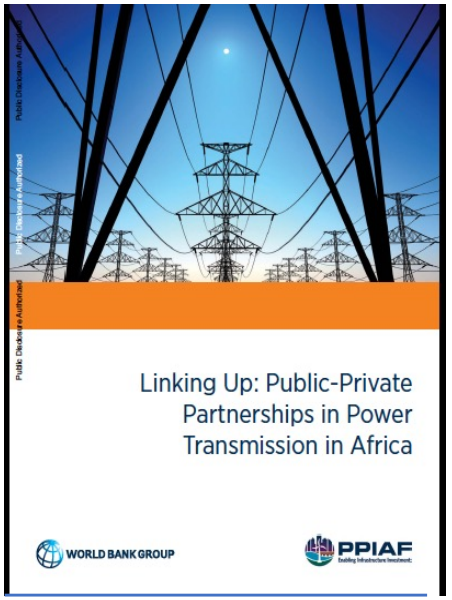
Transmission lines per capita

(kilometers of transmission lines per million people, data accessed in 2016)



Source: Castalia. Data sourced from Trimble, C. et al., "T&D Data—State-owned national grid T&D data," 2016, http://data.worldbank.org/data-catalog/affordable-viable-power-for-africa (accessed October 30, 2016); Rafael Ferreira, "Private Participation in Transmission Expansion: the Brazilian Model", Presentation from consultation workshop, Nairobi, Kenya, September 26, 2016.

The label "Africa" corresponds to "sub-Saharan Africa minus South Africa"



Why Is the Scaling Up of Private Investment in Transmission Necessary in Africa?

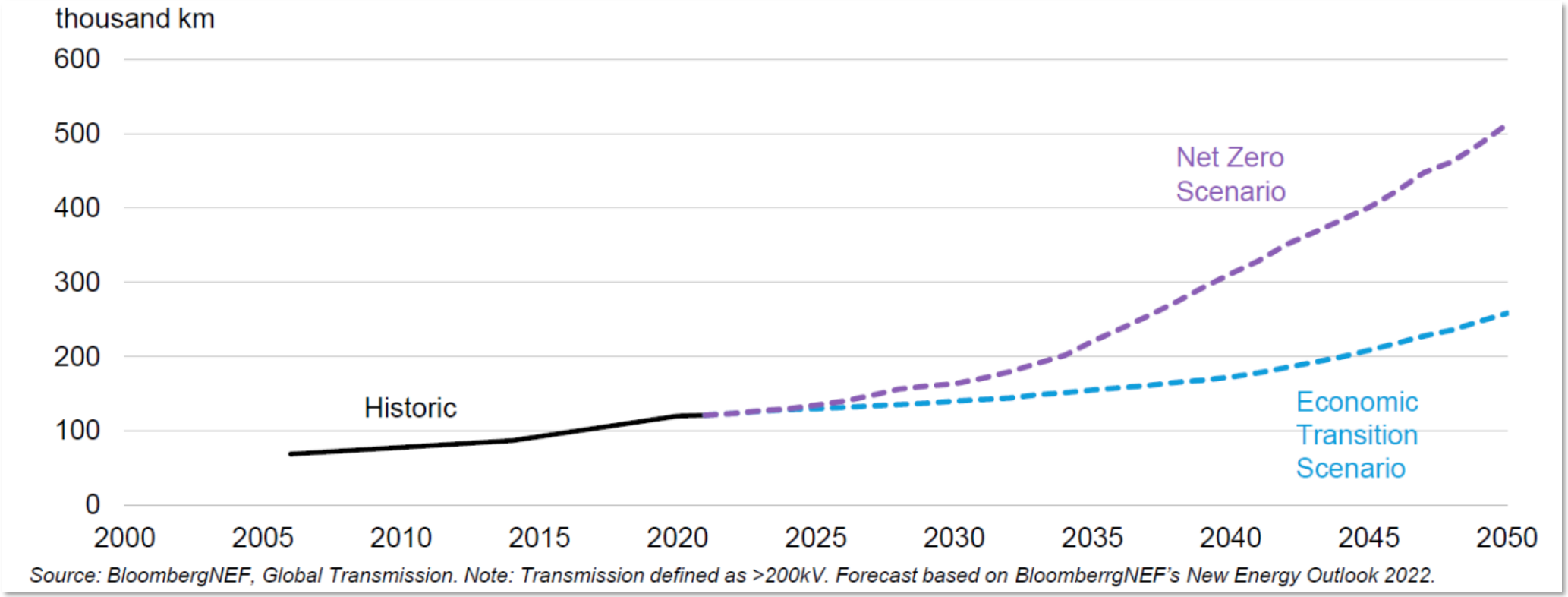
Of 38 countries, 9 have no transmission lines above 100 kV. **The combined length of transmission in 38 countries in Africa is 112,196 km**. The country of Brazil has a longer transmission network than Africa, at 125,640 km, and, at 257,000 km, the United States of America (United States) has more than twice the length of the African transmission network. Despite its large land mass, Africa also has fewer kilometers of transmission lines per capita than other regions.

The length of transmission lines in Africa is 220 km per million people (excluding South Africa). In contrast, Colombia has 295km of transmission lines per million people, Peru has 339km, Brazil has 610km, Chile has 694km, and the United States has 807km.

Building more transmission lines and upgrading transmission capacity will be an essential part of the overall expansion of the electricity sector

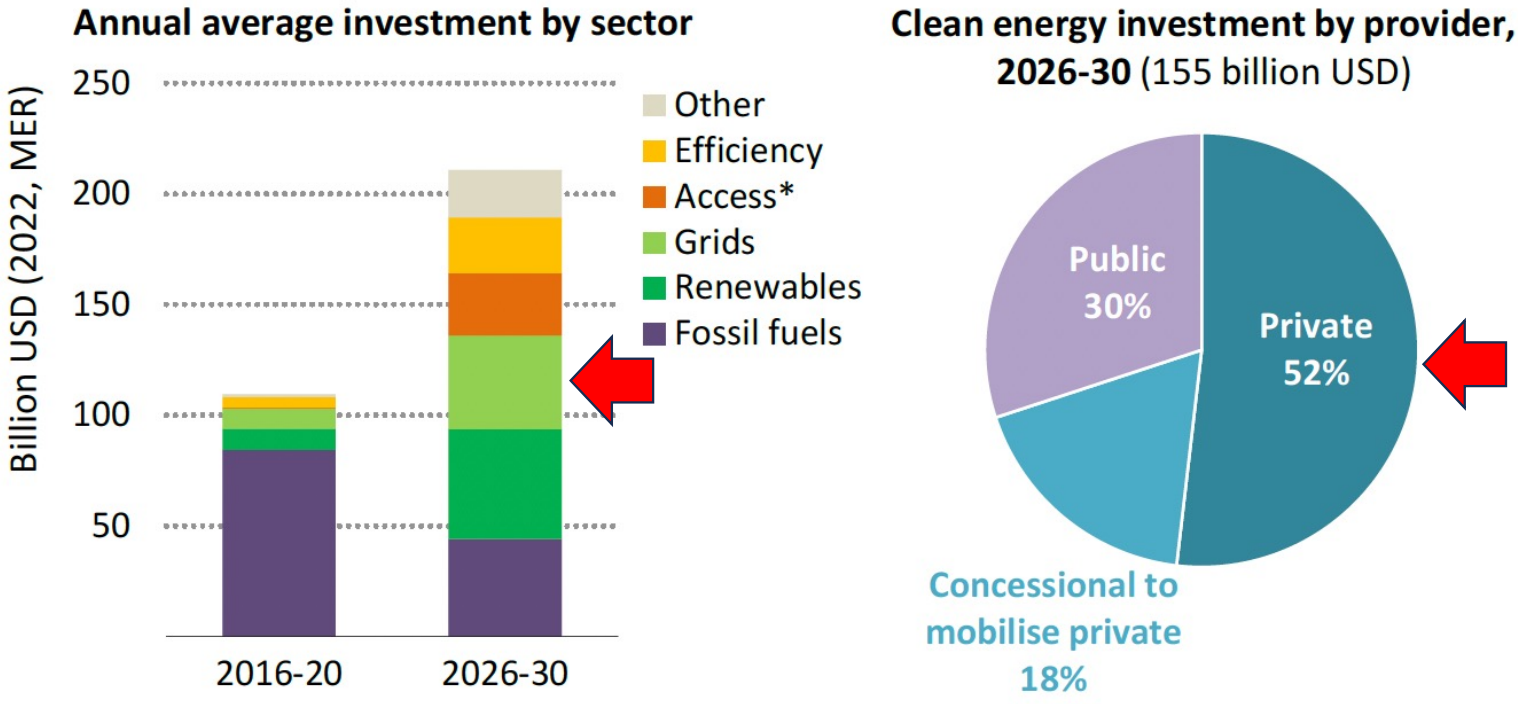
https://www.worldbank.org/en/topic/energy/publication/linking-up-public-private-partnerships-in-power-transmission-in-africa

Africa's transmission grids need to grow four-fold to achieve net zero by 2050



Slide provided by Chris Flavin Interim co-CEO, Gridworks

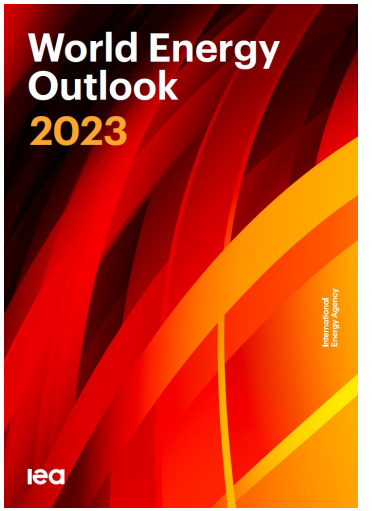
Figure 5.12 ▷ Investment needs to meet Africa's sustainable goals by 2030



Energy investment needs to double to achieve energy and climate goals, with concessional capital reaching USD 28 billion each year by the end of this decade

* Access includes investment related to fossil fuel sources.

Note: MER = market exchange rate; Other = low-emissions fuels, nuclear, battery storage, fossil fuel power with CCUS, and non-efficiency investment in the buildings, industry and transport sectors.



Meeting Africa's rising energy demand, providing universal access to modern energy by 2030 & achieving energy & climate goals means more than doubling energy investment this decade. This requires over $200 billion per year from 2026 to 2030, **of which almost $50 billion per year are for transmission & distribution networks.**

IEA 2023 WEO, Chapter 5.5

Resorting to private investment is inevitable, because massive investment is needed & public finance cannot do the job

Financing transmission projects

- **Public finance** is relatively scarce in fiscally constrained environments
  - The opportunity cost of public capital in the power sector can be high, especially in countries facing demands to address other socioeconomic deficits.
- **Project finance** can allow state-owned utilities to raise additional capital that would otherwise be unavailable, by separating out a portion of cash flows related to specific transmission investments.

Financing infrastructure projects

African governments cannot provide funds for the utilities to reach financial viability. Governments are constrained by fiscal limitations originating outside the power sector, and market perceptions based on their overall fiscal position and on aggregate indicators, such as the ratio of annual deficits or total debt to GDP. This means that they may not be able to borrow to invest, even on financially viable projects that could eventually improve their fiscal position.

On top of this, as shown by the 2016 WB study “Making Power Affordable for Africa and Viable for Its Utilities”, the immense majority of African distribution utilities have a systematic deficit of revenues over costs, which would persist even in efficiency was improved.

A greater role of private finance could help ease the financing constraints and overcome the transmission deficit.

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

Financing transmission projects

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Project finance can allow state-owned utilities to raise additional capital that would otherwise be unavailable, by separating out a portion of cash flows related to particular investments.

Under a project finance structure, the government's guarantee on payment does not make the fiscal position worse. Rather, **it ensures that a small increase in electricity tariffs intended to pay for a financially viable project will be truly dedicated to that** and will not be used for other debt services or expenditures. **Private finance allows the state-owned utility, or the government, to pay competitive and cost-reflective transmission prices.**

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

Financing transmission projects

Private involvement can also bring managerial skills, technical knowhow, and performance incentives.

Tenders to finance transmission investments will attract international bidders.

Private investments can also bring stronger accountability. The contract between the government and the private company will include performance obligations.

African countries would benefit from introducing at least some degree of private finance in the transmission sector, following their successful experience attracting private investment in generation.

Given these conditions, utilities in Africa are already looking to the private sector to finance transmission investments. See the example of Ketraco (Kenya)

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

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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.

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

How can regulation help?
First, we must understand transmission from a regulatory perspective

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.

Characterisation of the transmission activity
Summary

- Transmission of electricity is an **infrastructure activity**, NOT a commercial activity which buys energy cheap & sells it expensive.
- Transmission of electricity is a **natural monopoly** that must be regulated as such, centrally planned & with remuneration based on its efficient **cost of service.**
- 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.

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
  - Frequent **flawed regulatory interventions** (see next slide) create **unnecessary risk** *(therefore perfectly avoidable)* in the **remuneration** of the transmission activity.

REPUBLIC OF SOUTH AFRICA

ELECTRICITY REGULATION AMENDMENT BILL

(4D) Transmission and distribution licensees shall procure the energy they use to cover energy losses and reserve capacity in their system according to transparent, non-discriminatory and market-based procedures.

Flawed regulation creates investment risks

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

- **Revenues of transmission assets that depend on their 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.
- **Flawed transmission cost allocation methods** (i.e., design of transmission charges) 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.
- **Failure in ring fencing the transmission revenue requirement** in the revenues obtained from the end customer tariffs.

How to make transmission attractive to private investment?

How to make transmission attractive to private investment?

Transmission must be treated as a regulated monopoly, **avoiding to introduce unnecessary risks for investors**. Thus:

- Once transmission has been centrally planned and built, **the "viability" of the project is not questioned.**
  - Do not make transmission **remuneration** depend on the volume of flows or of wheeling charges, **just use cost-of-service.**
- The transmission cost is essentially a fixed cost. **Ring-fence the annuity** & recover it with priority from the regulated end customer tariffs.
  - Note that a few ITP projects add a small fraction to the total transmission cost, which is typically about 10% of the tariff. And they are meant to reduce total costs.
  - **No impact on sovereign debt** if ringfencing is secure in tariff design.

How to make transmission attractive to private investment?

(continuation)

- Establish **clear & stable transmission cost allocation rules, i.e., charges.**
  - This is particularly relevant for cross-border trade in **regional markets.**
- Governmental ITP Office *(with new mindset for transmission)* must get ready **licensing**, **environmental permits** & **rights of way**, **in advance.**
- **Some risks remain** with the ITP developer:
  - The winner of the tender must reach **financial closure** with financiers & later **refinance** the project once line is ready to enter in operation.
  - **Construction delays** & service **failures.**

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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

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

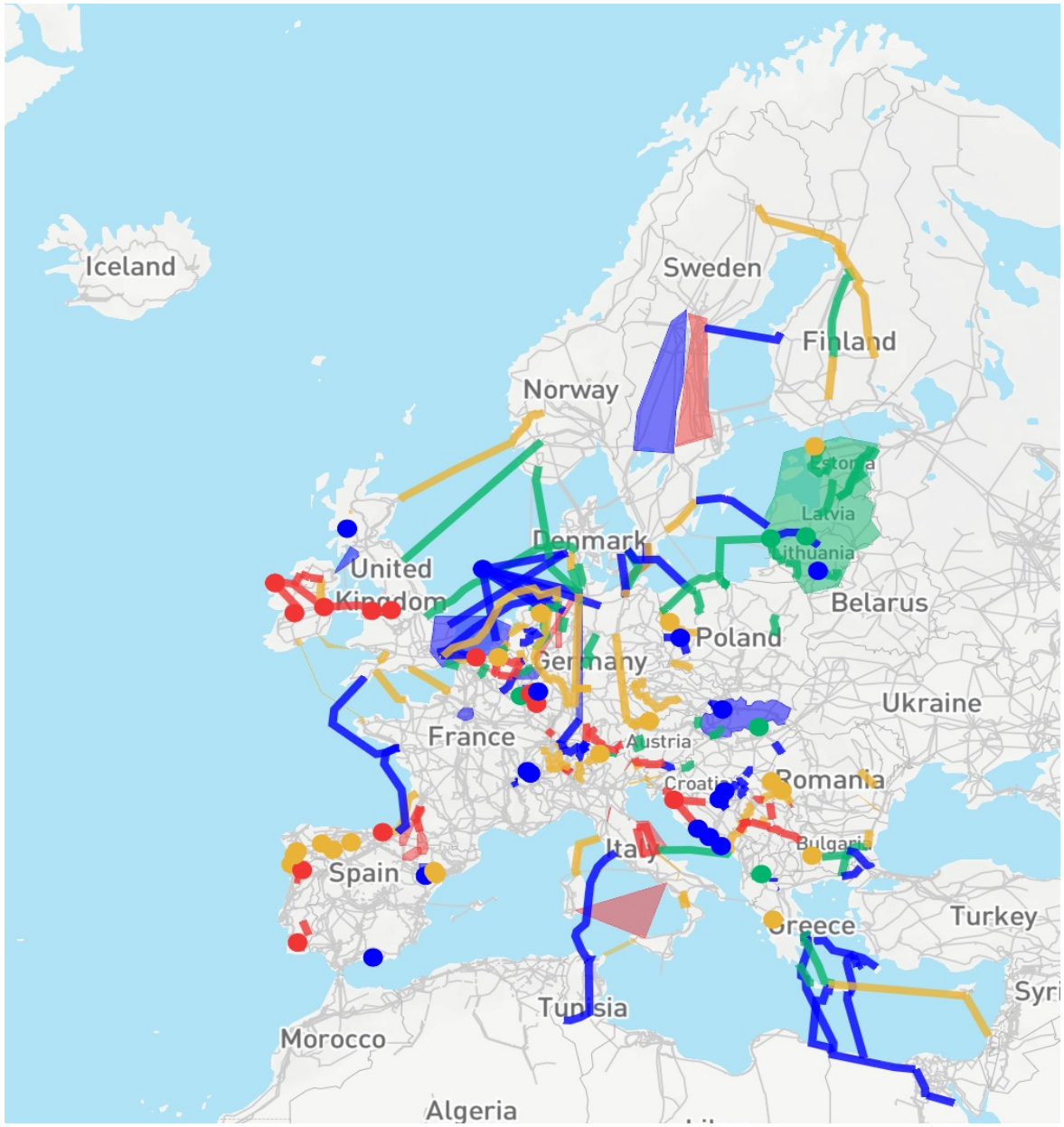
2. **Whole-of-grid concessions** provide *similar rights and responsibilities to privatizations, but for a shorter period*. In most cases, the government implements this business model with a *competitive tender of the concession* and enters a concession contract with the winning bidder.

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 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 & to reinforce the networks piecemeal



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

TYNDP 2022 identified 141 transmission projects and 23 storage projects.

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

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.

KETRACO

Kenya Electricity Transmission Company Limited

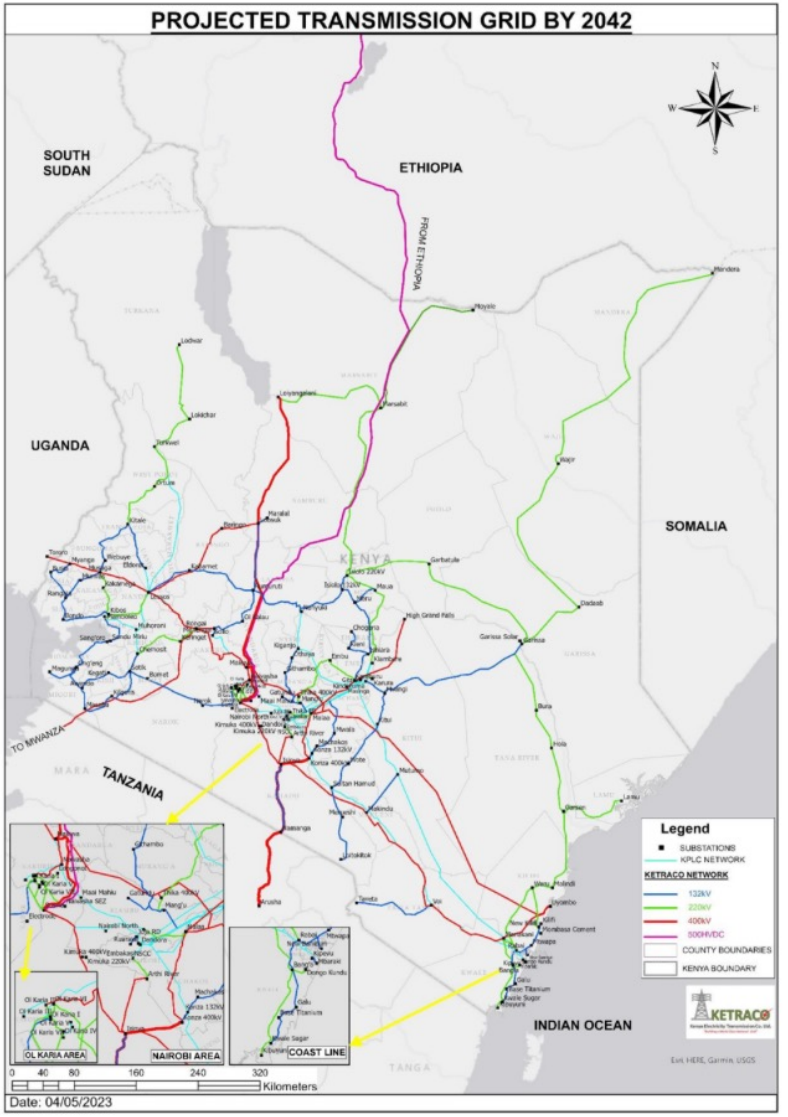
"Building a World Class National Grid"

Transmission Master Plan 2023-2042

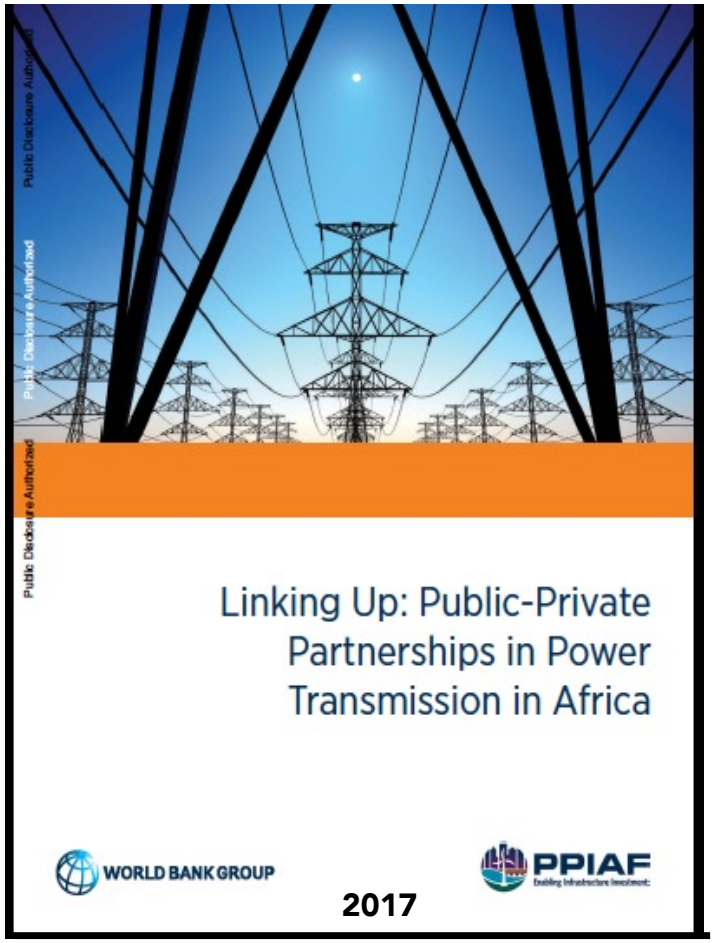
VOLUME I

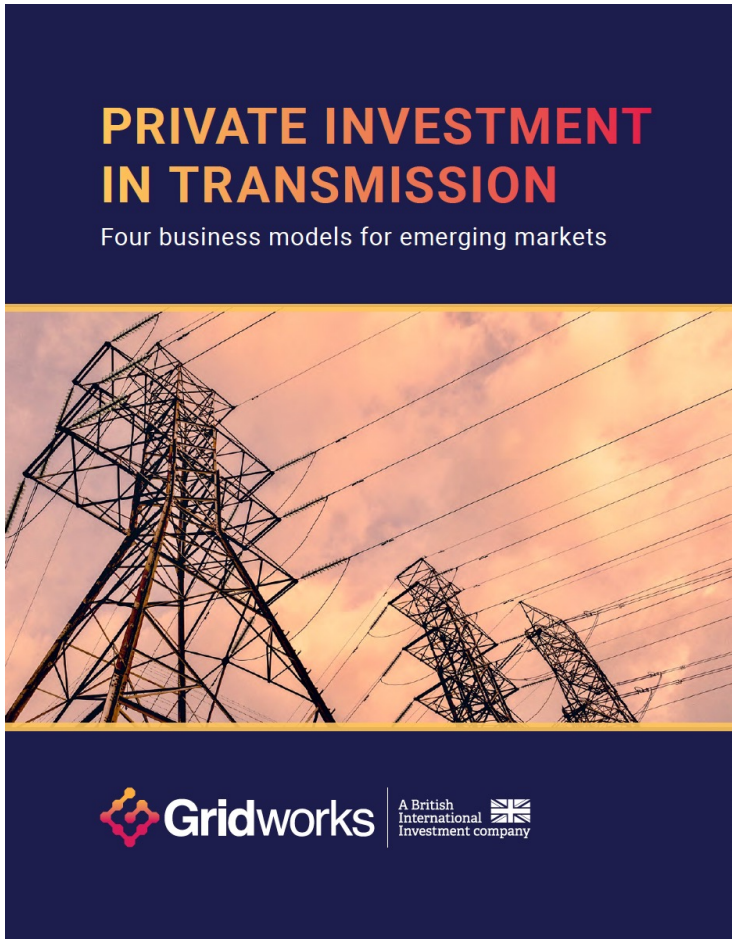
31st May 2023

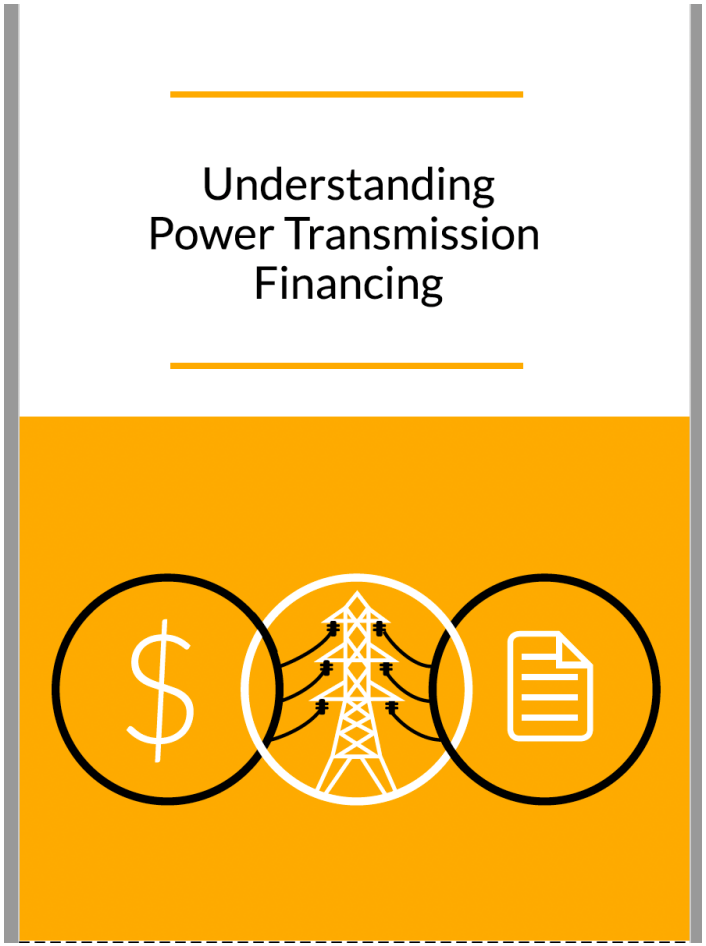
PROJECTED TRANSMISSION GRID BY 2042



The Independent Transmission Project (ITP) model is adequate for this purpose & is totally aligned with the correct regulatory characterisation of transmission just presented







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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

The Independent Transmission Project (ITP) model

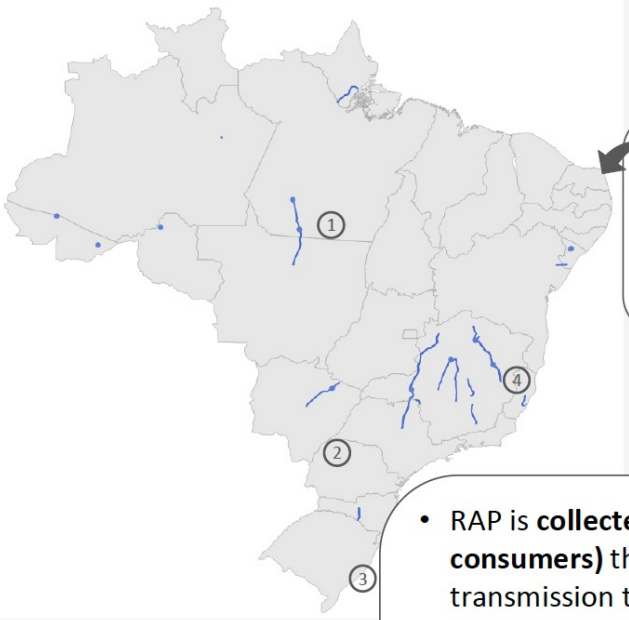
- The **ITP** involves the construction and maintenance of **a single transmission line or a package** of transmission lines **under a long-term contract**, generally between the state-owned utility that is responsible for transmission and the (private) project company that is established to undertake the project.

Let's see how it is done in Brazil

In the last 16 years, approximately 86,000 km of high-voltage lines have been auctioned (~ USD 40 billion in new investments)

This is one among many successful experiences in emerging economies & developing countries (other Latin American countries, India)

Transmission auctions as a low-risk business model: long-term concessions awarded through public auctions based on a revenue cap model



- EPE plans the expansion of the grid according to system needs.
- The (new) assets needed are divided into lots and put up for auction.

- Players compete for an annual revenue stream (RAP[1]) granted to build, maintain an operate the assets.
- ANEEL sets the auction's **cap for RAP**
- Whoever offers the **smallest** RAP, wins the right to develop the projects and becomes a "Transco"

- **30-year concession** contracts are awarded.
- Transco commit to **build, maintain and operate** the assets.
- In return, they are paid a **fixed revenue stream**, starting at the asset's COD, is **adjusted for inflation** on a yearly basis, and **revised every 5 years**[2].
- Revenues are independent from the actual power flow trough the facilities (**there is no volume risk**).
- Outage events can temporarily reduce the RAP (**penalty for unavailability**).

- RAP is **collected from all grid users (generators & consumers)** through a charge known as the transmission tariff (**TUST**).
- **Credit risk is negligible** due to diversification.
- ANEEL may (unilaterally) require that certain **improvements or reinforcements** are implemented, in which case it will grant an additional RAP.
- At the **end of the concession, assets are reverted** to the State but can also be renewed by ANEEL.

[1] RAP stands for Annual Allowed Revenue (*Receita Anual Permitida*, in Portuguese).
[2] Revisions, which consist in updating the regulatory cost of debt and operating & maintenance costs, are intended to share potential gains derived from technological improvements or better macroeconomic conditions with the public.

Slide borrowed from Luiz Barroso, PSR

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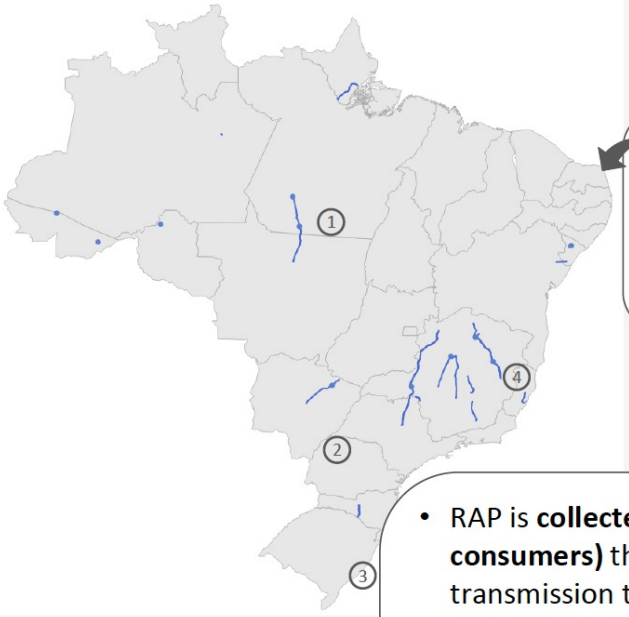

STEP #1

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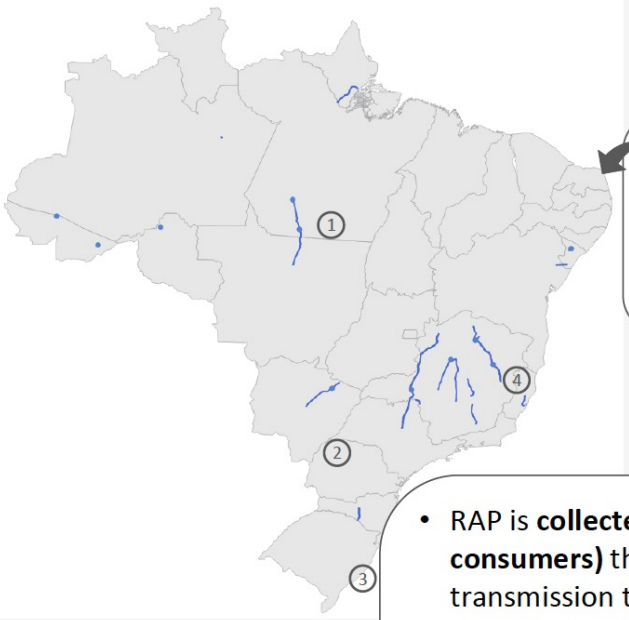
- EPE plans the expansion of the grid according to system needs.
- The (new) assets needed are divided into lots and put up for auction.

Transmission auctions as a low-risk business model: long-term concessions awarded through public auctions based on a revenue cap model



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STEP #2

- Players compete for an annual revenue stream (RAP[1]) granted to build, maintain an operate the assets.
- ANEEL sets the auction's **cap for RAP**
- Whoever offers the **smallest** RAP, wins the right to develop the projects and becomes a "Transco"

- **30-year concession** contracts are awarded.
- Transco commit to **build, maintain and operate** the assets.
- In return, they are paid a **fixed revenue stream**, starting at the asset's COD, is **adjusted for inflation** on a yearly basis, and **revised every 5 years**[2].
- Revenues are independent from the actual power flow trough the facilities (**there is no volume risk**).
- Outage events can temporarily reduce the RAP (**penalty for unavailability**).

- RAP is **collected from all grid users (generators & consumers)** through a charge known as the transmission tariff (**TUST**).
- **Credit risk is negligible** due to diversification.
- ANEEL may (unilaterally) require that certain **improvements or reinforcements** are implemented, in which case it will grant an additional RAP.
- At the **end of the concession, assets are reverted** to the State but can also be renewed by ANEEL.

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[2] Revisions, which consist in updating the regulatory cost of debt and operating & maintenance costs, are intended to share potential gains derived from technological improvements or better macroeconomic conditions with the public.

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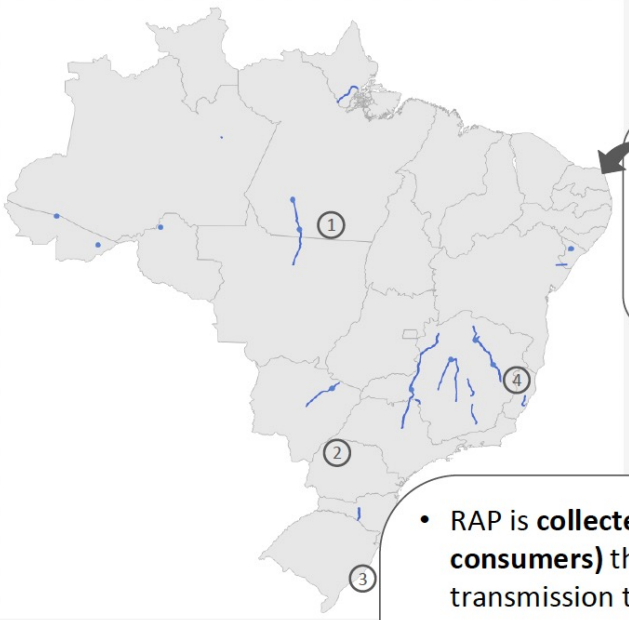

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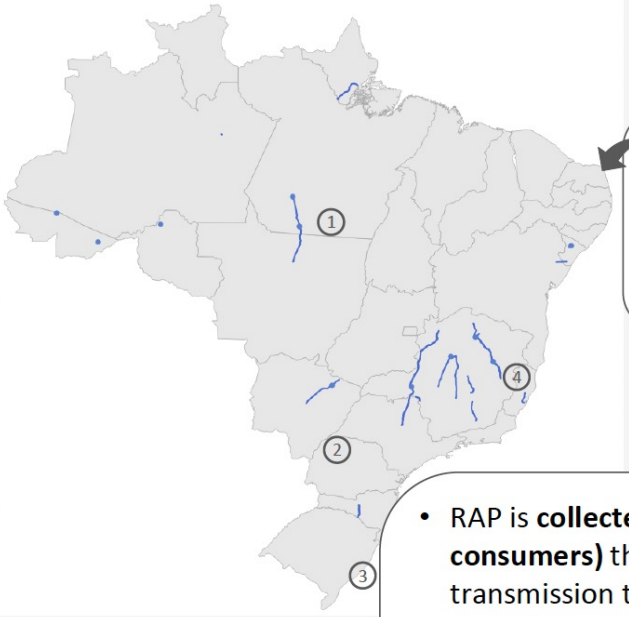

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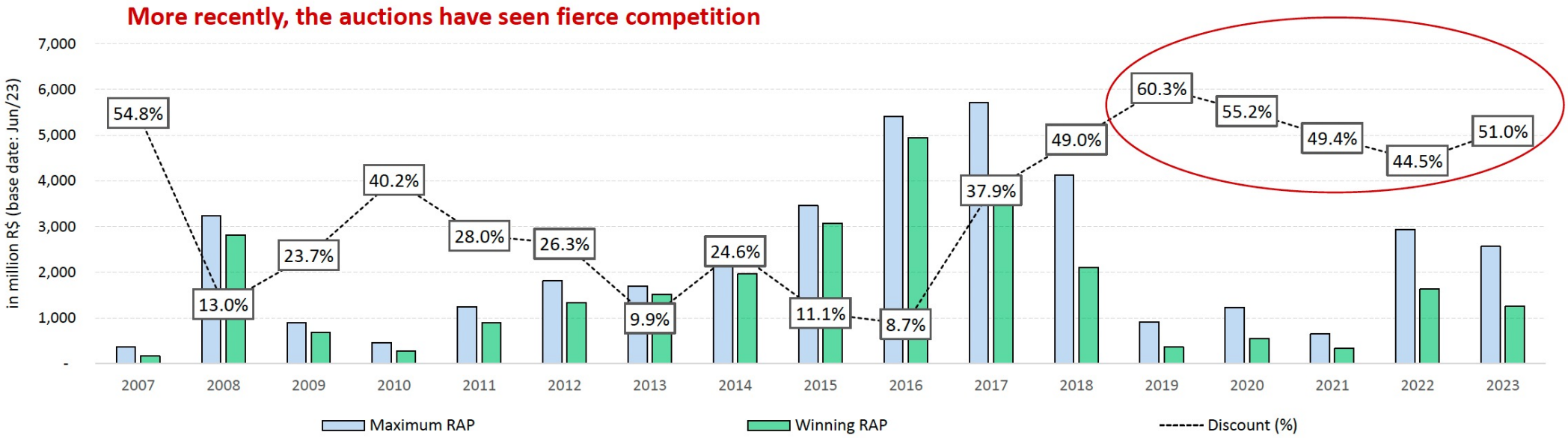

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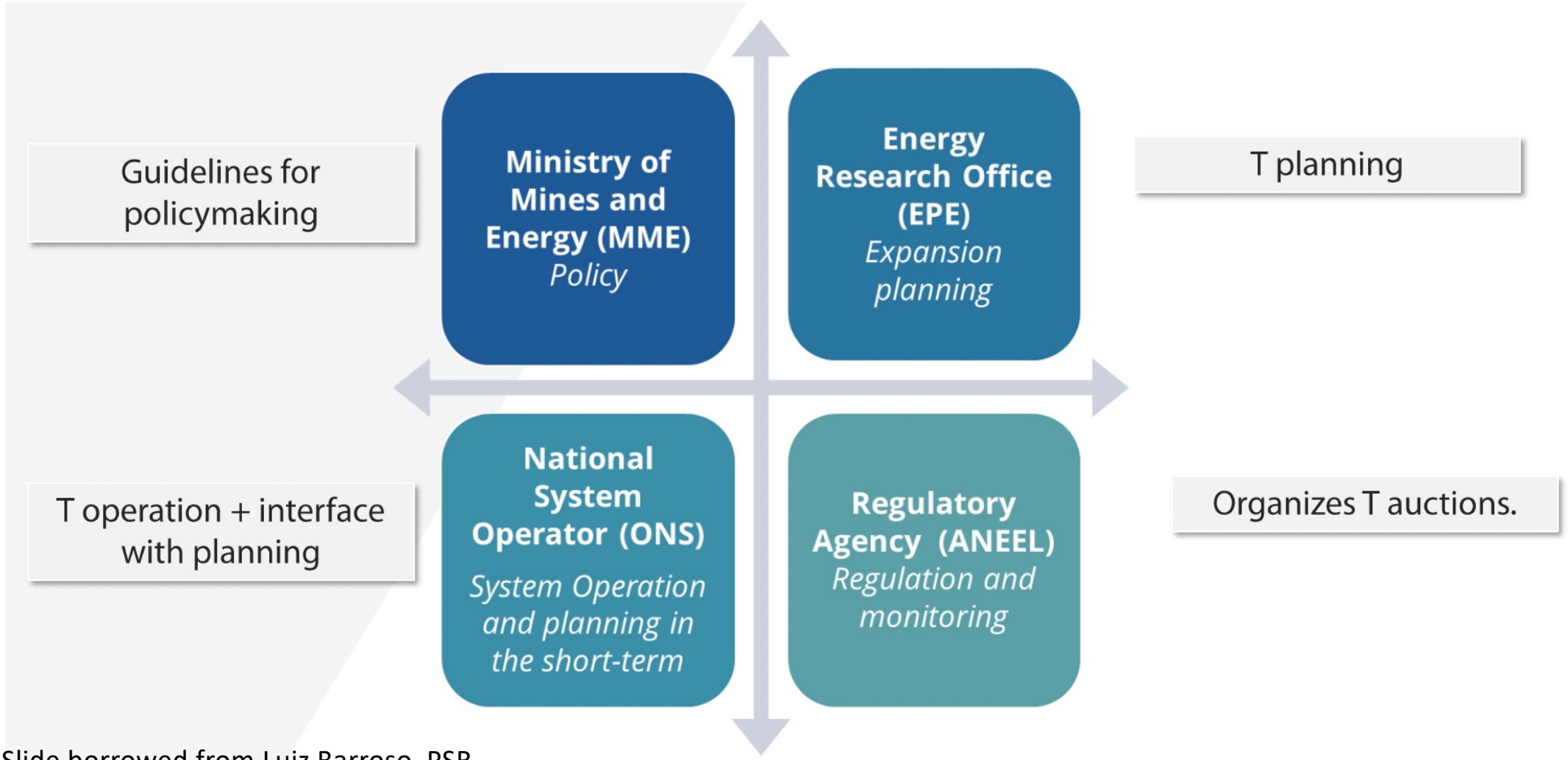
The institutional framework (Brazil)



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Some common questions (Borrowed from the Brazil's experience case)

1 How do you guarantee that the annuity of the remuneration to the private investor will be guaranteed with a low risk?

There is a system of guarantees (escrow accounts, etc.) that ensures the bankability of payments. The system has never had a default since the implementation of the business model. Financing has come from private lenders, debenture holders and transmission companies have been listed in the stock exchange.

2 Does the fact that some transmission infrastructure is privately owned represent a security risk for the power system?

No. The system operator dispatches generation and transmission resources independently of ownership.

3 Has private participation in transmission made transmission more expensive than paying for it with public funds?

No. Auctions have been competitive, financing has come from public and private lenders, and public funds, instead, have been destinated to other uses.

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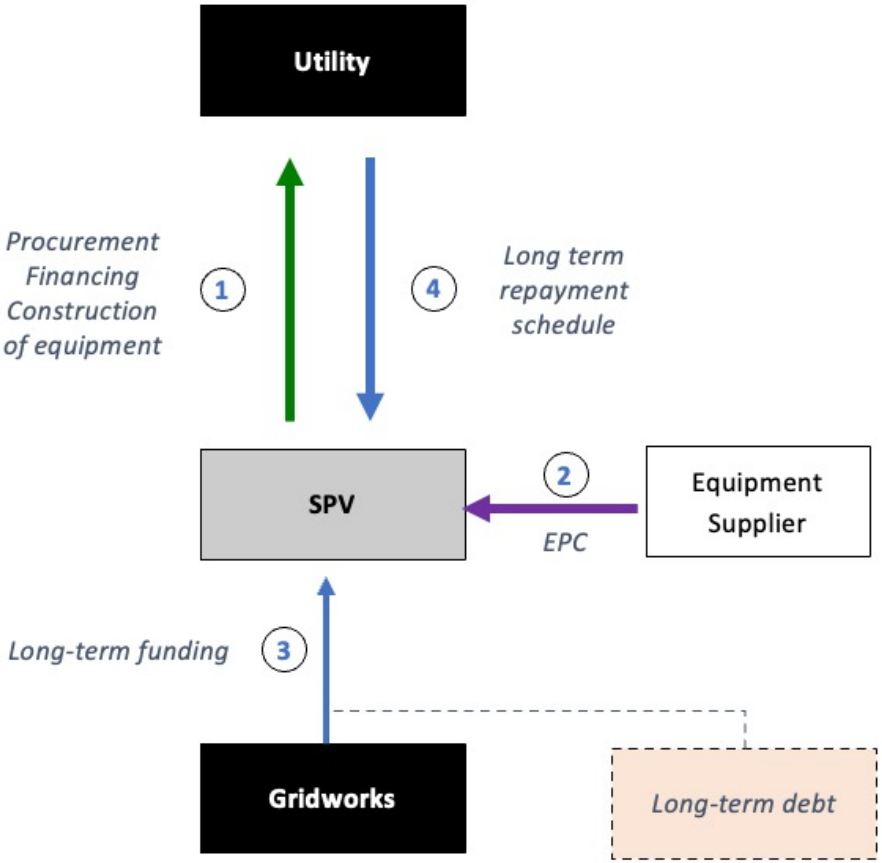
Further considerations on the ITP model

Typical ITP structure



1. *Utility selects developer for ITP*
2. The SPV will sign an **EPC contract** with for the procurement and construction of the assets.
3. The SPV will provide appropriately ***priced long-term financing***.
4. *Utility pays for use of the infrastructure over the long-term under a **Transmission Services Agreement***
5. *Government provides a backstop or guarantee to cover the utility's obligations*

Slide provided by Chris Flavin Interim co-CEO, Gridworks

Procurement process
What does the government need to do?

- **If tendered:** perform relevant studies, invite bidders, manage the process, and provide clear approval process and conditions for implementation.
- **If not tendered:** negotiate terms with relevant developer(s) who would need to identify contractors, perform studies, and raise funding.

Slide provided by Chris Flavin Interim co-CEO, Gridworks

Financial risk allocation

In principle similar to an IPP project. See “Private investment in transmission”, Hunton Andrew Kurth & Gridworks for a detailed analysis: https://gridworkspartners.com/wp-content/uploads/2023/05/Investment-in-Transmission-Gridworks.pdf

Risk	Who bears the risk?	Comments
Financial		
Demand risk	State owned transmission company, Consumers	Demand risk is effectively allocated to the state owned transmission company through the use of an availability payment. In a well-regulated sector, the demand risk would be re-allocated to consumers by the tariff methodology that is used to regulate the state owned transmission company or to establish the rates paid by consumers.
Credit risk	Host government	Unless a state owned transmission company has an investment grade credit rating – which is highly unusual in emerging markets – some form of credit support for the payment obligations of the state owned transmission utility will be necessary. This may take the form of a sovereign guarantee, a partial credit guarantee, partial risk guarantee, or a put and call option agreement combined with liquidity support.
Inflation	Consumers	The O&M component of the availability payment will typically be adjusted for inflation.
Interest rates	Hedge counterparties	In most cases, the level of the availability payments will not change depending on changes in risk free interest rates. Instead, the project company would typically either borrow at fixed rates of interest or, more likely, hedge its exposure to floating interest rates by entering into interest rate swaps.

Sound regulation & international experience conclude that…

- The **ITP approach makes sense** & it seems the only sensible course of action
  - for **critical projects**
  - for a gradual, **piecemeal development** of an entire network

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Outline

- Private investment in transmission in Africa
- Making transmission attractive to private investment
  - Unnecessary regulatory risks
  - A mindset change: transmission as regulated infrastructure: The ITP business model
- Transmission cost allocation
  - At national level
  - At regional level
- In a nutshell

Transmission cost allocation principles

Choice of method

- Transmission network charges should **not depend on commercial transactions => abolish wheeling charges.**
- **Beneficiary pays** *(i.e., responsibility in network investment)* or some measure of network utilization as a proxy.

Tariff design

- Transmission network charges should be **determined ex ante** and not updated *(at least for a reasonably long time)*
- The **format of the transmission charges** to the network users **matters**

#1. Ignore commercial transactions

- Do not allocate cross-border transmission costs to those who trade across borders.
- The consequence of ignoring this rule is charging too much to those who trade & thus to kill trade.
- Then, what?

#2. Allocate costs to those who benefit, i.e., those for whom the project is made

- In **major projects** it might be possible to **negotiate** the percentage to be allocated to each country
- Otherwise, & **for minor projects & the existing grid**, use some **tracking-flows method** applied to **actual past or future estimated** flow patterns to assign the use (& cost) of each asset to individual generation plants & loads…
  - … & then to countries, by **aggregation**.
    - This results in the **desired percentages** for large projects & in **inter-country compensations** for the rest of the network.
  - The **average participations method** can be trusted for this job.

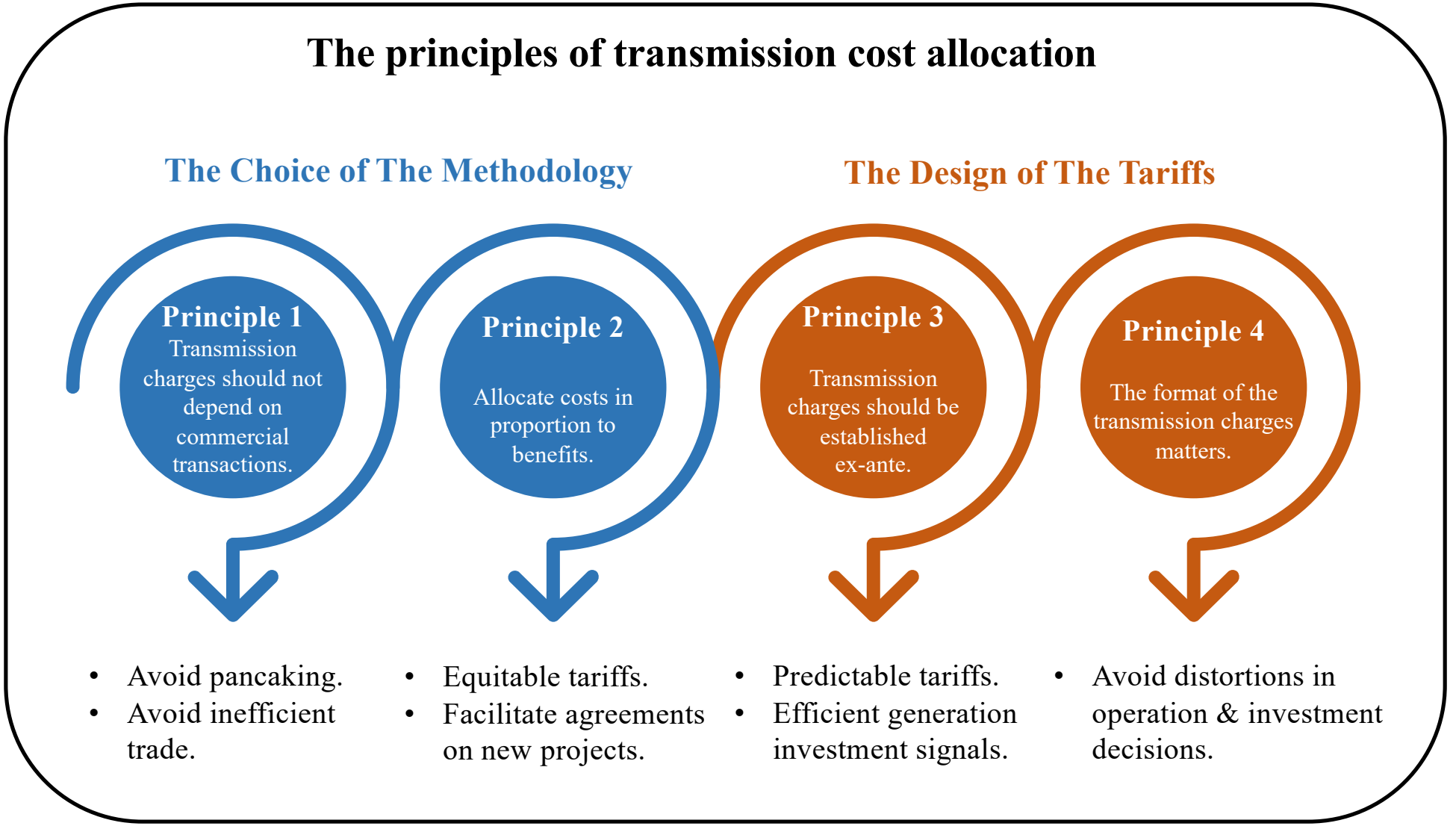
#3. Determine transmission charges ex ante

- Only if transmission charges for new generation & large loads are **announced well in advance & maintained for a long time** (7 to 10 years, at least, for instance) they may have a locational impact or help in making an investment (or retirement) decision of production or demand.

#4. The format of transmission charges matters

- **Do not use volumetric charges** ($/kWh) as they may distort efficient operation.
- **Do not use capacity charges** ($/kW) as they may distort investment decisions.
- **Use an annual lump sum** (split in monthly instalments) computed before reality happens.

The principles of transmission cost allocation



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Approaches used in practice

Transmission tariffs
Approaches used in practice

- **Beneficiaries pay**
  - Try to evaluate the economic benefit that each network user obtains from the existence of each individual transmission facility and allocate its cost pro-rata to each user
- **Responsibility in investment**
  - Try to evaluate the extra investment cost that each network user imposes on to the existing network, besides its dedicated (shallow) connection
- **Network utilization**
  - Try to evaluate the power flow that each network user causes (marginally or as average) on each transmission facility and allocate its cost pro-rata to each user
- **Postage stamp**
  - Uniform allocation only based on a simple criterion: peak demand or generation (actual or contracted) or energy consumed or produced.

The format of transmission charges

- Regardless of the method employed to determine the transmission network charge for centralized generators, it remains deciding **how to apply the charges**. **Recommendations**:
  - **Do not apply volumetric charges** ($/kWh) to generators, as this artificially modifies their variable cost & thus their dispatch merit order
  - **Do not apply flat capacity charges** ($/installed kW capacity) to generators, as this may overcharge low utilization generators
  - Try to **apply lump sum annual charges** to generators that are not directly linked to actual recent production, to avoid the two previously described mistakes.

Transmission tariffs
Pragmatic recommendations

- **What is the purpose** of allocation? **Cost causality**, i.e., incentivize location of G & D? *(only large customers)* that does not create much transmission extra cost. Implications:
  - Use **locational charges**, if required to discourage siting (typically of wind & solar) that require much network reinforcement
  - Use allocation to **beneficiaries as a guide**, but resort to a reasonable **"network use" as a proxy**
  - **Predictable & mostly stable** transmission charges for the agents that matter (potential new generators or generators ready to retire)
  - The **format** (annual lump sum, $/kW, $/kWh) of the charge to the end customers matters.

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Regulation for regional trade must be guided by the "Single system paradigm"

The "Single system paradigm"

Design regional regulation so that the expected outcome is as close as possible to that of a sound regulation for *a single system of regional dimension.*


EUROPE
F.Y.R.O.M. - The Former Yugoslav Republic of Macedonia
Greenland (DENMARK)
Jan Mayen (NORWAY)
Greenland Sea
Denmark Strait
Norwegian Sea
Barents Sea
Reykjavik
ICELAND
Arctic Circle
Hammerfest
Tromsø
Murmansk
Kiruna
White Sea
Arkhangel'sk
Luleå
Oulu
NORWAY
Umeå
FINLAND
Lake Onega
Trondheim
Tórshavn
Faroe Islands (DENMARK)
SWEDEN
Gulf of Bothnia
Lake Ladoga
Tampere
Turku
Helsinki
Gävle
St. Petersburg
SHETLAND ISLANDS
Bergen
Oslo
Stockholm
ÅLAND ISLANDS
Gulf of Finland
Tallinn
ESTONIA
RUSSIA
Rockall (U.K.)
ORKNEY ISLANDS
HEBRIDES
Stavanger
Moscow
North Atlantic Ocean
Aberdeen
Skagerrak
Kattegat
Göteborg
Gotland
Rīga
LATVIA
Glasgow
Edinburgh
North Sea
Baltic Sea
Oland
LITHUANIA
Vilnius
Vitsyebsk
Smolensk
Belfast
UNITED
DENMARK
Copenhagen
Malmö
Kaliningrad
RUSSIA
Mahilyow
Minsk
Isle of Man (U.K.)
Dublin
Irish Sea
Leeds
Manchester
Liverpool
IRELAND
KINGDOM
Bornholm
Gdańsk
BELARUS
Hrodna
Homyel'
Hamburg
Cardiff
Birmingham
Bremen
Berlin
Poznań
Warsaw
Brest
Amsterdam
NETH.
Rotterdam
POLAND
Łódź
Kiev
Rivne
London
Celtic Sea
Essen
Leipzig
Wrocław
Brussels
Lille
BEL.
Cologne
Bonn
GERMANY
Prague
CZECH REPUBLIC
Brno
Kraków
L'viv
UKRAINE
English Channel
Guernsey (U.K.)
Jersey (U.K.)
Frankfurt am Main
Luxembourg
LUX.
Paris
Stuttgart
SLOVAKIA
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Mykolayiv
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Genoa
CROATIA
BOSNIA AND HERZEGOVINA
SAN MARINO
YUGOSLAVIA
Sarajevo
BULGARIA
Sofia
Toulouse
MONACO
Andorra la Vella
Marseille
Florence
Ligurian Sea
Adriatic Sea
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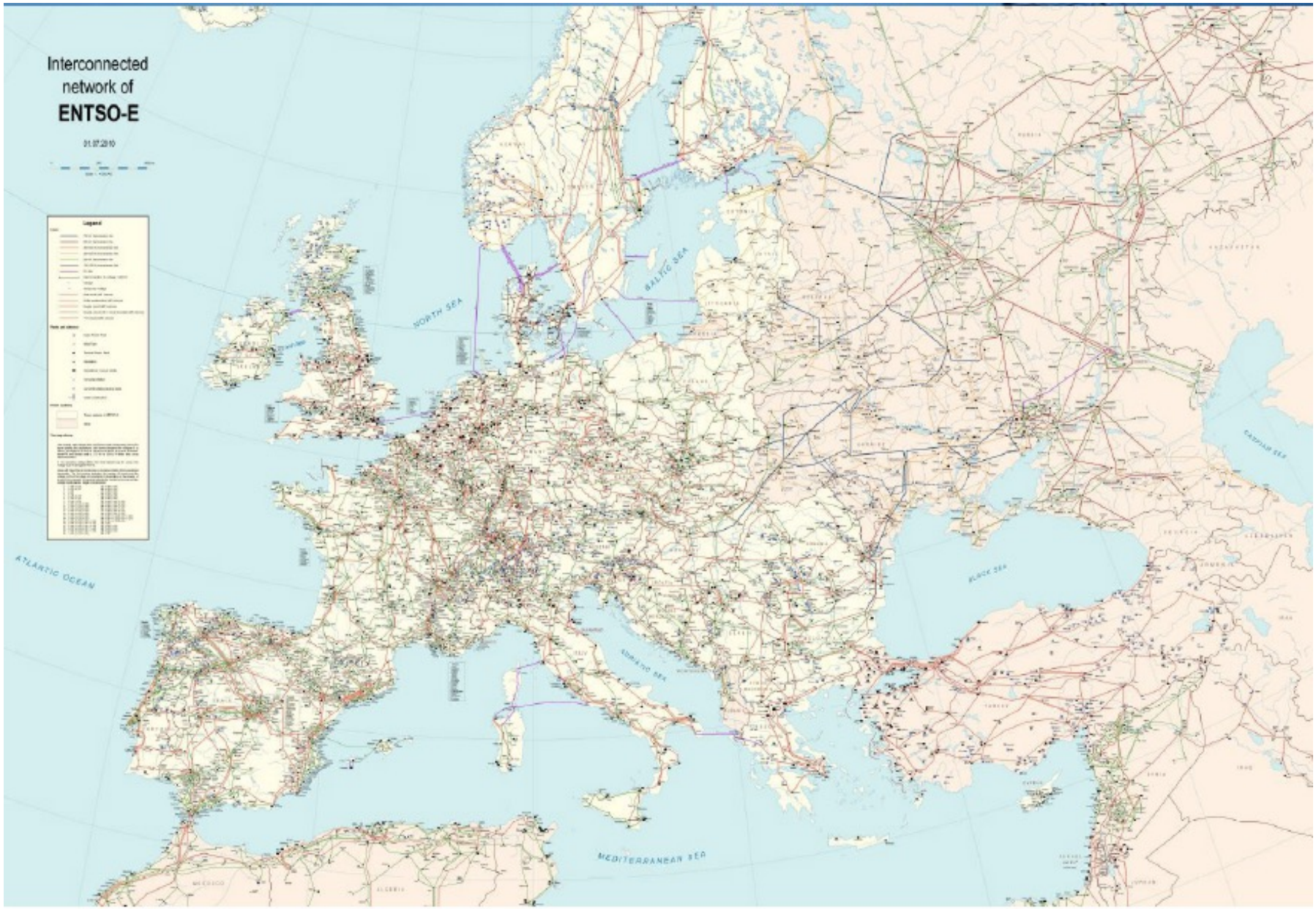
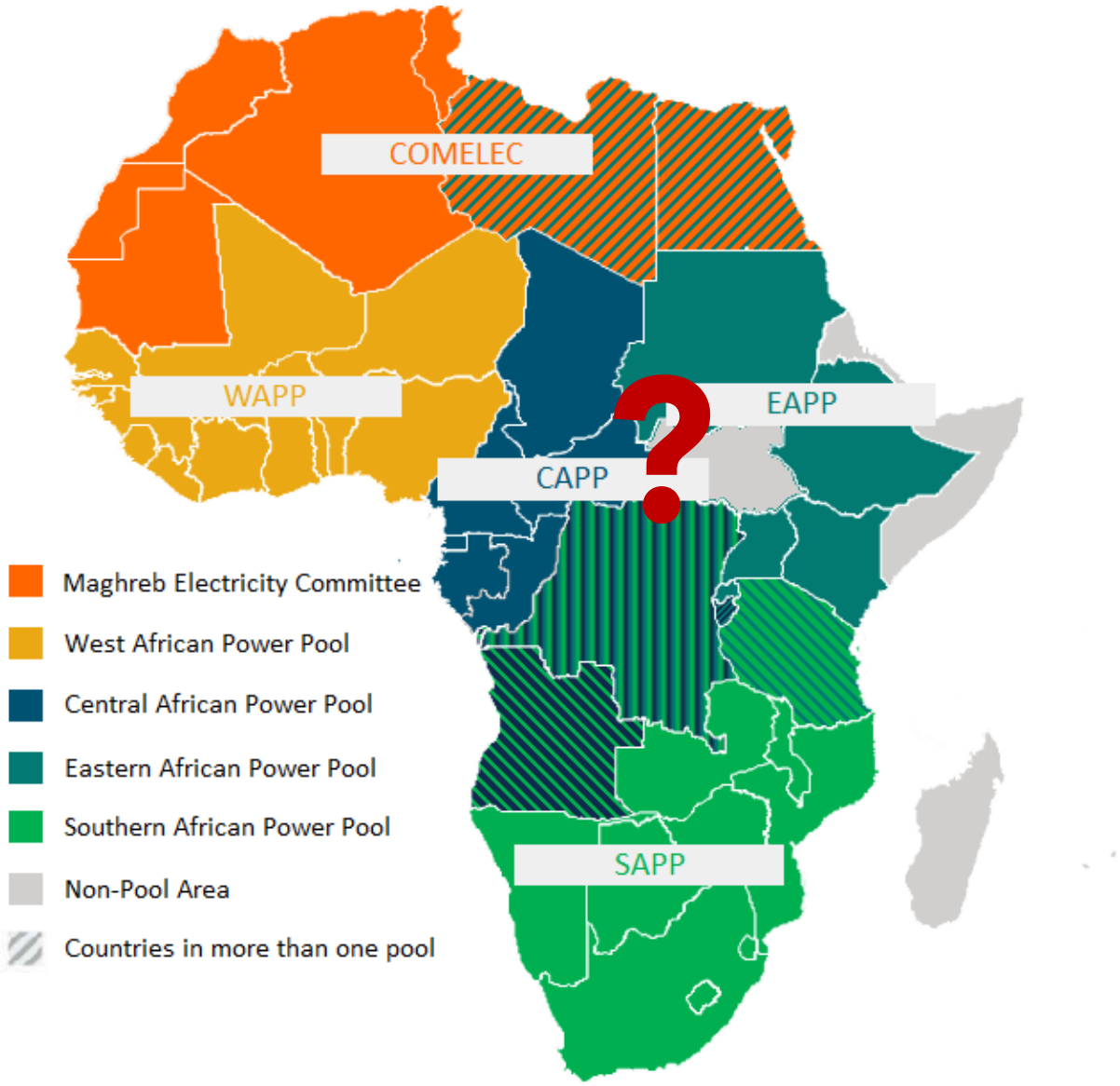
TURKEY
Lisbon
SPAIN
Valencia
Balearic Sea
Sardinia
Tyrrhenian Sea
Aegean Sea
İzmir
GREECE
Athens
Sevilla
BALEARIC ISLANDS
Cagliari
Palermo
Ionian Sea
Mediterranean Sea
Gibraltar (U.K.)
Málaga
Sicily
Rhodes
Strait of Gibraltar
Ceuta (SPAIN)
Alborán Sea
Melilla (SPAIN)
Oran
Algiers
Tunis
Valletta
MALTA
Crete
Rabat
Casablanca
MOROCCO
ALGERIA
TUNISIA
Scale 1: 19,500,000
Lambert Conformal Conic Projection, standard parallels 40°N and 56°N
300 Kilometers
300 Miles


Interconnected
network of
ENTSO-E
01.07.2010
NORTH SEA
BALTIC SEA
ATLANTIC OCEAN
MEDITERRANEAN SEA
BLACK SEA
CASPIAN SEA

SOURCE: WORLD BANK
RETRADE-EAPP-2024


COMELEC
WAPP
EAPP
CAPP
SAPP
Maghreb Electricity Committee
West African Power Pool
Central African Power Pool
Eastern African Power Pool
Southern African Power Pool
Non-Pool Area
Countries in more than one pool

Cost allocation of regional transmission projects
The principles

- The transmission network charge applied to a network user in its country must give **access to the entire regional market**
  - This is a consequence of the “single system paradigm”
- The configuration of the **political borders** in a regional electricity market **should have minimal impact** on transmission network charges
- **Transmission charges must not depend on commercial transactions**, but on the benefit obtained from (or “use of”) the network
  - Ignoring this principle, levies too high charges on cross-border trade, killing it
- The sounder the regulation the lower the **risk of opposition** to a transmission project

Cost allocation of regional transmission projects
A pragmatic approach based on "best practice"

- Avoid "**pancaking**" & charges associated to **commercial transactions**
- Agreement **among countries** for a **stable allocation to countries** of the cost of **major projects**
  - Try allocation to countries based on estimated benefits, otherwise…
  - … **track sources and sinks** of actual or forecasted flows, minimizing the use of extra assumptions
- Tracking sources & sinks allows determining **the share of the cost corresponding to each country**.
  - After that, each country will allocate internally the modified transmission total cost following its own principles.

It seems that Africa is in the process of abandoning the "common sense" but flawed transmission regulation…

AUTHORIDADE REGIONAL
REGULADORA DE ELETRICIDADE DA CEDEAO

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RESOLUTION N°006/ERERA/15

Adoption of the Tariff Methodology for Regional Transmission Cost and Tariff

The Regulatory Council,

Mindful of Article 18.5 of Regulation C/REG.27.12/07 of 15 December 2007, as amended, on the composition, organisation, functions and operations of ERERA, and

After the review of the Tariff Methodology for Regional Transmission Cost and Tariff for the West African Power Pool (WAPP) by ERERA's Consultative Committees,

RESOLVE THAT:

1. The Tariff Methodology for Regional Transmission Cost and Tariff for the West African Power Pool, hereby attached, is approved.
2. The Tariff Methodology for Regional Transmission Cost and Tariff for the West African Power Pool shall be published in the ERERA official Bulletin and Website.

Done in Accra, GHANA, on August 18, 2015

Mr. Alagi Basiru GAYE
Council Member

Mrs. Ifeyinwa IKEONU
Acting Chairperson

WAPP

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Website: www.au.int

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THE FIRST ORDINARY SESSION OF THE AFRICAN UNION SPECIALIZED TECHNICAL COMMITTEE ON TRANSPORT, TRANSCONTINENTAL AND INTERREGIONAL INFRASTRUCTURES, ENERGY AND TOURISM (STC-TTIET)
14 – 18 April 2019
Cairo, Egypt

CMP

CONTINENTAL TRANSMISSION TARIFF METHODOLOGY FOR INTERNATIONAL BILATERAL TRANSACTIONS

THEME: → DEVELOPING SMART INFRASTRUCTURE TO BOOST AFRICA'S CONTINENTAL TRANSFORMATION AND INTEGRATION

TECHNICAL PAPER

… to adopt the best regulatory practices that will facilitate transmission investment & power trade

Improving the performance of regional electricity markets in developing countries: The case of the Southern African Power Pool

by

Amy Michelle Rose

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in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Engineering Systems

at the

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June 2017

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RICARDO

The Improvement of the SAPP Transmission Pricing Methodology for Implementation

Final Report for Southern African Power Pool/The World Bank

World Bank Grant No. H9890

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Economic Community of West African States	WEST AFRICAN POWER POOL WEST AFRICAN POWER EXCHANGE SYSTEM General Secretariat / Secrétariat Général	Communauté Economiques des Etats de l'Afrique de l'Ouest

FINALIZATION OF THE WAPP TARIFF COMPARATIVE ANALYSIS

FINAL MEETING

Lomé, 13-15 May 2024

- ERERA and WAPP to develop the necessary Regulation and Procedures for the application of the customized APM to the WAPP Region. The Regulation should set the rules for the transitional period for the application of the APM.

- ERERA to collaborate with the National Regulators to facilitate the necessary legal measures for the approval of the APM.

XI. VOTE OF THANKS

35. The WAPP Secretariat expressed its sincere gratitude to the participants for their availability and collaboration.

36. The Participants expressed their utmost gratitude to the WAPP Secretariat and World Bank for the organization of the meeting as well as for the provision of adequate resources which contributed enormously to the success of the meeting.

37. The participants in the meeting also expressed their deep gratitude to the people and Government of Togo, in particular His Excellency Faure Essozimna GNASSINGBÉ, President of the Republic of Togo for the warm hospitality they enjoyed throughout their stay in the country.

SIGNATURE

For WAPP Secretariat

Mr. Abdulkadir NAZIF .....

The Chairman of the Taskforce

Mr. Etienne BAILLY .....

For CESI-S. P.A

Mr. Fabio RIVA .....

CONSULTANCY SERVICES FOR THE DESIGN OF THE EAPP POWER MARKET

FINAL REPORT

22nd October 2021

NORD POOL

RICARDO

Outline

- Private investment in transmission in Africa
- Making transmission attractive to private investment
  - Unnecessary regulatory risks
  - A mindset change: transmission as regulated infrastructure: The ITP business model
- Transmission cost allocation
  - At national level
  - At regional level
- In a nutshell

In a nutshell…

QUESTIONS WITH ANSWERS

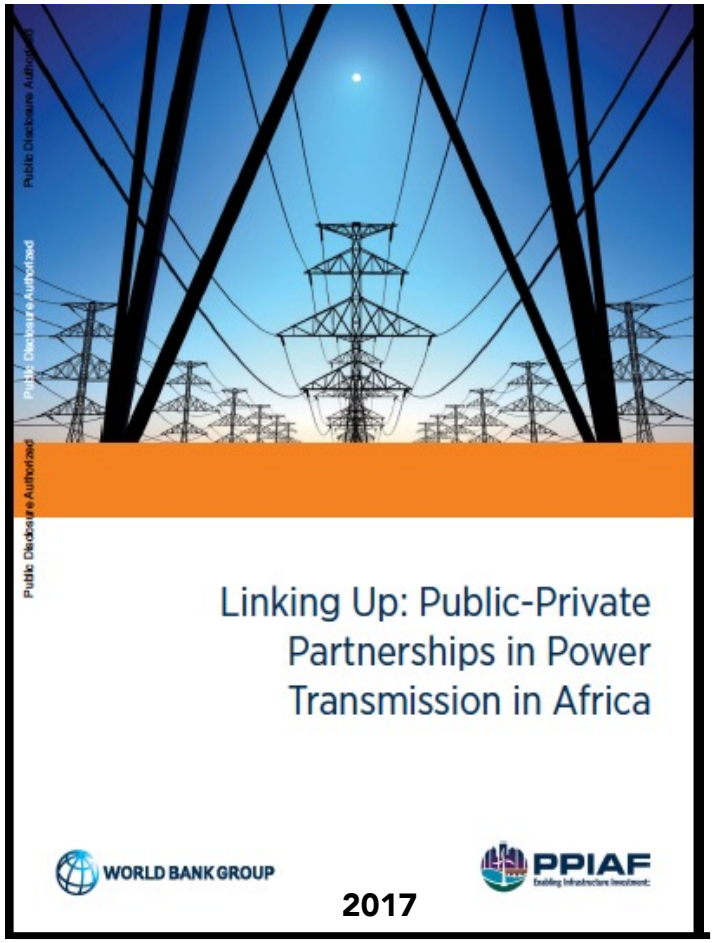
- What prevents private investment in transmission in Africa when it is happening elsewhere, in developed and developing countries?
  - Largely, flawed regulation
- Is private investment in transmission tantamount to privatisation?
  - No. With ITP the assets remain in public property.
- Are there operational or security of supply risks associated with private investment in transmission?
  - No. The System Operator must not discriminate by ownership.
- Is the "wheeling mindset" appropriate for today's national and regional transmission networks and electricity trading?
  - No, wheeling charges must be banned.
- Can transmission investment be made a low-risk business, attractive even to pension funds? Yes, with the ITP business model & sound regulation
- Is there a simple, well-proven approach to share the cost of cross-border transmission? Yes, and it is (slowly) becoming accepted in Africa.

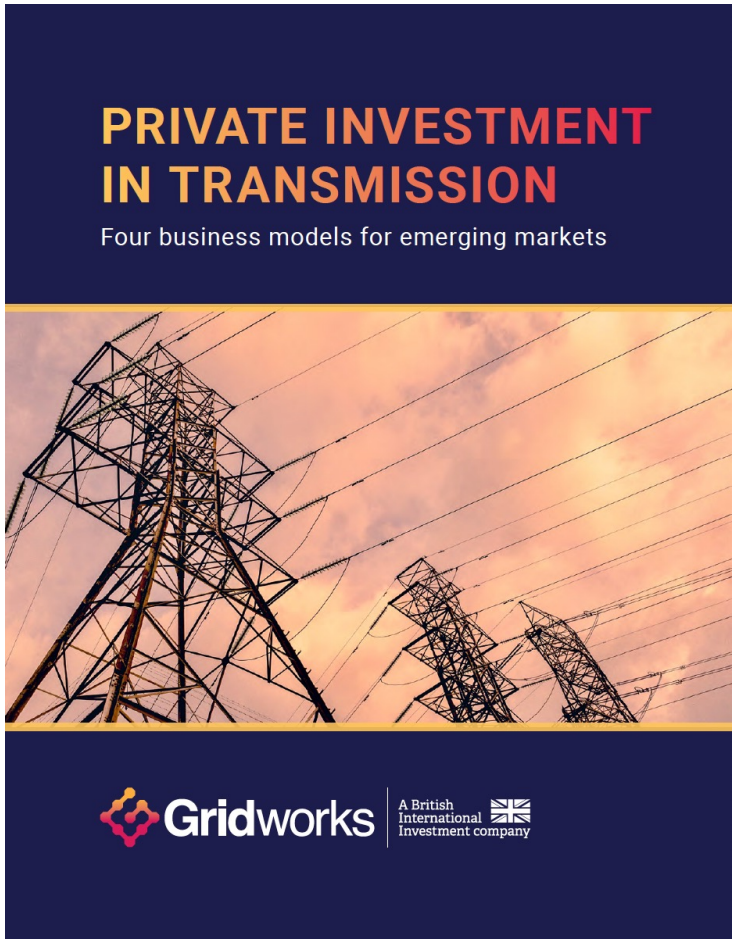
Final recommendations

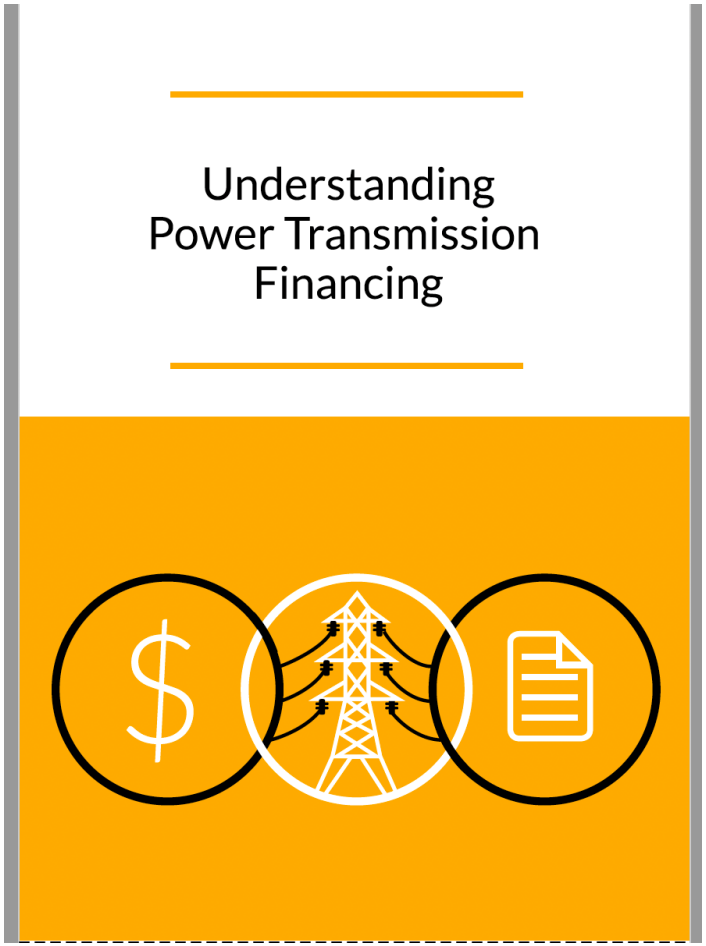
Make private investment in transmission possible by…

- … **ringfencing the remuneration** of critical transmission projects
- … **educating decision makers** *(abandon wheeling mindset, private transmission assets do not interfere with security, more transmission reduces costs)*
- … **eliminating unnecessary or incorrect regulation**, not adapted to the true nature of transmission
- … **simplifying cost allocation** of cross-border projects.

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

… & the videos & presentations of this 3-day online conference of the African School of Regulation

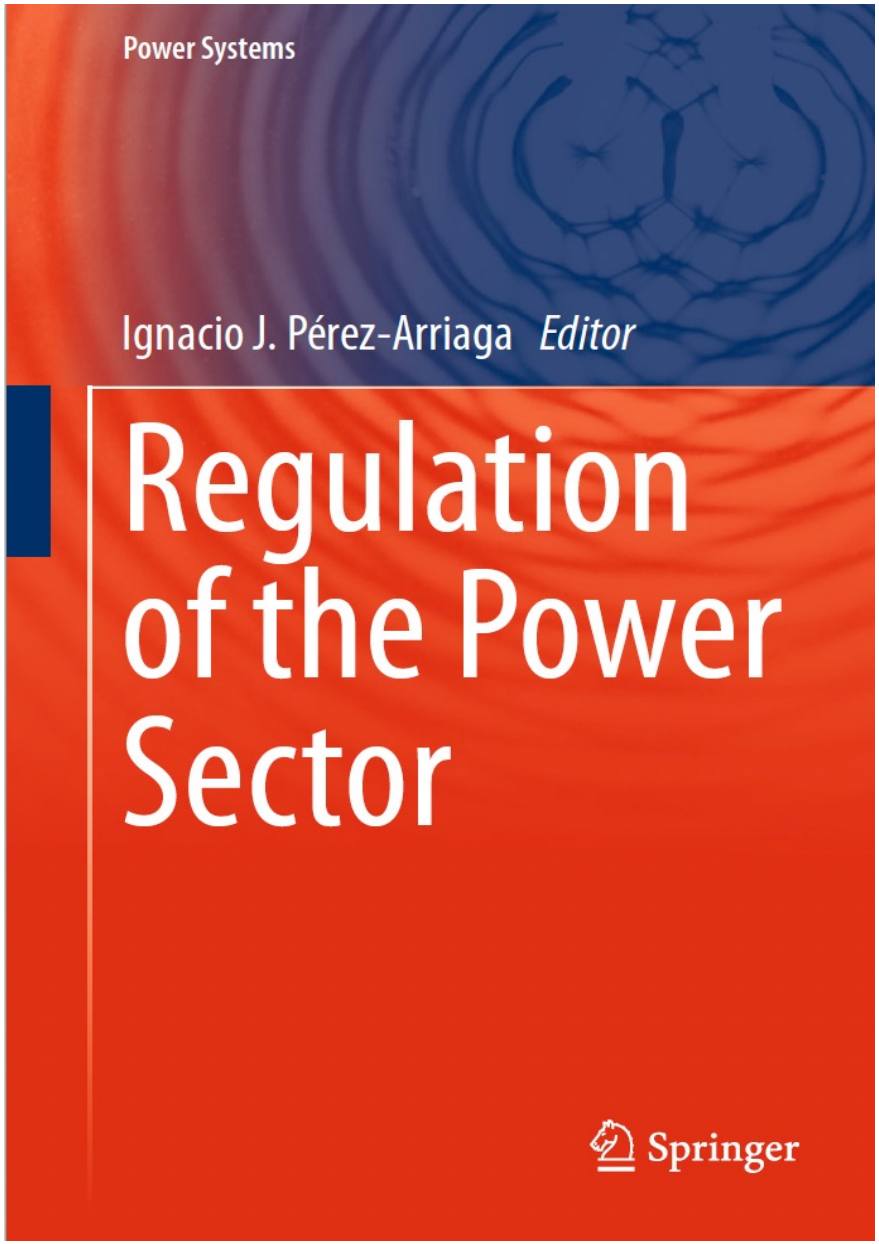
https://africanschoolregulation.org/event/international-online-conference-private-investment-in-electricity-transmission-in-africa/

EAPP REGIONAL TRADE CONFERENCE 2024

Mombasa, 9 December 2024

AFRICAN SCHOOL OF REGULATION

Building the capacity in energy regulation that Africa needs to meet the objectives of the Agenda 2063



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Mombasa, December 9-11, 2024

Private sector participation in (regional) transmission network development.

International experience from PPP in Transmission – What works, what doesn't?

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