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Business models to unlock private investment in sub-Saharan Africa's electricity transmission sector

Expansive electricity transmission networks reduce overall costs in the power sector by enabling economies of scale in generation, expanding access to cost-efficient energy resources, reducing the necessary reserve margin, and supporting grid integration of renewable assets. In most African countries, state-owned utilities build, own, and maintain transmission networks, with support from public budgets, development finance, or sovereign guarantees.

Due to the fiscal constraints of most governments and state-owned utilities, investment in transmission significantly lags the need and represents a major infrastructure deficit. Conversely, investment in generation projects is less risky, easier to structure, and offers higher returns, though ironically underinvestment in transmission can undermine this risk profile. In contrast to transmission, generation has also been opened to private sector participation across much of the continent. As a result, many regional markets, like Ghana and Nigeria, have seen investment in generation capacity disproportionately outpace transmission and distribution investment, which can lead to lower utilization factors, curtailment, and frequency regulation problems for the system operator. Ultimately, deficient transmission infrastructure is a primary driver of unreliable power supply.

Business models to drive private investment in transmission can help bridge the financing gap

The World Bank identified four primary business models that have been successful elsewhere in the world at appropriately allocating risks across counterparties.

1. **Indefinite privatization:** The sale of an entire state-owned transmission system to a private entity with regulatory approval and oversight to ensure a reasonable rate of return for the asset owner and high-quality service for customers. Transmission privatization was most notably successful in Chile's electricity reforms which began in 1980, as well as in England and Wales in 1990.
    a. **Advantages**: Selling the entire system to a single entity can simplify contract and regulatory structures, align incentives between public and private stakeholders, and reduce operational friction.
    b. **Disadvantages**: This model requires governments to surrender permanent control of critical national infrastructure to private enterprise, which they can be justifiably reluctant to do, especially given that there are relatively few private firms with a demonstrated track record of power sector management at that scale.
2. **Whole-of-grid concession:** Long-term concession contract for an entire state-owned transmission system's operation, maintenance, and management, with regulatory oversight to ensure a reasonable rate of return for the concessionaire and high quality

of service for customers. The National Transmission Corporation in the Philippines successfully tendered a 25-year whole-of-grid concession in 2009. African countries including Cameroon, Mali, Senegal, and Côte d'Ivoire have successfully tendered similar concessions.

   a. **Advantages**: Whole-of-grid concessions may be particularly advantageous for countries with heavily mismanaged utilities, where a private operator could bring significant cost efficiencies and improve power quality, or for utility networks that need massive upgrades and improvements requiring private capital.
   b. **Disadvantages**: Given that operations and maintenance costs tend to fluctuate significantly over the term of the concession, they are difficult to price into the original deal, leaving the concessionaire exposed to rate-of-return and revenue requirement proceedings to offset costs in many markets which have poor track records of charging cost-reflective tariffs. Like indefinite privatization, concessions also require governments to surrender control of critical national infrastructure to private enterprises.

3. **Independent Power Transmission (IPT):** The IPT model is like the independent power producer (IPP) model, where a private player develops, finances, builds, and operates a single transmission network asset under a tendered contract. Most IPT contracts, which are common in India and in some ISOs in the United States, are executed under similar frameworks, such as build-own-operate (BOO), build-own-operate-transfer (BOOT), and build-transfer-operate (BTO), the latter two of which require the transfer of ownership of the asset to the counterparty at either the beginning or the end of the operating contract.
   a. **Advantages**: Most IPT operators would be paid for availability of transmission capacity, rather than quantity of power that flows over each individual line, which reduces counterparty risks and makes it more straightforward to segment and allocate risk and therefore to raise project finance. IPTs can also be straightforwardly procured using competitive tenders, which can drive costs down and target grid improvements and extension projects accurately.
   b. **Disadvantages**: Most IPT agreements are structured so that a majority of the annual revenue requirement or monthly availability payment is fixed, leaving little room to cover large, unplanned maintenance costs, and little recourse in the event of non-payment. IPTs are also beholden to the system operator dispatching and managing power flows, meaning a poorly managed or congested network may cause undue strain on IPT-owned infrastructure. The IPT model is also less applicable for cross-border transmission lines, where more government-to-government coordination is needed.

4. **Merchant investment:** The merchant model is the most common business model for private investment in transmission, and operates almost identically to a toll road. In markets like the United States and Australia, investors develop, finance, build, own, and operate a transmission line with proprietary access rights which are sold to power market participants who are buying and selling power between two locations with a nodal price differential.

a. **Advantages:** In spot markets, a merchant line can play a lucrative game of arbitrage between two places experiencing high demand and high supply at the same time.
b. **Disadvantages:** Given the low reliability and quality of service in many African electricity sectors, reliance on a merchant model can be highly risky. The merchant model is also less applicable for most sub-Saharan African utilities because it typically requires the line to have a monopolistic position serving disconnected supply and demand and it depends on cost-reflective utility tariffs. Merchant models are also typically applied to a single transmission line rather than to a whole system, making them a partial solution to larger systemic issues.

Progress to date

It's still early days for private transmission investments in sub-Saharan Africa, but the most promising opportunity in many places is expanding the use of IPTs in national or cross-border markets that charge close to cost-reflective tariffs and have access to public sector de-risking instruments. The Transmission Company of Nigeria tried to tender the rehabilitation and expansion of two MV/HV lines under an IPT model in 2014, but after shortlisting 29 applications, the process stalled and the contract was never awarded. On the other hand, MOTRACO, the special purpose vehicle owned by three regional utilities in Southern Africa – ESKOM (South Africa), EDM (Mozambique), and SEC (eSwatini) – has successfully implemented IPT-type models. Additionally, Africa50 recently reached financial close with Power Grid Corporation of India Ltd(POWERGRID) on the continent's first IPT transaction, which would entail the development, financing, construction, and operation of the 400kV Lessos - Loosuk and the 220kV Kisumu - Musaga transmission lines as a counterparty to KETRACO.

Takeaways for policymakers

- In most markets, especially partially unbundled ones, **there are likely to be many significant similarities between IPP contracting and IPT contracting**. Regulators may be able to provide some portable lessons to investors who are comfortable with IPP investing to bridge the private funding gap in transmission.
- While full power sector unbundling is not a precondition for IPTs, at least **partial unbundling makes setting up an IPT framework easier** because private developers only need to work with the National TransCo rather than a vertically integrated state utility to participate in tenders and negotiate contracts, or lobby for grid codes to be changed to accommodate (and remunerate) private operators. In India, private transmission companies like IndiGrid and PowerGrid operate as IPTs with remuneration secured by pooling revenue collected from generators in a single account and distributed pro rata with TransCos, so that the cost of delayed payments or nonpayment are shared across all owner-operators.
- Private sector investment in and management of transmission assets – particularly when procured competitively – have repeatedly delivered significant capital and operational cost savings in other geographies. The UK grid has seen cost reductions for

new transmission of between 23-34%; some ISOs in the US report cost savings in the 20-30% range; and IPT tenders in Peru and Brazil repeatedly delivered results at costs on average 36% less than the expected capital requirements.

TABLE 1: Risk Allocation Matrix for relevant businesses

	Independent Power Transmission (IPT)		Whole-of-grid Concessions		
	Govt/Transmission Utility	IPT Project Company	Govt/Transmission Utility	Concessionaire	Consumers
Financial Risk					
Demand risk			X		X
Credit risk	X	X	X	X	
Inflation	X	X			X
Interest rates		X	X		X
Foreign exchange rates	X		X		X
Termination payment	X		X		
Land					
Pre-existing environmental conditions	X				X
Pre-existing defects in title	X				X
Land acquisition for expansions	X				X
Technical risk					
Construction and commissioning of new assets		X		X	
Scope changes before/during construction	X	X		X	X
Interface between transmission infrastructure and generation facilities	X	X		X	

Technology risk		x		x	
Operation, maintenance, and technical performance	x	x		x	
KPIs, service levels		x		x	
Accidents, damage, theft		x		x	x
Social and environmental risk					
Social and environmental impacts		x		x	
Occupational health and safety	x	x		x	
Resettlement	x	x		x	
Non-political force majeure events	x	x		x	x
Political and regulatory risk					
Initial issuances of licenses, permits		x	x	x	
Renewals, modifications	x		x		
Changes in law	x		x		
Changes in tax	x		x		
Political force majeure events	x		x		
Disputes					
Resolution of disputes (contractual)	x	x	x	x	
Resolution of disputes (tariff methodology)		x	x	x	

Source: Understanding Power Transmission Financing, US Department of Commerce 2020.