International Energy Agency

Attracting private investment to the electricity transmission sector in Southeast Asia

September, 2020

Objective of the assignment

- The Government of Viet Nam, as 2020 Chair of ASEAN, requested the IEA to help identify innovative models to attract private funds to the power transmission sector.
  - This work is a deliverable under the annual energy priority number 7.
- This analysis presents (1) a broad overview of the main business models for privately-financed in-country transmission investments and (2) a framework to implement these models, including
  - A description and key characteristics of each model are described, the risk allocation between the private and public sector in each case and where each model has been applied.
  - A "checklist" that policymakers could use as guideline to decide how to choose among these models and key steps to take into account to implement them.
- The IEA response was prepared as a slide deck by the Energy Supply and Investment Outlooks Division (ESIO) and the Renewables Integration and Secure Electricity Unit (RISE) with inputs from the Asia-Pacific and Partnerships Division (APP).
- This response is part of an ongoing process with ASEAN and AMS to deepen understanding of transmission-related challenges and opportunities in Southeast Asia.

Outline

1. **Context**

2. **Investment trends**

3. **Business models for privately-financed transmission grids**

4. **Framework for implementation**

5. **Closing considerations**

Context

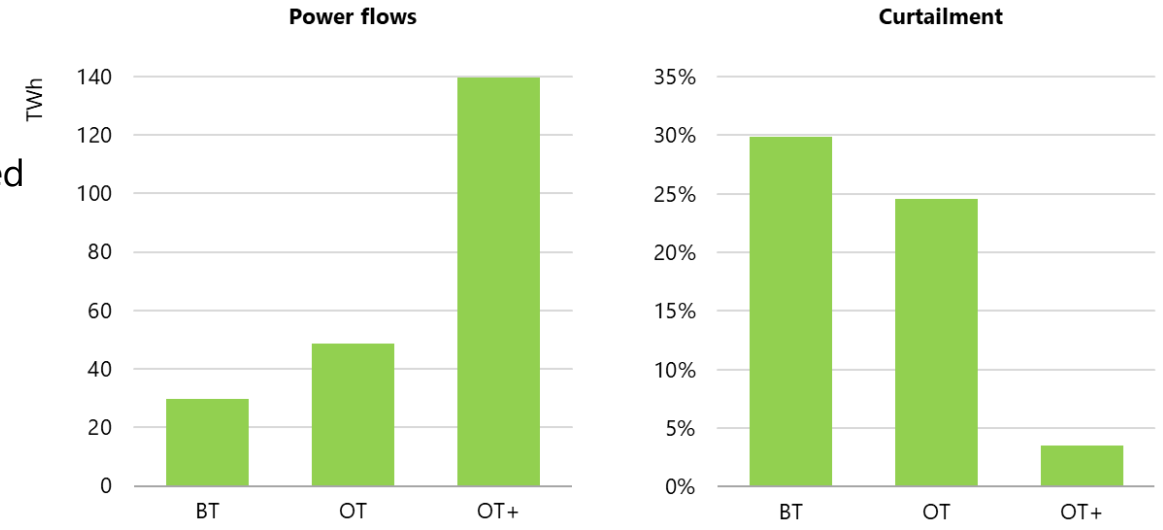
Transmission grids are the backbone of national & regional systems

- Transmission grids connect electricity generation with consumers.
- They also provide flexibility and ensure system reliability as renewables are integrated into the grid.
- Cross-border transmission, and regional coordination, can:
  - Reduce the need for domestic reserve margins, which translates into reduced costs for countries.
  - Increase resilience to climate-related risks.
  - Enable large, low-cost projects that may not be viable given the domestic demand only.
- Establishing Multilateral Power Trade (MPT) is one of the priorities in the ASEAN Plan of Action for Energy Cooperation. In order for MPT to be effective, the grid needs to support trade in two aspects:
  - National grids need to be developed to facilitate wheeling.
  - Well-designed cross-border transmission lines to link national grids.
- Cross-border transmission lines have specific characteristics and associated risks that require a separate treatment and are therefore not the focus of this analysis.
  - Still, some of the models presented here may be applicable for cross-border investment.
  - Cross-border relevant models could be proposed for future work, in order to support the development of the APG.

Transmission is a necessary ally of increased renewable integration

- Increased transmission along with multilateral trading will lead to increased power flows and lower RE curtailment.
- Transmission is important for RE integration.
- This was shown in the 2019 "ASEAN renewable integration analysis" published by the IEA.
- The figure shows three scenarios
  - BT: bilateral trade no new transmission
  - OT: power flows optimised across the region no new transmission
  - OT+: power flows optimised across the region with new transmission.

Annual power flows (left) and curtailment of variable renewable output (right) by case in 2035 based on IEA Sustainable Development Scenario



BT: the existing model of bilateral trade, with no new transmission.
OT: power flows optimised across regions, with no new transmission.
OT+: power flows optimised across regions, with new transmission.
Source: Southeast ASIA Energy Outlook 2019.

Source: ASEAN Renewable Energy Integration analysis" (2019).

The benefit of transmission investment models

- There are several benefits to adopting clear business models for attracting investment in transmission:

1. Financiers would be more willing to provide financing when frameworks for investments are clear.

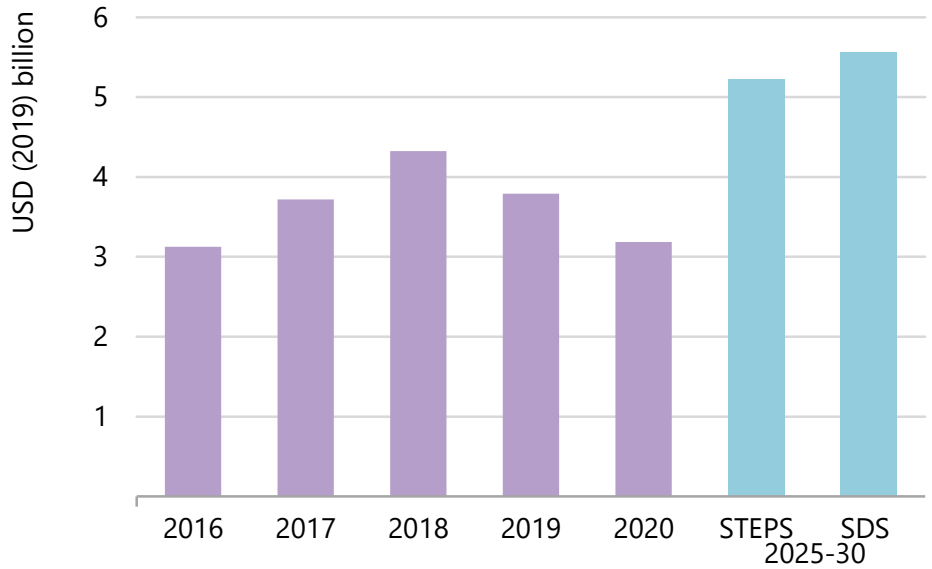
2. Private investors will require a lower rate of return if they have confidence in the business model governing the investment, and may also be more inclined to allocate more capital for the investment.

3. The development of grids in ASEAN, both domestically and internationally, will help meet the economic goals of ASEAN given that they enable
   - Increasing reliability of energy systems.
   - Energy access and affordability.
   - Higher integration of VRE.

Investment trends

Investment in transmission in Southeast Asia is falling short

Annual transmission investment in Southeast Asia compared with annual average investment in IEA Stated Policies and Sustainable Development scenario over 2025-30



Notes: SDS = Sustainable Development Scenario; a trajectory consistent with the Paris Agreement.; STEPS = Stated Policies Scenario: a trajectory consistent with current policies of governments. Scenarios from IEA World Energy Outlook.

Increased investment in electricity transmission is required in any scenario—enabling more flexible, cleaner and reliable systems.

Transmission has been funded mainly by state-owned utilities

	Company in charge of transmission investment	Open access?	Wholesale competition?
Brunei Darussalam	State-owned vertically integrated utility.	No.	No.
Cambodia	State-owned vertically integrated utility.	No.	No.
Indonesia	State-owned vertically integrated utility.	No.	No.
Lao PDR	State-owned vertically integrated utility.	No.	No.
Malaysia	State-owned vertically integrated utility.	No.	No.
Myanmar	State-owned vertically integrated utility.	No.	No.
Philippines	National Grid Corporation of the Philippines (NGCP), a private consortium, has the concession to operate, maintain and expand the transmission sector. NGCP is also the system operator. State-owned TransCo owns transmission assets.	Yes.	Yes.
Singapore	State-owned transmission and distribution utility.	Yes.	Yes.
Thailand	State-owned vertically integrated utility.	No.	No.
Viet Nam	State-owned vertically integrated utility.	No.	No.

New sources of finance could help close the financing gap

- Investment in transmission has trended downwards in Southeast Asia, and is expected to decrease by around 15% in 2020 (versus 2019)—compared with a 7% decline globally.
- Investment in transmission has been funded mainly by state-owned enterprises (SOEs), generally vertically integrated utilities.
- Current investment levels are falling short. The average investment needs in 2025-30 in the IEA Stated Policies Scenario is almost 40% higher than the 2019 level. Average annual investment needs in the Sustainable Development scenario are almost 50% higher.
- The Covid-19 crisis has put pressure on already budget-constrained SOEs. Energy investment needs are now under stronger competition with other sectors of the economy for the limited public funds.
- SOEs are likely to continue to have a critical role in financing transmission, but new sources of finance – especially from the private sector – could help bridge the financing gap.
- The stability and predictability of their regulated revenues can be attractive to investors with long-term horizons like institutional investors.

Business models for privately financed transmission grids

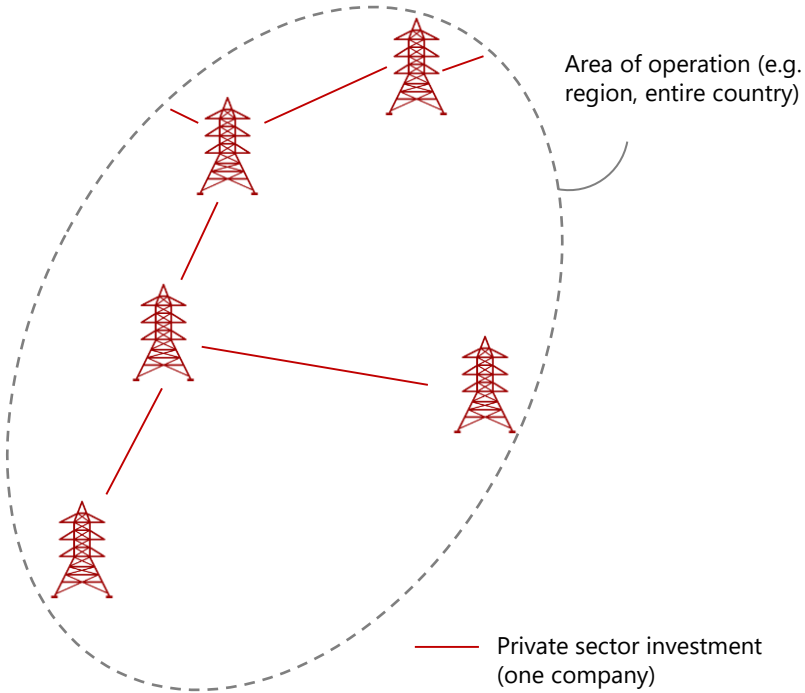
Main business models for privately-financed transmission

Business model	Long-term concession	Build, own, operate and transfer (BOOT)	Financial ownership	Merchant line	Dedicated line (for IPP)
Description	Private company obtains long-term concession to manage and operate existing transmission assets and is in charge of expanding the transmission grid in its area of operation.	Private company finances, builds and operates a new transmission line under a long-term contract. After that, it transfers it back to the government.	Private company provides part of the financing for a new transmission line, but it is built and operated by the system operator.	Private company finances, builds and operates transmission line, with revenues coming entirely from short-term wholesale transmission market prices.	New line evacuating power from Independent Power Producer (IPP), connecting to existing grid.
Contract duration	Long term (30-50 years) or indefinite.	Long term (often 25 years or more).	Indefinite, but possibly with buy back option for the system operator.	Indefinite.	Same as IPP, unless line is transferred at commission.
Contract coverage	All existing and new lines in a limited transmission zone (country, region).	New line (or sometimes a package of lines).	New line.	New line, often HVDC.	New line.
Revenue/tariff setting	Regulated revenues, generally defined annually and subject to periodic regulatory review.	Majority of revenues defined by winning bid, for the entire contract term.	The scheme normally applicable to system operator, e.g. congestion rents or regulated revenue.	Revenues from wholesale market prices. sometimes supported by price mechanisms (e.g. cap-and-floor scheme).	If line not transferred, revenues defined as part of IPP contract payment.
Who funds capex?	Private sector.	Private sector.	Private sector and system operator.	Private sector.	Private sector.
Applicable to interconnections ?	Limited.	Yes, if the line in each side of the border is built on a BOOT scheme.	Yes.	Yes, but requires restructured markets and a primary model for multilateral power trading.	Not recommended since this implies cross-border integration of specific assets instead of grid integration.
International examples	Philippines, Scotland and other parts of Europe.	Brazil, Chile, India, UK, Australia, USA, among others.	Denmark and Germany.	USA and Australia.	Globally applied.

Most commonly used models globally.

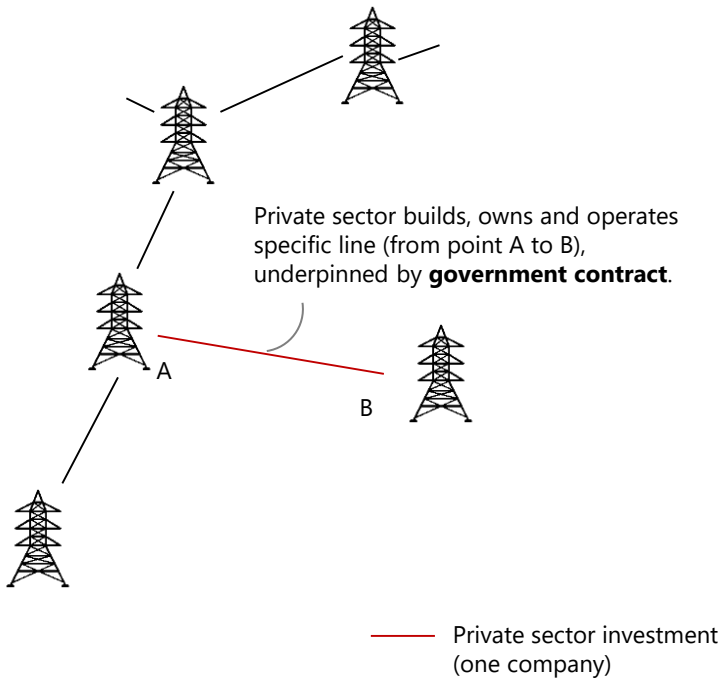
Notes: Based on World Bank (2017), "Linking Up: Public-Private Partnerships in Power Transmission in Africa". Capex = capital expenses.

#1: Long-term concessions



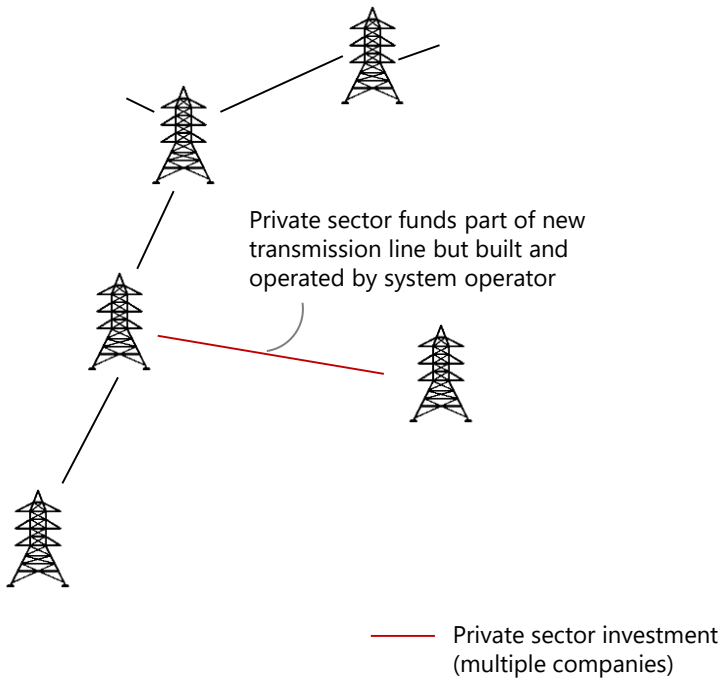
- Private company obtains concession to manage and operate existing transmission assets and is in charge of expanding the transmission grid in its area of operation (entire country or region).
- Transactions tend to be for large amounts.
- Implementation requires strong, independent regulation to ensure private company provides quality service, follows grid standards defined in the country and obtains a reasonable return on investment, as well as sheltering the sector from politically-motivated decisions.
- Regulator typically defines revenue requirements (reviewed periodically) according to investment needs and based on an efficient company.
- Model applied in the UK (e.g. Scottish Power and Scottish and Southern Energy in Scotland) and in the Philippines. Also in parts of Europe (without time limits).

#2: Build, own, operate and transfer (BOOT)



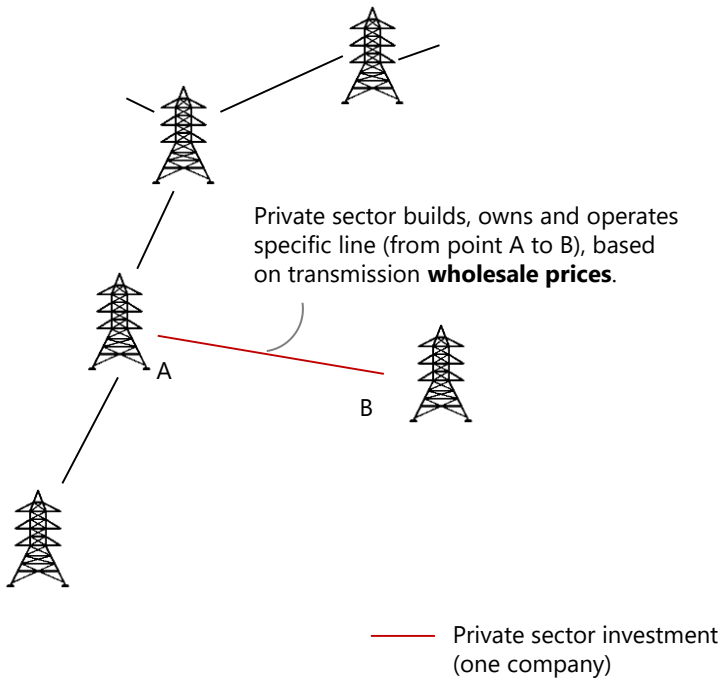
- Private company finances and builds a transmission line (or a package of lines) and operates it for 20-25 years. After that, it transfers it to the government.
- As model is applied mainly to a single line (e.g. 500km 300MW line), projects are of lower value compared to concessions, and can be piloted.
- Less regulatory capacity required to implement this model, and less regulatory risk for investors. Tariffs are set largely by the bid price and not reviewed over project lifetime, as long as line meets availability conditions (~98%).
- Regulation should focus on operations, to ensure the operation of the transmission line are transparent and follows national rules.
- Model has been applied in Brazil, Chile, Colombia, Peru, India, UK, Australia, USA, among others.

#3: Financial ownership



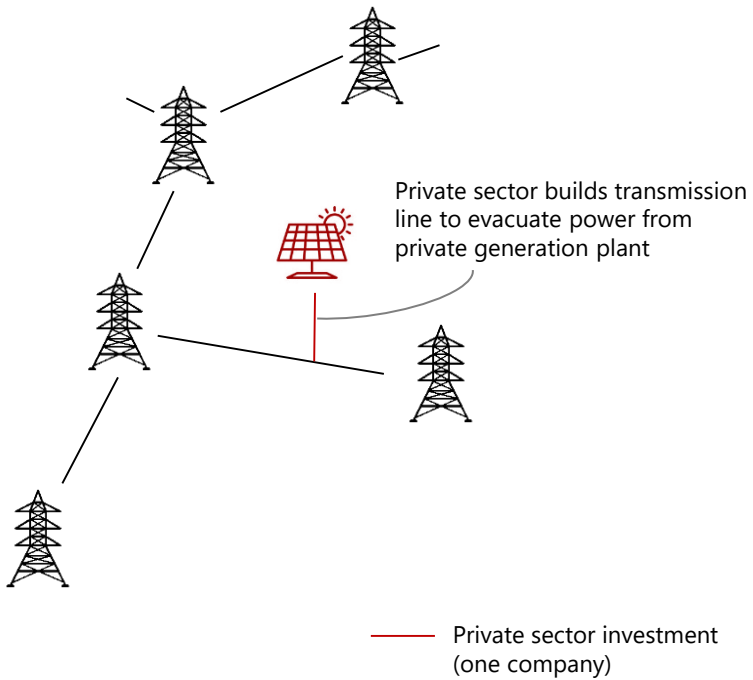
- Country system operator provides an investment prospect to attract private investment in transmission. The agreement is that the investor only gets financial ownership and no mandate in the operation of the line once it is commissioned. The private investor gets returns and pays operation costs according to ownership share.
- Does not require more regulatory capacity compared to normal oversight of system operators.
- Compensation, costs and rights related to the private investor is regulated in a bilateral agreement between the system operator and investor.
- One example of this model is applied on a cross-border line between Denmark and Germany where Vattenfal owns 33 % of the transmission line.

#4: Merchant lines



- Private company finances, builds and operates transmission line, with revenues coming from short-term wholesale transmission market prices (requires a restructured market).
- This model is rare and revenues (in full or in part) are generally supported by a price mechanism; e.g. cap-and-floor scheme where revenues are subject to an upper-bound level (cap) while downside risk is protected by a lower-bound level (floor)—allowing investors to "hedge" from the wholesale price risk. This model has been implemented in the UK and European countries.
- Regulation focused on ensuring that operation of the line follows national rules and are transparent.
- Model also applied in the United States and Australia (e.g. Basslink, a 370km HVDC line between Tasmania and mainland Australia).

#5: Dedicated lines for IPPs



- IPP finances and builds a transmission line to connect to generation plant to the grid. Once the plant is commissioned, there are generally two alternatives for the transmission line: (1) it is transferred to the government or (2) it is owned and operated by the IPP for the lifetime of the IPP contract (typically 20-25 years). After that, it is transferred to the government.
- Lines tend to be short and for relatively smaller amounts compared to the overall power plant.
- Compensation to private investor tends to be included in the power purchase agreement signed between the IPP and the government.
- Model applied globally.

Most appropriate business model depends on government's scope

Business model	Long-term concession	Build, own, operate and transfer (BOOT)	Financial ownership	Merchant line	Dedicated line (for IPP)
Key associated risks for private company	Operation of the entire operation zone. Changes in regulation.	Construction risk, commissioning the line at date stated in the contract, operation of the line. Investor doesn't take price risk.	Risks related to the system operator (SO) in terms both financial and operational.	Construction, operation, and price risk.	Construction and operation risk (if line is not transferred when the IPP plant is commissioned).
Main advantages	Substantial private capital can be attracted in a single transaction (i.e. the concession tender, generally competitively awarded).	Doesn't require strong regulatory capabilities and can be piloted.	System operator retains full control over transmission system, without further regulation needed.	Doesn't require government assistance (e.g. no underlying government, long-term contract for the investor).	Generally doesn't require strong regulatory capabilities or power sector reform.
Main disadvantages	Requires strong regulatory capabilities on the government side, and private sector needs to trust regulatory environment.	Transaction costs may be high (compared to concessions), given every line is procured individually.	Requires high level of trust on SO; for SO not to prioritise own assets over shared assets if payment for the asset depends on flow and grid structure allows for controlling flow (DC lines); and financial security which may have to be provided by the government.	Market failures mean many lines would not be built if this were the only model applied. Even where merchant lines may be viable, they require well-developed wholesale markets.	Depends on associated IPP and mainly applied on an *ad-hoc* basis. Does not take the wider system into account. Transmission should ideally be build with the wider network in mind.
Potential to attract private investment	High.	High.	Medium-low.	Medium-low.	Low.

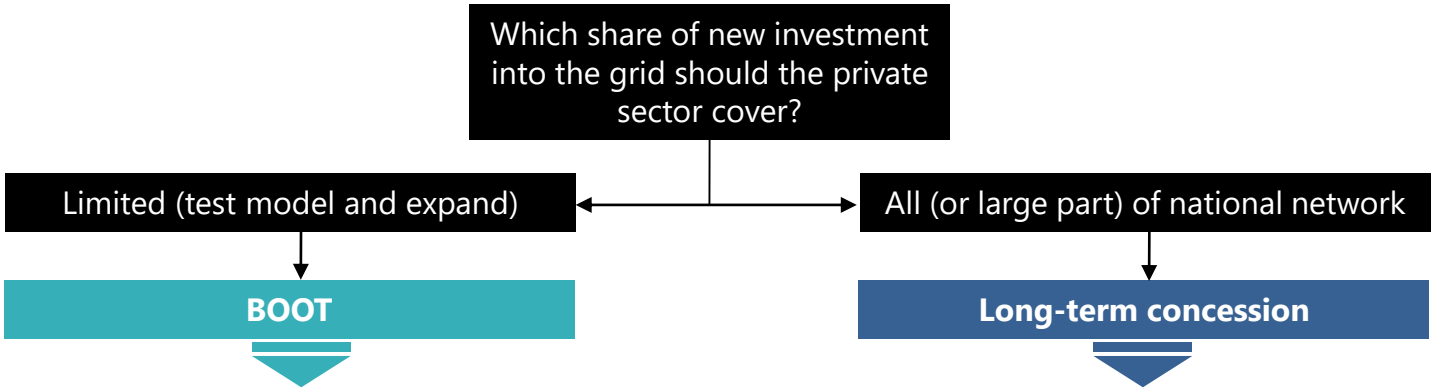
Zooming in on concession and BOOT models

- There is no perfect model, but long-term concessions and BOOT models have been more effective at attracting high levels of private capital to countries across the world.
- Other models have been more rare or, by design, implemented under very particular circumstances (e.g. dedicated lines), so their potential to attract large amounts of private investment is lower.
- The most appropriate model for each country will depend on the country's specific scope and domestic characteristics but the quality to design, implement and enforce regulation will be a key factor for success; e.g. concessions require a much stronger regulatory capacity than BOOTs.
- An advantage of the BOOT model is that it can be tested, while maintaining the existing engagements (e.g. while the SOE continues financing and operating the majority of the transmission assets).
- Implementing long-term concessions and BOOT models in Southeast Asia will likely require policy/regulatory changes, depending on the country (e.g. allowing open access for networks). The next sub-section explores the steps and requirements to implement each of these models.

Framework for implementation

Long-term concessions and BOOT model

Framework to attract private participation in power transmission



1. Is the current legal and regulatory framework appropriate to implement this model?
2. Which project is appropriate for private sector participation?
3. How to design the contract?
4. Which are the minimum requirements to participate in the tender? How to run it successfully?

1. Is the current legal and regulatory framework appropriate to implement this model?
2. What will be the concessionaire's area of operation and how will it interact with other power sector actors?
3. How to design the concession contract?
4. Which are the min. requirements to participate in the tender?

Requirements to implement a BOOT model: setting the basis

1 Legal and regulatory framework

- Regulation should allow private companies to obtain a license to build, own and operate transmission lines – and should describe the licensing process clearly. It must also clarify if this includes foreign companies (as this has security implications).
- Regulation should be clear whether a transmission investor can also own/manage generation and/or distribution assets.
- Grid code must be clear on the obligations among public and private stakeholders.
- Open access must be allowed (only under wholesale market regimes).
- If line is not radial then there should be clear regulation on how to distribute flows between lines for settlement purposes.

2 Appropriate project selection and viability

- Line selection. Large separate assets from the exiting grid are better suited for this model.
- Project bankability. Who is the contracting entity in the BOOT contract and what is their financial standing (i.e. are transmission revenues enough to cover costs)? If the contracting entity does not (fully or entirely) recover costs, the private investor will require credit enhancement to reduce perceived risks or even enter into the agreement.
- Decide upfront who will be responsible for the right of way (ROW) and other preliminary works:
  - *Late-stage tenders*: the government is responsible for all preliminary work (ROW, route designs, permits).
  - *Early-stage tenders*: private investor responsible for all preliminary work.

Requirements to implement a BOOT model: contract and tender

3 Contract design

The obligations and responsibilities of the public and private sector must be clearly defined in the transmission contract, especially clauses around tariff and/or revenue settings, exposure to currency risk, force majeure & dispute mechanisms.

Key performance indicators generally included in BOOT contracts:

- Line availability. Investor payment set by the bid price as long as line meets availability conditions (~98%). Penalties set to guarantee performance.
- Commissioning. Investors must deliver project before predetermined date, otherwise penalized. Government may also want to provide incentive for early termination.
- Following the instructions of the system operator and cooperation with other transmission owners. Investors will be required to follow instructions from the system operator in a certain way.

4 Tender process

The bidding process has various steps that should be defined clearly and well-communicated :

- What is the evaluation criteria and who will be in charge of running the tender?
- What is the timeline and which documents will be included in the bidding package?
- Who can participate? Governments require minimum requirements (on pass/fail basis) to attract high-quality bidders:

- Technical. To enter the bidding process, investors have to demonstrate a minimum track record building and/or operating transmission assets (number of years, value/length of transmission assets, geographic location).
- Financial. Minimum liquidity level, net assets or credit rating. Financial bonds required to guarantee that bids will be honoured.
- Can state-owned companies participate? This is the case for example in Brazil and Colombia.

Requirements to implement a long-term concession

1 Legal and regulatory framework

- Regulation should allow private companies to obtain a license to build, own and operate transmission lines – and should describe the licensing process clearly. It must also clarify if this includes foreign companies (as this has security implications).
- Ownership of assets may be retained by the government.
  - e.g. in the Philippines, the state-owned TransCo was created to retain ownership of the existing and new transmission assets that the concessionaire finances, builds and operates.
  - If there are legal impediments for private sector to own the assets, concession could be set for shorter period (~15 years).
- Regulation should be clear whether a transmission investor could also own/manage generation and/or distribution assets.
- Open access must be allowed.

2 Concessionaire's area of operation and interaction with other stakeholders

- Regulation must define if it's a monopoly and for how long. If not a monopoly then how do different concession owners cooperate?
- Regulators would need supervisory powers over the concessionaire.
- In a restructured market (i.e. unbundled with wholesale competition) the concessionaire would have to treat all generation assets equally and provide transparency.
- Clarity on who provides rules on technical standards is key; e.g. does the concessionaire propose and regulator approve or does the regulator specify?

Requirements to implement a long-term concession

3 Contract design

- If the concession agreement is for a fixed term it is important to plan for shift in concessionaires:
  - How long of an agreement do you give? Needs to be long enough to be worth it. Generally ~30 years or more.
  - When the contract runs out is there an automatic renewal or automatic tender?
  - If a different concessionaire wins a tender renewal, is the original concessionaire forced to sell the assets and how will they be valued? Similarly, how would the assets be valued if there is an early termination from one of the parties?
- If it is infinite would it be advantageous to divide into several concession zones to have benchmarking within the country?

4 Tender process

The bidding process has various steps that should be defined clearly with a well-communicated :

- What is the evaluation criteria and who will be in charge of running the tender?
- What is the timeline and which documents will be included in the bidding package?
- Who can participate? As with BOOTs, governments generally demand minimum requirements to attract high-quality bidders.
  - Can public-private partnerships participate?
  - Can foreign companies participate?

Closing considerations

- Investment in transmission –funded mainly by SOEs– has trended downwards in Southeast Asia. SOEs will likely continue to have a critical role in financing transmission, but private capital could help bridge the financing gap.
- There is **no perfect model for private participation, but long-term concessions and BOOT models have been more effective at attracting high levels of private capital** to countries across the world.
- Implementing any of these models in Southeast Asia will likely require **policy and regulatory changes**, depending on the country's capacity to design **bankable contracts** and **successful tenders**.
- **Regulators need to be heavily involved** in the process of choosing, designing and implementing these models as their capacity is key for success of the different models.
- Other considerations within the power sector in terms of **permitting, access to finance, transparency in market design will also play a large role** in successful attraction of private finance for transmission
- Regardless of the business model, **confidence in the overall investment enabling environment** (macroeconomic and political risks, tax regime, among others), as well as ensuring **transparency** throughout the process, **are critical** to attract private capital at low cost.

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