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On-line Training of SAARC Professionals on Power Purchase Agreements of Renewable Energy Projects



Development and importance of competitive power markets

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Role of Wholesale Power Markets

- The introduction of wholesale competition is a relatively complex measure intended to further improve efficiency in a sector that is already functioning relatively well.
- Wholesale competition may induce efficiency gains in a restructured power industry, and may also help in passing these gains to final customers.

Developing countries' woes

- In many developing countries the problems faced by the power sector may be much more fundamental, including
 - underpricing of electricity,
 - operational inefficiencies of the utilities, and
 - lack of a stable regulatory environment to promote investment.
- The introduction of a wholesale power market will not contribute much to addressing any of these basic problems, and should be deferred until other measures have been taken to improve the situation in distressed power systems.

Developing countries' woes

- For example,
 - Integrating Independent Power Producers might be a better alternative to alleviate serious capacity shortages,
 - Reforms to the distribution sector might be more effective in improving the quality of electric service and the financial sustainability of the power industry.

Preconditions for Wholesale Power Markets

- The majority of developing countries does not present the full range of preconditions for a wholesale power market, and can only make limited use of market forces.
- The list of prerequisites for a wholesale power market to be established and function effectively is quite lengthy, and is only met by a relatively small proportion of developing countries.

Preconditions for Wholesale Power Markets

- These preconditions can be primarily grouped into a number of categories as indicated below:
 - the **financial sustainability** of the power sector so that entities are sufficiently creditworthy to provide payment security,
 - the **scale and structure of the generation segment** and its ability to support competition,
 - the **quality of institutions** available to oversee and regulate the functioning of a complex market,
 - the **broader economic, political and social conditions** of the country.

Precondition: Financial health of the utilities

- The financial health of the power industry is an absolute pre-requisite for the introduction of competition.
- Distribution utilities, which are the main buyers in the market, need to be **creditworthy and financially sustainable**, otherwise there will be no payment security and confidence in market transactions will break down.
- Governments should be **politically committed to closing the revenue-cost gap** as their first priority

Precondition: Financial health of the utilities

- **Payment integrity** is needed along the entire electric supply chain for unbundled power sectors.
- This remains a challenge in many developing countries with distribution utilities facing arrears from their own customers and getting into arrears with their payments to generators.
- Leads to a **circular debt crisis** in the unbundled power sector

Precondition: Financial health of the utilities

- Opening wholesale competition under serious non-payment problems will not be fully effective, and can even contribute to the further deterioration of the power sector rather than its improvement.
- Case in point: Ukraine and other countries in Eastern Europe and the Former Soviet Union during the 1990s.

Precondition: Financial health of the utilities

- In Ukraine, poor enforcement of payments led to a crisis where suppliers received little cash, and delinquent distributors withheld from the wholesale market the little cash they did receive.
- Even the little cash allocated by the Ministry to the distributors did not cover the costs of their distribution networks and customer services.
- *Reforms to the distribution segment should be prioritized over introduction of wholesale power markets prior to the achievement of cost recovery.*

Precondition: Competition in generation sector

- A generation sector that provides scope for genuine competition among suppliers is another fundamental precondition for wholesale power markets.
- The scope for competition in the generation segment depends on several factors, including
 - the size of the power system,
 - the market structure in the power generation segment,
 - an adequate demand-supply margin,
 - the competitiveness of upstream fuel markets, and
 - the absence of transmission bottlenecks.

Precondition: Competition in generation sector

- The **power system needs to be large enough** to accommodate many buyers and sellers.
- Min. power system size for viability of unbundling = 1,000 MW.
- Min. size threshold for wholesale power markets = 3,000 MW and beyond.
- In practice, only around 10 percent of countries with small power systems (under 5,000 MW) have introduced wholesale markets, compared with over three-quarters of countries with power systems above 20,000 MW.

Precondition: Competition in generation sector

- In addition to market size, the main constraint on the feasibility of wholesale markets to operate is the ability of new generation companies
 - to enter the market,
 - to access transmission resources on a non-discriminatory basis and
 - to enter into enforceable contracts with new or existing buyers
- The potential competition in generation is closely related to the resource mix and the share of inflexible baseload generation plants of the given country

Precondition: Competition in generation sector

- Moreover, an adequate **margin between supply and demand** for power generation capacity is needed to make competition meaningful.
- If the electricity market is tight, it follows that almost all available capacity will always be needed, reducing any scope for competition among suppliers.
- Countries facing serious supply adequacy problems should **address the lack of investment in new generation capacity** before considering the introduction of wholesale competition.

Precondition: Competition in generation sector

- Competitive power markets need to be underpinned by **competitive fuel markets** in countries reliant on thermal power generation.
- Fuel availability at competitive prices, together with diversity in fuel supply sources, are required for enhancing wholesale competition and facilitating entry of new competitors with efficient generating plants.
- **Transmission bottlenecks and vertical integration** need to be alleviated before establishing wholesale competition.

Precondition: Quality of institutions

- Emerging empirical evidence supports the importance of establishing **appropriate institutional and regulatory framework** in line with the institutional endowment of the country.
- A **sound regulatory framework** will help to reduce risk perceptions, attract investment and keep financing costs down.
- Power markets require the **legal infrastructure** for dispute resolution in a rapid, fair, and competent manner.

Precondition: Overall economic, political and social conditions

- **Macroeconomic, political and social conditions** cannot be separated from the analysis of the initial design of reform, its sustainability and subsequent adaptations or even reversions back from wholesale competition.
- It is extremely difficult to carry out **structural reforms** of the sector and **attract private investors** during conditions of economic turmoil.

Role of Regional Power Markets

- Regional integration of electricity markets is a growing trend among developing countries with large potential benefits.
- Regional markets are at **varying stages of development**, but typically evolve from bilateral contracts (such as the West Africa Power Pool - WAPP) towards organized power pools (such as the Central American Power Market – SIEPAC)

Role of Regional Power Markets

- Economic studies suggest that the benefits of cross-border power exchanges can be substantial, including
 - **arbitrage** between high and low-cost sources of electricity in neighboring countries,
 - **optimizing** the use of existing resources, and
 - **improving** supply adequacy
- Regional power markets may provide an opportunity for smaller countries to enjoy some of the benefits of power trade, as long as other conditions are met.

Examples of regional integration of power markets

- South Africa
 - South Africa Power Pool (SAPP) has been established for over 20 years with relative success, driven by surplus power from South Africa.
 - Large traded volumes from South Africa to its neighbors, albeit **mostly via bilateral contracts**.
 - Short-term markets are in place since 2001 but amount for little trading overall.

Examples of regional integration of power markets

- West Africa
 - West African Power Pool (WAPP) yet to resume market operation at pool level.
 - Current power exchanges are based on **bilateral contracts** not guided by WAPP.
 - Slow evolution of regional trading due to lack of transmission links and shortage of generation.

Examples of regional integration of power markets

- Central America
 - Central American Power Market (MER) with spot market since 2002, although **limited volumes** are currently traded across borders.
 - Eventual building of **1200km SIEPAC transmission line** with 300 MW capacity.

Examples of regional integration of power markets

- South America
 - 19 operating **bilateral interconnections**, including three **binational power plants**.
 - Initiatives are underway to integrate Andean Markets (Bolivia, Colombia, Ecuador, Peru and Chile).
 - However, **distrust between neighboring states** obstructs the evolution of electric integration.

Examples of regional integration of power markets

- East Asia
 - **Ongoing integration effort** underway in the Greater Mekong Subregion, comprising Cambodia, the Lao People's Democratic Republic (Lao PDR), Myanmar, Thailand, Vietnam, and the Guangxi Zhuang Autonomous Region and Yunnan Province of the People's Republic of China (PRC).
 - Trade is envisioned to evolve **gradually from PPAs to an integrated power market.**

Examples of regional integration of power markets

- EU / US
 - The EU and particularly Nord Pool are currently in **advanced stages of integration**, featuring regional power exchanges and energy prices.
 - **Mature regional markets** also exist in the US, although further regional integration and more transmission interconnection capacity is needed.

Examples of regional integration of power markets

- South Asia
 - Currently **lacking long-term commitments** despite large potential benefits of regional integration, particularly for a joint Bangladesh, Bhutan, Nepal and India market, aimed at exploiting the considerable and under-utilized hydro potential of Bhutan and Nepal; the export of gas based generation from Bangladesh.
 - **Policy, institutional, and political barriers** impede a SAR integrated electricity market, for example:
 - lack of confidence and trust,
 - trade-restrictive policies, and
 - challenges in creating effective regional bodies for cross-border coordination

Examples of regional integration of power markets

- South Asia
 - **Developing domestic power markets** (most of which are single-buyer structures) and **harmonizing grid codes** and regulations among countries has been suggested for further integration in the region.

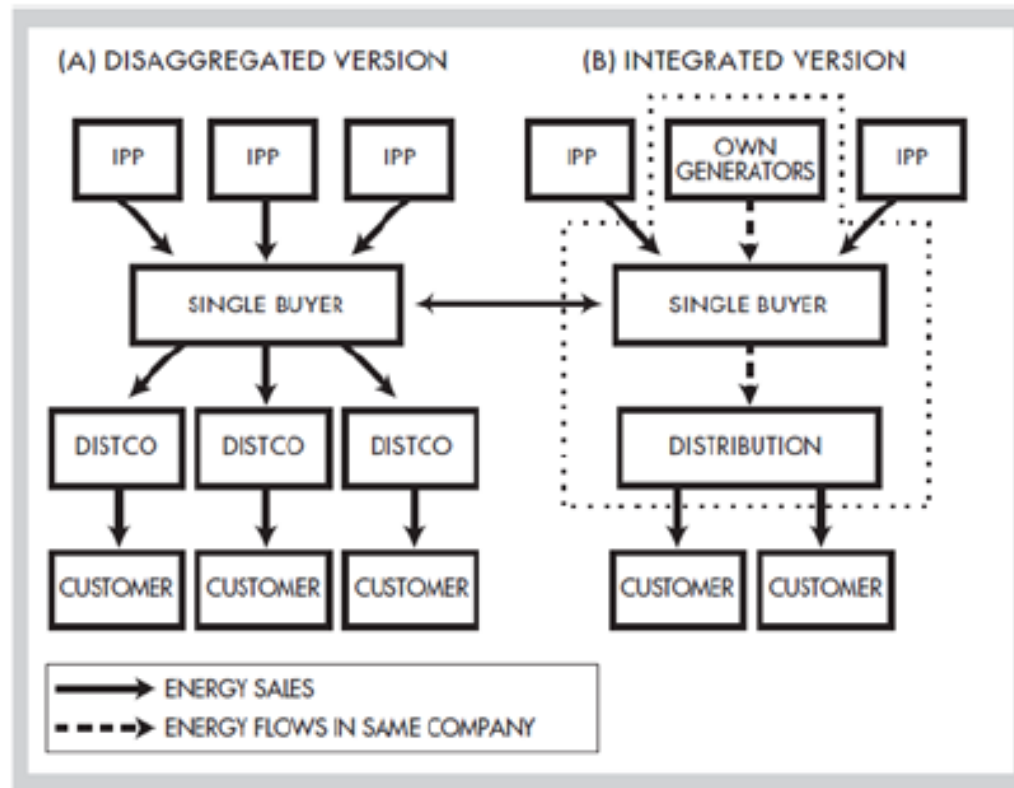
Development of Wholesale Power Markets

- Given the demanding prerequisites for wholesale power markets, many developing countries find themselves at the **intermediate stage with the Single Buyer Model**.
- In a pure single-buyer model only the existing **integrated monopoly in any area is permitted to buy power** from a number of competing generators and/or Independent Power Producers.
- IPPs may only sell at regulated prices to the existing utilities, which still have a **complete monopoly over all final customers**.

Development of Wholesale Power Markets

- In developing countries, IPPs have generally sold their output to the **state-owned single buyer** on the basis of a **long-term PPA with a state-backed guarantee** for the off-taking utility's performance.
- Under this market structure, competition may take place for the market through **tendering of IPPs**, and within the market as different generators compete to sell to the single buyer.

Development of Wholesale Power Markets



- Single Buyer Model. Source: (Hunt, 2002)

Development of Wholesale Power Markets

- The Single-Buyer Model is considered by some to be a **second best to comprehensive restructuring**, which allows for **gradual transition** towards fully wholesale competitive markets.
- It is a relatively easy-to-implement **interim market structure** between vertically integrated monopoly and wholesale competition.
- It could help **launch the reform process** by showing the benefits of private investment and management.

Development of Wholesale Power Markets

- Transition from the Single Buyer Model (SBM) towards wholesale power markets (WPM) requires **special provisions and cautions**.
- The **examples and experiences** of a few countries that have recently made or are making this transition are discussed in the following slides.

Countries transitioning from SBM to WPM: **Mexico**

- Mexico laid the legal foundation (which required amendments to the Constitution) for **electricity sector reforms in 2013**.
- **Market rules were published during 2015** for a complete wholesale power market with
 - day-ahead, hour-ahead, real-time, capacity, and ancillary markets;
 - financial transmission rights;
 - medium and long-term capacity auctions; and
 - marketers (with no ownership of generation assets) engaging in virtual transactions.

Countries transitioning from SBM to WPM: Mexico

- The current design has been criticized for the **partial vertical separation** of generation, transmission and distribution – which raises **concerns on discriminatory access** procedures by the incumbent state-owned enterprise – among other reasons.
- Given that nearly all the currently available capacity and electricity generation existed before the new rules were put in place, it has been suggested that **there will likely not be any new participants** from the supply side in the new wholesale market.

Countries transitioning from SBM to WPM: Turkey

- Turkey recently replaced the Single-Buyer Model by a wholesale market.
- Turkey's transition plan covered
 - **procedures for privatizing** distribution and generation assets ...
 - ... with the introduction of **transitory vesting contracts** through which generation, either from existing contracts or from public companies, will be allocated to distribution companies based on their weighted share in total demand to compensate for the demand of captive consumers.

Countries transitioning from SBM to WPM: Turkey

- The main purpose of these contracts is
 - to provide for **a smooth transition by ensuring predictability** of electricity prices and supply during the transition period and
 - to **cover stranded costs** that are taken by a public specialized company (TETAS).

Countries transitioning from SBM to WPM: **Vietnam**

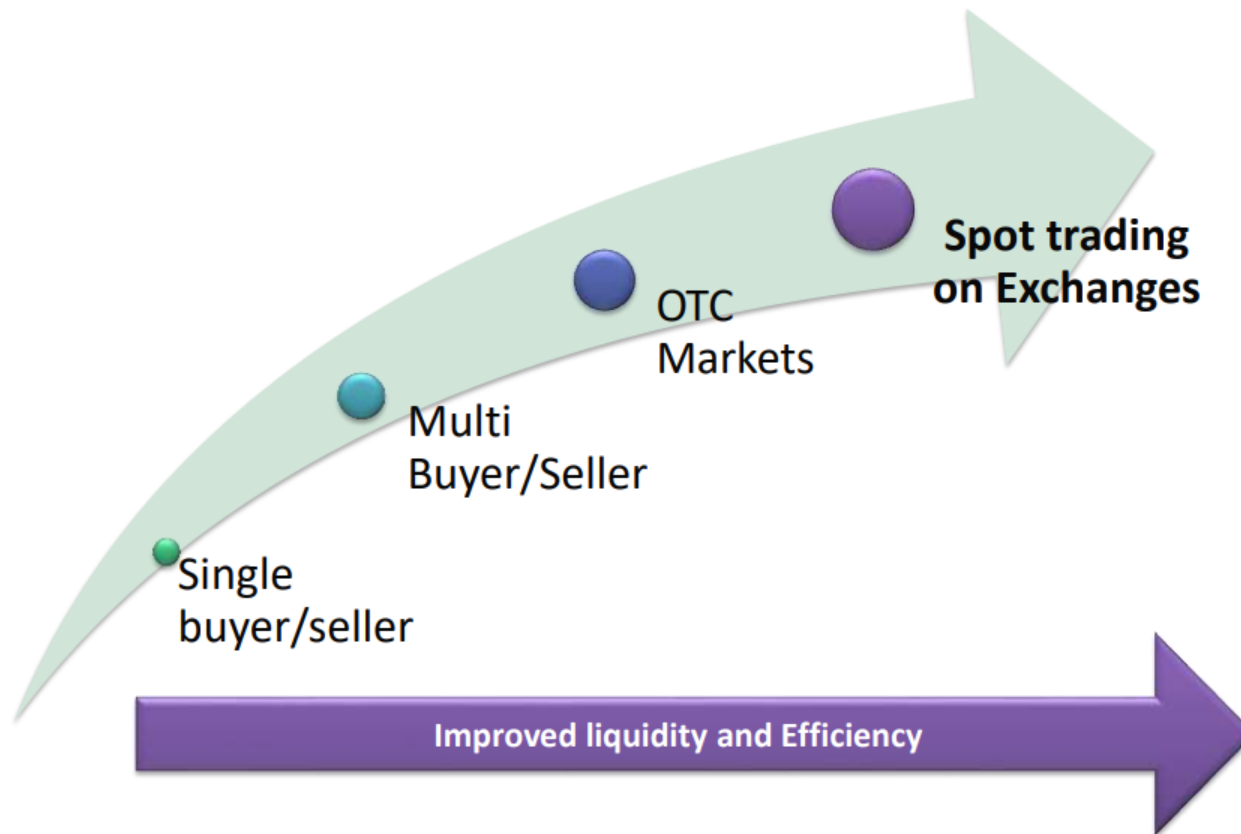
- Vietnam has taken **a phased approach** towards competitive wholesale and retail electricity markets.
- The electricity law enacted in 2005 established a single-buyer market starting in 2010.
- The single-buyer sells power to DISCOMS and large consumers **at regulated prices**.
- This market structure is planned **to evolve into a pool** with multiple buyers and sellers.

Countries transitioning from SBM to WPM: Vietnam

- Currently, generation prices are the largest component of the retail tariff.
- At present, there is little possibility for reducing these through operational efficiency, as 90% of sales are covered by **long-term financial PPA contracts** (10 to 20 years for local IPPs and up to 25 years for a BOT)
 - the prices of these PPAs are **not transparent** and have been negotiated between generators and the government.
- **Special tariffs** apply to renewable generation and small hydro plants, providing preferential pricing for renewable power

Success stories: India

- Indian Power Market Development trend



India: Road to Power Markets

- Electricity Act 2003

- Intent of the Act was to promote competition by “freeing” all possible avenues of procurement and sale of power:
 - De-licensing of generation (Sec-7)
 - Development of a multi-buyer multi-seller market in power (Restructuring of SEBs – Sec 131)
 - Trading – licensed activity (Sec-12).
 - Non Discriminatory open access to transmission (Sec 38-40) and Open Access in Distribution (Sec-42)
- Autonomous Regulatory Commission (Sec 76) to overlook functioning of Power markets

India: Road to Power Markets

- Open Access Regulations, 2004
 - Reservation of transmission capacity: Long Term and Short Term Access
 - Short term open access granted on inherent margins
- Power Exchange Guidelines, 2008
 - Defined 'Power Exchanges'
 - Transaction categorized as Bilateral or Collective (through PXs)
 - Transmission charges

India: Road to Power Markets

- Power Market Regulation, 2010
 - Role of PXs defined and norms for setting up and operating PX
 - CERC approval for setting up a PX
- **Indian Energy Exchange (IEX)**
 - started its operations on June 27, 2008
 - ~97% Market Share
 - + 5000 MW average daily trade
 - 6000+ Participants
 - 4000+ Industries, 70+ Commercial, 50+ Discoms, 400+ Conventional Generators, 1500+ RE Participants

Conclusion

- Wholesale Power markets are likely to further **enhance the efficiency** in the restructured power industry.
- Developing countries, however, need some ground work before the **suitable conditions** for setting up wholesale competitive markets could be achieved.
- **Regional power markets** can offer a way out in many cases, especially for a group of smaller countries.
- **Single-Buyer Model** could be adopted as an intermediate stage before transitioning to a full-scale competitive Wholesale Power Market

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Thank you

