

Market-Based Models for Wind Energy

Pramod Jain

Consultant to ADB

Quantum Leap in Wind

Technical Assistance Program

Energy Regulatory Commission of Mongolia

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Agenda

- Overview of Market-Based Models
- Types of Market-Based Models
- Renewable Portfolio Obligations and Renewable Energy Credits
- Auctions
- Renewable Energy Sale to Wholesale market
- Bilateral contracts with large consumers of electrical energy



Overview of Market-Based Models

- Feed-in Tariff (FiT) is considered to be a non-competitive fixed-price cost-based model
- Standard contract for the life of the energy generating facility with a fixed tariff
- Most countries have used this mechanism to promote renewable energy and in particular wind energy development
- In countries with successful wind development, FiT has been adjusted multiple times



Types of Market-Based Models

- Renewable Portfolio Obligations (RPO) and Renewable Energy Credits (REC)
- Auction
- Renewable energy sale to wholesale electricity market
- Bilateral contracts with large consumers of electrical energy



Renewable Portfolio Obligations & Renewable Energy Credits

- RPO is a policy that mandates the electric utility companies to purchase certain percentage of electrical energy from renewable energy sources.
- RPO takes the form of goals like: 15% of renewable energy by 2015 and 20% by 2020.
- Why is this approach market-based?
 - The reason is it forces the electric utility companies to purchase the “most efficient” renewable energy from the market. Most efficient means a combination of high reliability, low variability and low cost.



Renewable Portfolio Obligations & Renewable Energy Credits

- RPO is also called Renewable Portfolio Standard (RPS)
- A utility may choose to purchase Renewable energy credits (REC) if it cannot meet the RPS obligation
- RECs are tradable certificates earned by renewable energy generators for electricity production



Auction

- Reverse auction is a mechanism for bidding
- Government or Utility company announces its intent to buy certain amount of wind energy from a region
- It is a competitive method to seek the most cost effective project from a pool of developers in a region
- Two types of reverse auction:
 - Lowest delivered price for energy
 - Lowest total install cost
- An electricity auction increases the competition and transparency
- Developed power markets with a large number of buyers and sellers in sound financial standing are more conducive to competition



Renewable energy sale to wholesale electricity market

- Allowing RE projects to sell into a wholesale electricity market
- This is applicable in countries with both conditions:
 - Established wholesale market
 - Average wholesale price that is higher than average cost of production of RE.



Bilateral contracts with large consumers of electrical energy

- Allowing RE projects to sign bilateral contracts with large electricity consumers
- Such a model requires:
 - Deregulated electricity market in which a large consumer of electricity can buy from any generation source
 - Transparent and predictable transmission and distribution tariff.



Experiences in UK

- Non-Fossil Fuel Obligations (NFFO) obligated utilities to purchase renewable energy at a premium
 - Introduced in 1990 and stayed in effect until 1998
 - Premium was funded by a fossil fuel levy.
 - Four auctions for 600MW, 1000MW, 1500MW & 1177MW
- NFFO did not have penalties for companies that won bids, but did not start a wind project
 - Unutilized capacity
 - Companies were bidding low with impunity, sometimes to block competitors
 - There is general agreement that if NFFO had a penalty for non-performance, it would have been a good mechanism



Experiences in UK

- Since 2002, Renewable Obligations (RO) have taken the place of NFFO.
- It mandates all distribution companies to supply set percentage of electricity to consumers from renewable sources
- RE projects generate Renewable Obligation Certificates (ROCs), which are tradable
- This quota-based market model has proved to be more successful, with growth to 7% of electricity from renewable energy versus 3% before the RO.



Experiences in Brazil

- Started with The Programme of Incentives for Alternative Electricity Sources (PROINFA) in April 2002
 - 1,100MW was assigned under this Feed-in Tariff scheme with a deadline of 2008
 - Not successful because of:
 - Complex and highly bureaucratic permitting process and procedures to obtain or renew environmental licenses
 - Problems and delays in obtaining the Declaration of Public Utility (DUP) for projects
 - Difficulty in connecting to the grid, particularly in the Central-West region
 - Difficulty faced by the domestic fledgling wind industry to meet high local content guidelines for any wind turbine /equipment.



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 - High local content requirement for turbines & BOP
 - Deadlines were repeatedly postponed
 - Lack of a clear long-term policy signal strongly undermined investments



Experiences in Brazil

- In 2009 PROINFA was replaced with auction
- New policy signals spurred the development of the projects
- Under reverse price auction (competitive bidding system) aim was to efficiently and cost effectively increase the country's energy supply security
- Structure of the auction system set the bar for entry sufficiently high such that only serious players were able to compete for the tenders
- Rigorousness of this system has given the industry confidence to move ahead even with the very low prices of the winning bids in auctions
- 7,000 MW of wind energy pipeline has developed under the auction scheme



UK vs. Brazil

- UK started with auctions with little success
- Renewable portfolio obligations with renewable energy credits has proved to be successful
- Brazil started with Feed-in tariff with luke warm uptake
- Auctions have resulted in sharp rise in wind projects



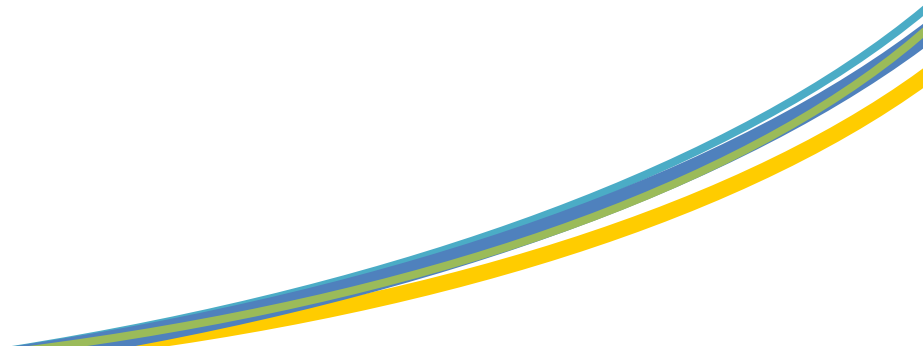
Experiences in Italy

- Italy's national policy for renewable operates through complex set of incentives:
 - Indirect regulatory support measures such as feed-in tariffs and fiscal incentives
 - Market based mechanism such as quota obligations and tradable green certificates
- According to the EU RE-Shaping study, Italy has the highest average expenditure for supporting wind power
- Result: Sustained investments despite long administrative procedures and grid constraints



Experiences in Italy

- As examples of favorable incentives:
 - Price of Green Certificates was 109 EUR/MWh in 2005 and 130 EUR/MWh in 2007
- The current level of favorable incentives and support are not sustainable and a reduction is likely
- Starting 2013, the Green Certificates will be replaced with Feed-in tariff for small projects and tendering system for larger projects



Experiences in India

- Tried a wide variety of and combinations of incentives and market-based mechanisms:
 - In the formative years, the most successful incentive was 100% depreciation in year 1, which was reduced to 80% and now has been phased out. It has been replaced by a generation-based incentive.
 - Most states in India have Renewable Portfolio Standard, which are met by renewable energy purchases or tradable Renewable Energy Certificates (REC)
 - Most states have state-specific feed-in tariff, computed based on a cost-plus methodology
 - Few wind rich states allow for third party sale of electricity generated from wind projects within the state, in addition to banking and wheeling facility. These states have enjoyed large number of wind installations.



Experiences in India

- India's early success was also from manufacturer driven vertically integrated model :
 - Wind turbine manufacturer provides complete start to end services--Land acquisition, installation, commissioning, operations and maintenance
- New model is Independent Power Producer based system with the following collection of incentives:
 - Feed-in Tariff
 - Generation-based incentives
 - Market oriented incentives in the form of RPS & RECs.



Lessons from Italy & India

- Collection of incentives that combine feed-in tariff and market-based incentives that are continuously fine-tuned is a recipe for success
- Policies that result in successful growth of renewable energy may not necessarily be efficient



Experiences in Denmark and Germany

- Denmark is the pioneer of wind industry, while Germany has the largest amount of wind installations in Europe
- Both countries have benefited from long-term renewable energy targets
- Primary incentive mechanism is feed-in tariff, specified as a premium over the market price
 - Denmark: Premium in 2009-2012 is 33.5EUR/MWh
 - Germany, the Feed-in tariff mechanism is extremely detailed and designed to respond to market developments. Since 2009, the total feed-in tariff is 92 EUR/MWh, with an annual depression.



Experiences in Denmark and Germany

- Both countries started with a very community-focused approach to wind development, which resulted in cooperative owned wind farms
- There were no auctions, so no competition from outside
- Market-oriented policies like auctions have been adopted recently, but only for off-shore wind



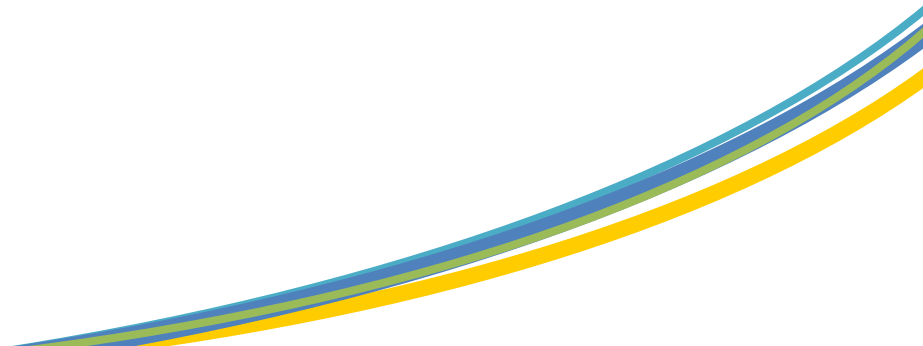
Experiences in China

- China's wind industry has experienced extremely high growth. Primary reasons are:
 - Sustained government support
 - Clear long-term goals
 - Stable tariff
- Until 2008, there was low to moderate growth, and then experienced sharp growth
- Prior to 2008, the feed-in tariffs were determined by competitive bidding, which resulted in low and uncertain tariffs
- After 2008, the feed-in tariffs are fixed for different regions of the country



Lessons from Denmark, Germany and China

- Primary mechanism that has resulted in high growth is Feed-in tariff
- Stimulating growth requires constant fine tuning and adjustment based on market conditions
- Key ingredient in addition to feed-in tariff is long-term commitment reflected in long-term goals/targets for renewable energy



Conclusions

- There is no “one-size-fits-all” model
- Market-based model based on Renewable Portfolio Obligations and Renewable Energy Credits can be effective in generating demand from electricity distribution companies for competitively priced wind energy
- Market-based model based on auction can also be effective if conditions are in place to impose penalties for non-performance, and qualification bar is set high for wind developers
- In deregulated markets, sale to wholesale market and bi-lateral contracts can also be effective
- None of the above market-based models works in isolation. In most countries, Feed-in tariff model is supplemented with one or more market-based policies



Conclusions, Contd.

- None of the policies were effective in the first or second iteration.
- The most successful renewable energy markets have evolved over successive iterations
- Successive iterations not only align incentives with market/investor expectations, but also demonstrate a long-term commitment of government to tune policy parameters in response to market conditions
- Policies must be long-term with built in flexibility and mechanisms to adapt to lack of or excessive development of wind energy
- Built-in flexibility and mechanisms must be transparent and predictable to ensure steady progress of RE development.



Conclusions, Contd.

Policy sequencing is critical for policy effectiveness

- Preconditions must be in place before RE policy is introduced, otherwise bottlenecks are created and there is chaos
- Preconditions:
 - Basic legal and regulatory mechanisms: Deregulation, IPP contracts
 - Institutional and administrative processes to conduct auctions, issue licenses , sign PPA
 - Legal and regulatory frameworks for grid connection and integration



Conclusions, Contd.

- Other preconditions for any model (Feed-in tariff with market-based models) to achieve sustained development
 - Grid interconnection standards
 - Planning for transmission capacity to evacuate power from wind rich areas
 - Sufficient spinning reserves to compensate for variability of wind energy
 - Clear guidelines for permitting: Environmental Impact Study, Interconnection study, Microwave & EM interference
 - Clear land ownership & land use rules

