Electricity Market Reform in China

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China Energy Issues in the 12th Five Year Plan and Beyond
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Goals and Objectives of China’s Electricity Market Reform
China’s Electricity Supply Industry
In A Glimpse (1)

• 1st power plant in Shanghai in 1882
• 1st Chinese Power Producer in Guangzhou in 1888
China’s Electricity Supply Industry
In A Glimpse (2)

Installed capacity of 1.85 GW in 1949
rapidly expanded to 968.34 GW in 2010
## China’s Electricity Supply Industry In A Glimpse (3)

<table>
<thead>
<tr>
<th>Technology</th>
<th>2010</th>
<th></th>
<th>2020</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>GW</td>
<td>Percentage</td>
<td>GW</td>
<td>Percentage</td>
</tr>
<tr>
<td>Coal</td>
<td>646.60</td>
<td>66.77%</td>
<td>1,030.00</td>
<td>57.68%</td>
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<tr>
<td>Gas</td>
<td>26.42</td>
<td>2.73%</td>
<td>58.90</td>
<td>3.30%</td>
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<tr>
<td>Nuclear</td>
<td>10.82</td>
<td>1.12%</td>
<td>80.83</td>
<td>4.53%</td>
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<tr>
<td>Hydro</td>
<td>198.21</td>
<td>20.47%</td>
<td>340.00</td>
<td>19.04%</td>
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<tr>
<td>Pumped storage</td>
<td>17.84</td>
<td>1.84%</td>
<td>50.00</td>
<td>2.80%</td>
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<tr>
<td>Wind</td>
<td>29.57</td>
<td>3.05%</td>
<td>150.00</td>
<td>8.40%</td>
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<tr>
<td>Solar</td>
<td>0.26</td>
<td>0.03%</td>
<td>24.00</td>
<td>1.34%</td>
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<tr>
<td>Biomass</td>
<td>1.70</td>
<td>0.18%</td>
<td>15.00</td>
<td>0.84%</td>
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<tr>
<td>Other</td>
<td>36.92</td>
<td>3.81%</td>
<td>36.92</td>
<td>2.07%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>968.34</strong></td>
<td><strong>100.00%</strong></td>
<td><strong>1,785.65</strong></td>
<td><strong>100.00%</strong></td>
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China Energy Issues in the 12th Five Year Plan and Beyond
1st phase (1986 – 1995)  
(7th and 8th Five-year Plans)

- Multi channel financing capital expansion project
- Allow foreign investment since 1995
- Aroused the enthusiasm of the society to generate power and rapidly changed the serious power shortage all around the country
- Multiple investment bodies gradually formed in the power market
2\textsuperscript{nd} phase (1996 – 2000) (9\textsuperscript{th} Five-year Plan)

• State Power Corporation was founded in January 1997

• Four-step reform strategy in August 1998
  - Separation of Administration from Enterprise Operation
  - Separation of Generation from Grid and bidding for on-grid

- Plans of Power Regime Reform was formally approved by the State Council in March 2002
- State Electricity Regulatory Commission (SERC) was set up in October 2002
- The former SPC was restructured into two grid corporations, five large Gencos and four subsidy groups in Dec 2002
- Separation of Generation from Grid

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4th phase (2011 – Present)
(12th Five-year Plan)

- Approved by the Central Committee of the Communist Party of China (CPC) on 14 March 2011
- Focused on optimizing the structure of power generation in a micro-level for better economic and sustainable development
- Set out systematic reform strategies for developing clean energies, optimising production of coal-fired electricity, rationally allocate peaking power, developing distributed energy and constructing a strong and smart grid
Reform Objectives In The Later Stage (1)

Apart from

• Introduce competitive incentives
• Improve efficiency
• Reduce cost
• Improve power pricing
• Optimize resource allocation
• Advance nationwide grid construction

and to ensure the sector

• Contribute to meeting boarder economic and environmental goals
Reform Objectives In The Later Stage (2)

Slow down of the Program for Electricity System Reform introduced since February 2002 due to

- Uncertainty inspired by the crises in California and elsewhere
- Power plant financing is no longer a significant objective
- Electricity prices do not depart significantly from marginal cost

Provide opportunity to

- Pause, reflect and adjust its plans for the industry
Goal 1 of the Electricity Market Reform (12th Five-year Plan)

New power generation structure for new (hydro, biomass, wind, solar, and nuclear power) and renewable energy resources

- non-fossil fuel generation account for 11.4% of total
- primary energy consumption by 2015
- renewable energy resources to 20% by 2020

To reach emission reduction targets, the proportion of new and renewable energy in China’s overall energy mix will continually increase
Goal 2 of the Electricity Market Reform (12th Five-year Plan)

Optimizing coal-fired power generation capacity by accelerating construction of coal-based generation

• Electricity demand will grow rapidly in China for a long time into the future.
• The absolute consumption gap between supply-side regions and demand-side regions will continue to increase

Rationalizing the location of coal-fired power and achieve greater overall economic and social benefits
Goal 3 of the Electricity Market Reform (12th Five-year Plan)

Need to allocate peaking power rationally

- Large portion of coal-fired units and run-of-water hydropower plants in Northern plants
- Rapid development of wind power of intermittent nature

Need to construct gas-fired power and pumped storage power stations to meet system peaking demand
Goal 4 of the Electricity Market Reform (12th Five-year Plan)

Need to exploit Distributed Energy Sources

- The National Energy Board has stated that most large-scale cities in the country will implement distributed energy systems by 2020.
- The National Development and Reform Commission specified that the installed capacity of distributed energy should reach 50 GW by 2020.

Establish uniform technical standards, develop a rational energy price mechanism, promote use and manage distributed energy.
Goal 5 of the Electricity Market Reform (12th Five-year Plan)

Need construction of a Strong and Smart Grid

- Construct the inter-provincial transmission grid for long distance, high capacity, and high energy efficiency power transmission so as to optimize the allocation of bulk volume production of energy resources
- Based on intelligent, digital, efficient information platform and service network, smart grid can collect and respond to a diversified supply side and demand side

Smart grids can provide a dynamic platform for a variety of distributed energy resources to connect flexibly and provide an intelligent control and management platform to improve energy efficiency and achieve demand side response
Multitude Dimension Nature of the Electricity Market Reform
Multitude Dimension Nature

- Technologies to ensure secure, efficient and clean electricity supply
- Market economy to propel reform for a balance between social and economic benefits of the community at large
- Legal framework to uphold rules for ensuring fair, just and transparent market operation
Core Technologies of Smart Grid

- Distributed intelligence, sensors, controls
- Data Networks and communications
- Advanced software and systems
- Power electronics

*Future: Operation of system will be shared between central and distributed generators. Control of distributed generators could be aggregated to form microgrids or ‘virtual’ power plants to facilitate their integration both in the physical system and in the market.*
Meeting Power Market Needs

- Accommodates a wide variety of generation options
- Empowers the consumers to manage their energy use
- Self-healing
- Provides power quality needed
- Enables competitive energy markets
- Optimizes assets deployment
Strategic Power Flow

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Transmission Corridors

Power transmission from The West to the East: Three transmission corridors

The capacity of each corridor will reach about 20GW in 2020.
Legal Dimension of the Electricity Market Reform
Landmark of Legal Support

- Civil law principles promulgated in 1986
- Electricity Law formulated in 1995
- Renewable Energy Law in 2006
- Anti-monopoly Law in 2008
Electricity Law of China

- Effective on December 1995
- Promote development of the electric power industry
- Safeguard the legal rights and interests of investors, operations and users of electric power
- Maintain the safe operation of electric power
Renewable Energy Law

  - Establishing national targets
  - Grid connection priorities
  - Classifying tariffs for RE electricity
  - Sharing cost at national level
  - Special fund for renewable energy
  - Favorable credit and favorable tax treatment
Anti-monopoly Law of China

- Effective on August 2008
- Prohibit certain types of agreements unless they fall within specified exemptions
- Prohibit certain behaviors classified as abuse of dominant market position, providing a framework for determining when dominance exists
- Establish a board merger review scheme
- Prohibit abuse of government administrative powers restraining competition
Prospective Law of Reform (1)

• Meet the legal obligations of the international trading system by removing barriers to trade and investment;

• Improve transparency, neutrality, and due process;

• Build new institutions and practices expected by international norms;

• Adopt pro-active strategy to complement trade and investment liberalization;

• Construct a framework of credible rules, legal systems, and institutions needed for supporting development of the market economy;
Prospective Law of Reform (2)

- Strengthen law enforcement capacities to regulate behavior in competitive market;

- Adopt coordinated and strategic reform approach based on market principles focusing on systemic issues of institutional capacities and interactions that cut across multi-dimensional sectors on technical, economic, government administrative and legal systems;

- Take concrete steps to move closer to good international practices, with potentially large rewards in market performance and investor confidence;
Prospective Law of Reform (3)

• Set goals and design reform by observing good regulatory practices on competitive market openness, and public management principles;

• Improve regulatory transparency through more systematic publication, public consultation, and notification procedures;

• Enhance the capacities of regulators and to choose efficient regulatory solutions to reduce market risks and failures;

• Improve regulatory planning, coordination, and oversight from the center of the government through new institutions at the center of government; and

• Establish a truly independent judiciary – a keystone of the rule of law.
Challenges on the Electricity Market Reform
Challenge 1 of Electricity Market Reform
(12th Five-year Plan)

The shift of the reform toward reducing greenhouse gas emissions, very large investment in renewable energy and energy efficiency, and grid expansions to accommodate the new mix of clean resources by revisiting:

- Carbon price support
- Feed-in-tariff
- Capacity payments
- Emission performance standards
Challenge 2 of Electricity Market Reform
(12th Five-year Plan)

Integration of economic and social pressure on energy price, energy efficiency, environmental protection and climate change

- Need explicit policies to attract investment for cleaner technologies
- Need new mechanism and jurisdiction for redesigning the earlier reform to adapt the new challenges
- Need increase of interprovincial and inter-regional trading and power plant dispatch
Challenge 3 of Electricity Market Reform (12th Five-year Plan)

Inertia on strong government influence on the reform of the electricity market

- Generation and grid assets are mostly controlled or with policies influenced by the government
- Directing these investment to meet the long-term efficiency and environmental goals is a challenge
- Bid-based generation markets will not achieve all the benefits of China’s dispatch policies
Summary

• China has gone through the various phases of electricity market reform:
  - Reform to raise capital for expansion
  - Reform to market-oriented restructuring
  - Reform to introduce competition in the electricity industry

• Innovative technologies continue to be the prime mover to propel generation and national grid expansion

• Open-economy policy supports the reform to achieve a balance among a multitude dimension of interests

• Legal reform continues to strengthen rule of law in general for establishing clearer market operation, pricing and effective governance systems.
Thank you for your attention!