

**CASE STUDY:  
LEGAL AND STRUCTURAL REFORMS IN THE  
DEVELOPMENT OF ALTERNATIVE ENERGY IN EMERGING MARKETS**

**Introduction**

Intense economic development over the past several decades has placed an enormous strain on world resources. The pressure to produce goods at ever increasing rates has heightened human dependence on fossil fuels, accelerated deforestation, and led to unsustainable agricultural practices. These ecological stresses have also contributed to energy shortages and a rapid increase in the concentration of greenhouse gases in the atmosphere.

In order to address dwindling energy supplies as well as the health and environmental effects of fossil fuel use, many developing countries have embarked on initiatives aimed at reducing emissions and increasing energy efficiency through the use of alternative energy sources. China and India, two of the world's largest developing economies, stand out for the progress they have made in industries such as wind power and solar energy.

The case studies below will explore how China and India have used legal and structural reforms to develop their alternative energy industries and to address energy constraints.

**Two Case Studies**

**China**

*Factors Contributing to a Shift Towards Alternative Energy Use*

Since 1978, China has been experiencing spectacular economic growth as a result of its economic reforms and a shift to an open-door trade policy. Between 1979 and 2006, China's GDP growth rates ranged between 5% and 14% per year, with an average of 10%.<sup>1</sup> This growth caused a tremendous increase in demand for energy across sectors. As a result, China's electricity industry has become the second largest in the world.<sup>2</sup>

While economic growth has been a boon for China, the country's rapidly expanding economy coupled with its heavy reliance on dirty-burning coal have caused unparalleled damage to the environment<sup>3</sup> and significant pressures on its energy supply. In addition, the growing demand for energy in China is also increasing demand for oil imports, which contributes to rising world oil prices.

*Environmental Effects*

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<sup>1</sup> Ming Yang, "China's energy efficiency target 2010," *Energy Policy* 36 (2008): 562.

<sup>2</sup> Zhing-Xiang Zhang, "China is moving away [from] the pattern of 'develop first and then treat the pollution,'" *Energy Policy* 35 (2007): 3547.

<sup>3</sup> *Ibid.*

The negative environmental effects of this unprecedented economic growth are reflected in the following:

- Burning coal contributes to 90% of the national total of sulfur dioxide (SO<sub>2</sub>) emissions, and about 70% of the national total dust, nitrogen oxide and carbon dioxide emissions.<sup>4</sup>
- Acid rain damage to crops and forests has affected more than one-third of the land in China, and economic losses approach 2% of the country's gross domestic product.
- China is now the largest emitter of greenhouse gases in the world.
- Since electricity generation, particularly coal-fired generation, uses up a huge amount of water, Chinese cities are now facing a moderate to acute water shortage.<sup>5</sup>

### *Electricity Supply*

Chinese power supply has not kept pace with energy demand despite an annual growth rate of 8% in installed capacity over the last two decades. Chronic electricity shortages caused production to be shut down during peak times and production schedules to be moved to nights or weekends. In 2003, shortages caused power cuts at peak hours for 21 provinces.

When energy shortages in 1986 reached 17% of annual power consumption, China began instituting reforms in its energy sector,<sup>6</sup> focusing on reducing energy intensity and developing renewable energy.

### *Laws and Regulations Aimed at Developing Alternative Energy*

China's constitution, passed in 1982, mandated environmental protection. However, except for the Environmental Protection Law passed in 1982, legal reforms in the energy sector started in earnest after the 1986 energy shortages. China passed specific environmental laws in the 1980s and 1990s ranging from general environmental protection<sup>7</sup> and air pollution control<sup>8</sup> to energy conservation.<sup>9</sup> It also issued its own Agenda 21 in 1994, which emphasized energy efficiency, renewable energy, clean coal and combined-cycle technologies, and nuclear power.<sup>10</sup>

The new Renewable Energy Promotion Law (the "Renewables Law"), passed in 2005, and effective from January 2006, is the first comprehensive policy document for the promotion of renewable energy in China. It now acts as the legal basis for country-wide activity to promote renewable energy and to increase the share of renewables within the electricity industry.<sup>11</sup>

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<sup>4</sup> *Ibid.*

<sup>5</sup> Judith A. Cherni and Joanna Kentish, "Renewable energy policy and electricity market reforms in China," *Energy Policy*, 35 (2007): 3617.

<sup>6</sup> *Ibid.*

<sup>7</sup> Regulations for Administration of Environmental Protection in Power Sector, 1996; Environmental Impact Assessment Law, 2002 (in effect 2003).

<sup>8</sup> Air Pollution Prevention and Control Law, 1987, amended 1995, 2000

<sup>9</sup> Electric Power Law, 1995; Energy Conservation Law, 1997 (in effect 1998).

<sup>10</sup> Antonette D'Sa, K. V. Narasimha Murthy, "Environmental Reform in the Electricity Sector: China and India," *The Journal of Environment & Development* 15 (2006):162-163.

<sup>11</sup> Cherni, 3618.

The relevant features of the Renewables Law are as follows:

- Renewable energy goals set as a proportion of gross energy consumption – 5% by 2010 and 10% by 2020
- Government-approved concessions for open bidding
- Power grids must purchase electricity from qualified grid-connected renewable facilities
- Fixed-term differential (favorable) pricing for grid-connected renewable energy
- Increased price for renewable power systems shared by all consumers.<sup>12</sup>

### ***Policy Initiatives***

Since China's Agenda 21 was drawn up in 1994, renewable energy technologies have received increased attention, with Guidelines on Renewable Energy Development included in long-term planning until 2010. The Chinese Renewable Energy Industries Association (CREIA), established through the United Nations Development Programme (UNDP) and Global Environmental Facility (GEF), brought together national and international investors in this field.<sup>13</sup>

China implemented national and provincial policy initiatives, sometimes coupled with multilateral assistance, that were aimed at promoting renewable energy development. These include:

- Subsidies to assist renewable energy research and development
- Favorable accounting rules for capitalization of research and development costs within high-tech institutions
- Use of income tax revenues to support local renewable energy development
- Grants and preferential loans for small and medium sized technical enterprises supporting energy efficiency and renewable energy
- National Township Electrification Program aimed at developing renewable energy to power 1,000 villages, where 20 MW from PV, 840 kW from wind, and 200 MW from small hydropower were installed
- The Sunlight Programme, which runs until 2010, establishing large-scale grid-connected PV projects, PV/hybrid village power demonstration systems, and home-PV projects for remote areas
- The Brightness Programme, instituted through multilateral assistance to install several solar and wind systems in north-western China
- The Ride the Wind Programme, a bilateral cooperation program to install wind turbines in various parts of China, which involved establishing a joint venture agreement between Chinese and international renewable technology manufacturers to aid development of the local manufacturing industry.<sup>14</sup>
- Mandates for blending biofuels into vehicle fuels.<sup>15</sup>

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<sup>12</sup> D' Sa, 169.

<sup>13</sup> D' Sa, 169.

<sup>14</sup> Cherni, 3619-3620.

<sup>15</sup> Renewables 2007 Global Status Report, 27.

In addition, China's current 11<sup>th</sup> Five-year Plan (2006-2010) targets reduction of energy intensity by 20% between 2006 and 2010.<sup>16</sup>

### ***Barriers to Implementation***

Despite over two decades of legal and structural reforms in the energy industry, it is estimated that environmental pollution still cost China US\$ 64 billion or 3.05% of GDP in 2004.<sup>17</sup>

Prior to the enactment of the Renewables Law in 2005, the following were cited as barriers to renewable energy development in China:

- High cost of developing renewable energy
- Difficulty in connecting renewable energy to the grid due to the following factors:
  - Difficulty in gaining approval for price increases that result from the high cost of renewable energy
  - Reluctance of grid owners to share grid-connection costs
  - Problems not only in connecting but also dispatching renewable energy into the electricity grid
- Institutional barriers
  - Reliance of renewable energy development on foreign grants and loans conditioned on the purchase of donor country generation equipment. This reliance increased costs and inhibited the development of the domestic manufacturing industry.
  - Lack of international investment in generation due to:
    - Negotiated power purchase agreements on a plant by plant basis and annual renegotiation, creating investor uncertainty
    - Weak legal framework
    - Uncertain level of future demand for renewable energy
    - Weak regulatory framework, where responsibility for policy formulation for renewable energy is unclear
    - Lack of guaranteed fixed prices

The Renewables Law attempts to address these constraints with a mix of three policy mechanisms: the feed-in tariff (FIT); the competitive bidding systems; and mandated market share (MMS). The law has been a very positive development for the renewable energy industry in China. However, it is clear that reforms in China are still underway, with further developments likely in coming years.<sup>18</sup>

## **India**

### ***Challenges to Energy Sector***

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<sup>16</sup> Yang, 562.

<sup>17</sup> Zhang, 3549.

<sup>18</sup> Cherin, 3620-3624.

Economic liberalization in India, as in China, has fueled its economic growth over the past two decades. Liberalization began in the 1980s, leading to growth rates of over 5 % per year. The deregulation policy and reforms initiated in the 1990s increased growth rates to 6.5% per year for a decade.<sup>19</sup> Such growth was accompanied by increased energy demand, which grew at the rate of 6 % per year between 1981 and 2001.

The dominant commercial source of energy in India is coal, followed by oil. A sizeable amount of its national energy requirement, however, continues to be met by non-commercial energy sources such as fuel wood, crop residue, animal waste, human and draught animal power. This is especially true in the rural household sector.

The major challenge to India's energy sector has largely been finding enough supply to keep pace with rising demand. Despite efforts to enhance domestic energy production and diversify fuel mix, India still faces energy and peak shortages at around 8% to 12%, respectively. At the same time, large sections of the rural population continue to lack access to clean and efficient energy fuels to meet their daily requirements.

### *Effects of Energy Use*

Increased dependence on coal and oil and inadequate use of renewable resources have resulted to the following adverse effects:

- Increased imports of coal and oil impose a high financial burden and expose India to oil supply shocks originating from external factors.
- India has become the sixth largest greenhouse gas emitter in the world, the second fastest growing one next to China.
- Urban pollution from combustion of fossil fuels
- Indoor air pollution resulting from unprocessed biomass use, which has adverse health effects.

### *Alternative Energy Legal and Policy Framework*

As part of its efforts to address high energy demand and consequent shortages, as well as the adverse environmental effects of intense energy use, India has enacted legislation and pursued policies to improve its alternative energy availability in the electricity and transport sectors.

#### *Electricity Sector*

Laws and policies aimed at promoting renewable energy in the electricity sectors are as follows:

- Electricity Act of 2003 – mandates the promotion of cogeneration and generation of electricity through renewable sources of energy by:
  - Providing suitable measures for connectivity with the grid, the sale of electricity, and

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<sup>19</sup> Indian Economy: Next Five Years, [http://scid.stanford.edu/events/NKSignh\\_06-03-03.pdf](http://scid.stanford.edu/events/NKSignh_06-03-03.pdf) (Accessed on 18 March 2008).

- For purchase of electricity from these sources, specifying a percentage of total consumption of electricity in the area of a distribution licensee
- National Electricity Policy of 2005 – authority granted to each state legislator to create a Renewable Energy Portfolio Standard for transmission and distribution companies serving their jurisdictions
- Renewable Energy Plan 2012
  - Targeted 10% share for renewable energy in incremental power capacity through additional grid-connected 10,000 MW of renewable energy
  - Other initiatives:
    - Installment of 1 million household solar water heating systems
    - Electrification by renewable mini-grids for 24,000 villages without electricity
    - Deployment of 5 million solar lanterns and 2 million solar home lighting systems
    - Establishment of additional 3 million small biogas plants

### *Transport Sector*

In the transportation sector, India has also enacted legislation and pursued policies promoting biofuel and other low emission technology use. It has identified ethanol and bio-diesel as key focus areas. These measures include:

- National Auto Fuel Policy of 2003 – provides a roadmap for achieving various vehicular emission norms over a period of time and the corresponding requirements for upgrading fuel quality
- Mandated 5% blending of petrol with ethanol in 2004
- Creation of National Biodiesel Board to promote, finance, and support organizations engaged in oilseed cultivation and oil processing leading to bio-diesel production
- Bio-Diesel Purchase Policy – prescribes purchase by oil-marketing companies in the public sector of bio-diesel meeting Bureau of Indian Standards (BIS) specification from registered authorized suppliers
- National Urban Transport Policy – encourages integrated land use and transport planning in cities, focusing on greater use of public transport and non-motorised modes
- Auto Policy of 2002 – spells out the direction of growth for the auto industry in India and addresses most of its concerns, among which are:
  - Promotion of R&D in the automotive sector to ensure continuous technology upgrades and enhanced designing capacities to remain competitive
  - Providing an impetus for alternative fuel vehicles through appropriate long-term fiscal structures to facilitate their acceptance
  - Emphasizing low emission fuel auto technologies and availability of appropriate of auto fuels

### *Fiscal Policies*

India has also adopted fiscal policies that allow renewable energy to become competitive with other sources of conventional energy in India. Among these policies include income tax holidays, accelerated depreciation, duty free import of renewable energy equipment, capital subsidies and concessionary financing from the Indian Renewable Energy Development Agency (IREDA), requirements for energy purchases by distribution companies, and exemptions from electricity taxes and sales taxes.

### ***Developments in the Field***

As result of legal and policy initiatives of India in the renewable energy sector, the nation has the most developed and diversified renewable energy market in the region. The annual turnover of the renewable energy industry in India is approximately USD500 million, with a total renewable energy investment of around USD 1 billion. Current installed capacity is just a fraction of the estimated total economic potential of 100,000 MW.

The table below summarizes India's installed renewable energy capacity, up to September 30, 2006:

<b>Renewable Energy Source</b>	<b>Unit</b>	<b>Cumulative Achievement</b>
Wind Power	MW	6,070
Small hydro (up to 25 MW)	MW	1,850
Biomass power	MW	542
Biomass gasifiers	MW	76
Solar PV	MW	3
Waste-to-energy	MW	35

Source: Ministry of New and Renewable Energy

In addition, several measures have been taken to upgrade automobile technology, improve fuel quality, enhance pollution under control checking systems, and expand urban public transport systems. The gross emission standards for vehicles have been made progressively more stringent and a roadmap has been developed to improve fuel quality.

Some state governments are promoting bio-diesel production, including setting up state bio-diesel boards and implementing buy-back schemes with farmers. Private players have already come into the plantation phase of the bio-diesel production chain in some states. In Gujarat, private companies are already producing quality bio-diesel that meets the American Society for Testing and Materials (ASTM) 16750 standard.

### ***Barriers to Full Development***

While India has achieved advanced development of renewable energy, there are several areas of concern that may well serve to constrain full use of India's renewable energy potential. Some of these concerns are as follows:

- Sustainability and the fundamental economics of the renewable energy boom, as some marginal policies may be speculative given the generous fiscal policies provided to renewable energy
- The wind energy boom is somewhat constrained by machines that have been installed with limited capacity factors, in some cases requiring taxpayers to make up the difference via a guaranteed return.
- Stalled development of small hydro potential due to speculative purchases by developers via state-administered auctions rather than for development purposes.
- Considerable confusion at the state level regarding implementation of the Electricity Act requirement for a renewable energy portfolio standard, resulting in different standards imposed in different states.<sup>20</sup>

## **Conclusion**

While the UN Framework Convention on Climate Change (UNFCCC) and its accompanying protocol, the Kyoto Protocol, does not impose emissions target obligations on emerging market economies like China and India, this has not stopped these countries from exploring and developing alternative energy sources.

The initiatives are fueled in large part by:

- energy shortages, where the rate of economic growth has outpaced growth in energy supply;
- inadequacy of existing energy sources to meet domestic demand, especially in rural areas where poverty is still widespread; and
- adverse health and environmental effects of over-dependence on fossil fuels.

While tremendous strides have been made in developing alternative energy sources in these countries, they are still faced with the challenge of formulating a cohesive policy that will maximize their existing energy resources, minimize negative externalities, and promote sustainable economic growth.

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<sup>20</sup> USAID Asia, India Country Report, June 2007, [http://usaid.eco-asia.org/programs/cdcp/reports/annexes/Annex%202\\_India.pdf](http://usaid.eco-asia.org/programs/cdcp/reports/annexes/Annex%202_India.pdf) (Accessed on 18 March 2008)

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