

India: Can she make the most of her opportunities?

A fast growing economy and an appetite for energy to match mean India will be attractive to power companies and providers of environmental services equipment for some time. Where do the opportunities lie?



caption

India will remain a robust market for worldwide providers of power plant and environmental equipment at least until 2030. Demand for electricity in the country is high and India has aggressive targets for adding capacity. The country's potential in the power sector is yet to be fully realized and additions to its power generation capacity are expected to be substantial despite shortfalls resulting from factors internal and external to the country.

So what is driving India's demand for power and what opportunities does it open up to power companies and providers of environmental services equipment?

Four major economic and social drivers characterize the energy policy of India: a rapidly growing economy, increasing household incomes, limited domestic reserves of fossil fuels and the adverse impact on the environment of

rapid development in urban and regional areas. Rapid economic growth has created a growing need for dependable and reliable supplies of electricity, gas and petroleum products. India's economy has expanded by above six per cent per year over the last five years, one of the fastest rates in the world. Projections are for it be more than eight per cent per year until 2020. Supplies of electricity, gas and water must keep up with this. India's economy has more than tripled in real terms since economic reforms began in 1991.

Part of the reason for this growth is the commitment successive governments have shown to continue economic liberalization, stance that has instilled confidence in investors and presented opportunities. The second driver of the country's energy policy, rising household incomes, has pushed up demand for affordable electricity. Consumer demand too has grown

rapidly over the decades. India has a population of over a billion people and as a market for retail consumer goods it is already one of the largest, whose size is expected to grow to \$600 billion per year by 2012, putting it among the top five in the world. Geographically speaking India is one of the largest countries in the world. Its area covers more than 3 million km², or roughly a third that of the United States.

India is a young nation. Some 70 per cent of its population is under the age of 36 and 20 per cent under 24. It produces over 1.5 million fresh university graduates each year, about 1.5 times as many as China and about twice as many as the United States. It has also made considerable progress on many socio-economic fronts. Since the 1950s, the fraction of the population below the poverty line has dropped from over 50 per cent to just over 25 per cent, and adult literacy

State/Union Territories	Peak Demand (MW)	Peak Deficit MW	Peak Deficit (%)	Energy Requirement (MU)	Energy Deficit (MU)	Energy Deficit (%)
Gujarat	11 841	3024	25.5	61 910	6654	10.7
Chhattisgarh	2887	57	2	13 682	395	2.9
Madhya. Pradesh	7,564	754	10	38 262	6,379	16.7
Maharashtra	18 049	4674	25.9	110 767	23 792	21.5
Daman and Diu	225	25	11.1	1630	202	12.4
Dadar and Nagar Haveli	466	32	6.9	3239	132	4.1
Goa	464	51	11	2532	40	1.6

rates have risen from the high 30 per cent range to the mid-60 per cent range. India will need a total capacity addition of 150-250 GW over the next 12 years to address its goal to alleviate poverty.

FOSSIL FUEL RESERVES

Low domestic reserves of fossil fuels form the third main driver in India's energy policy. As about 64 per cent of India's total installed capacity is fossil-fuel fired it has to import vast amounts of natural gas, crude oil and petroleum products. Coal accounts for about 53 per cent of the nation's generating capacity, while gas and oil account for 10 per cent and 1 per cent respectively.

India's domestic of coal resources are available in abundance. Most of these are in the states of Bihar, Jharkhand, Orissa, Madhya Pradesh, Chhattisgarh and West Bengal. Production of coal in India has traditionally been low compared with its reserves. One reason is because the past has seen restrictions on the entry of private sector players in the mining of this fuel in the country. These restrictions have been removed, encouraging private participation in coal mining.

Indian coal is high in silica and alumina and is highly abrasive, with high slagging characteristics. Its high ash content of 35-45 per cent and the weak coal transportation system in the country mean that it is economical to locate power plants close to pit heads. Most of the pit head stations have their own dedicated coal transportation system and do not depend on India's railways.

To address the need for a higher quality of coal many Indian power producers are now acquiring fields in the countries of east Asia, such as Indonesia, and erecting power plants in Indian coastal towns to tap into a more economical fuel supply. This should fulfill some of the country's need for higher quality coal, but

<p>Coal</p> <ul style="list-style-type: none"> • Domestic coal resources are in abundance in India • Private participation in coal mining expected to result in greater production efficiencies • Economical imported coal is accessible for coastal locations • Coal is the most economical fuel for meeting base load demand • Clean coal technologies a priority by the Government of India 	<p>Natural Gas</p> <ul style="list-style-type: none"> • Limited availability of domestic gas • High price of LNG in spite of growing production • Potentially a long-term fuel source for India
<p>Nuclear</p> <ul style="list-style-type: none"> • Ambitious plans for nuclear power face many challenges • Access to nuclear technology, fuel source and safety considerations 	<p>Hydro</p> <ul style="list-style-type: none"> • Large amounts of hydro potential mainly in the North and Northeast India • High capital costs & long lead time • Seasonality effects of snow and rainfall
<p>Wind</p> <ul style="list-style-type: none"> • Not suitable for base load generation • Potentially low load factors • Moderate wind patterns. 	<p>Solar</p> <ul style="list-style-type: none"> • Abundant sunlight and ideal for solar powered generation • Population density and space constraint • Supplement to coal-fired generation • Not suitable for large base-load operations

domestic supplies will still fuel the bulk of the country's power generation.

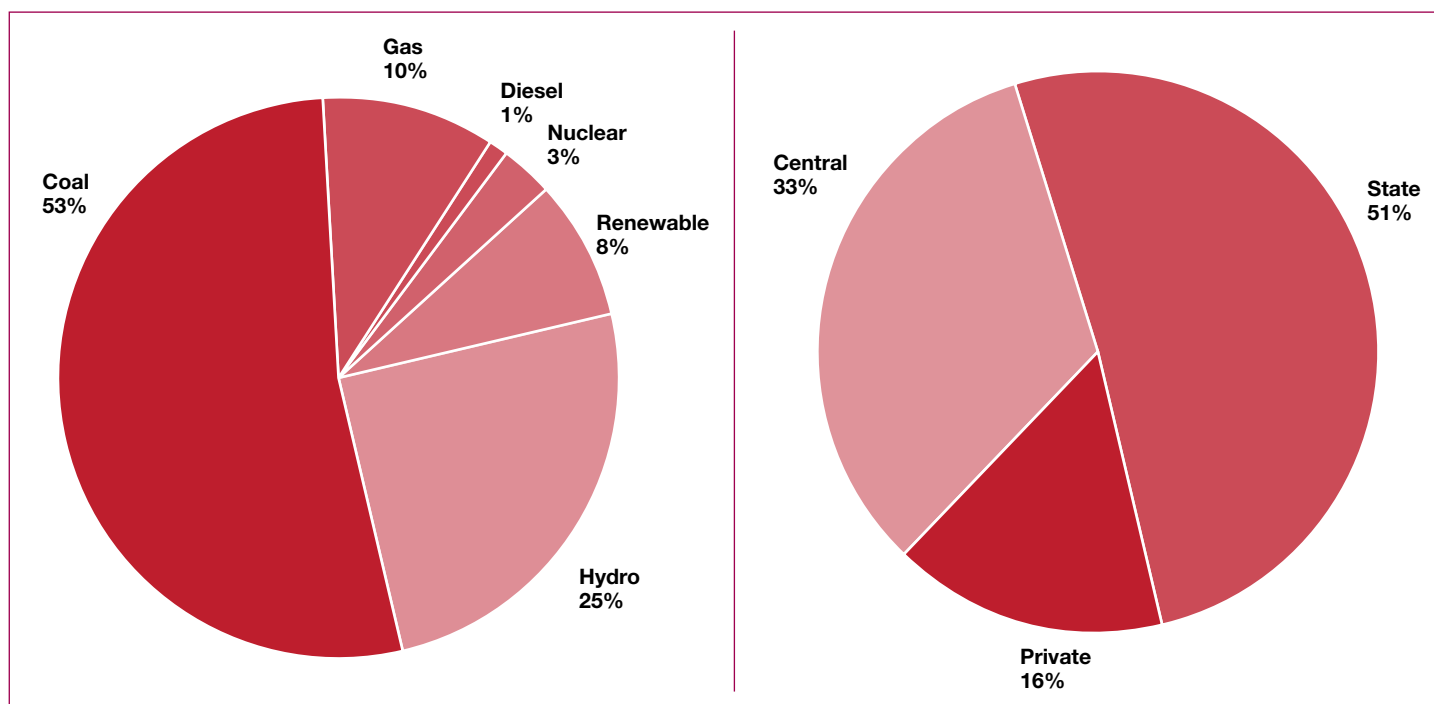
Natural gas is in short supply in India and supply to gas fired power stations has been inadequate, which has meant they have been operating at load factors of around 58-60 per cent. Gas is not expected to bridge the power generation deficits in the short-term although India has identified a few domestic natural gas reserves and is in discussion with suppliers in Qatar, Iran and Australia. Table 2 shows India's fuel alternatives.

The final main driver of India's energy policy concerns the environment, on which rapid urban and regional development has had a negative impact. India aims to adopt cleaner fuels and cleaner technologies to compensate. Projections are that coal fired power generation in India is

likely expand rapidly. If this growth is uncontrolled it will be to the detriment of the environment. While India's focus is on generating low-cost power, the government recognizes the potential impact on air-quality that new coal plants would have.

In response, India has begun various initiatives at the national level that aim to bring in more stringent regulations for nitrogen oxides (NO_x), PM10, sulphur dioxide (SO₂) and, potentially, mercury emissions. For example, some of the plants burning high-sulphur coal now must either include an FGD scrubber, depending on the plant location, or make space provisions for a future retrofit of SO₂ removal technologies.

This is a major development for a country that has no official standard for major pollutants such as NO_x, SO₂ and mercury but largely regulates



India's power generation by capacity

Breakdown of generation assets ownership

on a case-by-case basis. In the case of CO₂ emissions, no regulations exist.

India is not expected to accept a binding emissions reduction target as the initiative is considered too expensive and could double the cost of electricity generation. However, various measures are being considered to deploy cleaner coal technologies.

India's infrastructure has not kept up with its economic growth, despite progress on various fronts. Compared with western nations, the quality of the rail and road systems is poor and they fail to offer the same connectivity. Similarly the country's energy infrastructure is in continuous need of expansion to support increasing demand from consumers and industry.

Although infrastructure investment is on the rise, the government recognizes that future growth may be constrained without further improvements to infrastructure, the inadequacy of which is a key risk to the continued growth of the Indian economy. Since independence in 1947, electricity generating capacity has grown from 1400 MW to about 150 GW today, the sixth highest in the world behind the figures of the US, China, Japan, Russia, and Canada.

Over the same period, the population of India has grown from 250 million to over 1.1 billion. The rising population, India's high economic growth rate and its inadequate supply and distribution infrastructure have caused power supply shortages in terms of peak demand and overall energy supply. Peaking shortage has been about 13 per cent on an all-India

basis with significantly greater shortages in selected regions such as the west of the country, where deficits are as high as 26 per cent, as Table 1 shows.

The large energy deficit gaps have resulted in low per-capita consumption, so India will need additional generating capacity to serve its population and fuel economic growth. To this end the government embarked on an ambitious plan to raise power generation capacity to bridge the growing power demand-capacity gap with low-cost power.

The Planning Commission has established five-year plans that lay out specific targets for new generation capacity.

The tenth five-year plan, covering 2002-2007, had a target of 41.1 GW of additional capacity. The 11th, covering 2007-2012, is slated to add 78 GW of capacity. Some 83 GW of new capacity is the target for the 12th plan, covering 2012-2017.

This expansion includes 14 Ultra Mega Power Projects that are awarded based on tariff-based competitive bidding. The projects are designed to be environmentally friendly. They will emit low amounts of greenhouse gases, employ supercritical technology and use 100 per cent of fly ash.

SHORTAGES CONTINUE

India's power sector has traditionally faced a range of challenges in expanding generation capacity. The country has added 30 GW in the past 7 years whereas China has added 303

GW over the same period. India needs to add 78 GW in the current five-year plan, essentially doubling the 78 GW added over the last 22 years.

Of the targets set across the last three five-year plans, only 50 per cent of the target capacity has been achieved, failures largely attributed to a shortage of boiler, turbine and generator equipment, long lead times, shortages of construction equipment, shortage of skilled manpower, fuel availability, a lack of project financing, rail and other infrastructure related issues, and delays in obtaining environmental and governmental clearances.

To accelerate capacity additions, the government has embarked on programmes to encourage foreign participation in the supply of power generation equipment supply. The result is that Western and Chinese manufacturers now actively provide equipment and services in India.

This has significantly eased the bottlenecks the industry previously faced. Various training and manpower development programmes and expedited processes to obtain various permits and clearances have also been initiated to address external delays.

Financing for power projects from world capital markets – a historical constraint – is less of an impediment for India today as many Indian Power Producers have started delivering results that match their earlier projections.

Confidence among the investment community is on the rise.