

Although India's economy is showing signs of slowing, the government must continue its ambitious power infrastructure investment as demand for electricity continues to grow.

The Republic of India is bounded to the southwest by the Persian Sea, to the southeast by the Bay of Bengal and the Indian Ocean to the south. Along its northeastern frontier are the Himalayas, which form India's geographic boundary with the People's Republic of China, Bhutan and Nepal.

It is home to close to 1.2 billion people, making it the world's second most populous country. It comprises 28 states and seven union territories and covers an area of 3 287 590 km². India has a democratically-elected government, which has been led by the prime minister, Dr. Manmohan Singh since May 2004. National elections are scheduled in April this year.

India currently has the fourth largest economy in the world on a purchasing power parity basis, with an estimated gross domestic product (GDP) of \$3.32 trillion in 2008. Since 2000, the country's economy has grown exponentially, averaging around 7 per cent a year. However, the central bank has revised its estimate of economic growth this year downwards to 7.5-8 per cent. In 2010, the rate could fall to 5.5 per cent or less, the lowest since 2002.

Energy Overview

According to the International Energy Agency (IEA), India's proven reserves of oil were 5.6 billion barrels at the end of 2007. Oil production is around 800 000 barrels per day (bpd), however this is insufficient to meet domestic demand, which is 2.9 million bpd, so India currently imports over two million bpd, primarily from the Middle East, with Saudi Arabia the biggest supplier.

India's proven natural gas reserves were reported by the Energy Information Administration to be 1.2 trillion m³ in 2006, while production amounted to around 28 billion m³. However, consumption of natural gas is expected to rise at an average annual growth rate of 4.8 per cent to 2030, according to the IEA, so in the longer-term production is not expected to meet the growing demand. Thus, natural gas imports will increase, with liquefied natural gas playing an ever more important role.

India's total coal reserves, which amounted to 287 billion tonnes in 2007, are ranked fifth largest after the USA, Russia, China and Australia. Its proven reserves total some 115 billion tonnes. State-owned Coal India is responsible for 85 per cent of coal production in India.

Electricity Market

India has the fifth largest installed generation capacity in the world, with over 147 GW as of January 2009.

In the public domain, electricity generation falls under the responsibility of the central government and state governments. According to the Central Electricity Authority (CEA), more than 76 GW of this installed capacity is owned by the State Electricity Boards (SEBs). The SEBs are also responsible for buying electricity from other companies and selling it, accounting for 95 per cent of retail sales.

Approximately 49 GW of the generation capacity is owned by the central government via a number of government-owned companies, the largest being the Nuclear Power Corporation of India Limited, NTPC and the National Hydro Power Corporation.

NTPC is the single largest company with an installed capacity of close to 28 GW comprising 22 fully owned thermal plants and four part-owned coal and gas plants.

The remainder of India's installed capacity, i.e. over 22 GW, is controlled by the private sector. This comprises independent power producers (IPP) and captive power plants. The capacity of captive power plants has grown at a higher rate than IPP capacity, prompted by irregular and insufficient public electricity supply and by high tariffs, and was facilitated by certain provisions of the Electricity Act 2003. As a result many industries now use their own power plants for in-house consumption.

Of the total installed capacity in India, over two-thirds is thermal generation (coal, oil and gas). Thermal capacity is dominated by coal, which represents over 53 per cent of the total, close to 77 400 MW, with gas and oil trailing at 14 700 MW and 1200 MW, respectively.

India has a significant installed hydropower base of 36 700 MW, which represents close to a quarter of the country's total installed capacity. India ranks fifth in the world in term of exploitable hydropower resources.

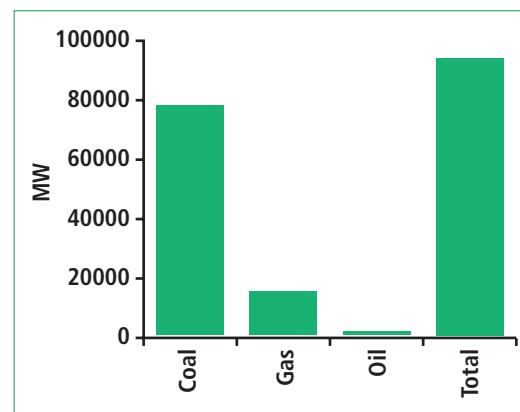
India has a largely indigenous nuclear power development programme. According to the CEA's latest figures, the nuclear installed capacity is 4120 MW as of January 2009. Its nuclear fleet currently comprises of 15 small (90-200 MW) reactors and two mid-sized (500 MW) reactors. It also has six reactors under construction, four of which are due to enter commercial operation this year.

In 2004, the government set an ambitious target of having 20 GW of nuclear capacity online by 2020, and for this generation source to supply 25 per cent of electricity by 2050.

In recent years nuclear development has been hampered by chronic shortages in domestic uranium

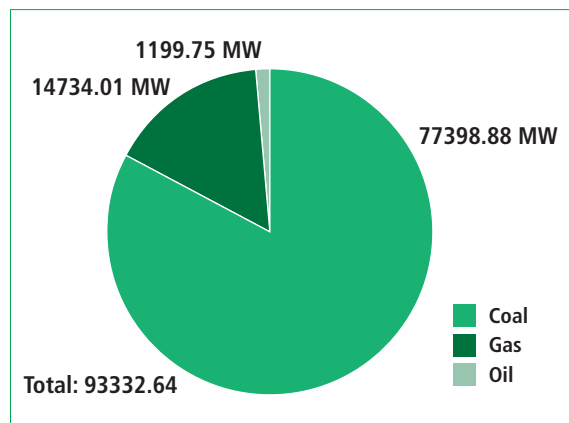
Total installed thermal power capacity (January 2009)

Source: CEA



Ownership breakdown of installed capacity

Source: CER



supplies. However, following a deal with the US, signed in 2008, India will get access to US nuclear fuel, reactors and technology, paving the way for the entry of the private sector into the country's nuclear power sector.

India's renewable energy capacity is 13 200 MW, and comprises small hydro, biomass gasifiers, biomass power plants, urban and industrial water power and wind power. In the latter, India continues to make steady progress, and in 2007 its installed wind capacity was 7845 MW. In 2007, India was ranked

as the fourth largest wind market in the world on the basis of cumulative MW however, according to the latest figures from the Global Wind Energy Council, it slipped to fifth position in total wind power installed capacity last year. In 2008, India added 1800 MW rather than the expected 2000 MW, increasing its total capacity to 9645 MW. However, BTM Consult forecasts that the demand for electricity from wind power will double by 2012 and that India will have a total installed wind capacity of 22 845 MW.

On the transmission side, Power Grid Corporation of India Limited integrates India's five regional grids into a national grid, although inter-regional capacity is still limited. Currently, 1700 km of 800 kV lines, 70 000 km of 400 kV lines and 110 000 km of 220 kV lines make up the bulk of the high voltage transmission network.

Chronic underinvestment in the country's power sector has been a major constraint to the country's development, with close to 40 per cent of the population not having access to electricity. According to the Ministry of Power, in the period 2007-2008 peak demand was 108 866 MW, while peak generation was only 90 793 MW, representing a deficit of over 16 per cent of peak demand.

According to the International Energy Agency, India

will need to invest \$1.25 trillion in energy infrastructure between 2006-2030, with more than three-quarters of this investment in power infrastructure (generation, transmission and distribution).

As part of the country's 11th Five-Year Plan, which runs between 2007-2012, the Ministry of Power has set the goal of 'Power for All' by 2012, representing a total installed generation base of 200 GW.

To achieve this goal, 78 GW of additional capacity will need to be created between 2007-2012, which represents more than the capacity added in the last 20 years. This will cost in the region of Rs.800 000

crores (\$180 billion), including associated transmission and distribution improvements.

Infrastructure Investment

India is now halfway through its 11th Five-Year Plan, and in the 12 months from January 2008 to January 2009, more than 5.5 GW of capacity has been added.

In 2007, the Ministry of Power set tentative targets for the central sector to add of 46 500 MW by 2012, while at state level and private sector a combined 41 800 MW target was set. The targets include 6400 MW of new nuclear generation and 10 700 MW through non-conventional resources, most notably wind.

In 2006, the Ministry of Power launched an initiative to develop large coal based plants. Known as ultra-mega power projects (UMPPs), these are a series of ambitious supercritical power projects, with each project having a minimum capacity of 4000 MW, and are aimed at bridging the capacity gap. The selection of the projects is based on competitive bidding.

As of August 2008, a total of 12 UMPPs have been planned. To-date, four UMPPs have been awarded. India's largest private power producer, Tata Power, won the UMPP in Mundra, Gujarat Province in 2007, while Reliance Power, part of Reliance Energy Limited, has bagged three UMPP to-date – Sasan, Madhya Pradesh Province, Krishnapatnam, Andhra Pradesh Province, and in January this year, Tilaiya UMPP in the province of Jharkhand.

With the transmission constraint problem severe in the eastern region, a plan has been developed to build 30 000 MW of inter-regional transmission capacity by 2012 and the formation of a national grid. Indian authorities have launched an international competitive tender for two transmission schemes, which together have an estimated cost of more than \$1 billion. The projects, the 1980 MW North Karanpura project and the Talcher augmentation system, due for completion between 2009 and 2012 are the first of 14 planned.

Future Trends

Coal will continue to be India's main fuel source for new power generation. All of the country's operating coal fired power stations use subcritical technology, and although six supercritical plants were included in the 10th Five-Year Plan, none were built. The plan for 12 UMPPs in the 11th Five-Year plan is an important development, and four at least look likely to reach construction.

With the meeting to decide on the successor to the Kyoto Protocol taking place later this year, rapidly developing economies like India will come under greater pressure to cut their carbon emissions. Thus, the country will continue to diversify its fuel generation mix to bolster low-carbon energy sources such as wind power and nuclear, as well the greater exploitation of its hydropower resource estimated to be 250 000 MW.

Wind power growth forecast (2008-2012)

Source: C ER

