

# 11 Energy

ENERGY is an essential input for economic development and improving the quality of life. Development of conventional forms of energy for meeting the growing energy needs of society at a reasonable cost is the responsibility of the Government. Development and promotion of non-conventional/alternate/new and renewable sources of energy such as solar, wind and bio-energy, etc., are also getting sustained attention. Nuclear energy development is being geared up to contribute significantly to the overall energy availability in the country.

## POWER

Power development in India commenced at the end of the 19th century with the commissioning of electricity supply in Darjeeling during 1897, followed by the commissioning of a hydropower station at Sivasamudram in Karnataka during 1902. In the pre-Independence era, the power supply was mainly in the private sector that too restricted to the urban areas. With the formation of State Electricity Boards during Five-Year Plans, a significant step was taken in bringing about a systematic growth of power supply industry all over the country. A number of multi-purpose projects came into being and with the setting up of thermal, hydro and nuclear power stations, power generation started increasing significantly.

The Ministry of Power is primarily responsible for the development of electrical energy in the country. The Ministry is concerned with perspective planning, policy formulation, processing of projects for investment decisions, monitoring of the implementation of power projects, training and man-power development and the administration and enactment of legislation with regard to thermal and hydro power generation, transmission and distribution. In all technical matters, the Ministry of Power is assisted by the Central Electricity Authority (CEA).

The construction and operation of generation and transmission projects in the Central sector are entrusted to Central Sector Power Corporations, viz., the National Thermal Power Corporation (NTPC), the National Hydroelectric Power Corporation (NHPC), the North-Eastern Electric Power Corporation (NEEPCO), and the Power Grid Corporation of India Limited (PGCIL). The Power Grid is responsible for all the existing and future transmission projects in the Central Sector and also for the formation of the National Power Grid. Two joint-venture power corporations, namely, Satluj Jal Vidyut Nigam (SJVN) (formerly known as NJPC) and Tehri Hydro Development Corporation (THDC) are responsible for the execution of the Nathpa Jhakri Power Project in Himachal Pradesh and Projects of Tehri Hydro Power Complex in Uttaranchal respectively. Three statutory bodies, i.e., the Damodar Valley Corporation (DVC), the Bhakra-Beas Management Board (BBMB) and Bureau of Energy Efficiency (BEE), are also under the administrative control of the Ministry of Power. Programmes of rural electrification are provided financial assistance by the Rural Electrification Corporation (REC). The Power Finance Corporation (PFC) provides term-finance to projects in the power sector. The autonomous bodies (societies), namely, Central Power Research Institute (CPRI) and the National Power Training Institute (NPTI) are also under the administrative control of the Ministry of Power. A Power Trading Corporation has also been incorporated primarily to

support the Mega Power Projects in private sector by acting as a single entity to enter into power Purchase Agreements (PPAs).

**Capacity Addition:** To meet the projected power requirement by 2012, an additional capacity of 1,00,000 MW is required during the 10<sup>th</sup> and 11<sup>th</sup> Five-Year Plans. A capacity of nearly 41,110 MW (Thermal: 25416.24 MW) is targeted to be set up in the Tenth Plan and the remaining in the Eleventh Plan with a stronger focus on hydropower. The Central Sector would contribute 22,832 MW (Thermal: 12790 MW), the State Sector 11,157 MW (Thermal: 6675.64 MW) and Private Sector 7,121 MW (Thermal : 5950.6 MW) in the Tenth Plan. However as per latest review, the likely capacity addition during 10<sup>th</sup> Plan is 30,700 MW.

The installed power generation capacity in the country has increased from 1,400 MW in 1947 to 1 24287.17 MW as on 31 March 2006 comprising 82, 410.54 MW thermal, 32,325 MW hydro, 6190.86 R.E.S and 3360 MW nuclear. A capacity addition programme of 19682 MW was fixed for the year 2006-07. Considering the fact that a large chunk of proportion of the installed capacity will come from the public sector, the outlay for the power sector has been raised from Rs. 45,591 crore during the Ninth Plan to Rs.1,43,399 crore in the Tenth Plan. This would include a gross budgetary support of Rs, 25,000 crore and the remaining Rs. 1,18,399 crore would be internal and from extra budgetary resources.

As a follow up of preparation of PFRs implementation/ preparation of DPRs for attractive schemes selected from PFR schemes have already been taken up thereby providing a shelf of projects for execution in the near future. At the first instance, based on their preliminary techno-economic analysis, 77 schemes (33951 MW) whose first year tariff works out below Rs. 2.50 /kWh have been considered as low tariff H.E. schemes and have been selected for taking up of detailed survey and investigation and preparation of DPR/implementation. Action has already been initiated for these schemes for S&I and preparation of DPR by CPSUs/SPSUs/SEBs in consultation with respective state governments. Among these 77 projects, 12 projects (3043 MW) have been identified as likely to yield benefits during 11<sup>th</sup> Plan and balance during subsequent plans.

**1,00,000 MW Thermal Initiative :** Keeping in view the huge power generation capacity requirement, Ministry of Power/CEA has proposed a 100,000 MW environment-friendly thermal initiative. This initiative has been intended to prepare shelf of projects, which could be taken up during the course of 11<sup>th</sup> & 12<sup>th</sup> Plan.

The Standing Committee constituted by the CEA is in the process of identifying new sites in consultation with the State Utilities. The CEA has awarded studies to CMPDI and NRSA for identification of large pithead and coastal sites respectively by using satellite mapping through remote sensing. The CMPDI has submitted the report for the 36,000 MW pithead power plant sites identified near the coal blocks in the eight major coalfields. They have also identified additional coal blocks for 24,000 MW capacity for which they will be identifying the power plant sites. The NRSA has submitted the reports for coastal sites in Gujarat, Maharashtra, Tamilnadu and Andhra Pradesh. The reports of the CMPDI and the NRSA have been sent to the concerned state governments and also made available to prospective developers for further investigation and development of sites for setting up thermal power plants. Many of these sites have been identified for development by various developers.

Higher sized coal based units of 800-1000 MW which are environment-friendly with super critical technology are proposed to be introduced to achieve the huge

capacity addition programme. Also, in view of the difficulties faced by power utilities in getting coal allocation, thrust is now being given to identify and set up power plants in the coastal regions using imported/washed coal.

The CEA has already prepared shelf of sites for thermal power projects totaling to more than 100,000 MW capacity. Of this shelf, about 40,000 MW projects are to be taken up for implementation during 11<sup>th</sup> Plan including benefits from Ultra Mega Power Projects. The need for capacity addition during 12<sup>th</sup> Plan would be firmed up towards the end of 11<sup>th</sup> Plan.

**National Grid :** The Ministry of Power envisages establishing an integrated National Power Grid in the country in a phased manner by the year 2012. The first phase was completed in 2002, wherein regional grids were mainly connected by HVDC back to back stations, of and an inter-regional power transfer capacity of 5050 MW was established. The implementation of the second phase has already commenced and with the commissioning of Talcher Kolar HVDC bipole, Raipur Rourkela 400 kV D/C transmission system along with series compensation and a second back to back station at Gajuwaka, the inter-regional power transfer capacity has grown to 9450 MW. It has created a synchronous grid from Arunachal Pradesh to Goa spanning across a length of 2500 km, encompassing an area of 16 lakh Sq.Km with an installed capacity of over 50,000 MW. With other links, under implementation/planning, cumulative inter regional power transfer capacity is expected to be enhanced to 37,150 MW by the year 2012.

### **CENTRAL ELECTRICITY AUTHORITY**

Central Electricity Authority (CEA), a statutory organisation constituted under Section 3(1) of the Electricity Supply Act, 1948 which has been superseded by Section 70 (1) of Electricity Act, 2003, plays an important role in formulating policies and programmes for power development in the country and in planning and coordinating various development activities in the Power Sector. The CEA advises the Central Government on matters relating to the National Electricity Policy, formulates short-term and perspective plans for development of the electricity system and coordinates the activities of the planning agencies for the optimal utilisation of resources to subserve the interests of the national economy and to provide reliable and affordable electricity for all consumers.

Under the Electricity Act, 2003, the CEA makes regulations/standards on matters such as construction of electrical plants, electric lines and connectivity to the grid, installation and operation of meters, concurrence of hydro-electric schemes, safety and grid standards. It also specifies measures relating to safety with respect to electricity supply. This will inculcate higher efficiency in all fields of the power sector.

The CEA is responsible for the concurrence of hydro power development schemes of the Central, State and Private sectors taking into consideration the best ultimate development of the river or its tributaries for power generation, consistent with the requirement of drinking water, irrigation, navigation, flood control or for other public purposes. It also makes studies for the optimum location of dams and other river works keeping in view the norms regarding dam design and safety.

It promotes and assists in the timely completion of schemes and projects for improving and augmenting the electricity system by carrying out a close monitoring of the construction of generation and transmission projects to ensure their timely

completion by identifying bottlenecks and problem areas and initiating remedial measures/actions. It lays stress on improving the performance of existing power stations through better O&M practices, renovation and modernisation and life extension programmes. It is also charged with the responsibility of monitoring Schemes/Projects for their timely completion.

Collection and recording the data concerning the generation, transmission, trading, distribution and utilisation of electricity and carrying out studies relating to cost, efficiency, competitiveness, etc., are important functions of the CEA. It makes public from time to time information secured under the Electricity Act, 2003 and provides for the publication of reports and investigations.

The CEA advises Central Government, State governments and Regulatory Commissions on all technical matters relating to generation, transmission and distribution of electricity. It also advises State Governments, licensees or generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control in an improved manner and where necessary, in coordination with any other Government, licensee or the generating company owning or controlling another electricity system.

The CEA plays a lead role in promoting an integrated operation of Regional Grid systems and the evolution of a National Grid. The Eastern, North-Eastern and Western regions have been integrated and are operating in a synchronous mode. The Eastern Region is connected with the Northern as well as the Southern Region through HVDC back to back links. Similarly, the Western Region is also connected with the Northern and the Southern Regions through the same arrangements. The CEA facilitates exchange of power within the country from surplus to deficit regions and with neighbouring countries for mutual benefits.

It promotes research in matters affecting the generation, transmission, distribution and trading of electricity; carries out, or causes to be carried out, any investigation for the purposes of generating or transmitting or distributing electricity and promotes measures for advancing the skills of persons engaged in the electricity industry. It actively participates in power supply restoration process in case of occurrence of unfortunate incidents of destruction caused due to drought/cyclone/floods/tsunami, etc., in various parts of the country.

The CEA makes a significant contribution to a number of professional fora in India as well as abroad like the Conference International Des Grands Research Electriques (CIGRE), the Bureau of Indian Standards (BIS), the Central Board of Irrigation and Power (CBI&P), etc. The CEA renders consultancy services in the planning and design of hydro, thermal and transmission projects.

### **THE ELECTRICITY ACT, 2003**

The Electricity Act, 2003 has been enacted and the provisions of this Act have been brought into force with effect from the 10 June 2003 (with this, the Indian Electricity Act, 1910, the Electricity (Supply) Act, 1948 and the Electricity Regulatory Commissions Act, 1998 stand repealed). The main features of the Act are as follows:

- (i) Generation has been delicensed and captive generation freely permitted. Hydro projects would, however, need concurrence from the Central Electricity Authority.
- (ii) No license required for generation and distribution in rural areas.
- (iii) Transmission Utility at the Central as well as state level, to be a government

- company – with responsibility for planned and coordinated development of the transmission network. Provision for private licensees in transmission.
- (iv) Open access in transmission with provision for surcharge for taking care of current level of cross subsidy with the surcharge being gradually phased out.
  - (v) Distributing licensees would be free to undertake generation and generating companies would be free to take up distribution.
  - (vi) The State Governments are required to unbundle the SEBs. However, they may continue with them as distribution licensees and State Transmission Utilities.
  - (vii) Setting up of the State Electricity Regulatory Commission (SERC's) made mandatory.
  - (viii) An Appellate Tribunal to hear appeals against the decision of the CERC and SERCs.
  - (ix) The SERCs are required to permit open access in distribution in phases with surcharge for current level of cross subsidy to be gradually phased out along with cross subsidies and obligation to supply.
  - (x) Metering of electricity supplied, made mandatory.
  - (xi) Provisions relating to theft of electricity made more stringent.
  - (xii) Trading as, a distinct activity recognised with the safeguard of the Regulatory Commissions being authorised to fix ceilings on trading margins, if necessary.
  - (xiii) For rural and remote areas stand alone systems for generation and distribution permitted.
  - (xiv) Thrust to complete rural electrification and provide for management of rural distribution by panchayats, cooperative societies, non-government organizations, franchises, etc.
  - (xv) The Central Government to prepare a National Electricity Policy and Tariff Policy.
  - (xvi) The Central Electricity Authority to prepare a National Electricity Plan.

**Formulation of Rules and Regulations by the Central Electricity Authority :**

Section 177 of the Electricity Act, 2003 requires the CEA to make regulations consistent with the Act and rules to carry out provisions of this Act. Regulations on Installation and Operation of Meters has since been notified by Government of India. Draft regulations on Rules of Procedure for Transaction of Business, Grid Connectivity have been prepared and comments / suggestions from various stake holders have been received and the regulations are being finalised for notification. The other draft regulations on Safety, Grid Standards and Technical Standards, etc., are also being got readied for previous publication.

**Appellate Tribunal for Electricity:** The Central Government has established Appellate Tribunal for Electricity under Section 110 of the Electricity Act, 2003 on 7 April 2004. The headquarters of the Appellate Tribunal is at Delhi. The Appellate Tribunal will hear appeals against orders of the Regulatory Commissions/ Adjudicating Officers.

**National Electricity Policy:** The National Electricity Policy has been notified by the Government under the Act. Competitive bidding guidelines have been issued by the Government. The Tariff Policy has been notified.

**National Electricity Plan :** The draft National Electricity Plan has been prepared and sent to MOP for approval.

**Anti-theft legislation :** The States of Andhra Pradesh, Karnataka, Madhya Pradesh, Uttar Pradesh, West Bengal, Maharashtra, Kerala, Gujarat, Bihar, and Punjab have passed/drafted anti-theft laws.

Special courts dealing with Power theft have been set up in the States of Andhra Pradesh, Delhi, Himachal Pradesh, Madhya Pradesh, Manipur, Rajasthan, Tripura, Uttar Pradesh, West Bengal and Karnataka.

**Redressal of grievances of Consumers and appointment of an Ombudsman:** As per the provision of the Electricity Act, 2003, every distribution licensee shall have to establish a forum for redressal of grievances of the Consumers in accordance with the guidelines as specified by the State Commission. Every State Commission shall appoint an Ombudsman. Any consumer who is aggrieved by the non-redressal of his grievances may make a representation for the redressal of his grievances to the Ombudsman. Distribution Companies in many States have taken action to establish the redressal grievances forum and many State Commissions have appointed an Ombudsman. Other States are in the process to take the action in this behalf.

#### **ACCELERATED POWER DEVELOPMENT AND REFORMS PROGRAMME**

The Government has launched the Accelerated Power Development Reforms Programme (APDRP) which aims at upgradation of sub-transmission and distribution system, in the country and improvement in the commercial viability of State Electricity Boards by reducing the aggregate technical and commercial (AT&C) losses to around 15 per cent as against the existing over 50 per cent. This will ensure reliability and quality of power supply with adequate customer satisfaction. This involves a Six Level Intervention Strategy that encompasses initiative at National Level and Level, State Electricity Board/ Utilities level, distribution circle level, feeder level and the customer level. This strategy aims at technical, commercial, financial and IT intervention, organisation and restructuring measures and incentive mechanism for cash loss reduction. The APDRP has two components (a) investment component for strengthening and upgradation of the sub-transmission and distribution system – the Central Government provides additional Central assistance to the States for strengthening and upgradation and distribution work. The Government has sanctioned 583 projects amounting to Rs. 19180.46 crore in various states all over the country during last three years (b) under the incentive component, an incentive equivalent to 50 per cent of the actual cash loss reduction by SEBs/ Utilities is provided as grant. The disbursement upto March 2006 was Rs 6131.70 crore for the investment component and Rs. 1536.64 crore for incentive component under the scheme.

**Selection of sites for Thermal Power Projects :** In the context of the need to set up additional thermal power stations to meet the power requirements of the country up to the year 2012 AD and beyond, the CEA had in September 2001 constituted a committee under the Chairmanship of Member (Thermal) and consisting of members from different Ministries/Deptts./SEBs, etc., for selection of sites for large coastal/pithead and other Thermal Power Stations. As the process of selection of sites is of continuous nature, the above mentioned Committee was converted into a Standing Committee. Teams consisting of the members of the Committee from the CEA, Planning Commission, MoE&F, CMPDI, Railways, etc., are being constituted from

time to time for visiting the sites tentatively identified by the State agencies. These teams also interact with various States/Central Departments for assessing the availability of various inputs like land, water, fuel, etc., required for setting up of Thermal Power Plants.

The CEA has also awarded studies to the CMPDI and the NRSA for identification of large pithead and coastal sites using satellite mapping through remote sensing. CMPDI has submitted the reports for the 36,000 MW near the coal blocks in eight major coalfields. They have also identified additional coal blocks for 24,000 MW capacity for which they will be identifying the power plant sites. NRSA has submitted reports for the States of Gujarat Maharashtra, Andhra Pradesh and Tamil Nadu. They are carrying out studies for the other coastal states.

Based on the reports of the teams of the Committee which visited identified sites in different states, the Reports of CMPDI/NRSA and details of various other sites compiled by the Committee, a large shelf of potential sites has been created. Many sites from this shelf have been identified for benefits during the 11<sup>th</sup> Plan. The reports of the CMPDI and the NRSA have been forwarded to the concerned State governments/NTPC for development of the identified sites. The NRSA reports for coastal sites have also been given to the Site Selection Committee of Nuclear Power Corporation who are in the process of identifying coastal sites for new Nuclear Power Plants.

**Setting up of Ultra Mega Power Projects :** The Ministry of Power, Government of India in association with Central Electricity Authority and Power Finance Corporation has launched an initiative for development of coal based Ultra Mega Power Projects in India, each with a capacity of 4000 MW or above. These projects will be awarded to developers on the basis of tariff based competitive bidding.

To facilitate tie-ups of inputs and clearances, project specific shell companies are set up as wholly owned subsidiaries of the Power Finance Corporation Ltd. These companies will undertake preliminary studies and obtain necessary clearances including water, land, fuel, power selling tie-up, etc., prior to the awarding of the Project to the successful bidder. Initially, five sites were identified by the CEA in different states for the proposed Ultra Mega Power Projects. These include two pithead sites one each in Madhya Pradesh and Chhattisgarh and three coastal sites in Gujarat, Karnataka and Maharashtra. On the request of the State governments of Orissa and Andhra Pradesh, two more sites have been identified for Ultra Mega Projects consisting of a pithead site in Ib-Valley coalfield in Orissa and a coastal site at Krishnapatnam in Andhra Pradesh. It is proposed to set up pithead projects as integrated proposals with corresponding captive coal mines. The Ministry of Power has already requested Ministry of Coal to allocate such large coal blocks. For the coastal projects imported coal shall be used.

The projects are to be developed with a view to result in minimum cost of power to the consumers. Because of bigger sized units, the cost of the project would be lower due to economy of scale. These projects would be environment- friendly as supercritical technology is proposed to be adopted to reduce emissions. Further, the layout of the project would be compact and all systems would be optimised resulting in a lower cost of power. Further a time-bound action plan for preparation of project reports, tie-up of various inputs/clearances, appointment of consultants, preparation of RFQ/RFP have been prepared. The whole process up to selection of bidder is proposed to be completed in a period of one year. Once the developer is selected, the ownership of the Shell companies shall be transferred to the successful bidders.

Expression of Intent (EOI) have been issued in respect of four Ultra Mega Power Projects (UMPP), namely, Sasan UMPP in Madhya Pradesh, Mundra UMPP in Gujarat, Girye UMPP in Maharashtra and Tadri UMPP in Karnataka. EOI for two new projects, namely, Ib valley UMPP in Orissa and Krishnapatnam UMPP in AP are likely to be issued shortly. The shell companies have appointed technical consultants for the projects for which EOI have been issued. They have also separately appointed consultants for preparation of bid documents namely RFQ & RFP, etc. The RFQ bid documents for Sasan and Mundra projects were issued on 31 March 2006.

**Private Sector Participation :** The Government announced a policy in 1991 which allowed private sector participation in power generation schemes. It was decided in February 1995 that no private power project proposal would be considered by the Central Electricity Authority (CEA), if the project was not awarded through the international competitive bidding (ICB) route after a cut-off date of 18 February, 1995. Since 1991, a total capacity of around 7637.21 MW from 40 large and medium sized conventional private power plants has so far been commissioned and another capacity of around 5500 MW from 11 conventional power projects are under construction.

The Electricity Act, 2003 that has been enacted reduced the barriers to entry to different segments of the sector. Thermal generation has been delicensed. Captive generation is freely permitted. Transmission, distribution and trading of electricity are licensed activities. To facilitate the growth of all India electricity market, open access in transmission has been put in place. Open access in distribution is to be introduced in phases. The law also permits more than one distribution licensee in the same area. 100 per cent FDI has been permitted through automatic route in generation, transmission and distribution. Power trading has recently been fully opened for foreign investment.

## **PUBLIC SECTOR UNDERTAKINGS AND OTHER ORGANISATIONS**

### **NATIONAL HYDROELECTRIC POWER CORPORATION LTD.**

The National Hydroelectric Power Corporation Ltd., is a Schedule 'A' Enterprise of the Government of India with an authorised share capital of Rs. 1,50,000 million and an investment base of over Rs. 2, 22,000 million. Established in 1975, in its existence of about 31 years, the NHPC has become the major organisation for hydropower development in India, with capabilities to undertake all the activities from "concept to commissioning" in relation to setting up of hydro projects. The NHPC has ISO-9001 certification for its quality management system and ISO-14001 for an environment standard in Corporate Office.

The NHPC has completed 9 hydro electric projects with an installed capacity of 2,755 MW on its own and one project, i.e., Indira Sagar (1,000 MW) in MP which is a joint venture with the Government of M.P. 10 projects of the NHPC with an installed capacity of 5,103 MW and one project in joint venture with Government of MP, i.e., Omkareshwar (520 MW ) is under active construction stage. In addition the NHPC has also completed the 14.1 MW Devighat Hydropower Project in Nepal, 60 MW Kurichu Hydro Power Project in Bhutan and 5.25 MW Kalpong Hydro Power Project in the Andaman and Nicobar Islands on deposit work basis. Power generated at these Power Stations is supplied to 24 States/Union Territories.

The NHPC has signed a Memorandum of Understanding with the Uttaranchal Government for the implementation of a 240 MW Chungar Chal, 630 MW Garba Tawaghat and 55 MW Karmoli Lumti Tulli Projects in Uttarakhand. Power Purchase agreements have been signed for Kishanganga, Nimmo Bazgo, Chutak, Uri-II, Dul Hasti, Chamera-III and Teesta Low Dam Project Stage-IV with the concerned beneficiaries. The NHPC has signed agreements with the Government of Sikkim for the execution of the 495 MW Teesta Stage-IV and 210 MW Lachen Hydroelectric Projects in Sikkim on BOOM basis.

The Organisation has launched a major initiative to implement Enterprise Resource Planning (ERP) software solution framework for integrating major business processes to achieve quality of work, improved profitability and performance.

### **NATIONAL THERMAL POWER CORPORATION LIMITED**

The NTPC Ltd. (formerly National Thermal Power Corporation Ltd.) was incorporated in November 1975 with the objective of planning, promoting and organising an integrated development of thermal power in the country. The company has now been renamed as NTPC Ltd. In line with the changes taking place in the business portfolio of the company that transformed the company into an integrated Power Company it has now a presence across the entire energy value chain.

Ratnagiri Gas and Power Private Ltd. was formed on 08 July 2005 as a joint venture between NTPC, GAIL, MSEB holding company and Indian Financial Institutions with a view to take over the assets of the erstwhile Dabhol Power Company Ltd., complete the project and operationalise it. NTPC has invested Rs. 500 cr. as 28.33 per cent equity in this project.

The NTPC is implementing its first hydro project, the 800MW Koldam Hydroelectric Power Project (HEPP) in Himachal Pradesh. Further, NTPC has signed the Implementation Agreements for execution of Loharinag Pala HEPP (600 MW), Tapovan-Vishnugad HEPP (520 MW) and Rupsiabagar Khasiyabara HEPP(260 MW). Moreover, NTPCs subsidiary NTPC Hydro Ltd. (NHL) has signed the Implementation Agreements for execution of Lata-Tapovan (171MW) HEPP and Rammam-III (120 MW) HEPP.

During the year, a consortium comprising NTPC Ltd., Canoro Resources Ltd and Geo Petrol International has been allotted an oil exploration block in Arunachal Pradesh. A Production Sharing Contract (PSC) for the block has been signed between the Government of India and the Consortium.

The NTPC was allotted Pakri Barwadih coal mining blocks by Government of India and action has been initiated by the NTPC for its development. Further, the NTPC has been allotted 7 more captive coal mining blocks by the Government. These blocks are expected to produce 50 million tonnes of coal per annum. Of these 2 mine blocks at Brahmini and Chichro Patsimal in Orissa are to be developed through a 50:50 joint venture between the NTPC and Coal India Limited.

As part of its diversification drives, the NTPC has formed several joint venture companies such as : NTPC – SAIL Power Supply Company (P) Ltd. (NSPSCL) for operating the Captive Power Plants of Durgapur and Rourkela Steel Plants having total capacity of 240 MW, the Bhilai Electric Supply Company Ltd. (BESCL), for operating Captive Power plant (74 MW) at Bhilai Steel Plant of SAIL. The Company is also implementing of 500 MW (2x250 MW) expansion of Bhilai Captive Power Project. NTPC Alstom Power Services Limited (NASL) for taking up renovation

and modernisation (R&M) assignments of power plants in India and abroad; Utility Powertech Limited (UPL) for taking up assignments of construction, erection and project management in power and other sectors; NTPC Tamilnadu Energy Company Limited (NTECL) to set up a coal based power station of 1000 MW capacity, at Ennore in Tamilnadu, using Ennore Port infrastructure facilities, Ratnagiri Gas and Power Private Ltd. (RGPPL) for revival/restart of Ratnagiri Project (erstwhile Dabhol Project).

The NTPC has also formed several wholly owned subsidiaries such as : NTPC Vdiyut Vyapar Nigam Limited (NVVN) for trading in Power. NVVN is also engaged in facilitating the development of power exchange in India; NTPC Electric Supply company Ltd. (NESCL) to take up the power distribution business; NTPC Hydro Limited (NHL) for development of small and medium hydro power projects of capacity less than 250 MW; Pipavav Power Development Company Ltd. (PPDCL) for processing of setting up a 1000 MW thermal power project at Pipavav.

The NTPC has extended benefits of its success and experience by providing services for the development of Indian Power Sector. The NTPC has participated in several programmes of Subsidiaries, such as:

- (i) **Accelerated Rural Electrification Programme" (AREP)**, later merged with the programme of Electrification of Rural Villages & Households under the name of "Rajiv Gandhi Grameen Vidyutikaran Yojana(RGGVY)", under which the NTPC is involved in the turnkey execution of rural electrification work in 40,000 villages in 6 states.
- (ii) **Distribution, Reforms and Upgradation Management (DRUM)**- a collaborative effort of Ministry of Power and USAID, with NTPC Power Management Institute (PMI) as a leading partner in delivering training programmes on the distribution business.
- (iii) **APDRP (Distribution)**- The NTPC has been identified as the lead Advisor cum Consultant(AcC) for implementation of the APDRP programme targeted at improvement of the distribution sector in 12 states, out of which 6 states are directly assigned to NTPC and the balance 6 are through field AcC-CPRI and MECON.
- (iv) **Partnership in Excellence** – The CEA has identified 26 stations which are operating at a PLF of less than 40 per cent. These stations would have a "Partnership in Excellence" with better performing utilities, so as to achieve an improvement in performance in the shortest possible time. The NTPC has been entrusted the responsibility of 14 stations out of the identified 26.
- (v) **R&M of SEB stations** – The 10<sup>th</sup> Plan envisages R&M of an installed capacity of 11.055 MW with a target of achieving 75-80 per cent PLF and 20 years of life extension. NTPC has taken up consultancy services for a few of these stations.

### **POWER GRID CORPORATION OF INDIA LIMITED**

The Power Grid Corporation of India Limited (PGCIL) was incorporated as a Government enterprise on 23 October 1989 for establishment of regional and national power grids to facilitate transfer of power within and across the regions with reliability, security and economy and on sound commercial principles. It has been recognised as a miniratna category-I PSU.

As on 31 March 2006, PGCIL is operating about 55,120 ckt kms of transmission lines consisting of 563 ckt. kms. of 800 KV, 4,368 ckt kms, of HVDC system, 40,179

ckt kms of 400KV, 7,734 ckt, kms of 220 KV and 2, 241 ckt. kms., of 132 KV and 37 ckt. kms. of 66 KV lines along with 93 sub-stations with about 54, 380 MVA transformation capacity. The transmission system availability is maintained consistently over 99 per cent by deploying the best operation and maintenance practices at par with international utilities. Presently, about 45 per cent of total power generated in the country is being transferred over PGCIL's transmission network.

With a view to operate, monitor and control the Regional Power Grids in a unified, well coordinated and integrated manner, PGCIL has established Unified Load Dispatch and Communication (ULDC) schemes in all the regional power grid of India, namely, Northern, Southern, North-Eastern, Eastern and Western regions. Further, to facilitate smooth operation of the National Grid on a real time basis and free uninhibited bulk exchange of power among the regions, the National Load Dispatch Centre at Delhi is being set up.

PGCIL has diversified into Telecom business to utilise spare telecommunication capacity available with its Unified Load Dispatch Centre (ULDC) schemes and leveraging its country-wide transmission infrastructure. It envisages to establish a telecom network of about 20,000 kms., interconnecting about 60 major cities including Metros and all State capitals at a cost of about Rs. 1,000 crore.

Under Accelerated Power Development and Reforms Programme (APDRP), PGCIL has been assigned the role of Advisor-cum-consultant to lend its managerial and technical expertise for developing 182 distribution circles/towns/schemes spread over 18 States costing about Rs. 7,820 crore. The Company is also executing APDRP schemes of about Rs. 1,100 crore on deposit work basis under bilateral arrangement on behalf of States like Goa, Bihar, Meghalaya, Uttar Pradesh, Tripura and Gujarat.

### **RURAL ELECTRIFICATION CORPORATION LIMITED**

The Rural Electrification Corporation Limited (REC) was incorporated as a Company under Companies Act, 1956 in 1969 with the main objective of financing rural electrification schemes in the country. The current mission of REC is to facilitate availability of electricity for accelerated growth and for enrichment of quality of life of rural and semi-urban population and to act as a competitive, client-friendly and development oriented organisation for financing and promoting projects covering power generation, power conservation, power transmission and power distribution network in the country.

**Objectives :** (1) To promote and finance projects aimed at integrated system improvement, power generation, promotion of decentralised and non-conventional energy sources, energy conservation, renovation and maintenance, power distribution with focus on pump-set energisation, the implementation of Government of India scheme for the electrification of all villages and all households by 2009 and other related works in rural and urban areas. (2) To expand and diversify into other related areas and activities like financing of decentralised power generation projects, use of new and renewable energy sources, consultancy services, transmission, sub-transmission and distribution systems, renovation, maintenance and modernisation, etc., for optimisation of reliability of power supply to rural and urban areas, including remote, hill, desert, tribal, riverine and other difficult/ remote areas. (3) To mobilise funds from different sources including raising of funds from

domestic and international agencies and sanction loans to the State Electricity Boards, State Governments, Power utilities, Rural Electric Cooperatives, Non-Government Organisations (NGOs) and private developers. (4) To optimise the rate of economic and financial returns for its operations while fulfilling the corporate goals viz. (i) laying of power infrastructure; (ii) power load development; (iii) rapid socio-economic development of rural and urban areas, and (iv) technology upgradation. (5) To ensure client satisfaction and safeguard customers' interests through mutual trust and self respect within the organisation as well as with business partners by effecting continuous improvement in operations and providing the requisite services. (6) To assist State Electricity Boards/Power Utilities/State Governments, Rural Electric Cooperatives and other loanees by providing technical guidance, consultancy services and training facilities for formulation of economically/financially viable schemes and for accelerating the growth of rural and urban areas.

### **RAJIV GANDHI GRAMEEN VIDYUTIKARAN YOJANA**

A scheme "Rajiv Gandhi Grameen Vidyutikaran Yojana" for Rural Electricity Infrastructure and Household Electrification was launched in April 2005 for the attainment of the National Common Minimum Programme of providing access to electricity to all Rural Household in five years. The scheme would be implemented through the Rural Electrification Corporation (REC).

Under this scheme 90 per cent Capital Subsidy would be provided for projects for: (i) Creation of Rural Electricity Distribution Backbone (REDB) with one 33/11 kV (or 66/11 kV) substation in every Block, appropriately linked to the State Transmission System. (ii) Creation of Village Electricity Infrastructure (VEI) for electrification of all un-electrified villages/habitations and provision of distribution transformer(s) of appropriate capacity in every village/habitation. (iii) Decentralised Distributed Generation (DDG) and Supply System from conventional sources for Villages/Habitations where grid supply is not cost effective and where Ministry of Non-Conventional Energy Sources would not be providing electricity through their programme(s).

The scheme *inter alia* provides for financing of electrification of all un-electrified Below Poverty Line (BPL) households in the country with 100 per cent capital subsidy as per norms of Kutir Jyoti Programme in all rural habitations.

For projects to be eligible for capital subsidy under this scheme prior commitment of the States would be taken before sanction of the projects for: (i) deployment of franchisees for the management of rural distribution in projects financed under this scheme. (ii) provision of requisite revenue subsidy to the State utilities as required under the Electricity Act, 2003.

The States would also be required to make adequate arrangements for supply of electricity and there should be no discrimination in the hours of supply between rural and urban households. The scheme covers the entire country and the funds would be released on the basis of sanction of the projects submitted. It is estimated that Rs.16,000 crore would be required for the entire scheme. For Phase-I of the scheme approved for implementation during the 10<sup>th</sup> Five-Year Plan Period Rs. 5,000 crore has been provided by the Central Government as Capital subsidy.

As per the new definition of Village Electrification, there are 1,25,000 un-electrified villages. Number of electrified rural households are 60,180,685, i.e., 43.52 per cent as per 2001 census.

### **POWER FINANCE CORPORATION LTD.**

The Power Finance Corporation Limited was incorporated on 16 July, 1986 and registered as a Non-Banking Financial Institution by Reserve Bank of India in February, 1997. Set up as a Power Sector Financial Institution, the Company has been a dominant player in funding the projects of the State Power Utilities. Over the last 4 to 5 years, the Company has also started playing a major role in funding of Central Sector and Private Power Projects. The Company's loan portfolio of Rs. 35,603 crore as on 31 March 2006 includes various types of Power Projects viz. Generation, Transmission, Renovation and Modernisation, System Improvement, etc. In the Generation segment, the projects funded by the Company include coal-based thermal, gas based thermal, hydro, bio-mass and wind power projects.

The company has recently been identified as the nodal agency for the present development of seven Ultra Mega Power Projects of 4000 MW each in various parts of the country through tariff-based competitive bidding. These include three pit-head based projects which would include development of captive coal mines and four coastal projects based on imported coal. Each of these projects will be progressively commissioned over the next 5 to 7 years.

### **NORTH-EASTERN ELECTRIC POWER CORPORATION LIMITED**

With a need to develop the huge power potential the North Eastern Electric Power Corporation (NEEPCO) was incorporated on 2 April 1976 as a wholly owned Government Enterprise under the Ministry of Power to Plan, Promote, Investigate, Survey, Design, Construct, Generate, Operate and Maintain power stations in the N.E. Region. The authorised share capital of the Corporation presently stands for Rs. 3,500 crore. The installed capacity of the NEEPCO is 1,130 MW comprising of 755 MW of Hydro Power and 375 MW of gas based power. The Corporation currently meets more than 68 per cent of the energy requirement of the North Eastern Region. It is an ISO:9001:2000(Quality) ISO 14001:1996(environment) and OHSAS-18001:1999 (Safety) Company with its Corporate Office at Shillong.

The Corporation plans to add 1380 MW more during the eleventh five-year plan to its present installed capacity of 1130 MW. Presently, two projects of total capacity of 660 MW are under execution by the NEEPCO.

### **SATLUJ VIDYUT NIGAM LTD.**

The successful completion and commissioning of the prestigious 1500 MW Nathpa Jhakri Hydro Power Project in Himachal Pradesh in September 2003 was an important landmark for the Corporation. The Nathpa Jhakri Hydro Electric Project was dedicated to the nation by the Hon'ble Prime Minister of India Dr. Manmohan Singh on 28 May, 2005 in the august presence of Hon'ble Union Minister of Power at a function presided over by Hon'ble Chief Minister of Himachal Pradesh. After the successful implementation of this Project, SJVN has embarked on a target of becoming 5000 MW multi-project company. It has already taken up six more projects in Himachal Pradesh and Uttaranchal as per details:

<b>Project</b>	<b>Capacity</b>	<b>State</b>
Ranpur HE Project	412 MW	Himachal Pradesh
Luhri HE Project	700 MW	Himachal Pradesh
Khab HE Project	1020 MW	Himachal Pradesh

Devsari Dam HE Project	300 MW	Uttaranchal
Devra Mori HE Project	35 MW	Uttaranchal
Jhakhol Sankari HE Project	33MW	Uttaranchal

The Satluj Jal Vidyut Nigam Limited, SJVN (formerly Nathpa Jhakri Power Corporation Limited (NJPC) was incorporated on 24 May 1988 as a joint venture of the Government of India and the Government of Himachal Pradesh (GOHP) with an authorised share capital of Rs. 4500 crore. The debt equity ratio for the Nathpa Jhakri Hydro Electric Project (NJHEP) is 1:1 and the equity – sharing ratio of GOI and GOHP is 3:1 respectively.

All the Units of the NJHEP have since been commissioned as detailed below:

Unit	Synchronisation	Commercial Generation
Unit - 6	23 November 2003	02 January 2004
Unit – 5	20 September 2003	06 October 2003
Unit – 4	22 January 2004	30 March, 2004
Unit – 3	13 February 2004	31 March 2004
Unit – 2	09 March 2004	06 May 2004
Unit – 1	31 March 2004	18 May 2004

**Project Benefits :** Besides the social and economic uplift of the people in its vicinity, the 1500 MW NJHEP is designed to generate 6950 MW of electrical energy, in a 90 per cent dependable year. It also provides 1500 MW of valuable peaking power to the Northern Grid.

Out of the total energy generated at the Bus Bar, 12 per cent is supplied free of cost to the home state, Himachal Pradesh. From the remaining 88 percent energy generation 25 per cent is supplied to HP at Bus bar rates. The power allocated to different States/ UTs of Northern Region by the Ministry of Power is as follows.:

Haryana	64 MW
H.P	547 MW
J&K	105 MW
Punjab	114 MW
Rajasthan	112 MW
U.P.	221 MW
Uttarakhand	38 MW *
Delhi	142 MW
Chandigarh	08 MW
Unallocated quota at MOP disposal	149 MW

\* Transferred to Punjab as Uttaranchal was not willing.

The Corporation has bagged a number of awards for environment protection safety and eco-systems. It also has the ISO 9001 certification.

**Consultancy Services :** SJVN has the experience of corporate and project planning, design, engineering, construction management, erection and commissioning, contracts management, project management, human resource management, financial

management and commercial management of India's largest hydro-electric project. To effectively utilise the in-house expertise and the experience gained, a dedicated consultancy division has been established for providing consultancy services to national and international organisations.

### **TEHRI HYDRO DEVELOPMENT CORPORATION LIMITED**

The THDC, a joint venture Corporation of the Government of India and Government of U.P., was incorporated in July 1988 as a Limited Company under the Companies Act, 1956, to develop, operate and maintain the Tehri Hydro Power Complex and other Hydro Projects.

The Corporation has an authorised share capital of Rs. 4000 crore. The THDC is presently responsible for the implementation of the Tehri Hydro Power Complex (2400 MW), on the river Bhagirathi, comprising Tehri Dam and Hydro Power Plant (HPP) (1000MW), Koteshwar Hydro Electric Project(HEP) (400MW) and Tehri Pumped Storage Plant (PSP)(1000MW).

The Tehri Stage-I is at an advance stage of completion. Two units of 250 MW each were successfully rolled on 31 March 2006. With this, the commissioning process of Tehri Stage-I Project has started. Generation from the Project was planned to commence from June 2006 onwards. The works of Koteshwar HEP are in progress and the project is scheduled to be commissioned by March 2008. Essential works of Tehri PSP have been taken up alongwith the execution of Tehri Stage-I. Investment approval of Tehri PSP is under process. The Project is envisaged to be completed in 4 years after investment approval.

The Tehri Hydro Power complex (2400 MW) will generate 6200 Million Units of energy annually on its completion (3568 Million Units on completion of Tehri Stage-I) and will provide additional irrigation facility in 2.70 lakh hectares of land besides stabilising existing irrigation facility in 6.04 lakh hectares of land. The project will provide drinking water for 40 lakh people in Delhi and for 30 lakh people in the town and villages of Uttar Pradesh.

The Corporaton is also entrusted with the Vishnugad Pipalkoti Project (444 MW) on river Alaknanda, Kishau Dam and HPP (600 MW) on river Tons (tributary of Yamuna), and 6 other new Hydro Projects in Uttaranchal, totaling to 695 MW. The Government of Uttarakhand has signed an MoU for preparation of Detailed Project Report (DPR) of Vishnugad Pipalkoti Project in April 2003. The Stage-I activities of the project are already complete. A DPR envisaging an installed capacity of 444 MW (4x111) has been submitted to the Central Electricity Authority in March 2006 for Techno-Economic Clearance. The Project is scheduled for commissioning by year 2011, i.e., during Eleventh Plan. The Government of Uttarakhand also allocated following six projects to THDC for development:

S.No	Name of Projects	Capacity	River	Distt.
1	Karmoli	140MW	Jadhganga	Uttarkashi
2	Gohana Tal	60 MW	Birahiganga	Chamoli
3	Jadhganga	50 MW	Jadhganga	Uttarkashi
4	Malari Jhelam	55 MW	Dhauliganga	Chamoli
5	Jhelam Tamak	60 MW	Dhauliganga	Chamoli
6	Bokang Bailing	330 MW	Dhauliganga (K)	Phithoragarh

Implementation Agreement between the THDC and Government of Uttarakhand for above new projects were signed in November 2005. Investment approval for carrying out Stage-I activities for five Projects excluding Bokang Bailing was accorded by Government of India in March 2006 and works for Stage-I activities have been taken up.

The Government of Uttarakhand has conveyed "in principle" approval for allocation of Kishau Dam (600 MW) to the THDC. The project will generate 1216 MU of power annually, besides providing irrigation (97076 ha.) and drinking water to Delhi (616 MCM). THDC would be taking up the project once issue of the appointment of cost among Power, Drinking Water Supply and Irrigation Components are firmed up and Implementation Agreement/MOU is signed.

#### **BHAKRA BEAS MANAGEMENT BOARD**

The Bhakra Beas Management Board (BBMB) manages the facilities created for harnessing the waters impounded at Bhakra and Pong in addition to those diverted at Pandoh through the BSL Water Conductor System. It was also assigned the responsibility of delivering water and power to the beneficiary states in accordance with their entitled shares. The Board is responsible for the administration, maintenance and operation at Bhakra Nangal Projects, Beas Project Unit I and Unit II including Power Houses and a network of transmission lines and grid sub-stations. The Power generation of BBMB power evacuation system running into 3735 circuit km length of 400 KV, 220 KV, 132 KV and 66 KV transmission lines and 24 EHV sub-stations. The installed capacity of BBMB Power plants is 2,866.30 MW.

#### **DAMODAR VALLEY CORPORATION**

The Damodar Valley Corporation (DVC), the first multipurpose river valley project of the Government was set up in July 1948 for the unified development of Damodar Valley region spread over the States of Jharkhand and West Bengal. Its objectives include flood control and irrigation, water supply and drainage, generation, transmission and distribution of electrical energy, both hydro-electric and thermal, afforestation and control of soil erosion, public health and agricultural, industrial, economic and general well-being in the Damodar Valley.

The DVC's main projects include four dams at Maithon, Panchet, Tilaiya and Konar with connected hydro-electric power stations (except at Konar), thermal power stations at Bokaro 'A', Bokaro 'B', Chandrapura, Durgapur, Mejia and also one gas turbine station at Maithon. The T&D system of DVC is supported by 42 sub-stations, 15 receiving stations and 964 circuit kms. of distribution lines. DVC supplies power at voltage levels of 33 KV, 132 KV and 220 KV to the core sector industries in the region of coal mines, steel plants, railways and other big/ medium industries and also to its licensees including State Electricity Boards of Jharkhand and West Bengal. As a constituent of Eastern Regional Grid, the DVC is also exporting its surplus power to the deficit regions of the country through the Central Transmission Utility network.

The DVC has also taken up action for refurbishment of its old thermal and hydel units through RLA based R&M/LE. Matching extension, augmentation and strengthening of its transmission and distribution network has also been undertaken by the Corporation.

#### **NATIONAL POWER TRAINING INSTITUTE**

The National Power Training Institute, a registered society, an ISO 9001:2000 & ISO

14001 Organisation under the Ministry of Power, is committed to the development of Human Resources in Indian power and Energy Sectors. The NPTI operates on an all India basis with its Corporate Office at Faridabad and the Regional Institutes located at New Delhi, Nagpur, Durgapur, Neyveli, Bangalore and Guwahati. NPTI's Corporate Centre and its Institutes are well equipped with world-class hi-tech infrastructural facilities for conducting different courses on technical as well as management subjects. Since its inception, the NPTI has shared its engineering and technological expertise through its long-term and short-term training programmes, imparting training to more than 1,11,000 power professionals. Also through its mass awareness programmes of in Energy Conservation, Power Reforms, Electrical Safety, Energy Environmental Linkage, Water for Sustainable Development of Power, etc. over 1,47,000 persons were sensitised across the country.

The NPTI also established high fidelity, Real-Time, Full-Scope 500 MW & 210 MW Fossil Fuel Fired Power Plant Training Simulators imparting training to nearly 8,000 engineers and operators across the country. Also a 430 MW CCGT Replica Simulator has been commissioned at the Corporate Office, Faridabad. A GIS Resource Centre has also been established for Training purposes at Faridabad. Over 40 self-paced, menu-driven, cost-effective multimedia computer-based training packages have been developed and marketed by the NPTI.

In its attempts to weave formal education with Industry-oriented inputs, the NPTI is conducting (a) A two year MBA in Power Management (b) A four-Year Degree Course in B.Tech/B.E.(Power) and a (c) Post Graduate Diploma in Thermal Power Plant Engineering. These AICTE approved courses have an overwhelming response and the trained manpower is being recruited by various Public/Private Sector Organisations through Campus interviews. Besides these, NPTI is also conducting a Post Diploma Course in Thermal power Plant Engineering.

### **CENTRAL POWER RESEARCH INSTITUTE**

**The Central Power Research Institute (CPRI)** a society registered under the societies Registration Act under the Ministry of Power serves as a national laboratory to carry out applied research in Electrical Power Engineering. It also functions as an independent National Testing and Certification Authority for Electrical Equipment for ensuring their reliability.

The Institute, with its existence of over four decades has built sophisticated facilities, both in the areas of research and testing. The important facilities include 2500 MVA Short Circuit Testing with Synthetic Testing Facility at Bangalore, Ultra High Voltage Research Laboratory at Hyderabad, Short Circuit Testing Facility at Bhopal, Thermal Research Centre at Koradi, Nagpur and Energy Research Centre at Thiruvananthapuram to cater to the R&D and testing needs of the power sector. A state-of-the-art test facility for seismic qualification of power equipment and Real Time Digital Simulation (RTDS) facility have been set up and commissioned.

The CPRI's laboratories are accredited under the National Accreditation Board for Testing and Calibration of Laboratories (NABL), which is the national body for accreditation of laboratories as per ISO/IEC 17025 norms. The CPRI's low and medium voltage laboratories are accredited by ASTA BEAB, UK. The CPRI has been given the 'observer status' in the group of Short Circuit Testing Liaison(STL) of Europe and is likely to be a full member of this prestigious club. CPRI laboratories are approved for testing for certain products like communication cables, L.T.

Capacitors for motors, etc., by Underwriters Laboratories(UL) and Canadian Standard Association (CSA). The CPRI is also CBTI, under IEC-EFCB Scheme. CPRI's R&D and Consultancy activities have been granted ISO 9001:2000 Certificates.

Over the years, CPRI has built up expertise in the areas of transmission and distribution systems, power quality, energy metering, energy auditing, transmission line, tower design, conductor vibration studies, power systems instrumentation, transformer oil reclamation and testing, diagnostic studies, condition monitoring and estimation of remaining life of equipment, new material for power system application, UHV testing, short circuit testing, HV testing, seismic qualification of equipment and other related fields. CPRI offers consultancy services in these areas. The Institute works as a nodal agency for national level power system research. Among the new ventures of the CPRI, the Centre for Collaborative and Advanced Research (CCAR) has been established for creating infrastructure for the visiting Scientists/Technologists to carry out research in the areas of power sector. The other important facility currently added is for showcasing of all available technologies for Industrial Solid Waste Utilisation. The Institute is creating testing facilities at Kolkata and Guwahati to cater to the testing requirements in the Eastern and North Eastern States of the country, with the infrastructure assistance from WBSEB and ASEB. The other new facility being established included a labeling laboratory for air conditioners and refrigerators. The CPRI is expanding its services to other Asian and African countries and is executing many consultancy and testing jobs.

#### **BUREAU OF ENERGY EFFICIENCY**

Recognising the fact that the efficient use of energy and its conservation are least-cost options to meet the increasing energy demand, the Government of India enacted the Energy Conservation Act-2001 and established the Bureau of Energy Efficiency (BEE) under the Ministry of Power in March 2002. The Act provides for institutionalising and strengthening the delivery mechanism for energy efficiency services in the country and provides the much needed coordination between the various entities. The mission of the Bureau of Energy Efficiency is to develop policies and strategies based on self-regulation and market principles, within the overall frame work of the Energy Conservation Act (EC Act), 2001 so as to finally reduce the energy intensity of the Indian economy. The aim is to have the active participation of all stakeholders, resulting in the accelerated and sustained adoption of energy efficiency in all sectors.

Under the National Energy Conservation Award Scheme-2005, 311 participating industrial units saved Rs 9890 million against an investment of Rs 13160 million on account of implementation of various energy conservation measures. Electricity savings resulted in avoided capacity equivalent to 250 MW. Savings of 865 MW as equivalent avoided capacity has been achieved during the period 1999-2005 through the National Energy Conservation Award Scheme.

#### **CENTRAL ELECTRICITY REGULATORY COMMISSION**

The Central Electricity Regulatory Commission (CERC) an independent statutory body with quasi-judicial powers, was constituted on 25 July 1998 under the Electricity Regulatory Commissions Act, 1998 and has been continued under the Electricity Act, 2003. The Commission consists of a Chairperson and four other Members including the Chairperson, CEA as the ex-officio Member.

## STATE ELECTRICITY REGULATORY COMMISSIONS

Many State Electricity Regulatory Commissions (SERCs) have been established under the provisions of the ERC Act, 1998 or under respective State Reforms Acts. These SERCs have been continued under the provisions of Electricity Act, 2003.

**State Reforms Acts :** Orissa, Haryana, Andhra Pradesh, Uttar Pradesh, Uttarakhand, Karnataka, Rajasthan, Madhya Pradesh, Delhi and Gujarat have enacted their State Electricity Reforms Acts, which provide, *inter-alia*, for unbundling/corporatisation of SEBs, setting up of SERCs, etc. The SEBs of Orissa, Haryana, Andhra Pradesh, Karnataka, Uttar Pradesh, Uttarakhand, Rajasthan, Delhi, Assam Tripura, Gujarat, Madhya Pradesh and Maharashtra have been unbundled/corporatised. Distribution was privatised in Orissa and Delhi

So far twenty five states viz, Orissa, Haryana, Andhra Pradesh, Uttar Pradesh, Karnataka, West Bengal, Tamilnadu, Punjab, Delhi, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Himachal Pradesh, Assam, Chhattisgarh, Uttarakhand, Goa, Bihar, Jharkhand, Kerala, Tripura, Sikkim, Jammu & Kashmir and Meghalaya have either constituted or notified the constitution of SERCs. A Joint Electricity Regulatory Commission (JERC) has been notified for Mizoram and Manipur. A JERC has also been notified for Union Territories (except Delhi).

Twenty SERCs viz. Orissa, Andhra Pradesh, Uttar Pradesh, Maharashtra, Gujarat, Haryana, Karnataka, Rajasthan, Delhi, Madhya Pradesh, Himachal Pradesh, West Bengal, Punjab, Tamilnadu, Assam, Uttarakhand, Jharkhand, Kerala, Chhattisgarh and Tripura have issued tariff orders.

**Reorganisation of State Electricity Boards (SEBs) :** The Central Government has agreed for continuation of the SEBs of 11 States after considering their respective requests in this regard upto 9 June 2006 except for Bihar for which extension has been given upto 9 September 2006. Of the eleven states, Madhya Pradesh and Assam have carried out the re-organisation except for the area of trading of electricity for which extension upto 9 June 2006 has been agreed to.

**Appellate Tribunal for Electricity :** The Appellate Tribunal for Electricity, established by the Central Government under Section 110 of the Electricity Act, 2003 has been operationalised. The Headquarters of the Appellate Tribunal is at Delhi. The Tribunal has started hearing appeals against orders of the Regulatory Commissions/ Adjudicating Officers.

**Electricity Rules, 2005 :** The Central Government has notified Electricity Rules, 2005 on 8 June 2005 which carry provisions related to Captive Generating Plants, Consumer Redressal Forum and Ombudsman, Tariff of Generating Companies, etc. Nine Removal of Difficulties Orders regarding inclusion of measures to control theft in Electricity Supply Code, etc., have been issued by the Central Government under Section 183 of the Electricity Act, 2003.

**Tariff Policy :** A Tariff Policy has been notified by Government of India under the provisions of section 3 of the Electricity Act, 2003.

The objectives of the tariff policy are to : a) Ensure availability of electricity to consumers at reasonable and competitive rates; b) Ensure financial viability of the sector and attract investments; c) Promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimise perceptions of regulatory risks; d) Promote competition, efficiency in operations and improvement in quality of supply.

**Guidelines for procurement of electricity :** In compliance with section 63 of the Electricity Act, 2003, the Central Government has notified guidelines for the procurement of power by Distribution Licensees through competitive bidding. The Central Government has also issued the standard bid document containing RFQ, RFP and model PPA for long-term procurement of power from projects that have specified site and location.

**Forum of Regulators :** The Forum of Regulators has been constituted under sections 166 (2) & (3) of the Electricity Act, 2003.

The Forum shall discharge, *inter-alia*, functions viz. analysis of tariff orders and other orders of the CERC and SERCs and compilation of data arising out of the said orders, highlighting, especially the efficiency improvements of the utilities, laying of standards of the performance of licensees, evolving measures for protection of interest of consumers and promotion of efficiency, economy and competition in the power sector.

**Regional Power Committees :** Regional Power Committees have been constituted under the provision of section 2(55) of the Act for facilitating integrated operation of the power system in respective regions on 29 November 2005.

## PETROLEUM AND NATURAL GAS

The Ministry of Petroleum and Natural Gas is entrusted with the responsibility of exploration and production of oil and natural gas including import of Liquefied Natural Gas (LNG), and the refining, marketing, distribution, import, export and conservation of petroleum products.

Considering the oil demand scenario vis-a-vis domestic production level, the Government is encouraging oil sector PSUs to venture abroad to access exploration blocks and oil producing properties for equity oil either on its own or through strategic alliances/joint ventures.

India is a member of the International Energy Forum (IEF) which provides a platform for biennial meetings of the Ministers from the energy producing and consuming countries. This forum was earlier known as "Producer-Consumer Dialogue" between the oil producing and consuming countries. The permanent secretariat of the IEF is in Riyadh. The mission of the secretariat is to further strengthen and enhance the process of global dialogue on energy at the political level.

## CRUDE OIL AND NATURAL GAS PRODUCTION

Oil and Natural Gas Corporation Limited (ONGC) and Oil India Limited (OIL), the two National Oil Companies (NOCs) and private and joint venture companies are engaged in the Exploration and Production (E&P) of oil and natural gas in the country.

In the last five years, the Government has made concerted efforts for enhancing "Energy Security". The Tenth Five-Year Plan formulated thereunder represented a paradigm shift over earlier plans in as much as exploration areas were decided to be awarded through international competitive bidding in a deregulated scenario. Since 1991, Government of India has been inviting bids on a regular basis with several rounds of bidding carried out till operationalisation of New Exploration Licensing Policy (NELP).

### **COAL BED METHANE**

Coal Bed Methane is an environment-friendly clean fuel similar to conventional natural gas. In order to explore and produce new sources of natural gas from coal bearing areas, Government had formulated a CBM policy providing attractive fiscal and contractual framework for exploration and production of CBM in the country. The Government has also offered 10 blocks under CBM-III for exploration and production of CBM. The Government has so far signed 16 contracts for exploration and production of CBM.

### **OIL AND NATURAL GAS CORPORATION LIMITED**

The Oil and Natural Gas Commission was established on 14 August 1956 as a statutory body under Oil and Natural Gas Commission Act for the development of petroleum resources and sale of petroleum products. As per the decision of the Government, the ONGC was converted into a Public Limited Company under the Companies Act, 1956 and named as "Oil and Natural Gas Corporation Limited" from 1 February 1994. In March 2004, the Government has disinvested around 10 per cent of the equity shares of ONGC through a public offer in the domestic capital market at Rs. 750 per share.

### **ONGC VIDESH LIMITED**

'Hydrocarbons India Limited' formed in 1965 as a subsidiary of ONGC was Shri K. D. Malaviya's brainchild to give India succour by getting oil from abroad. It was renamed as OVL (ONGC Videsh Limited) in 1989. Today it participates in 21 projects in 13 countries, namely, Vietnam, Russia, Sudan, Iran, Iraq, Libya, Myanmar, Syria, Qatar, Cuba, Egypt, Brazil and Nigeria. OVL has a 25 per cent interest in the Greater Nile Oil Project in Sudan, which is an onshore crude oil production area, consisting of three blocks. The ONGC Videsh Limited (OVL) is currently producing Oil & Gas from its Sudan (Greater Nile Oil Project), Vietnam, Syria and Russia (Sakhalin-1) assets. OVL's investment commitment overseas stands at USD 4.5 billion. This makes OVL the biggest Indian multinational corporate. Now OVL has become the 2nd largest E&P Company in India, after ONGC.

OVL's efforts have been supported wholeheartedly by the Government of India, which has allowed OVL exclusive empowerment by providing a single window clearance for overseas upstream projects. OVL has been designated as the Indian Nodal Agency for overseas petroleum business and is maintained as a permanent participant in all bilateral interactions and Joint Working Groups of the Ministry of Petroleum and Natural Gas.

### **OIL INDIA LIMITED**

Oil India Limited (OIL), under the administrative set-up of the Ministry of Petroleum and Natural Gas, is a National Oil Company engaged in the exploration, production and transportation of crude oil and natural gas in the country. OIL was incorporated in 1959 as a company with a two-third shares of Burmah OIL Company and one-third share of Government of India. In 1961, OIL became a joint venture company with equal share of Government of India and Burmah OIL company. On 14 October 1981, OIL became a Government of India enterprise, a wholly-owned Public Sector Undertaking. OIL has operational areas in the States of Assam, Arunachal Pradesh, Orissa, Uttar Pradesh, Uttarakhand and Rajasthan.

OIL was awarded a total of 14 NELP blocks in I to V rounds of bidding- as operator in 6 blocks and with Participating Interests in the balance 8 blocks. Majority of these blocks are in the Phase-I of exploration, while in 2 blocks with OIL as operator, Phase-II works are in progress. Drilling of 1 well in NELP-III Block No. RJ-ONN-2001/1 in Rajasthan has since been completed by OIL. So far, discovery of hydrocarbons has not been made in any of these 14 NELP blocks.

### **GAIL INDIA LIMITED**

GAIL ( India) limited, a 'Navratana' enterprise was established in the year 1984 and is India's principal nature gas transmission and marketing company with activities expanding to Gas processing for fractionating LPG, Propane, SBP Solvent and Pentane: transmission of Liquefied Petroleum Gas (LPG): Petrochemicals like HDPE and LLDPE; leasing bandwidth in Telecommunications. The company has extended its presence in Power, Liquefied Natural Gas (LNG) re-gasification, City Gas Distribution and Exploration and Production through equity and joint ventures participations. The current holding of Government of India in GAIL, is 57.35 per cent.

The GAIL owns and operates a network of over 5,340 km of Natural Gas high pressure trunk pipeline with a capacity to carry 118 MMSCMD of Natural Gas across the country. It has a capacity to transport 3.8 MMTPA of LPG.

Its gas-based integrated petrochemicals plant at Pata, Uttar Pradesh has a capacity of producing 4,00,000 TPA of Ethylene and 3,10,000 TPA of Polymers, i.e., HDPE and LDPE. It is also involved in setting up a gas distribution network in the cities for supply of Natural Gas to households, commercial users and for the transport sectors. GAIL has also been operating its state-of-art telecommunication network. GAIL's telecom business unit- 'GAILTEL' which has approximately 13,000 km network, offers highly dependable bandwidth for telecom service providers in the states of Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Uttar Pradesh, Andhra Pradesh, Haryana, Punjab and Delhi. The first to become operational is the Delhi-Mumbai route. GAILTEL has become a formidable force today. Its North-West-Central network corridor accounts for 65 per cent of India's long distance traffic. Currently, the company is involved in exploration activities over an average of over 83,600 sq kms and plans to invest approximately Rs 800 crore in E&P activities over the next three years.

The GAIL now holds a participating interest between 10 to 80 per cent in 16 exploration blocks. Of these, 7 are on-land blocks and 9 are offshore blocks. In India, there are 13 blocks which are in Basins such as Mahanadi, Bengal, Gujarat-Saurashtra, Mumbai, Cambay, Assam- Akaran and Cauvery. Further more, GAIL has also got a stake in the A-1 and A-3 blocks in Maynmar and block no. 56 in Oman. The various consortium partners of the company in the 16 blocks are ONGC, GSPC, Gazprom, Oil, IOC, Hardy Exploration and Production, Enpro Finance Private Ltd., ENI India Limited, Jubilant, GGR Canada, Daewoo, OVL, Korea Gas Corporation, Oliex, Videocon, BPCL and HPCL.

Apart from its globalisation programme, the GAIL has already obtained equity participation in three retail gas companies in Egypt, viz, Fayum Gas Company, NATGAS and Shell CNG, Egypt and also acquired 7.5 per cent equity in China. GAIL has a participating interest in 2 blocks in Myanmar and in one onland block in Oman. GAIL (Singapore) Pvt Ltd in Singapore is looking after GAIL's overseas ventures.

## **CONSERVATION OF PETROLEUM PRODUCTS**

After coal, petroleum products remain the primary energy source in India, with their consumption increasing at a very steep rate. For faster development, the role of energy sector is of paramount importance. India is at present one of the least energy efficient countries in the world with an identified scope of reducing energy consumption by 20-30 per cent in all major sectors through conservation measures. The spiralling prices of crude oil in the recent past have made all the developing economies adopt a cautious approach for the judicious utilisation of the already strained resources. The Petroleum Conservation Research Association (PCRA) set up as a registered society under the Ministry of Petroleum and Natural Gas in 1978 has been given the mandate to promote conservation of petroleum products in the major sectors of economy like transport, industry, households and agriculture through direct technical assistance, R&D, educational and training programmes, and mass awareness campaigns. The PCRA's activities cover conservation of all energy sources, development, evaluation and commercialisation of efficient equipment and additives, popularising petro-crop cultivation and production of bio-fuels, environment protection, etc. Under the new initiatives/ thrust areas PCRA has taken up the promotion of bio-fuels, and urban energy management. Initiatives were also taken for the production of *Jatropha* based diesel in the rural sector.

## **REFINING**

The refining capacity in the country as on 1 April 2006 was 132.468 million metric tonnes per annum (MMTPA). At present, there are 18 refineries operating in the country (17 in the Public Sector and one in the Private Sector). Out of 17 Public Sector refineries, 7 are owned by Indian Oil Corporation Ltd. (IOCL), two each by Chennai Petroleum Corporation Limited (a subsidiary of IOCL), Hindustan Petroleum Corporation Limited and Oil & Natural Gas Corporation Ltd., one each by Bharat Petroleum Corporation Ltd. (BPCL), Kochi Refineries Limited (a subsidiary of BPCL), Numaligarh Refinery Limited (a subsidiary of BPCL), and Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of IOCL). The private sector refinery belongs to Reliance Industries Limited.

## **COAL**

Coal is the main source of energy in the country and accounts for about 67 per cent of the country's commercial requirement. It is also an essential input in steel and carbo-chemical industries.

## **COAL RESERVES**

As a result of exploration carried out down to a depth of 1200m by the Geological Survey of India and other agencies, a cumulative total of 2,53,300 million tonnes of coal resources have been estimated in the country as on 1 January 2006.

## **PROJECTS AND PLANNING**

The coal projects costing up to Rs 100 crore can be sanctioned by the Board of Directors of Coal India Limited (CIL), and coal projects costing up to Rs 50 crore can be sanctioned by the Board of Directors of Northern Coalfields Limited (NCL), Western Coalfields Limited (WCL), South Eastern Coalfields Limited (SECL), and Mahanadi Coalfields Limited (MCL) subject to certain conditions.

## COAL CONSERVATION

Conservation of coal enjoins maximum recovery of *in-situ* reserves of coal. The aspect of conservation of coal is taken into account right from the planning stage and maximum recovery is ensured during the implementation stage.

Mechanised opencast mining is presently the commonly adopted technology for extraction of thick seams at a shallow depth. This is also important from the conservation point of view since the percentage recovery by this technology is much higher. The dominance of this technology can be understood from the fact that it now contributes more than 80 per cent of the total coal production. This trend is likely to continue in the near future too. Further, the thick seams, which were earlier developed by Board and Pillar method or other methods of underground mining and had been standing on pillars for long in the absence of a suitable technology for extraction, have now in many cases become extractable by opencast method of mining with HEMM equipment of a suitable type in some mines of WCL, BCCL, CCL and ECL under shallow cover.

In case of underground mining, the introduction of mechanisation has resulted in an increased percentage of extraction thereby leading to better conservation of coal.

Longwall and continuous mining technology yields higher percentage of recovery (70 per cent to 80 per cent) with higher rate of output compared with other methods of underground mining. These methods have been implemented in some mines of Coal India Limited as well as of SCCL. However, due to difficult geomining conditions prevalent in India, a large-scale adoption of longwall technology has not been possible.

With the improvement in roof support technology using mechanised bolting with resin bolts, it has been possible to maintain a wider gallery span and extract seams under bad roof conditions more efficiently resulting in improved conservation of coal.

The Coal Conservation and Development Act, 1974 provides for the imposition of excise duty on coal despatches for meeting the needs of activities like conservation of coal, development and development of coal mines, execution of stowing and other operations for the safety in coal mines and research work connected with conservation and utilisation of coal, etc and assistance in mining operation.

## SAFETY AND WELFARE

Special efforts to improve the standard of safety in the coal industry have brought down the rate of fatalities per million tonne of output in Coal India Limited from 2.62 in the year 1975 to 0.28 in the year 2005. A Standing Committee on Safety regularly reviews safety standards in coal mines.

Coal India Limited had 4.73 lakh, employees as on 1 January 2005 and the coal industry employs over seven lakh workers. Since the nationalisation of coal-mines, welfare of coal miners by way of providing facilities like housing, water supply, medical care, education, etc., is being given greater attention.

## LIGNITE

Lignite reserves in India have been estimated at around 36,009 million tonnes as on 1 January 2004. Out of this, 4,150 million tonnes is in the Neyveli area of the

Cuddalore district in Tamilnadu of which about 2,360 million tonnes has been proved. Geological reserves of about 1,168 million tonnes of lignite have been identified in Jayamkondacholapuram of the Trichy district in Tamilnadu. In Mannargudi and East of Veeranam (Tamilnadu) geological reserves of around 22,661.62 million tonnes and 1,342.45 million tonnes of lignite have been estimated respectively. Lignite reserves have been identified in Rajasthan, Gujarat, Jammu and Kashmir and Kerala to the extent of 3485 million tonnes, 1816 million tonnes, 128 million tonnes and 108 million tonnes respectively.

Lignite reserves at Neyveli are exploited by Neyveli Lignite Corporation Limited (NLC). Incorporated as a private limited company in 1956, NLC was wholly owned by the Government and converted into a public limited company with effect from 7 March 1986. Over the years, it has acquired considerable expertise and has established itself as a premier organisation in the field of lignite-mining and lignite based power generation. The NLC is an integrated complex consisting of three lignite mines and three thermal power stations.

### **NON-CONVENTIONAL ENERGY SOURCES**

India is blessed with plenty of reponsible energy sources such as solar, wind, hydro and biomass. The importance of renewable energy was recognised in the country in the early 1970s. India has today many large programmes for renewable energy. Several renewable energy systems and devices are now commercially available. The Ministry of Non-conventional Energy Sources (MNES) is the nodal Ministry of the Government for all matters relating to new and renewable energy systems and devices. The renewable energy programmes cover the entire gamut of technologies, including biogas plants, biomass gasifiers, solar thermal and solar photovoltaic systems, wind mills, co-generation, small hydro plants, energy recovery from urban/municipal and industrial wastes, geothermal energy, hydrogen energy, electric vehicles and bio-fuels among others. Marketing outlets, namely, "Akshay Urja Shops" have been set up in 104 major cities and towns with a view to promote sales, servicing and repair of these systems and devices. Over 12,800 MW of grid-connected renewable power capacity (upto 2008) has been installed mainly through wind, small hydro and bio-energy which account for around 8 per cent of the total installed capacity in the country. In addition, over one million solar lighting systems, one million sq. m collector area of solar water heating systems, 4.0 million biogas plants and several other renewable energy systems and devices have been deployed all over the country.

The need to boost the efforts for further development and promotion of renewable energy sources has been felt world over in light of high prices of crude oil. The Prime Minister released the National Action Plan on Climate Change (NAPCC) on 30<sup>th</sup> June, 2008. The Plan proposes to start 8 missions, amongst which one is the National Solar Mission. The NAPCC also mentions that other sources of renewable energy would be promoted. Specific action points that have been mentioned include promoting deployment, innovation and basic research in renewable energy technologies, resolving the barriers to development and commercial deployment of biomass, hydro power, solar and wind technologies, promoting straight (direct) biomass combustion and biomass gasification technologies, promoting the development and manufacture of small wind electric generators, and enhancing the regulatory/tariff regime in order to mainstream renewable energy sources in the national power system.

Earlier, on 27<sup>th</sup> June, 2008, the Prime Minister had chaired the meeting of the Energy Coordination Committee. It was then decided that MNRE will prepare a comprehensive Plan of Action which would include State specific issues and thrust areas; up-scaling of outcome/generation based initiatives in renewables with specific focus on solar; concerns of various stakeholders like utilities etc. and strategies to address them and a national roadmap to increase the percentage of power from renewable energy sources, presently around 8%.

Over the last two decades, considerable expertise has been gained by different stake-holders such as State Nodal Agencies, State Electricity Boards, NGOs and industries, etc., in planning and implementation of renewable energy projects. However, a lot more needs to be done to make available renewable energy at an affordable price to the common man. It is imperative to take further steps to make the people aware about the potential of renewable energy and availability of various systems and devices to make them less dependent on fossil oils. A White Paper on “*Transitioning to a Renewable Energy Future*” prepared by the International Solar Energy Society has stated the following:

*“The renewable energy transition will happen city-by-city, region-by-region, country-by-country. It will be a process generated in each locale when a “critical mass” of the application of renewable resources has been reached. These turning points happen when people, governments, regulators, utilities, and the financial community have all become familiar with the technology. The renewable energy transition must start now or it will be too late. Governments, cities, companies and people must cooperate in moving it”.*

A manufacturing infrastructure has emerged for the manufacture and supply of non-conventional energy equipments. These include small-scale and medium/large-scale industries, both in the public as well as the private sectors. Technical guidance and help has been provided to some developing countries for the construction of biogas plants. Products, which are being exported, mainly include solar photovoltaic modules and systems. Wind turbine components have been exported to Europe, Australia and the USA. A Swiss company has used Indian designs for the manufacture of small gasifiers.

## ACHIEVEMENTS

During the last two decades, several renewable energy technologies have been deployed in rural and urban areas. Some of the achievements are given in Table 11.3 along with the estimated potential:

TABLE 11.3 : RENEWABLE ENERGY POTENTIAL AND ACHIEVEMENTS

Sl. No.	Source/System	Estimated Potential	Achievements (as on 31 March 2006)
<b>A. Power from Renewables</b>			
1.	Solar Photovoltaic Power	5,000 MW	2.74 MW
2.	Wind Power	45,000 MW	5,310.40 MW
3.	Small Hydro Power (up to 25 MW)	15,000 MW	1,826.43.63 MW
4.	Biomass/ Power Cogeneration	66,000 MW*	912.53 MW

5.	Biomass Gasifier	-	1.00 MW
6.	Energy Recovery from Wastes	7,000 MW	34.95 MW
	Power from Renewables (Total)	1,83,000 MW	8,088.05 MW
<b>B. Decentralised Energy Systems</b>			
7.	Family-Type Biogas plants	120 lacks	3.84 million
8.	Solar Photovoltaic Systems	20 MW/sq km	
	i. Solar Street Lighting Systems	-	54,795 Nos.
	ii. Home Lighting Systems	-	3,42,607 Nos.
	iii. Solar Lanterns	-	4,78,058 Nos.
	iv. SPV Power Plants	-	1566 kWp
9.	Solar Water Heating Systems	140 million sq m	1.5 million sq m
		Collector area	Collector area
10.	Solar Cookers	-	6 lakhs
11.	Solar PV Pumps	-	7015 Nos.
12.	Wind Pumps	-	1111 Nos.
13.	Hybrid Systems	-	484.68 kW
14.	Battery Operated Vehicles	-	212 Nos.

sq k = Square Kilometer

Sq m = Square Meter

MW = Mega-watt

KW = Kilowatt

kWp = Kilo watt peak

\*Including Biomass Gasifier

## RURAL ENERGY

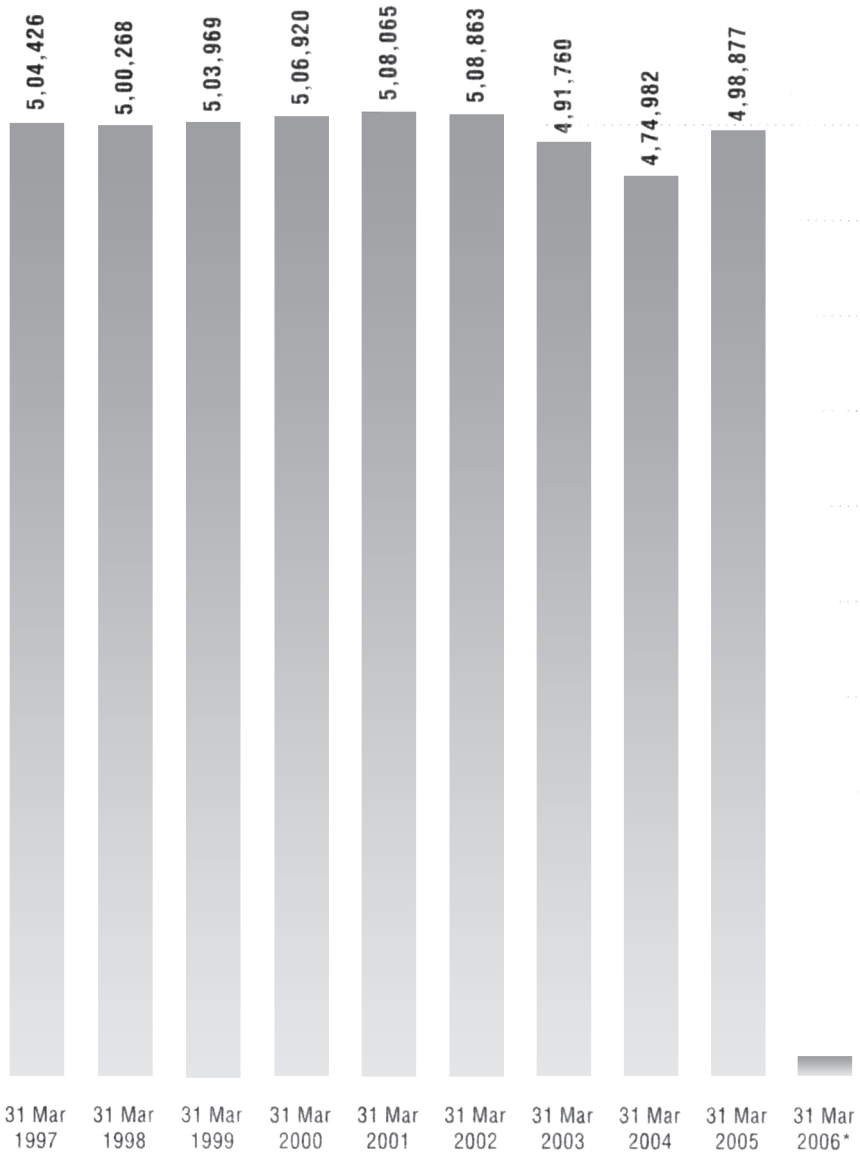
Nearly 73 per cent of India's population lives in nearly 6 lakh villages and hamlets. The Ministry has been supporting programmes for the use of renewable energy products and devices such as bogus plants, solar thermal systems, photovoltaic devices, biomass gasifiers. Programmes introduced during the 10<sup>th</sup> Plan period, such as Remote Village Electrification, Village Energy Security Test Projects and Biogas Power Generation, continue to be implemented during the 11<sup>th</sup> Plan.

**National Biogas Programme :** Biogas is an alternate source of fuel derived mainly from organic wastes available abundantly in various forms. Biogas obtained from the biogas plants through anaerobic digestion contains a mixture of methane (55 – 65 per cent), carbon dioxide (35-40 per cent) and traces of other gases. The National Biogas Programme was initiated in 1981-82 for the promotion of family size biogas plants with the aim of providing a clean and cheap source of energy along with other benefits such as enriched organic manure, improved sanitation and hygiene and reduction in drudgery for women. Three types of biogas designs, namely, the floating drum type or KVIC design, fixed dome type and bag type portable digester made of rubberised nylon fabric are being propagated under this programme. Biogas can be offered as an excellent fuel for many energy applications, i.e., cooking, lighting and motive power among others.

The biogas programme is implemented through the State Governments and administrations, corporate/registered bodies, KVIC and non-governmental organisations. Technical Back-up Units (TBUs) set-up at nine locations are providing technical and training support in a decentralised mode. Commercial and co-operative banks are providing loans for the setting up of biogas plants. The

# PROGRESS OF RURAL ELECTRIFICATION

VILLAGES ELECTRIFIED  
(CUMULATIVE)



**KBK**

\* Under Rajiv Gandhi Grameen Vidyutikaran Yojana launched w.e.f. April 2005

programmes aims to bring down the cost of biogas plants as also to develop technology for use in cold climatic regions of the country. Another R&D initiative taken in converting biogas into natural gas removing CO<sub>2</sub> from it and bottling for easy transportation and use in a decentralized manner. <sup>2</sup>

Over 4.00 million family size biogas plants have been installed so far. India is second only to China in biogas plants. In addition, enriched organic manure is produced from biogas plants to supplement and complement environmentally degrading chemical fertilizers.

**Integrated Rural Energy Programme :** The Integrated Rural Energy Programme (IREP) aims at undertaking energy planning for meeting the energy needs of cluster of villages through a blend of conventional and non-conventional sources of energy. Earlier, the programme was implemented by taking the Block as a unit of planning and 860 Blocks were covered till 2002-03. The programme was modified in 2003-04. Now it envisages preparation of energy plans for a cluster of villages, district and the State, besides implementation in the selected cluster of villages. As on March 2006, the modified IREP Programme is being implemental in 21 States/UTs and 312 districts have been covered under the programme. Five Regional Training Centres set up under the programme at Delhi, Lucknow, Amrol (Gujarat), Bangalore and Shillong meet the training requirements of different target groups involved in planning and implementation of IREP.

**Remote Village Electrification :** The Remote Village Electrification programme of the Ministry, since 2001-02, has aimed at providing basic lighting/electricity/facility through renewable energy options in remote villages/hamlets which are not likely to receive grid connectivity under the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) as certified by the REC, owing to non-feasibility or non-cost effectiveness. However, as decided in the ECC June, 2008 meeting provision of lighting by solar devices can only be an interim measure and would not jeopardize the eligibility of a village so covered to get grid connectivity. In view of this, MNRE proposes to enhance the scope of coverage of the programme to all unelectrified villages/hamlets below population of 100. Small hydro Power Generation systems, biomass gasification based electrifies generation systems, solar photovoltaic power plants, etc., in distributed power generation mode may be used depending upon the availability of resources for generation of required electricity. Based on experience so far, over 90% coverage is envisaged through solar photovoltaic lighting systems that will centralized charging stations. Other options will be micro/mini hydel plants, biomass gasifiers and aerogenerators/hybrid systems. A target of covering around 1 million households in 10,000 remote villages/hamlets is envisaged by 2012.

Central Financial Assistance of up to 90% of the project costs, subject to pre-specified maximum amounts for each technology, is provided for approved projects for electrification of remote unelectrified census villages/hamlets through Non-conventional Energy Sources. In addition to the support for installation of renewable energy systems, financial assistance is also provided for creation of awareness, training specific surveys etc.

The programme is implemented in States by state identified implementing agencies such as the state nodal agencies for renewable energy. Power Departments, or the Forest Departments. During 2007-08, projects for electrification of 1648 remote unelectrified villages and 344 remote unelectrified hamlets have been sanctioned under the Programme. The cumulative numbers of villages and hamlets taken under

the Programme since its inception reached 6907 villages and 1812 hamlets, out of which 3985 villages and 1142 hamlets have been reported to be completed.

**Village Energy Security Programme :** The Ministry had evolved a concept of providing energy security in villages mainly through biomass, and an Outline Plan on Village Energy Security is being taken up in remote villages and hamlets that are not likely to be electrified through conventional means, with emphasis on forest fringe and tribal villages, so as to demonstrate the techno-economic parameters, provide operational experience, mobilise local communities and firm up the institutional arrangements as projected in the Outline Plan.

The objective of the village energy security test projects is to go beyond electrification per se by meeting the total energy requirements of villages including cooking, lighting and motive power, with full participation of the local communities, including women. The projects would be environment-friendly and create avenues for local employment, thus improving the quality of life and leading to overall sustainable development.

A limited number of 200 test projects on village energy security are being taken up to demonstrate the techno-economic parameters, provide operational experience, mobilize local communities and firm up the institutional arrangements. At present 65 projects are under implementation in nine States, 29 of which have so far been commissioned. All 200 projects are expected to be completed by March 2010. The Ministry has received a grant of US\$ 998,700 from World Bank for a Technical Assistance Project that will support activities for the pilot phase of Village Energy Security Test Projects for a period of two years. The purpose of the grant is to identify and test scaleable models for designing and implementing community-driven programmes for meeting comprehensive village energy needs.

## **SOLAR ENERGY**

India lies in the sunny belt of the world. India receives solar energy equivalent to over 5,000 trillion kWh (kilo watt hours) per year. The daily average solar energy incident varies from 4-7 kWh per square meter depending upon the location. The annual average global solar radiation on horizontal surface, incident over India, is about 5.5 kWh per square meter per day. There are about 300 clear sunny days in most parts of the country. The highest annual radiation is received in Ladakh, western Rajasthan and parts of Gujarat, while the north-eastern region of the country receives relatively lower annual radiation.

**Two routes to harness Solar Energy :** Solar energy experienced as light and heat can be harnessed through two routes, namely solar photovoltaic and solar thermal, by direct conversion to electricity and heat energy respectively.

## **SOLAR THERMAL ENERGY PROGRAMME**

Solar thermal devices are being utilised for water heating, space heating, cooking, drying and can be utilised for space heating, water desalination, industrial process heat, steam generation for industrial and power generation applications, operation of refrigeration systems, etc. Low-grade solar thermal devices (for temperature range 100-300 degree C) like solar water heaters, air heaters, solar-cookers, solar dryers, etc., have been developed and deployed in the country. Solar water heaters of capacity ranging from 50 litre per day to 20,000 litre per day for domestic, commercial and industrial applications have been installed in the country. Over 2.3 million

sq m. of collector area has so far been installed in domestic, industrial and commercial sectors. The manufacturing base of water heaters is now well established in the country with 62 BIS approved manufacturers of Flat plate Collector based solar water heating system and 44 MNRE approved suppliers of Evacuated Tube Collector based system.

Around 6.34 lakh solar cookers were also deployed. Solar concentrating collectors were installed for generating steam and the world's largest solar steam cooking system for cooking food for 15,000 people per day was installed at Tirumala, in Andhra Pradesh. Dish Solar Cookers were also promoted in the villages, which are electrified or to be electrified with conventional grid for faster outdoor cooking for about 10 people. Efforts are also on to make use of solar passive architecture principles to reduce energy consumption and improve comfort conditions in buildings. Solar air heating systems have also been deployed for drying of agricultural and industrial products which has helped in saving a substantial amount of conventional fuels.

### **SOLAR PHOTOVOLTAIC PROGRAMME**

India receives high solar radiations over most parts of the country. Therefore, the country has very high potential for utilizing solar energy through solar photovoltaic systems, which directly convert sunlight into electricity. Solar photovoltaic systems are becoming increasingly attractive source for decentralized electricity generation, especially in remote and energy deficient areas for meeting the essential requirements such as lighting, water pumping, powering primary health centers, community centers, schools and other similar requirements. Solar photovoltaic systems are most reliable power source for unmanned applications such as T.V. transmitters, battery charging etc. In order to encourage megawatt size grid power generation in the country during 2007-08 the Ministry has announced a new demonstration programme under which generation based incentive is provided to project developers, who set up solar power plants under 'build' own and operate basis, on fulfillment of the guidelines issued by the Ministry in this regard. More than 130 industries are involved in the manufacturing of SPV systems and above 21 industries are involved in the production of PV modules. During the year 2007-08, solar photovoltaic modules of about 80 MWp have been produced; out of which 55 MWp have been exported. So far more than 1.5 million SPV systems are powering a variety of applications in the country. The cumulative production of photovoltaic modules in the country as on 31<sup>st</sup> March, 2008 was more than 460 MW of which 325 MW was exported to Europe, USA and various other countries.

Under the solar photovoltaic demonstration and utilisation programme about 6.70 lakh solar lanterns, 4.03 lakh solar home systems, 70,500 solar street lighting systems, 7148 solar water pumping systems, standalone power plants cumulating to a capacity of 2.2 MW and grid interactive power plants cumulative to a 2.2 MWp have been installed in the country till March 2006. In addition to the above, 3985 remote villages and 1142 hamlets have also been electrified using different solar photovoltaic systems.

### **GRID-INTERACTIVE RENEWABLE POWER**

A total grid interactive power-generating capacity of 12,800 MW has been added from renewables, mainly wind, small hydro, biomass and solar energy. Most of this capacity has come through commercial projects.

**Wind Power :** While the gross wind power potential is estimated at around 45,000 in the country. A capacity of 8,757 MW up to 31 March 2008 has so far been added through wind, which places India in the fifth position globally after Germany, Spain and USA.

**Solar Power :** Under the Solar Photovoltaic Programme, about 6.70 lakh Solar Lanterns, 4.03 lakh Solar Home Lighting Systems, 70,500 Solar Street Lighting Systems, 7148 Solar Water Pumping systems, Stand alone Power Plants of cumulative capacity 2.2 MW and Grid Interactive Power Plants cumulative to 2.2 MW have been installed in the country till March, 2008. In addition to the above, 3985 remote village and 1142 hamlets have also been electrified using solar photovoltaic systems.

**Biomass Power :** The Biomass Power Programme especially through Cogeneration Projects aims at utilisation of a variety of biomass materials, agro industrial residues, energy plantations besides agro residues for power generation through the adoption of conversion technologies like combustion, pyrolysis, gasification, etc. The plants utilise gas/steam engines or combination thereof, either for generation of power alone or cogeneration of power and steam for either captive use or sale to the grid.

Capacity addition of around 266 MW was done in the country during 2007-08 through the technologies of biomass power and bagasse cogeneration in sugar mills. The country now has more than 1500 MW of capacity based on these two technologies. In bagasse cogeneration more than 100 sugar mills are now meriting a surplus electricity of 950 MW for feeding into the grids. The technology and the equipment for these projects have been sourced indigenously. The 90 biomass power projects aggregating to 610 MW capacity have also been beneficial to the country through creation of a large number of employment and income generation opportunities—especially in rural areas.

The potential of Biomass power in the country has been estimated at about 19,500 MW, including surplus power generation potential of around 3,500 MW from bagasse-based cogeneration from existing sugar mills in the country. So far, a total capacity of 912 MW biomass based power-generating systems has been installed in the country. Projects of a capacity of 1180 MW are under installation.

**Small Hydro Power :** The potential for Small Hydro Power (SHP) has been assessed at around 15,000 MW. By 31 March 2008, a total of 2180 MW capacity had been set up. In addition, projects aggregating to 638 MW capacity are under various stages of implementation.

## **RENEWABLE ENERGY FOR URBAN, INDUSTRIAL AND COMMERCIAL APPLICATIONS**

In an effort to mitigate the energy problems of cities and towns and to provide alternative energy solutions for industrial and commercial establishments, various systems/devices working on solar energy, energy recovery from urban and industrial waster, biomass energy and co-generation (non-bagasse) in industry, etc., are being promoted by the Ministry.

**Solar Energy :** An accelerated programme for development and deployment of solar water heating systems aimed at installation of one million sq.m. of collector area is being implemented by the Ministry. Around 1.5 million sq.ms of collector

area has been installed so far in the country, which includes 4.0 lakh sq.m. installed during 2005-06. Interest subsidy is now provided by the Ministry so that loans are available from banks/Fls at effective interest ranging from 2 per cent to 5 per cent. The network of participating banks/Fls has also been expanded. Supportive measures e.g. amendment in building bye-laws for making the use of systems mandatory, providing rebates in electricity tariff and property tax to the users, persuading builders and developers to construct buildings and housing complexes integrated with solar water heaters etc are being taken to accelerate the deployment.

Solar Air Heating/Steam Generating Systems are being promoted in industries and institutions for the purpose of drying, cooking and process heat applications. About 10,000 sq.m. of collector area for solar drying and 12 solar steam generating systems of different capacities for various applications have been installed so far. Solar buildings based on solar passive architecture design are being promoted with a view to provide comfortable living and working conditions, both in winter and in summer, while conserving conventional electricity.

As per the 2001 census, the Urban Indian population residing in 5161 cities and towns is 285 million. Urban areas in India are estimated to be generating about 50 million tonnes of solid waste (1.4 lakh tonnes per day) and 6000 million cubic meters of liquid waste per year. This translates into a potential for generation of over 2900 MW of power from urban wastes, which is likely to increase over 5600 MW by 2017.

Eight projects with an aggregate capacity of 22.50 MW based on urban waste such as municipal solid and liquid wastes, cattle manure, vegetable market and slaughterhouse wastes, etc. have been installed so far in the country, these projects are based on both biomethanation as well as RDF combustion technologies. This also includes a 3 MW projects for generation of 1 MW power from biogas produced at each of the three Sewage Treatment Plants in Surat completed during 2007-08

**Energy Recovery from Urban Wastes :** A potential for the generation of about 1300 MW power from industrial wastes has been estimated for the country. There are about 200 distilleries in the country which have installed the wastewater treatment plants and are generating a large quantity of biogas having a potential of generating about 200 MW power. Similarly the projects for the generation of biogas/power are being set up in other industrial sectors such as food processing poultries, tanneries, pulp and paper, oil extraction and pharmaceuticals, etc.

23 industrial Waste-to-Energy projects with a total capacity about 35 MWeq have been installed in the country. With this, a total of 39 Industrial Waste-to-Energy projects with a cumulative capacity of about 59 Mweq have been installed in the country upto 31.03.2008. In addition, 8 projects with a total capacity of about 13 MWeq are under installation.

**Biomass Energy and Co-generation in Industry :** The Ministry has been implementing Biomass Co-generation (non-bagasse) in Industry. 19 projects with a capacity of 95 MW have been installed in various industries like paper mills, rice mills and ferrous mills, etc. for meeting their total captive energy requirement of heat and power. In addition, 20 projects with a total capacity of about 40 MW are under installation and likely to be completed during the year 2008-09.

Similarly a programme on Biomass Gasifier Systems is also being implemented in industries for meeting their captive heat and power requirement. 100 biomass-gasifier systems with a total capacity of about 27 MWeq have been installed upto 31.03.2008 and about 30 biomass gasifier systems with a total capacity of about 12 MWeq are under installation in various industries and likely to be completed during 2008-09.

### NEW TECHNOLOGIES

**Hydrogen Energy** : A programme covering research and development pertaining to production of hydrogen, its storage, safety, applications, etc., has been undertaken in the country with a view to create an alternate source of energy. A National Hydrogen Energy Board has been set up to guide and oversee the preparation of a Hydrogen Energy Road Map and its implementation through a National Programme on Hydrogen Energy. The National Hydrogen Energy Board, set up a Steering Group for preparation of the National Hydrogen Energy Road Map. The Road Map prepared by the Steering Group was approved by the National Hydrogen Energy Board in its meeting held in January 2006. The Road Map envisages taking up of Research, Development and Demonstration activities in various sectors of hydrogen energy technologies. It has visualised goals of one million hydrogen-fuelled vehicles and 1,000 MW aggregate hydrogen based power generation capacity to be set up in the country by 2020. Applications of hydrogen directly in internal combustion engines for transport application as well as decentralised power generation and also in fuel cells for stationary, mobile and transport applications have been demonstrated. Hydrogen-powered two wheelers, three wheelers, catalytic combustors, and power generating sets have been developed and demonstrated in the country.

**Fuel Cells** : Research and Development Projects for development of different types of fuel cells like Proton Exchange Membrane Fuel Cells (PEMFC), Phosphoric Acid Fuel Cells (PAFC), Solid Oxide Fuel Cells (SOFC), Direct Methanol Fuel Cell (DMFC), Direct Ethanol Fuel Cells (DEFC) and Molten Carbonate Fuel Cells (MCFC) alongwith components and materials for fuel cells including control and instrumentation system are being supported. BHEL developed a 3 kW (3 x 1 kW) automated Proton Exchange Membrane fuel Cell Power Pack and demonstrated the same for the Stationary Applications. Under a project the Indian institute of Chemical Technology, Hyderabad will integrate already developed 10 kW methanol reformer with a 10 kW fuel cell to run it for 1000 hours. The Institute will also complete the development of 50 kW methanol reformer system for technology demonstration. Projects on the development of direct alcohol fuel cell & test protocols and on solid oxide fuel cells that operate directly on hydrocarbon feedstock have been sanctioned to Indian Institute of Technology, Delhi. A project on the development of high performance intermediate temperature solide oxide fuel cells (IT-SOFC) by low cost ceramic processing techniques was sanctioned to the institute of Minerals and Materials Technology, Bhubaneswar.

**Geothermal Energy** : Magnetotelluric studies carried out by National Geophysical Research Institute (NGRI). Hyderabad have shown existence of potential geothermal sites in Surajkhand, in Jharkhand and in Tapovan in Uttarakhand. In order to conform the potential for power generation at Puga Geothermal Fields in Ladakh, J&K and prepare an action plan for setting up of a power plant at Puga, an Export Group

was constituted in September, 2007 under the Chairmanship of Member (Planning), CEA, the Report has been submitted and the Ministry is following up the recommendations.

**Ocean Energy :** The various forms of ocean energy are waves, ocean energy thermal conversion, currents and tides. Of these, tidal energy has the potential for being harnessed for power generation, in the medium term. A project for setting up of a 3.75 MW capacity demonstration tidal power project at Durgaduani Creek in the Sundarbans area of West Bengal Renewable Energy Development Agency (WBREDA) in February, 2008. The total cost of the project is Rs 48.00 crore. The Ministry would provide 90% support for the project, while the balance 10% cost would be met by the State Government. The project would be completed within 33 months. The main objective of the project is to supply power to 11 remote villages in Gosaba and Bali Bijaynagar islands located in South 24 Parganas District of West Bengal. The project will be executed by the NHPC.

**Bio Fuels :** Several R&D projects have been taken up in the country to develop technologies to convert different non-edible vegetable oils to bio-diesel. The performance of stationary diesel engines using different neat non-edible oils for generation of power on decentralised basis is being studied under Bio-fuel pilot-demonstration project. Field trials with ethanol blends in petrol and diesel have also been taken up in the country under several projects financed by the Ministry.

**Battery Operated Vehicles :** R&D projects on development of high energy density batteries such as nickel-metal-hydride, lithium-ion and lithium polymer electrolyte batteries and super capacitors for BOVs are being supported. Prototypes of nickel-metal-hydride batteries developed have been demonstrated for operating an electric auto-wheeler.

### SPECIALISED TECHNICAL INSTITUTIONS

The Ministry has established the following institutions for R&D and related applications:

**Solar Energy Centre :** The Solar Energy Centre, which was set-up in 1982, is an integral part of the Ministry of Non-Conventional Energy Sources for development and promotion of solar energy technologies. The main objectives of the Centre are : (i) (a) To act as a national test and standardisation centre for solar energy materials, components and systems, (b) To pursue collaborative R&D with industry and academics, (c) To evaluate new technologies, (d) To provide advisory and consultancy services, (e) To work on human resource development and dissemination of information. (ii) The R&D campus of the Centre is located on the Gurgaon-Faridabad Road at the outskirts of Delhi. The campus houses the national test facility for solar thermal and solar photovoltaic systems and components, laboratories for system design and engineering, demonstration units on solar electric generating systems for their long-term performance evaluation, seminar hall and auditorium for training and workshops, a library for reference on renewable energy topics and a small guest house for visitors. Essentially, it functions as an effective interface of the Government, institutions, industry and user organisations. (iii) Right from its inception, the Centre has been playing a crucial role in promotion of solar energy technologies in the country. The Centre has been working closely with the solar energy group of the Ministry to provide technical back-up and carry out various

activities including R&D, testing and demonstration, training and information dissemination. The Centre contributed significantly in bringing out several National Standards on solar technologies. (iv) A large area sun simulator has been installed at SEC for testing and evaluation of large size (200 cm x 200 cm) solar photovoltaic modules (upto 600 W) capacity. Another advanced facility of 1.2 kWp capacity PV Concentrator Module Test Bed Facility has been established in collaboration with M/s Moser Baer Photovoltaic Limited. A project for preparation of the updated version of solar radiation data for the country has jointly been taken up with India Meteorological Department. Work on establishment of an "Automatic Weather Station" in the campus of the Centre has been initiated. A handbook on energy conscious architecture, prepared jointly with IIT Bombay, has recently been finalised.

**Centre for Wind Energy Technology :** A Centre for Wind Energy Technology (C-WET) has been set up at Chennai, Tamilnadu, its wind turbines test station located at Kayathar in district Thoothukudi, Tamilnadu. C-WET's mission is to make domestically-owned wind industry internationally competitive through demonstration and commercialisation of products and services at par with international standards, specifications and performance parameters, C-WET comprises five units, namely, Research and Development, Wind Resources Assessment, Wind Turbine Testing, Standards and Certification, and information, Training and Commercial Services. These units offer integrated solutions in keeping with its mission to facilitate development, demonstration and commercialistic of megawatt scale wind electric generators for on-shore and off-shore applications, to carry out Wind mapping for the country in order to determine areas and sites most suitable for Wind Electric Generators (WEGs) deployment; to ensure manufacturing and deploying of WEG by conducting their type approval tests at par with international standards, specifications and performance parameters, and to serve as the technical focal point for wind power development in India, for promotion and accelerating the pace of utilization of wind energy and support the growing wind power sector in the country.

Small wind turbine testing has been initiated for developing test procedure in accordance with IEC stipulations. A 5 kW wind-solar-battery-diesel hybrid system with microprocessor control and remote monitoring through GPRS/internet at C-WET campus is being installed to serve as a pilot-cum-demonstration plant. Preparation of Indian Wind Atlas is under progress. Pilot study is carried out for 15 sites from southern, central and western zones (5 from each zones) and sent to Risoe National Laboratory, Denmark for validation with meso-scale model (KAMM). Wind Resource Assessment unit has installed 25 wind monitoring stations during the year and 64 are under operation. A total number of 29 consultancy projects have been taken up and 9 are completed. This includes micro-survey, micro-siting and due-diligence studies. Two *in-situ* type wind turbine testing assignments were completed, two are in progress and agreement for one has been signed. Standards and Certification Unit has completed Provisional Type Certification of one wind turbine model and Provisional Type Certification of nine wind turbine models is under progress.

**Sardar Swaran Singh National Institute of Renewable Energy (SSS-NIRE) :** The Ministry is establishing an autonomous institution named as 'Sardar Swaran Singh National Institute of Renewable Energy (SSS-NIRE)' Wadala Kalan, Distt Kapurthala,

Punjab. The institute would conduct research, development and demonstration activities in the area of bio-energy, bio-fuels, synthetic fuels in all their forms for stationary and transport applications.

### **PUBLICITY AND AWARENESS CREATION**

Initiatives have been taken to create greater awareness on new and renewable energy in order to facilitate greater acceptability both in rural and urban areas and industrial and commercial sectors.

**Rajiv Gandhi Akshay Urja Diwas :** An effective and far reaching mass awareness campaign about renewable energy is being organised to commemorate the birth anniversary of former Prime Minister, late Shri Rajiv Gandhi as "Rajiv Gandhi Akshay Urja Diwas" on 20 August every year since 2004 all over the country. Public Awareness Programmes are organised on a mass scale on this day at the National, State, District and Block/Taluka levels through mass rallies, formation of human chains, organisation of essay, quiz, slogan-writing and painting competitions, and debates, seminars and group discussions, etc., among others. More than 50 lakh children participate in these activities throughout the country. These activities have helped create the much needed awareness on the use of renewable energy systems/ devices in daily life.

In the year 2007, National Function of Rajiv Gandhi Akshay Urja Diwas was held at Hyderabad. Dr. Y.S. Rajshekara Reddy, Hon'ble Chief Minister of Andhra Pradesh administered the renewable energy pledge to over 9,000 school students and other participants and gave away prizes to winners of marathon, essay writing, painting and other competitions held on the occasion.

The 'Special Day—Rajiv Gandhi Akshay Urja Diwas-2008' was observed all over the country in a befitting manner. The National Function on the Special Day was held at Panchkula, Haryana. Renewable Energy pledge was administered by Hon'ble Chief Minister, Haryana to over 18,000 school children and students who came from the tri-city i.e. Chandigarh, Mohali and Panchkula. The other events at the National Function included Akshay Urja half-marathon (21 kms.), Renewable Energy was also organized in which over 30 manufacturers of Renewable Energy based systems and devices from all over the country participated to display and demonstrate their systems and devices. Painting and slogan writing competitions in schools, on the theme of Renewable Energy, were also organized on the occasion.

State level function of Delhi on the occasion was held at National Bal Bhawan. Over 3000 school children from large number of schools and hundreds of college students participated in the event.

State level functions were also held in other States and Union Territories throughout the country. The 'Special Day' was observed in all districts of the country with active participation of large number of school children. An all India Quiz programme in Hindi/English on Renewable Energy and four State level quiz programme on Renewable Energy in regional languages (Kannad, Tamil, Marathi and Bangla) for students of class IX to XII were launched in the country on the occasion of the 'Special Day'.

**District Advisory Committees :** District Advisory Committees (DACs) have been set-up in every district with the Collector/Deputy Commissioner as its Chairman

in order to create awareness on renewable energy at the district level. 540 DACs have been set-up so far in the country, which have given a much-needed fillip to the development of renewable energy. Among others, district officials, representatives of Members of Parliament, Doctors, Engineers, Lawyers, representatives of NGOs, Rotary/Lion Clubs are DAC members of which 6 are women. These DACs are required to convene at least once every quarter. These committees which have led to the creation of an effective renewable energy promotion network at the grass root level will also help integrate renewable energy schemes with those of other developmental departments.

**Special Area Demonstration Programme :** The Special Area Demonstration programme (SADP) aims at demonstration renewable/non-conventional energy systems and devices in all parts of the country with a view to create awareness and give publicity amongst students, teachers and the public. 27 State level and 477 district level energy parts have been set up till March, 2008.

**Akshay Urja Shops :** With a view to create the outreach of renewable systems/devices, Akshay Urja Shops are being set up to cover every district in the country to ensure easy availability of such systems/devices apart from catering to repair and maintenance needs. With the setting up of these shops and other related initiatives, it is expected that the public will embrace renewable energy technologies in a big way for augmenting energy needs of cooking, lighting and motive power. Solar photovoltaic systems/devices e.g. streetlight control systems, street/public garden lights, illuminated hoardings, road studs, blinkers, traffic, signals, BIPV systems and power packs are made available at these shops. Besides promoting the renewable devices, they also help in creating awareness about the benefits of using these devices and reducing the burden on conventional electricity in cities/towns. So far 269 Akshay Urja Shops have been opened.

Other activities of public awareness include :

- Over 100 exhibitions and over 150 mobile exhibitions on Renewable Energy have been organized for display and demonstrating renewable energy systems and devices.
- 521 Renewable Energy Clubs have so far been set up in various AICTE approved engineering colleges and other technical institutes of the country.
- A ten episode series of "TERAVIEW", a TV programme on Renewable Energy, has been successfully telecast on DD News channel in association with TERI.
- Two Radio Sponsored Programmes on Renewable Energy titled "Nayee Dishayen Nayee Aashayen" and "Roshan Rahe Zamana" have been broadcast on AIR and 16 FM stations in 17 regional languages including Hindi.
- Renewable Energy Quiz competition has been organized for the vernacular medium schools in four States of Assam, Gujarat, Andhra Pradesh and Kerala.
- On account of completion of 25 years in the service of the nation, the Ministry celebrated its Silver Jubilee function at Vigyan Bhawan on 22<sup>nd</sup> November, 2007. On the occasion, hon'ble President of India, Smt. Pratibha Devisingh Patil released four commemorative postage stamps on renewable energy, launched a new website of the Ministry, released a compendium titled "25 years of Renewable Energy in India" and gave away National Awards on

Renewable Energy to State Nodal Agencies, banks and manufacturers for outstanding performance.

- An attractive exhibition on Renewable Energy, covering an indoor area of 500 square meters and outdoor area of 300 square meter was set up at Pragati Maidan during Indian International Trade Fair, 2007 from 14-27 November, 2007. Various renewable energy devices such as solar cookers, solar water heaters, solar lanterns, solar investors, solar water pumps, solar garden lights, solar torches, solar run street and home lighting were displayed and demonstrated by manufacturers from all over the country.
- Four orientation-cum-training programmes have been organized for District Advisory Committee members at Lucknow, Bhubaneswar, Jaipur and Hyderabad.
- A media visit was organized to Solar Energy Centre and State level Energy Park in Gurgaon to appraise media persons about developments in the field of Renewable Energy.