

**Annexure 4.1****Programmes supported by the Ministry of Non-conventional Energy Sources for the promotion of NRSE in India**

Renewable Energy Technologies are increasingly being viewed as an equitable and environmentally sound way of addressing the energy concerns in the country- low per capita energy consumption, inequalities in access, supply constraints, growing dependence on imports, and high environmental costs. Rural energy demand still to a large extent is met by non-commercial energy sources such as firewood, cattle dung and crop residues. The real cost of using these fuels- in terms of the time spent in collection, storage and preparation; the health implications of indoor air pollution caused by the use of these fuels; and potential environmental damage caused by deforestation and desertification- is extremely high.

Over the last few years, the technical, operational and economic viability of RETs (renewable energy technologies) has led to a surge of interest in their applications. RETs can contribute substantively towards meeting grid and off-grid energy needs. Several technologies for grid connected power generation such as using wind, small hydro and biomass are proven technologies which are in large scale application in the country. In addition, RETs offer possibilities of distributed generation in sparsely populated or far-flung areas where extension of the grid may be unviable. A niche area for RETs is a range of thermal applications both in rural and urban centres. Applications such as solar air and water heating systems, solar cookers, solar buildings, as well as energy recovery from urban, industrial and agricultural wastes are becoming popular in urban, semi-urban and rural centres. Perhaps the most wide spread application potential of RETs is in rural areas for purposes of cooking, lighting, water pumping, agro and rural industries, where the growth of RETs also creates significant employment opportunities. This section discusses the objectives and achievements of various programmes launched by the Ministry of Non-conventional Energy Sources<sup>a</sup>.

*Rural Energy***National Programme on Biogas Development (NPBD)**


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<sup>a</sup> The section draws largely from Ministry of Non-conventional Energy Sources, Annual Report 2000/2001

The NPBD, one of the earliest programmes to be taken up by the Ministry, was especially designed in view of the large-scale dependence on traditional fuels in rural areas.

It aims to:

- Provide clean and affordable source of energy in rural areas
- Improve sanitation and hygiene by linking toilets with biogas plants
- Reduce the drudgery of women and girl children in walking long distances to collect fuel wood
- Provide enriched manure for supplementing the use of chemical fertilisers
- Conserve on the use of fuelwood

A multi-agency approach has been followed in implementing the programme involving SNAs, various village organisations and NGOs, which provide construction, maintenance, and training services and also a number of promotional and awareness generation campaigns. Over 25% of the total potential of family size biogas plants has been achieved. Such households have been meeting their cooking fuel requirements largely and lighting fuel needs partially with biogas. With the current level of achievement, the programme is estimated to have resulted in a saving of 3.9 million tonnes of firewood and 0.9 million tonnes of urea per year as well as providing 5 million person-days of employment.

### National programme on Improved Cookstoves

Started in 1986, the NPIC aims at propagating the use of more efficient cookstoves that consume less fuel and emit less smoke thereby reducing the incidence of lung and eye ailments amongst rural women. The programme is being implemented through a multi-agency approach with the help of a number of grass roots institutions to ensure extensive coverage. It is estimated that around 32.9 million improved cookstoves are in use in the country resulting in a saving of 12 million tonnes of bio-fuels and 98 million litres of kerosene per year during the five year life span of the cookstoves.

### Integrated Rural Energy Programme

The IREP aims at developing planning and institutional capabilities to formulate and implement micro level energy plans and projects for promoting the most cost-effective mix of energy options for use in rural areas. The objectives of the programme are to

- Provide for minimum domestic energy needs

- Provide the most cost effective mix of energy sources for meeting the requirements of sustainable agriculture and rural development with due environmental considerations
- Ensure people's participation in the planning and implementation of IREP plans and projects through various micro-level institutions
- Develop and strengthen mechanisms and co-ordination arrangements for linking micro-level planning for rural energy with state and national level for energy and economic development

The centre and state provide financial, technical and training support for the IREP programme, which is being implemented in 724 blocks in the country against the 860 blocks sanctioned.

### Rural Energy Entrepreneurship and Institutional Development

This programme was initiated in 2000-01 for building capacity for installation and maintenance servicing of energy systems. The programme seeks to create and strengthen entrepreneurship in the rural energy sector at the local level to promote micro-enterprises for manufacturing, marketing, and servicing. The programme also aims to strengthen entrepreneurship development centres in various states for providing training, management skills, support for project formulation, maintenance services and export management and consultancy. The programme would be implemented through the involvement of NGOs, and educational institutions and by strengthening linkages amongst rural energy entrepreneur, renewable energy industries, financing institution including IREDA and SNAs.

### Women and Renewable Energy Development

This programme, introduced in 2000-01, aims at empowering women by involving them in the promotion and management of renewable energy systems and devices and through encouraging the widespread use of renewable energy technologies in rural areas. The SNA along with educational institutions, NGOs and other village institutions are implementing the scheme in select areas.

## *Solar Energy*

### Solar thermal energy Programme

The programme seeks to tap solar energy for thermal applications such as water heating, cooking, drying, space heating, distillation, power generation and solar passive architecture. The solar water heating, cooking and air heating concepts are being used extensively in the country while the concept of solar buildings is becoming increasingly

popular. The measures initiated by the Ministry towards the promotion of solar thermal energy programme include technology development, standardisation and quality control, financing, special area demonstration, publicity and awareness generation, training, amendments to the building bye-laws, establishment of sales and service networks etc. In terms of policy initiatives, there has been a general shift away from central subsidy towards soft loans, tax incentives and promotional support. The technology that is available in the country today is largely indigenously developed. The achievements under some of the solar thermal programmes are highlighted below.

*Solar water heating:* Can be used to meet the energy needs for heating water in homes, factories, and other commercial and institutional establishments. The collector area installed so far in India for water heating is around 5, 50, 000 sq. m. Solar water heaters are now being manufactured on a commercial scale with an annual production of over 50,000 sq. m. of collector area.

*Solar Cooking:* One of the oldest programmes of the Ministry being promoted in homes, commercial establishments, religious places, schools etc. Around 0.5 million solar cookers have been sold in the country since the inception of the programme.

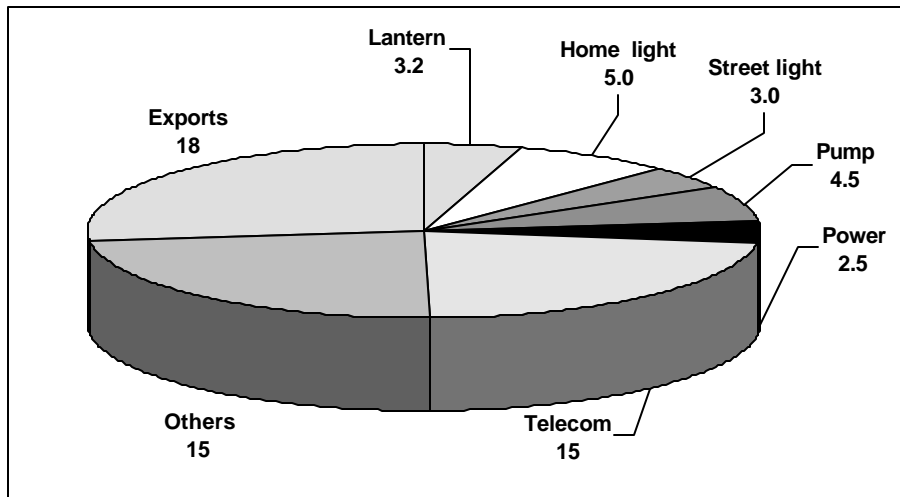
*Solar air heating:* Can be used to meet energy requirements for space heating during winter months and to meet process heat requirements in industries and agriculture. So far, around 4500 sq. m collector area has been installed in the country for space heating

*Solar buildings:* The objective of this programme is to promote energy efficient-building designs with optimum use of available solar energy and other forms of ambient energy in the management of energy needs of buildings. The Ministry has provided partial financial assistance to several government and semi-government organisations for designing and constructing solar-efficient buildings. In addition, there are ongoing efforts to develop a detailed climatic database for the country to evolve suitable design guidelines for energy efficient and environmentally friendly buildings in different parts of the country.

### Solar Photovoltaic Programme

The programme envisages direct conversion of sunlight into electricity for such decentralised applications as fixed and portable lighting units, water pumping, small power plants, power for telecommunications, railway signalling, offshore oil platforms, and TV transmission. These are being increasingly used for meeting the electrical energy needs in remote villages, hamlets, hospitals and households in the hilly areas, forest

region, deserts and islands. The programme is supported through intensive R&D, standardisation and testing, demonstration programmes, and various financing incentives. The programme has resulted in significant technology developments, besides widespread field demonstrations and utilisation of SPV technology for various applications. A strong research base, as well as indigenous production capability has been created in the entire SPV area starting from silicon material to solar cells, photovoltaic modules, complete systems and power plants. So far a total of 65 MWp aggregate capacity SPV systems have been deployed for various applications, including export of about 18MWp capacity of SPV products. The sector wise deployment of PV modules is shown in Figure 1.



**Figure 1** Sector-wise use of PV modules  
(Aggregate capacity: 65MW; 800,000 Systems)

### *Power from renewables*

The government has actively sought to increase the share of renewable sources of energy in the grid capacity. By the end of December 2000, about 3000 MW, representing around 3% of the total grid capacity in the country was based on renewable energy sources, mainly wind, small hydro, biomass (including bagasse-based cogeneration) and solar as indicated in Table 7.1. This has been possible through intensive R&D, survey and assessment of the potential of various sources, demonstration projects, development of capacity for manufacture, installation, operation and maintenance, institutional and infrastructural development, training programmes, awareness creation etc. In the 1990s, there has been a general policy shift towards large-scale commercialisation of RETs for

power generation and participation of the private sector through various financial and fiscal incentives.

### *Energy from wastes*

The national programme on energy recovery from wastes offers the multiple benefits of reduction of urban and industrial waste, abatement of environmental pollution and production of energy. The Ministry is currently implementing two programmes in this area. One is the national programme on recovery of energy from urban and industrial wastes and the other, with UNDP/GEF assistance, on development of high rate biomethanation processes to reduce the emission of greenhouse gases. The national programme on energy recovery aims at promoting efficient and proven technologies for treatment, processing and disposal of wastes, as means of improving the waste management practices in the country, besides augmenting decentralised power generation. Various fiscal and financial incentives are being provided under this programme to Municipal Corporations, State Nodal Agencies, promoters, entrepreneurs and financial institutions for setting up waste-energy projects. More than 26 MWe of capacity has been installed through such projects since 1996-97. The project on the development of high rate biomethanation processes, assisted by UNDP/GEF, seeks to build expertise and capabilities in national and state level institutes, R&D organisations and universities to assimilate develop and adapt technologies; to generate awareness; to set up demonstration projects; and to develop a master plan at the national level and a shelf of investment proposals.

### *New technologies*

Since its inception, the MNES has been promoting the development of other forms of energy namely chemical, geothermal, ocean and hydrogen. The Ministry has been supporting a number of RD&D projects sanctioned to various scientific institutions, universities, CSIR (Council for Scientific and Industrial Research) laboratories, and industries. In particular, progress has been made in the promotion of the following technologies.

- Fuel cells
- Hydrogen energy
- Alternative fuel for surface transport (electric/battery operated)
- Geothermal energy
- Ocean energy (tidal power, wave power and ocean thermal energy)