Figure 4.1: Organizational Structure of MNES Programmes.

- Family Biogas
- Community Biogas
- Improved stoves
- Biomass
- Integrated Rural Energy Planning

- Water Heaters
- Cookers
- Other solar thermal
- Passive architecture
- Photovoltaics
- Lighting
- Water pumping

- Wind power
- Bagasse cogeneration
- Biomass combustion
- Solar thermal power
- Photovoltaic power
- Small hydro power

- Biomethanation

- Fuel cells
- Hydrogen
- Geothermal
- Battery vehicles
- Ocean energy
- Animal energy
In 1982, the Department of Non-conventional Energy Sources (DNES) was set up in the Ministry of Energy for research and development, demonstration and dissemination of renewable and rural energy technologies. These programmes of the Government through the 1980's focussed on intensive research and development, setting up demonstration projects, and creating demand through Government subsidies.

In 1987, the Indian Renewable Energy Development Agency (IREDA) was established under DNES for developing, promoting, and financing commercially viable new and renewable energy alternatives in the country. In 1992, the DNES was upgraded into a full-fledged ministry - the Ministry for Non-conventional Energy Sources (MNES), making India the only country at that time, with a separate Ministry to develop various areas of renewable energy.

The CASE functions under the Chairmanship of Secretary, MNES. Its responsibilities include formulating policies and programmes for the development of new and renewable sources of energy, coordinating and intensifying R & D activities, and ensuring implementation of Government policies. However, the country is yet to get the benefit of a national energy policy integrating all the conventional and non-conventional energy sources.

MNES is in control of all aspects of renewable energy technology (RET) dissemination, setting of numerical targets for various RET programmes, implementing them through state nodal agencies, disbursing finances, coordinating training programmes, facilitating R and D, acting as a liaison with the manufacturing sector, etc. All the different stake holders involved in the sector play only supporting roles with little participation in policy-making and planning.

Organizationally, the Ministry has different divisions under which various RET dissemination programmes are grouped. Apart from the central office in New Delhi, MNES also has nine regional offices, which monitor the implementation programmes in different states. All the
programmes are implemented through the designated nodal agencies at the state level. In the rural areas, some large non-governmental organizations (NGOs) are also involved in implementing programmes like bio-gas and improved cook stoves programmes. In the national Five Year Plans, the MNES is primarily responsible for renewable energy programme formulation and implementation. The five divisions dealing with these programmes are the divisions of rural energy, solar energy, power generation, urban and industrial wastes and new technologies. Except for the solar energy division, all other divisions cover bio-energy technologies of the renewable energy programme. Unfortunately, there is no separate division for energy conservation; a mention is made of efficiency improvement through improved stove under rural energy division. Primarily, the organizational structure appears to focus on supply side management by inter-fuel substitution.

Till 1991-92 the implementation approach of the MNES focused on provision of subsidies and other financial incentives and support for R and D. The MNES in the recent past has assumed a more facilitative role through greater emphasis on formulating policy, planning and institutional development. These changing strategies have impacted the renewable energy sector (Ravindranath et al., 2000).

Recognizing financing as a vital factor for the promotion of these technologies, including bio-energy, the Government of India set up the Indian Renewable Energy Development Agency Limited (IREDA) as a public limited company in 1987 under the administrative control of the MNES. The activities of the IREDA - the direct financing arm of MNES - are integrated into the national Five Year Plans. IREDA acts as a financial intermediary and provides financial support for renewable energy users, manufacturers, and project developers. In addition to IREDA, MNES widened the network through existing financial institutions and banks to intensify renewable energy financing.
MNES has also established a network of existing institutions in the programme areas for R and D activities. Further it has constituted various specialized national level technical institutions, namely, the National Institute of Renewable Energy, Centre for Wind Energy Technology, and Solar Energy Center (SEC), which provide technical services, including capacity building, on various aspects of their respective technologies. Rural Energy Entrepreneurship & Institutional Development (REEID) was established in 2000-01 to promote local level entrepreneurship in the rural energy sector. Energy Parks are being set up in educational institutions for demonstration and awareness.

The SEC undertakes activities related to design, development, testing, standardisation, consultancy, training and information dissemination in the field of solar energy. The Center has been playing a crucial role in promoting solar energy technologies in the country, providing technical information, carrying out support activities such as testing and demonstration and building information and data base for the national solar energy programme. Its capabilities span optimum system designing, evaluation and assessment of emerging technologies and technical expertise for actual installation of systems. Equipped with highly advanced and unique facilities, the Center is recognized as a leading institution in India and South Asia (MNES 2001).

The Center has made significant contributions. Its achievements include the following:

- Development of national standards for solar thermal devices.
- Establishment of testing protocol for solar thermal and solar PV devices for attaining uniformity in testing carried out by various agencies.
- Establishment of a number of technology demonstration projects, including 4 kW solar PV power project at the Center.
- Establishment of the state-of-the-art facilities for solar energy research and testing under assistance from the United Nations.
Development Programme (UNDP), United States Agency for International Development (USAID), and German Agency for Technical Co-operation (GTZ).

- Establishment of a solar cooling system.

To make renewable energy products easily available to the public and to provide them with easy after-sale repair services, the Ministry is promoting the establishment of Aditya Solar shops in major cities. They are set up by state nodal agencies or manufacturers' associations or NGOs.

Different models of renewable energy devices from various manufacturers are sold through these shops, which also disseminate information on these devices to the visitors. To become commercially viable, these shops also sell energy efficient items such as compact fluorescent lamps, lighting accessories, high efficiency kerosene stoves etc. Through this diversification, they are serving as agents of energy conservation. The Ministry provides one time grant for the establishment of solar shops and a small recurring grant for the initial two years of operation. Publicity grants are provided to those which perform well. Special grants are provided to create awareness of such shops among the people. Workshops are conducted to discuss issues connected with making these shops more effective.

The total number of shops in the country is 29. The turn-over varies from Rs. 50 to Rs.200 lakhs a year. In Karnataka, it was set up in 2001-02 in Bangalore.

The institutional arrangements, fundamentally guided by the MNES programmes directly or indirectly, involve various institutional groups, namely, financial institutions (banks and non-bank finance companies), private sector manufacturers, and entrepreneurs (including after sales service support network) and community groups, non-governmental organizations (NGOs), village level functionaries and other agencies.
The Ministry has also a Women's Cell created in 1997 to cover various aspects of energy issues specifically relating to women. A Grievance Cell (1995) to redress the grievances of the staff of MNES and the public and an SC/ST Liaison Cell (1997) for the staff of the Ministry are also established.

The latest effort of the Government of India for promotion of non-conventional energy sources is through the Electricity Act 2003. Section 86 (1)(e) of the Act mandates the State Electricity Regulatory Commission to promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and to specify the quantum of purchase of electricity by a distribution licensee in his area of supply. Here again, the focus is on supply side management. The Act does not cover aspects relating to demand side management explicitly.

As of now, the Ministry has supported a total of 281 projects in various fields of renewable energy with a cumulative investment of nearly Rs. 56 crores.

4.3 Government of India - Policies and Programmes for Promotion of Non- Conventional Energy Sources

4.3.1 Policies:

MNES has formulated a comprehensive renewable energy policy for all round development of the sector encompassing the key aspects. The broad objectives envisaged in the policy are:

- Meeting the minimum energy needs through renewable energy
- Providing decentralized energy supply to agriculture, industry, commercial, and household sectors in rural and urban areas.

The policy envisages 10% of additional grid power generation capacity to be from renewable energy by 2012.
Through the policy support, the MNES expects to increase the role of private sector and foreign direct investment. For different energy sources, it has formulated fiscal and financial incentives (explained in some detail under the programmes in the following presentation). It has simplified procedures for investment, approvals and clearances, and availing finances. Specific policies are formulated to encourage small scale industries by giving them the freedom from locational restrictions which are mandatory for large industries and financial support through the National Small Industries Corporation.

4.3.2 Supply Side Management:

i) Solar thermal energy programme:

Solar energy is opted because of advantages like energy security, decentralized energy generation and environmental benefits. Thermal is one of the routes to utilize solar energy. Wide variety of technologies have been developed and efforts made for research and development, demonstration and large scale promotion during the 1980's and 1990's, have resulted in perfecting many of these technologies, such as water heaters, cookers, air heaters, distillation systems, etc.

An important component of the Ministry's efforts in renewable energy has been the exploitation of solar energy through both the thermal and SPV routes for variety of applications like cooking, water heating, drying of farm produce, water pumping, home and street lighting, power generation for meeting decentralized requirements in villages, schools, hospitals, etc. Under the solar thermal energy programme, solar water heating systems are becoming popular.

Solar cookers are picking up. Three models are being promoted to encourage its use at the family and community levels - dish solar cooker, the community solar cooker and solar steam cooking system. There is already a system catering to the cooking for 3,000 people (Shirdi in
Maharem). Another is the world's largest system with capacity to prepare food for 15,000 people (Tirupati in Andhra Pradesh).

A self-employed workers' scheme launched in 1999-2000 has also helped in building up a cadre of local technicians trained in the repair and proper use of solar cookers.

Solar water heating applications are quite widespread - residential, commercial, industrial and institutional. With the efforts made by the Ministry, both the technology and the manufacturing base are now well established. Systems are now commercially available in the market and can effectively supplement the conventional heating systems. The Ministry has advised the state governments to make mandatory the installation of solar water heaters in certain categories of buildings, by modifying building bye-laws.

The Ministry has also been promoting the use of solar air heating systems through the soft loan programme of IREDA. Solar air heaters are gradually becoming popular among industries which require hot air at low temperature ranges as process heat for drying. Among the industries using this technique are tea and food processing, dal mills and spice manufacturers. The Ministry proposes to evaluate the solar drying technologies. The potential of solar drying is also being explored through interaction meets with the appropriate target groups.

Under the solar thermal power programme, considerable progress has been made in the implementation of the 140 MW Integrated Solar Combined Cycle Power Project using concentrators in Rajasthan with financial assistance from World Bank / GEF and KfW of Germany.

The concept of solar building envisages climate responsive building designs with optimum use of solar energy. This will help reduce energy consumption to keep the interior of a building comfortable. The MNES has organized programmes to create awareness about the concept. A compilation of solar building projects from different climatic zones has been
Fifth, rigid banking systems and the consequent inaccessibility of credit to the poor stimulated many NGOs in introducing and expanding micro-finance programmes. A majority of the estimated 30,000 NGOs in India started micro-finance programmes. The government even formed programmes such as Rashtriya Mahila Kosh (RMK) through which SHG groups formulated by NGOs could access credit and other support. Quasi-government agencies, such as NABARD and the Small Industries Development Bank of India (SIDBI), also formulated programmes to link micro-finance. This was due to the growing role of NGOs, within micro-finance, which raised questions with regard to whether their services were complementary to or substituting the FRBS.

Some of the critiques argued that the total amount of credit provided by the microfinance programmes formed only a small proportion of credit provided by the FRBS, as the loan amounts offered by microfinance programmes were smaller. Therefore, it was argued that microfinance programmes could not play a significant role in poverty alleviation. The proponents of NGO microfinance programmes argued that NGO credit programmes provided a reliable source of credit to the poor, helped them meet their consumption credit requirements, reduced their dependence on moneylenders, and improved the collective strength of the poor in approaching government agencies and in accessing resources from them. They argued that although micro-finance programmes could not substitute the Formal Rural Banking System, they did enable the poor to save, and provide the poor with the confidence to approach banks to deposit their savings, thus allowing them to access the bank’s other resources. The proponents argued that a linkage process between the NGO, its members and the FRBS, would not become sustainable if the poor developed linkages from a weak position. Therefore, micro-finance programmes were adopted as the strategy to strengthen the position of the poor vis-à-vis the FRBS.

4.3: MICRO FINANCE- INDIAN EXPERIENCE:

There are no clear and systematic estimates available regarding the actual as well potential demand and supply of micro finance in the country. Regarding the
ii) Solar photo voltaic (SPV) programme

SPV technology enables direct conversion of sunlight into electricity without causing pollution. Photo voltaic systems and power plants have emerged as viable power sources for applications such as lighting, water pumping and telecommunication. They are being increasingly used in remote villages and also in hilly and forest areas where the grid supply is not feasible.

The Ministry has facilitated technological developments and widespread field level demonstration and utilization of SPV technology for various applications. A strong research base has been developed. The systems being promoted are solar lanterns, home lighting systems, street lighting systems, stand-alone power plants and water pumps. One of the major constraints to large scale use of PV systems is their high initial cost. R & D work has been undertaken for cost reduction in SPV cells, modules, operational efficiency.

There are 18,000 villages in remote areas which cannot be electrified through conventional grid extension. Their energy needs can be met by decentralized generation using locally available renewable energy options like solar photo voltaic, small hydro power and bio-mass. The Ministry proposes to cover these villages by 2012.

The SPV technology is also being deployed for water pumping, particularly for agriculture and related uses. Besides this, water pumping wind mills, small aero generators and hybrid systems are being promoted to harness both solar and wind energy potential for rural and remote area applications.

The solar PV power programme is aimed at providing voltage support in rural areas with a weak grid, and on public buildings for peak load saving, and diesel saving in islands and remote locations.

Primarily, the Ministry’s programmes have the following components:
a) Demonstration and utilization programme covering potable lanterns, fixed type home systems, street lighting, stand-alone small capacity village level power plants. This programme is implemented through state agencies and NGOs.

b) Soft loans to the programme implementing agencies like NGOs from IREDA for installation of SPV systems and power plants.

c) Quality control and standardization - Sample testing and certification of systems by authorized test centers for SPVs.

d) Financial support to agencies undertaking grid-interactive solar PV power projects and village electrification projects with capacity ranging between 25 kW and 239 kW

e) Solar PV applications for water pumping - Interest subsidy is given on the loan component given by IREDA

f) Research and development

g) Awareness and training

iii) Integrated Rural Energy Programme (IREP):

Sustainable energy security demands tackling the problems encountered in meeting the energy needs of the vast rural population in a planned, systematic and integrated manner. It was in this context that IREP was taken up during late 1970’s / early 1980’s. Its objectives include providing cost-effective source-mix for meeting minimum domestic energy needs for cooking, heating, and lighting purposes in 715 blocks. It hopes to achieve the same through local people’s participation, strengthening the mechanisms and co-ordination arrangements for linking micro level planning and rural energy and economic development. It supplements the local financial resources by making available Central and state budgetary support. There are three IREP Training institutions in the country to support R & D and training.

iv) Bio-gas Programme:

In the 1980’s with the onset of the second energy crisis, the emphasis of the Government shifted to fuel switching with focus on
renewable energy sources. As a consequence of this shift in emphasis, in 1981 - 82, the Government launched the National Project on Bio-gas Development (NPBD). The Government adopted a multi-agency approach involving state governments, local bodies, panchayats, non-government organizations (NGOs), research institutions, and the Khadi and Village Industries Commission to address several problem areas. Some states have dovetailed this with other efforts like sanitation schemes, rural development programmes.

Bio-mass is the major source of energy in rural areas, but the most inefficient source because of traditional methods of usage and contributes to pollution as well. Bio-gas is an alternative clean and higher quality energy source, though based on bio-mass and hence, an appropriate inter-fuel substitution strategy.

Under NPBD, the Government of India implemented the following schemes:

a) Technology development through support to R & D in research laboratories covering individual and community based plants - assisting studies for increasing the yield of bio-gas, cost-effective designs of bio-gas plants, development of designs and methodologies for utilization of bio-mass, other than cattle dung.

b) Central subsidy on capital cost of varying amounts depending on the category of beneficiaries.

c) Refinancing facility from NABARD to the banks to provide loans.

d) To inject professionalism into construction, provision of turnkey job fee to entrepreneurs, corporate bodies, and NGOs.

e) Organizing and financing training - establishment of Bio-gas Development & Training Centers in nine major states.

f) Publicity and awareness promotion

g) Monitoring and evaluation - three-tier system - monitoring by the field offices and state nodal departments and evaluation by independent organizations.
As regards savings and insurance, again there are no clear macro level statistics available. But going by the fact that the micro finance agencies in the country so far have focused their attention mainly on credit, and also that many local micro finance institutions are not able to mobilize savings in a full fledged way due to legal restrictions, the extent of gap in the demand and supply for these services would be definitely much higher than the credit. Thus, given the need and their current level of achievements, the MFIs and other agencies have still a long way to go in meeting the needs of the poor.

4.4: SHG-BANKING-THE INDIAN EXPERIENCE:

SHG-Banking is a programme that helps to promote financial transactions between the formal rural banking system in India comprising of public and private sector Commercial Banks, Regional Rural Banks and Co-operative Banks with the informal Self Help Groups as clients, they usually start by making voluntary thrift on a regular- mostly fortnightly or monthly – basis. They use this pooled resource together with the external bank loan to provide interest - bearing loans to their members. Such loan provides additional liquidity or purchasing power for use in any of the borrower’s production, investment, or consumption activities. SHG-Banking through SHGs and the existing decentralized formal banking network including several organizations in the formal and non – formal sectors as banking partners allow for large scale outreach of micro finance services to the poor in India. These banking services are made available at low cost, are easily accessible flexible enough to meet poor people needs.

The basic strategy contained three elements; (a) The NGO, which identified the SHG and provided adequate capacity, is building support including support to build up capital by regular savings. (b) NABARD, which provided the NGO, defines underwrites R & D programme (also to match the savings of SHGs). (c) The banks, which extended a line of credit directly to mature SHGs without determining the purpose for which the members could, use the loans. The SHGs could lend for any
commercial projects. Efforts are made to identify potential sites for small hydro projects of up to 25 MW capacity. The programme components are listed below:

a) In order to encourage the state governments and the private developers to undertake detailed survey and investigation, besides preparing detailed project reports, a composite scheme is being implemented with financial support. This has attracted a large number of private entrepreneurs.

b) Under its scheme of capital subsidy the Ministry is supporting 98 demonstration projects spread all over the country.

c) Demonstration project is launched by the Ministry to study the performance of portable micro hydel sets under field conditions. Local organizations are being encouraged to set up such micro hydel projects.

d) A programme for electrification of remote and inaccessible villages is being launched through decentralized hydro projects, involving local bodies and NGOs.

e) To promote small hydel projects in the North-Eastern regions, a special incentive package consisting of capital grants to cover project costs and equipment costs has been offered.

f) Development of commercial projects through private sector is accorded high priority. An interest subsidy scheme through financial institutions has been launched.

g) Soft loan scheme is implemented under which IREDA sanctions loans under the World Bank line of credit and from its own resources. So far, 92 projects with an aggregate capacity of over 268 MW have availed.

h) Financial support for renovation, modernization and capacity uprating is given under a special scheme of the Ministry. This support is given to projects up to 15 MW to the governments and utilities.

i) Promotional incentive scheme for the development and upgradation of water mills through financial assistance to local organizations such water mill associations, as co-operative societies, state nodal
It is not only the SHG bank Linkage Programme of NABARD that allows the SHGs to obtain loans from formal banking institutions. Other apex development banks in India such as SIDBI, HDFC & Government Institutions like RMK, as well as private financial agencies such as BASIX also provide special credit facilities to SHGs. They also have started to promote SHG federation as a strategy to ensure the financial viability and sustainability of SHGs as small informal organizations.

The Demand Side: SHGs as financial intermediaries in the villages:

An unique feature of "SHG –Banking " is the concept of lending to Self Help Groups as a very effective financial intermediation, for its retails loan funds to the poor members and mobilizes regular savings. Self Help Groups in the SHG-Banking Programme are quite autonomous in their decision making regarding savings and credit. SHG – Banking is demand oriented and The poor people’s most urgent needs were to find opportunities for depositing their small savings and access to additional external funds for loans to meet emergencies and for micro-investments

The Supply Side of Micro finance: The second key indicator for the success of SHG-Banking is the extent to which the vast network of Commercial Banks, Cooperative Banks and Regional Rural Banks with 160,000 retail outlets is ready to cooperate. The following institutions are actually or can be potentially involved in linkage banking: Some 94,000 branches of cooperative banks. Around 60,000 branches of 27 public sector commercial banks and 196 Regional Rural Banks and another 4,700 branches of 55 smaller private banks providing financial services in India as well as other financial institutions (37,000 NBFCs) spread all over the country (partially involved in micro-savings). The formal banking sector has played an important role in micro finance in India. Much of the micro finance initiative in India has involved Self-Help Groups (SHGs), predominantly of poor women. The SHG-Bank Linkage Programme, initially launched by NABARD with 500 SHGs on a pilot Project basis in 1992 has crossed a mark of ONE MILLION SHGs during last 15 years. As many as 10.79 lakh SHGs have financed by various financial institutions as at the end of 31 March 2004. Efforts of other Organizations supplement that of
gasification using gas turbine, steam turbine, dual fuel engine, gas engine, or a combination thereof, either for co-generation of power alone, or for co-generation of more than one energy forms, namely steam and power. Accordingly, the Ministry has formulated different components to promote them under the National Programme on Bio-mass Power / Co-generation.

The programme includes the following schemes:

a) National Bio-mass Resource Assessment Programme has the objective of providing inputs for preparing a bio-mass resource atlas for India and it is taken up through consultants with involvement of four apex institutions to guide the state nodal agency.

b) National Programme for Bio-mass Power Generation has as its components bio-mass based power generation, bio-mass / bagasse based power generation, and district level bio-mass based projects and assessment studies. Its objective is to establish the techno-commercial feasibility and viability of power generation from bio-mass.

c) National Bio-mass Gasifier Programme (NBGP) has the objectives of developing and commercializing conversion and utilization technologies such as biomass briquetting and gasification for various end use applications in rural and urban sectors. The two components are: R and D, and technology utilization and applications. ‘Sutra’ (Sustainable Transformation of Rural Areas) project is an innovative project of bio-energy for sustainable transformation, implemented by the Indian Institute Of Science. Five Gasifier Action Research Centers are being set up in selected technical institutions in different parts of the country.

d) UNDP/GEF project: A proposal on ‘Removal of Barriers to Bio-mass Power Generation’ has been prepared for UNDP/GEF funding. This involves implementation of bio-mass energy projects ranging from small scale to large scale, based on different bio-mass resources as well as conversion technologies through different implementation models.

Institutional arrangements: All the above mentioned programmes are being implemented with the active involvement of the state nodal agency.
state governments, state electricity boards, entrepreneurs, NGOs, who are responsible for the development of projects, monitoring of progress and for providing post installation feedback to MNES.

viii) Energy from waste

Urban municipal and industrial wastes have high potential for energy generation. Several technological options for energy recovery from urban and industrial wastes are available such as anaerobic / bio-methanation, landfill gas recovery, etc. Other conversion technologies like gasification are also in use. All these not only reduce the quantity, but also improve the quality of wastes to meet the required pollution control standards, besides generating a substantial quantity of energy.

There are two programmes for recovery of energy from urban and industrial wastes:

The National Programme on Energy Recovery from Urban, Municipal and Industrial Wastes: It was launched in 1995-96, with the objectives of creating conducive conditions and environment with financial and fiscal regime to promote, develop and demonstrate the utilisation of wastes for recovery of energy; improving waste management practices by adopting renewable energy technologies for processing and treatment of wastes prior to disposal; setting up of projects for recovery of energy from urban, municipal and industrial wastes. Under this programme, the following are undertaken:

a) Financial assistance in the form of interest subsidy being provided to lead financial institutions of the commercial projects; assistance towards the capital cost of the project for innovative demonstration projects for generation of power from waste.

b) Financial incentive for providing garbage at site to urban local bodies.

c) Financial incentive for promotion, co-ordination and monitoring of projects.
d) Sharing the cost of project preparation and of the techno-economic feasibility reports.

e) Bearing the full cost of resource assessment studies.

f) Financial assistance for training, awareness, publicity.

The UNDP-GEF Project on Development of High Rate Biomethanation Processes aims at reducing greenhouse gases emissions. It was started in 1994, with the MNES sharing the financial cost. Implemented by the National Bio-energy Board (NBB) which provides policy guidelines for development of a national strategy for bio-energy and oversees the implementation of this project. The programme achieves its objectives by institution and capability building; promotion of biomethanation technology; organisation of seminars, workshops and ongoing training programmes; development of national master plan; and setting up of demonstration sub-projects.

ix) Geothermal

Geothermal resources are used to generate power heat for space heating, greenhouse cultivation and cooking applications. The thrust areas are resource assessment and creation of a data base on infrastructure for indigenous production of geothermal power plants and equipment for deeper drilling of bore holes and secondly, applications of geothermal energy for power generation and direct heat utilization. Thus, this programme is still for exploration.

x) Tidal

At the current stage of technology, only tidal power can be exploited. Preliminary assessment of the potential is being carried out.

4.3.3 Demand Side Management

i) Chulhas Programme:

In the 1980’s, the emphasis of the Government of India shifted to energy conservation, considering the problem of deforestation, partly contributed by inefficient use of fuel wood as a source of energy. This
again contributed to pollution. As a consequence of the shift in emphasis to address both deforestation and pollution problems, in 1983 the National Programme on Improved Chulhas (NPIC) was introduced. This programme resulted in other benefits like reducing drudgery for women and children through smoky kitchens and fuel wood collection and expanding employment opportunities. The NPIC is the largest in terms of the number of devices disseminated.

Under NPIC, the Government of India implemented the following schemes:

a) Technology development through support to R & D in research laboratories covering constructing chulhas of different types and sizes catering to different bio-mass fuels, and health aspects.

b) Central support for Technical Back-up Unit to meet the expenditure on establishment, R & D, and training facilities.

c) Financial support to self-employed workers to put up the chulhas.

d) Financial support to the state governments, nodal agencies, autonomous bodies and NGOs.

e) Publicity and awareness promotion

f) Dealership support through grants for sales promotion.

g) Three-tier monitoring and evaluation system.

4.4 Government of Karnataka - Programmes and Policies for Promotion of Non- Conventional Energy Sources

Karnataka state is one of the states implementing various programmes and policies of MNES with the assistance of the state nodal agency called Karnataka Renewable Energy Development Limited (KREDL). The agency was established in 1996. There are no independent programmes of its own; some policies which fall in the State List are formulated and implemented by the state.
MODEL-WISE SHG–BANK LINKAGE IN INDIA:

The NABARD identified three models of credit linkage of SHGs with banks showed the following trend as on 31 March 2004:

Model 1: SHGs formed and financed by banks.

In this model, banks themselves take up the work of forming and nurturing the groups, opening their savings accounts and providing them bank loans. Up to March 2004, 20 percent of the total number of SHGs financed was from this category. This showed an increased of 52.5 percent over the position up to March 2003.

Model 2: SHGs formed by formal agencies, NGOs and others, but directly financed by banks.

This model continues to have the major share, with 72 percent of the total number of SHGs financed up to March 2004. Here, NGOs and formal agencies in the field of micro-finance, act only as facilitators. They facilitate organising, forming and nurturing of groups, and train them in thrift and credit management. Banks give loans directly to these SHGs.

Model 3: SHGs financed by banks through NGOs and other agencies as financial intermediaries.

This is the model wherein the NGOs take on the additional role of financial intermediation. In areas where the formal banking system faces constraints, the NGOs are encouraged to approach a suitable bank for bulk loan assistance. This, in turn, is used by the NGO for on lending to the SHGs. In areas where a very large number of SHGs have been financed by bank branches, intermediate agencies like federations of SHGs are coming up as link between bank branch and member SHGs. Other agencies like NBFCs are also coming up to take up this role. The share of cumulative number of SHGs linked under this model up to March 2004 continued to be relatively small at 8 percent.
As already observed, almost all the efforts of the MNES have been on supply management, with very little focus on conservation.

The successful penetration of renewable energy into bulk markets depends on several factors – the quality of locally available resources, technological developments affecting the relative cost competitiveness of renewable versus non-renewable options, and the structure and operation of such markets.

Both the technically mature and emerging set of technologies, being at different stages of commercialization, require different set of mechanisms of policy intervention, institutional setting and relationships, supporting infrastructure - financing options, servicing & maintenance, infrastructure etc. The MNES has tried to address this while formulating its policies and programmes.

Proper policy monitoring and programmes have led to development of support infrastructures like manufacturing base, servicing and maintenance network, financing option, fiscal incentives, matured institutional settings and relationships etc. (Neudorffer, et al, 2001)

One area of concern is the penetration rate achieved as a result of all the efforts made over twenty years. For instance, by 1999 improved cook stoves programmes reached a peak dissemination rate of 30.9 million (MNES , 2000), covering 23% of rural households. However, at the current rate of spread at least 40 years would be required to cover the entire households. The magnitude of unexploited potential in wind, small hydro and bio-gas has already been presented in Chapter 2.

The problem of fuel insufficiency, overexploitation of bio-mass resources and poor reliability and quality of energy services available to the rural masses, continue in spite of numerous initiatives by the government in the form of national level, rural and renewable energy programmes. Even though a large number of incentives are provided to promote bio-energy technologies, the results are not very significant. Even with greater budgetary resources provided by the government for the bio-energy sector
within the renewable energy sector, the impact has been relatively low when compared to other renewable energy technologies.

In the paper by Rao & Ravindranath (2002), the following critical observations are made of the policies and programmes.

Despite the potential for higher plant load factor of bio-energy systems when compared to some other renewable energy technologies, there is policy discrimination (high wheeling charges, higher interest rates) that discourage the use of bio-energy systems.

If one takes stock of all the barriers, it is obvious that their intensity or magnitude varies from one technology to another. The MNES changed its policies to address some of them, but several of the policy options would need major policy shifts such as economic pricing, supporting long-term R&D, and capacity- and awareness-building programmes. This would clearly pave the way for a technology-specific barrier removal strategy.

The government's programmes have generally limited the participation of local communities and assessment of their needs, values and practices, with the exception of IREP which is claimed to have taken note of this. The technology-push approach of the government in the initial stages did not mobilise the community and ensure its commitment to participating in the programmes. Further, the absence of appropriate policies to strengthen the institutional arrangements to empower local communities has limited the ability of rural communities to participate in dissemination of bio-energy technologies.

The capacity development efforts are largely target-oriented in terms of number of training programmes to be organised, and so on and ignore to a great extent some of the qualitative aspects such as training content, participant profile, and post-training follow-up and support to sustain their skills. There is a need to match the skills with demand as well.

It is further pointed out that the approval process is also reported to be cumbersome and bureaucratic. There have been instances where
manufacturers have pointed to long delays in getting technical approvals. Currently, there are technical back-up units (TBUS) at the state level to provide technical assistance to improve the quality and reliability of the technologies. The weak link has been in the area of availability of testing institutions, to provide the necessary technical assistance on these matters. The issues of performance and product guarantees also need to be addressed.

On account of the multiplicity of agencies involved in the implementation, it takes a long time for end-users to receive the incentives. The implementing agencies often complain about the long time taken for actual implementation and release of funds or incentives for bio-energy projects, which discourages the end-users.

Fiscal policies such as 100% depreciation benefit have had a very marginal impact on bio-energy technologies. These incentives have been exploited to their advantage only for some technologies such as wind and solar PV. International assistance is focused on technologies involving hardware imports. The government's budgetary allocation has also limited the dissemination rate of bio-energy technologies, such as bio-gas.

Mainstream financial institutions have been reluctant to take risks in lending due to a long history of poor recovery of loans in rural areas; they see little incentive in providing loans for renewable.

Even though IREDA's financial intermediary scheme provides incentives such as interest subsidy and bears transaction costs, existing financial institutions participating in these schemes seem to have adopted a negligent attitude because of low returns, high technological risks, and high costs of servicing the dispersed and low-volume markets. The experience of poor reliability of the systems has led to a further shying away by financiers, as they do not have any assurance of reliability and after-sales service from the manufacturers.

The financial incentives or subsidies given in India are largely investment subsidies to reduce the first cost to the investors or end-users.
and not linked to performance. Once the subsidy is disbursed, there is no accountability or incentive to ensure performance. Subsidised electricity by the Utilities has not led to its becoming accessible to the rural poor, who continue to depend on kerosene, which provides low-quality lighting. In such cases, it is more desirable to subsidise access to electricity rather than electricity use. The real financial barrier is the inability of subsidised bio-energy to compete with subsidised centralized electricity and kerosene. Experience all over the world has shown that subsidies rarely reach the target groups, nor do they contribute to long-term development (Neudoerffer, et al, 2001).

Most importantly, the subsidies are based on the capital costs rather than being linked with performance or output. The costs of commercial scaling-up of bio-mass production, processing, transportation, market development, etc., are yet to be established. There have been minimal efforts to ascertain the transaction costs of disseminating these technologies on a commercial scale.

The ‘product subsidy’ aimed at benefiting the poor has been only partially successful. The majority of the poor in rural areas have not benefited from these programmes. Subsidy on product design has stifled innovation as in the case of photovoltaics. There is therefore no range of products to cater to the wide variety of needs of the rural people. The parallel programmes of ‘commercialisation’ and ‘welfare’ (subsidy based) have led to lack of direction (Neudoerffer, et al, 2001).

The technical and performance standards are laid down by the MNES and incentives are made available to only those systems that conform to MNES standards. Manufacturers do not take any initiative to alter these standards, as they, in any case, are conforming to the specifications drawn up by the MNES and are eligible for incentives. The users cannot discern the improved performance of new technologies, for example, improved cook stoves, vis-a-vis traditional devices. Since the government plays a major role, little feedback on performance and designs
is received directly by the manufacturers or R&D institutions from the target beneficiaries of these technologies. Further, the MNES identifies areas of research and makes budgetary allocations, which again limits the scope of R&D (Ramana, 1998).

Further, R&D activities are often not need-oriented (Ramana, 1998). There is a lack of focused and coordinated policy for R&D for identified technology-specific problem such as high first cost, operation and maintenance. Inadequate funding for R&D is a barrier to technological development as well as cost reduction (Rao & Ravindranath, 2002).

Technical expertise is required for design, manufacture, marketing, sales, and operation and maintenance services of these systems. Despite several initiatives of the MNES to impart training, technically qualified manpower and servicing agents who can provide quick, efficient and cost-effective operation and maintenance services are not available in sufficient numbers, particularly in the rural areas. The training programmes are planned primarily to meet targets, which are quantitative (Rao & Ravindranath, 2002).

The principal thrust of any meaningful rural energy policy is to shift from the present traditional bio-mass technologies to efficient bio-mass technologies, which provide greater energy service with the same quantity. While a number of technologies are available for meeting rural energy requirements, some of them need to be developed further to attain techno-economic viability. Some technology development is also required to expand the resource base.

Presently, however, the choice of technologies available is quite limited and their impact is too low and slow. One of the reasons for this situation is the low priority attached to research and development (R&D). For instance, the investment made in the R&D of renewable energy technologies is just about 4.6% of the total expenditure of the MNES between 1982 and 1994. Besides there has been limited support for product development in the case of technology based
programmes such as bio-gas and photo voltaic. There has been no follow up to improve products or programmes based on the numerous evaluations. Since there is little flow of information between the lab and the field performance, the choice of options for the rural masses remains limited (Neudoerffer, et al, 2001).

Therefore, developing a focussed and target-oriented R&D programme should be a top priority in developing and demonstrating the new technologies. The main objective of such a programme should be to come up with technologies, which are low-cost as well as, highly efficient, and suitable to meet local practices and lifestyles.