

ROLE OF GOVERNMENT IN PROMOTING RENEWABLE RESOURCES IN INDIA

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ABSTRACT

The concept of 'Sustainable Development' presented through Brundtland Report under World Commission gained popularity and importance in 1987. Energy plays a vital role in usage of nature's resources and it has direct and indirect impact in economy and environment. Sustainable development of resources, proper mix of the resources for balancing the present need, future demand, conservation of precious resources and at the same time shifting towards non-conventional energy resources are the areas of key challenges we face today in India and the world over in general. India has taken a lead role in exploiting renewable energies and has become a role model to many of the countries of the world. In particular, the potential of solar energy in India is huge due to its location advantage. This paper illustrates various policies adopted by Government of India and other stakeholders for promotion of solar energies and challenges ahead to move towards sustainable energy development.

Keywords: Sustainable Development, Resources, Non-conventional Energy, Solar Energy

1. INTRODUCTION

The pair of terms 'Sustainable Development' has lately become so much clichéd due to its reiterative use and also we cannot help denying its popularity in publications and mass-media databases. Sustainable development is the typical pattern of economic development that help meet the needs of present by optimum utilization of resources without jeopardizing the needs of future. Sustainability in development is the index of existence of development. Development doesn't mean only industrialization, it includes everything that induces growth. Any kind of development will need resources which will be utilized, maneuvered and transformed to get the expected products. The resources we are using are mostly non-renewable or renewable only after a millions of years. Fast development will consume resources at an exorbitant rate. Sustainable development will help in establishing the equilibrium between resource exhaustion and resource renewal as far as feasible. Also it will open the scope for introduction of novice renewable resources.

So, as we see, renewable resources are so vital for growth development stature of a country. In fact in coming few decades the renewable energy exploitation index of a country will determine its position both in economic and diplomatic basis. In India, the energy scenario is not at all different and we are inevitably being confronted by the threat of National Energy Security. It is promising that our country is gifted with abundance of natural resources and renewable counterparts of them. Proper utilization with innovative techniques and initiatives will cater the purpose for meeting the increasing energy demand in India.

The potential of solar energy in India is huge due to its location advantage near the equator. India can produce over 1900 billion units of solar power annually, which is enough to meet the projected demand of entire country in 2030. The programs have already been initiated by Government of India to exploit this bulk of solar energy. Ministry of New and Renewable Energies (MNRE) of Government of India is working on the green projects for assimilation of new and renewable energy sources and effective energy conservative and transformation processes since 1981.

The government of India has set ambitious target of 550 MW by 2013 through solar energy. The various aspects of the Government ventures to promote renewable sources of energy, especially solar energy, will be discussed in the subsequent articles.

2. MINISTRY OF NEW AND RENEWABLE ENERGIES (MNRE), GOVERNMENT OF INDIA:

The Ministry of New and Renewable Energies, abbreviated as MNRE, is the central nodal Ministry of the Government of India for all pertinent issues for new and renewable sources of energy. This Ministry has its primitive instigation back in 1981 under the name Commission for Additional Sources of Energy (CASE). From then it had run through various names and corresponding objectives. The chronological development of this Ministry has been depicted below by a flowchart [1].

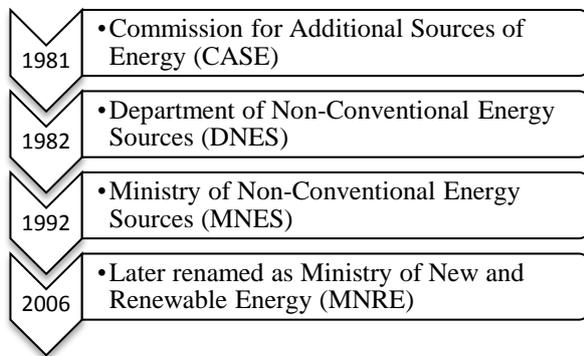


Fig. 1: Chronological Development of MNRE [1]

The over-exploitation of the non-renewable resources has led to incorporation of new or renewable counterparts of energy in our country in recent times and in past times also. Especially during the Oil crisis of 1970s, the worsened scenario of non-availability of oil leading to tremendous price hike had compelled Government to confront challenges about the energy issues [1]. Country’s energy security can only be guaranteed by indexing self-sufficiency of the Energy sources. The sudden augment in the oil-price, uncertainties associated with its supply and the adverse impact on the balance of payments position led to the establishment of the Commission for Additional Sources of Energy or CASE in 1981. From then this cell has lucratively contributed to the decision-making and implementation of the issues related to Non-conventional sources of energy.

The actual goals of MNRE are multifarious and manifold with all available constraints. In a nut-shell the goals of this Ministry can be given as below-

- To encompass new and renewable sources of energies with proper and up-to-date realizations and escalatory measures replacing non-renewable ones as far as feasible.

- To value-judge and assign the prospects of these sources for future utilization. Availability, Self-sufficiency, easy transformability, reliability and cost-effectiveness (both for transportation and processing) will be the yardsticks.
- To help in negotiations, in all aspects, for actuating the projects related to these sources including economic, social and political settlements.
- To supervise and to authorize or forbid different projects in any part of the country with quickest approach if possible.

The following are the policies and initiatives taken by MNRE [1]-

- National Policy on Biofuels.
- Jawaharlal Nehru National Solar Mission (JNNSM)
- National Biogas and Manure Management Program (NBMMP)
- Solar Lantern Program
- Solar thermal energy Demonstration Program
- Remote Village Lighting Program
- National Biomass Cook stoves Initiative (NBCI)

2.1 National Policy on Biofuels:

The ‘National Policy on Biofuels’ of MNRE is one of the prominent and decisive policies for manufacture and implementations of biofuels in India [1].

Fossil fuels, mainly liquid fuels, in our country will only be available for next few decades at acceptable rates. Moreover fossil fuels are exhaustible, polluting and non-renewable. The Petro-based oil meets about 95% of the requirement for transportation fuels, and the demand has been steadily rising. Provisional estimates have indicated crude oil consumption in 2007-08 at about 156 million tones [2]. The domestic crude oil is able to meet only about 23% of the demand, while the rest is met from imported crude [2].

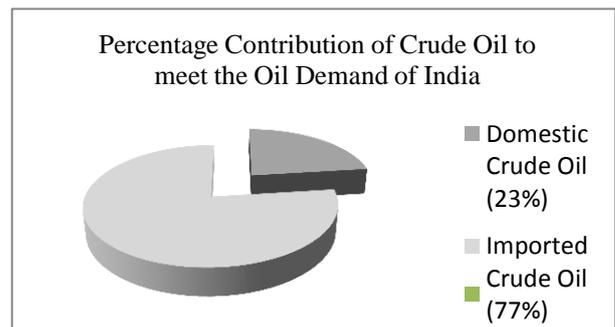


Fig. 2: Percentage Contribution of Crude Oil [2]

So it is high time to incorporate some complementary means to replace these fuels with renewable ones as far as possible. Biofuels will help tackle the crisis for liquid fuels. In the following paragraphs the salient aspects of this policy have been presented.

❖ Biofuels are liquid or gaseous fuels produced from biomass resources (biodegradable fraction of products, wastes and residues from agriculture, forestry and related industries as well as the biodegradable fraction of industrial and municipal wastes) and used in place of, or in addition to, diesel, petrol or other fossil fuels for transport, stationary, portable and other applications.

The main air pollution in our country is produced by the transportation sector due to high consumption of liquid fossil fuels. The biofuels will diminish carbon emissions from vehicles with high effectiveness curbing the air contamination. As biofuels are derived from renewable biomass resources, these help promote sustainable development as well as meet the energy need for transportation sector and vast rural population of India in environmentally benign and cost-effective manner. Considering all aspects, biofuels will reduce country's dependence on import of fossil fuels thereby providing high National Energy Security.

The Indian approach to biofuels is somewhat different from current International approach. The mechanism will include non-food feedstocks to be raised on degraded or wastelands that are not suited for agriculture, thus avoiding possible conflict between fuel and food security [3].

❖ In a nutshell, the aims of this policy are mainly-

I. This policy aims at mainstreaming of biofuels and envisages central role for energy and transportation sectors of the country. This will bring about the acceleration in cultivation, production and utilization of Biofuel products substituting the petroleum based fuels. Also this will contribute to energy security, climate change mitigations, environmentally sustainable development while creating new job opportunities [2].

II. Another aim of this policy is to ensure the supply of minimum level of biofuels readily available in the market to meet the demand at any time. An indicative target of 20% blending of biofuels, both for bio-diesel and bio-ethanol, by 2017 is proposed [2]. The blending level of bio-ethanol has already been made mandatory, effective from October, 2008, and will continue to be mandatory leading up to the indicative target.

2.2 Jawaharlal Nehru National Solar Mission (JNNSM):

The Jawaharlal Nehru National Solar Mission (JNNSM) is a key initiative of the Government of India and State Governments to promote the utilization of solar energy with the confluence of ecologically sustainable growth ensuring Energy Security of India. Initiated by Prime Minister Dr. Manmohan Singh on June 30, 2008, this mission will focus on the substitution of fossil fuel activities by renewable energy based activities, especially the solar energy [1]. The sole aim is to pool our scientific, technical and managerial talents, with sufficient financial resources, to develop solar energy as a source of abundant energy to power our economy and to transform the lives of our people.

It is under the supervision of MNRE and an integral part of National Action Plan on Climate Change (NAPCC).

2.2.1 Importance of Solar Energy for India:

The following salient features of solar energy in India make the mission viable to implement with better effectiveness.

I. First and foremost, India is endowed with large solar energy potential. India's land areas receive about 5000 trillion kWh energy per year with Global Horizontal Irradiance (GHI) Index of 4-7 kWh/m²/day in many areas. This vast solar energy can be harnessed by installing solar thermal plants and solar photovoltaics with huge scalability across the India

II. Virtually speaking solar energy will be abundantly available forever. So there is zero threat of resource depletion etc. It is environmental friendly, non-polluting and needs no raw materials other than sunlight. Once installed it does not have any problems other than the maintenance. The Energy Security is maximized by this energy.

III. Solar is currently high on absolute costs compared to the other sources of power such as coal.

2.2.2 Objectives and Mission Targets of JNNSM:

The main objective of this mission is to establish India as a global leader of solar energy. The fast depleting non-renewable energy sources have forced the countries across the world to confront energy crisis at every level of infrastructure. In this circumstance, the most effective exploitation of renewable resources will define the economic stature and position of a country at international platform. The notion of leadership in energy exploitation should be symbiotic rather than monopolized one. This mission will augment the potential of our country in harnessing solar energy for future use with elements of sustainability and energy-sharing circumstances with other countries. The immediate aim of the Mission is to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level.

The Mission will adopt a 3-phase approach. These phases have been listed below [4].

Table 1: Different Phases of JNNSM [4]

Phase	Span in terms of Five-year plans
1 st Phase	Remaining period of the 11 th Plan and first year of the 12 th Plan (2012-13)
2 nd Phase	Remaining 4 years of the 12 th Plan (2013-17)
3 rd Phase	During the 13 th Plan (2017-22)

The 1st Phase will mainly focus on capturing of the low-hanging options in solar thermal projects; on promoting off-grid systems to serve populations without access to commercial energy and modest capacity addition to grid-based systems. In the 2nd Phase, the experience gained in implementation of 1st Phase will be used aggressively to ramp up the capacity to create conditions for up-scaled and competitive penetration of solar energy in the country. There will be evaluations of progress at the end of each Plan and mid term during 12th Plan and 13th Plan with review of capacity and goals for subsequent phases, based on emerging cost and technology trends, both in domestic and global arena. The Government should not suffer from subvention exposure due to unstipulated rate of cost reduction. To achieve this, as a whole, the Mission targets are-

- ❖ To create an enabling policy framework for deployment of 20,000 MW of solar energy by 2022 [4].
- ❖ To enhance the capacity of grid-connected solar power generation to 1000 MW by 2013, also an additional 3000 MW by 2017 and lastly reaching 10,000 MW installed power by 2017. In case of off-grid applications the targets are 1000 MW by 2017 and 2000 MW by 2022 [4].
- ❖ To bring forth optimal conditions for solar manufacturing potential, solar thermal in particular for indigenous production and market leadership [4].
- ❖ To achieve 15 million sq. meters solar thermal collector area by 2017 and 20 million by 2022 [4].
- ❖ To deploy 20 million solar lighting systems for rural areas by 2022 [4].

Table 2: Targets for JNNSM [4]

Sl. No	Application segment	Target for 1 st Phase	Target for 2 nd Phase	Target for 3 rd Phase
1.	Solar Collectors	7 million sq. meters	15 million sq. meters	20 million sq. meters
2.	Off-grid solar applications	200 MW	1000 MW	2000 MW
3.	Utility grid power including roof top	1000-2000 MW	4000-10000 MW	20000 MW

The full-fledged strategy for the Mission has already been designed. This Mission strategy will work for the 1st and 2nd Phases. The strategies have been depicted below.

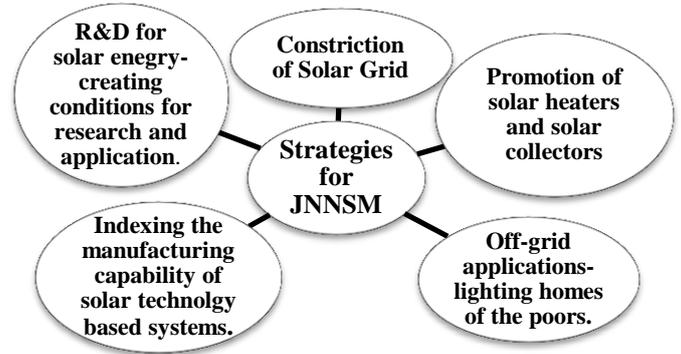


Fig. 3: Strategies for JNNSM [4]

As discussed earlier the objective of this Mission is to create a policy and regulatory framework which will provide a predictable incentive structure enabling drastic and large-scale capital venture in solar energy applications and will encourage for technical discoveries and lowering of costs. The Central Electricity Regulatory Commission has recently issued feed-in tariffs for purchase of solar power taking into account current cost and technology trends and investors and entrepreneurs are asked for venture in these projects with risk calculations. Also international collaborations will be availed in certain cases.

2.3 OTHER PROGRAMS AND INITIATIVES:

The other programs and initiatives by MNRE have been listed below with few relevant details-

Table 3: Other Programs and Initiatives by MNRE [1]

Sl. No.	Name of the Missions and Programs	Commencing year and authority	Details
1.	National Biogas and Manure Management Program	1981-82 MNRE, Govt. of India	The program will help avail fuel for cooking purposes and organic manure to rural households.
2.	Solar Lantern Program	2007-08, State Nodal Agencies or Departments	Solar lanterns and lights will replace and help diminish the consumption of kerosene in rural areas for lighting purposes thus improving the rural life quality and minimizing the risk of health and fire hazards.
3.	Remote Village Lighting Program	MNRE, Govt. of India	An upcoming program for electrification of remote villages through small hydro power plants and biomass plants.
Sl. No.	Name of the Missions and Programs	Commencing year and authority	Details
4.	National Biomass Cook-stoves Initiative	2009-10, MNRE, Govt. of India	Biomass Cook Stoves will replace Kerosene fed Cook Stoves.

3. INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY LIMITED (IREDA):

Indian Renewable Energy Development Agency Limited (IREDA) was instituted on 11th March, 1987 as a 'Public Limited Government Company' under the Companies Act, 1956.

It mainly promotes, develops and extends financial assistance for Renewable Energy and Energy Efficiency/Conservation Projects. IREDA's mission is to be a pioneering, participant friendly and competitive institution for financing and promoting self-sustaining investment in energy generation from Renewable Sources, Energy Efficiency and Environmental Technologies for sustainable development [5]. The main objectives of IREDA have been given below [5]-

- ❖ To give fiscal support to specific schemes and projects for generation of electrical energy through exploitation of new and renewable sources and conserving energy through efficient technologies.
- ❖ To maintain its position as a prime organization to provide efficient and effective financial backing in renewable energy and energy efficiency/conservation projects.
- ❖ To augment IREDA's share in the renewable energy arena by way of innovative financing.
- ❖ To improve effectively the efficiency of services provided to customers through persistent upgrading of systems, processes and resources.
- ❖ To emerge as a competitive establishment through customer satisfaction.

As far as encouragement for penetration of solar energy is concerned, IREDA is very much proficient in allocating monetary ventures. Also the collaboration from discrete investors and entrepreneurs for IREDA will prove to be helpful. The quality improvement of IREDA, as envisaged by them, will be achieved by incorporating customer satisfaction and corresponding improvement of professional skill of employees and processes.

4. KYOTO PROTOCOL:

The KYOTO PROTOCOL is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC) that set binding obligations to the industrialized countries to reduce their emission of green house gases. The Protocol was initially adopted on 11 December 1997 in **Kyoto**, Japan, and entered into force on 16 February 2005. The ultimate objective of the UNFCCC is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system [7]. As of September 2011, **191 states have signed and ratified the protocol** [8]. India and China, which have ratified the Kyoto protocol, are not obligated to reduce greenhouse gas production at the moment as they are developing countries; i.e. they weren't seen as the main culprits for emissions during the period of industrialization thought to be the cause for the global warming of today [9]. This protocol expires in 2012.

But on 17th conference on parties to the climate change convention at Durban in December the environment minister, Jayanthi Natarajan, made it clear that it wanted extension of the current Kyoto Protocol on emission cuts, but said it would not accept any further legally binding emission framework [10].

While the Kyoto Protocol came into force in 1997, the US has refused to ratify it, and the European Union, which as a block is the third largest emitter of carbon, says it was hardly effective as it left out all the major polluters. The new "roadmap" agreed upon by the 194 nations lays out for the devising of a new accord that would, for the first time, be legally-binding for all major emitters, including India and China, and would come into effect from 2020. The developed nations, meanwhile, will enter into another five-year commitment period of the Kyoto Protocol from 2013 to 2017 [10].

Kyoto Protocol sets binding targets for 37 industrialized nations and the EU to slash carbon emissions to 5% below the 1990 levels by 2012 [11].

5. RENEWABLE ENERGY CERTIFICATE MECHANISM OR REC MECHANISM:

The REC mechanism provides an effective tool to increase the contribution of states' to the development of renewable energy-based power in the country, to avoid the impeding effect of state-specific availability or lack of potential for growth of renewable energy. This mechanism will facilitate compliance with RPO in states that do not have adequate renewable energy potential or capacity [6]. REC aims to expand the renewables' market by broadening the availability and scope of power products available to customers. The concept of REC is based on separating the environmental or green power attributes of generation of renewable energy from that of underlying electrical energy.[6] This creates two separate, although related, products for sale by owners of generation assets — (1) Commodity electricity and (2) Renewable attributes (also known as renewable energy certificates).

A renewable energy certificate represents the renewable attributes of a single MWh of renewable energy. Renewable attributes can be sold separately or combined with system electricity at the point of sale by a developer [6].

6. FEED-IN TARRIFS:

A **feed-in tariff (FIT)** is a policy mechanism designed to accelerate investment in renewable energy technologies [12]. It achieves this by offering long-term contracts to renewable energy producers, typically based on the cost of generation of each technology.

In addition, feed-in tariffs often include "tariff digression", a mechanism according to which the price (or tariff) ratchets down over time [13]. This is done in order to track and encourage technological cost reductions.

The goal of feed-in tariffs is to offer cost-based compensation to renewable energy producers, providing the price certainty and long-term contracts that help finance renewable energy investments.

Under a feed-in tariff, eligible renewable electricity generators are paid a cost-based price for the renewable electricity they produce. This enables a diversity of technologies (wind, solar, biogas, etc.) to be developed, providing investors a reasonable return on their investments. This principle was first explained in Germany's 2000 RES Act:

"The compensation rates...have been determined by means of scientific studies, subject to the provision that the rates identified should make it possible for an installation – when managed efficiently – to be operated cost-effectively, based on the use of state-of-the-art technology and depending on the renewable energy sources naturally available in a given geographical environment." [14]

As a result, the tariff (or rate) may differ to enable various technologies to be profitably developed. This can include different tariffs for projects in different locations (e.g. rooftop or ground-mounted for solar PV projects), of different sizes (residential or commercial scale), and sometimes, for different geographic regions. The tariffs are typically designed to ratchet downward over time to both track, and encourage, technological change.

FITs typically offer a guaranteed purchase agreement for electricity generated from renewable energy sources. These agreements are generally framed within long-term (15–25 year) contracts [15].

The fact that the payment levels are performance-based puts the incentive on producers to maximize the overall output and efficiency of their project.

6.1 TARRIF ON POWER GENERATED FROM RENEWABLE SOURCES OF ENERGY:

In 1993, the Ministry of New and Renewable Energy (MNRE) issued guidelines for purchase of power from renewable energy sources by state utilities. These guidelines marked the power purchase tariff of Rs. 2.25 per unit, with an annual escalation of 5%. The guidelines also prescribed other promotional measures like wheeling and banking of power generated from different renewable energy sources. The guidelines were adopted by various state utilities, and provided the initial policy support for renewable-based power generation in India. Besides a fixed power procurement rate, the government provided other incentives like accelerated depreciation, and exemption in customs duty for imports of components/machinery for renewable energy systems/projects [16].

7. THE REGULATORY FRAMEWORK:

Subsequent to the enactment of the Electricity Regulatory Commissions Act in the year 1998, State Electricity Regulatory Commissions (SERCs) became key players in determining power tariffs.

The SERCs were constituted to bring transparency to the sector. The Electricity Act 2003 repealed the earlier acts: The Indian Electricity Act, 1910; The Electricity (Supply) Act, 1948; and The Electricity Regulatory Commission Act, 1998. The Electricity Act 2003 further strengthened the role of regulatory bodies in pricing, and in the promotion of competition and transparency. The Act, have specific provisions for promotion of power generation from renewable energy sources.

According to **Section-61(h)** of Electricity Act 2003: The Appropriate Commission shall, subject specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the promotion of co-generation and generation of electricity from renewable sources of energy.

Section-86(1)(e) of Electricity Act 2003 emphasizes to promote co-generation and generation of electricity through renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any persons, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.

The National Electricity Policy, formulated by the Ministry of Power, in pursuance of the provisions of the Act, also stresses the need for the promotion of non-conventional energy sources:

The share of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process [16]. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies. This regulatory framework will help ease the enactment and proper actuation of policies based on the constraints provided by the Indian Electricity Acts ratified until that time.

The National Tariff Policy, formulated by the Ministry of Power, has specific guidance on purchase tariff for power generated from renewables:

Section-6.4: It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.

Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs [16].

The Electricity Act 2003, and subsequent policies, provide for three important promotional measures for renewables:

- ❖ The Act provides a framework for tariff determination in Sec 61(h) and the tariff policy further elaborates it providing a long-term policy for pricing of power from renewable sources of energy, prescribing a gradual step by step introduction of competition [16].

- ❖ In addition to provisions on tariff determination, which boosts investor confidence, the Sec 86 (1)e, of the Act creates demand for power generated from renewable energy sources by mandating SERCs to specify a percentage of consumption which should be procured from renewable sources of energy [16].

- ❖ Power evacuation infrastructure is a critical requirement for promotion of renewables-based generation, since sources like wind and small hydro are geographically unevenly distributed and often located in remote areas. The Electricity Act addresses this by mandating SERCs to take suitable measures to ensure connectivity with the grid. Providing the infrastructure for evacuation of power is the responsibility of the state transmission utility (STU), and it is expected that the STUs would prepare grid expansion/augmentation plans in the light of the renewable energy potential of the state [16].

Various **STATE ELECTRICITY REGULATORY COMMISSIONS (SERCs)** have issued tariff orders for purchase of power from different renewable energy sources, which is a technology-specific tariff. This implementation of the provisions of the Electricity Act has boosted power generation from renewable energy, with total installed capacity reaching to 13838 MW as on 31st January 2009 [17].

- ❖ Listed below are some existing policies on renewable sources of energy of Government of India [17].

Table 4: Existing Policies on Renewable Sources [17]

Sl. No.	Policies and Actions	Details
1.	Integrated Energy Policy, 2006	It emphasized on mass transport, renewable including biofuels and fuel plantations and on accelerated development of nuclear and hydro power technology missions for clean energy.
2.	Rural Electrification Policy, 2006	Promotes renewable technologies where grid connectivity is not possible.
3.	Energy Conservation Act, 2001	Aims to reduce specific energy consumption in various sectors and to develop special Bureau of Energy Efficiency (BEE) to

		monitor energy efficiency at plant and macro level.
4.	New and Renewable Energy Policy, 2005	Promotes dependence on renewable energy sources.
5.	Biodiesel Purchase Policy	Mandates biodiesel procurement by petroleum companies.
6.	Ethanol Blending of Gasoline Policy	Mandates 5% blending of ethanol with gasoline from 1 st January, 2003 in 9 states and 4 union territories.
7.	Bachat Lamp Yojana	Country wide program for replacement of incandescent by CFL in households.
8.	50000 MW Hydroelectric Initiative, 2003	162 hydel projects have been identified for project preparation and implementation.
9.	Energy Conservation Building Code, 2006	Mandatory energy efficiency code for all buildings with greater than 500kVA connected load or conditioned floor area greater than 1000 m ² .

8. NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC):

The **National Action plan on Climate Change (NAPCC)** was released on 30th June, 2008 to state India's contribution towards combating climate change. The plan outlines **Eight National Missions** running through 2017. The NAPCC consists of several targets on climate change issues and addresses the urgent and critical concerns of the country through a directional shift in the development pathway. It outlines measures on climate change related adaptation and mitigation while simultaneously advancing development [18].

The following are the 8 missions of **NAPCC**-

I. National Solar Mission:

As stated earlier, this mission of NAPCC is actually the Jawaharlal Nehru National Solar Mission or JNNSM. In a nut-shell, the ultimate objective is to make solar energy competitive with fossil-based energy options. By **increasing the share of solar energy** in the total energy mix, it aims to empower people at the grass roots level. Another aspect of this Mission is to launch an R&D program facilitating international co-operation to enable the creation of affordable, more convenient solar energy systems and to promote innovations for sustained, long-term storage and use of solar power [18].

II. National Mission for Enhanced Energy Efficiency:

The Energy Conservation Act of 2001 provides a legal mandate for the implementation of energy efficiency measures through the mechanisms of **The Bureau of Energy Efficiency (BEE)** in the designated agencies in the country. A number of schemes and programs have been initiated which aim to save about 10,000 MW by the end of the 11th Five-Year Plan in 2012 [18].

III. National Mission on Sustainable Habitat:

This Mission was launched to make habitats, especially cities and townships, sustainable through improvements in energy efficiency in design of new and large commercial buildings to optimize their energy demand, management of solid waste and a modal shift to public transport. It aims to promote energy efficiency as an integral component of **urban planning and urban renewal** through its initiatives [18].

IV. National Water Mission:

By 2050, India is likely to be water scarce. Thus, the Mission aims at conserving water, minimizing wastage, and ensuring more equitable distribution and management of water resources. It also aims to **optimize water use efficiency by 20%** by developing a framework of regulatory mechanisms. It calls for strategies to accommodate fluctuations in rainfall and river flows by enhancing water storage methods, rain water harvesting and more efficient irrigation systems like drip irrigation [18].

V. National Mission for Sustaining the Himalayan Ecosystem:

The Himalayan eco-system is vital to preserve the ecological security of India. Increases in temperatures, changes in precipitation patterns, drought and melting of glaciers are obvious threats. The Mission calls for empowering local communities especially Panchayats to play a greater role in managing ecological resources. It also reaffirms the measures mentioned in the **National Environment Policy, 2006** [18].

VI. National Mission for Green India:

The Mission aims at enhancing ecosystem services such as carbon sinks. It builds on the **Prime Minister's Green India Campaign** for afforestation and increasing land area under forest cover from 23% to 33%. It is to be implemented through Joint Forest Management Committees under the respective State Departments of Forests. It also strives to effectively implement the Protected Area System under the National Biodiversity Conservation Act, 2001 [18].

VII. National Mission for Sustainable Agriculture:

The Mission aims to make Indian **agriculture more resilient to climate change** by identifying new varieties of crops (example: thermally resistant crops) and alternative cropping patterns.

This is to be supported by a comprehensive network of traditional knowledge, practical systems, information technology and biotechnology. It makes suggestions for safeguarding farmers from climate change like introducing new credit and insurance mechanisms and greater access to information [18].

VIII. National Mission on Strategic Knowledge on Climate Change:

The aim is to work with the global community in research and technology development by collaboration through different mechanisms. It also has its own research agenda supported by climate change related institutions and a **Climate Research Fund**. It also encourages initiatives from the private sector for developing innovative technologies for mitigation and adaptation [18].

IX. A Ninth Mission – Government to Prepare a National Bio-energy Mission:

The mission, to be launched during the 12th Five-Year Plan, will offer a policy and regulatory environment to facilitate large-scale capital investments in biomass-fired power stations, Minister of New and Renewable Energy, Farooq Abdullah said. It will also encourage development of rural enterprises [18].

The NAPCC has an imperative role to play in country's energy security but these plans are subject to change, as far as opportunities and resource availability are concerned. These plans consider the time value of resources, both monetary and aesthetic.

9. CONCLUSION:

Strictly speaking, there can never be made any conclusions while alighting on renewable sources of energy and other peripheral things. The approach of our country to exploit the renewable sources of energy for sustainable future is excellent and compatible with respect to technologies available in our country. But the whole process and procedures are not flawless and they can never be devoid of them. So tolerance should be there. Special awareness and training programs, updated with latest international proceedings, on Renewable Energy technologies should be organized from grass root level and frequently. Awareness programs won't do alone unless and until investments are made towards foundation of the platform for renewable energies in our country. In order to achieve this State Nodal Agencies should develop "bankable projects" with all necessary clearances to be made available to private investors and entrepreneurs, considering risk constraints. Special fiscal incentives like Sales tax incentives to be routed through lending agencies. Cost of infrastructure, development, erection of transmission lines etc. should be shared by state governments. Especially Biomass based projects' resource assessment to be carried on regular basis as biomass availability depends on climatic conditions, cropping pattern, agriculture pattern, etc.

Project developers should be allowed to mortgage government or forest lands to lending agencies. All the policies should be consistent and valid for a long term basis. Declaration of all RE projects as a part of rural infrastructure sector and introduction of tradable credits may be helpful. These suggestions are not at all complete or best. Various suggestions can be made from various notions. But proper agreement of these suggestions may lead to optimum results which are otherwise unattainable. Renewable energies are going to be our fate if we really want to avoid havoc. So exuberance for manipulation and multiplication of renewable energies should be the only practicable way. Our strive for existence should be strive for 'better future-greener future'.

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