



# IAS PARLIAMENT

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## GIST OF YOJANA

MAY 2019

**Shankar IAS Academy™**

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# **I N D E X**

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## YOJANA MAY 2019

### 1. ENERGY EFFICIENCY IS THE KEY FOR SUSTAINABLE DEVELOPMENT

#### *What is the need for energy efficiency?*

- There is a direct relation between energy, environment and sustainable development.
- A country seeking sustainable development ideally must utilize only those energy resources which have minimal environmental impact.
- Some of the concerns regarding the limitations imposed on sustainable development by environmental emissions and their negative impacts can in part be overcome through increased energy efficiency.
- As the conventional sources of energy are reducing and the renewable sources are under developing phase, improving energy efficiency at all levels of the energy spectrum is the cost-effective and quick solution to address this problem.

#### *What are the measures taken to achieve energy efficiency in Industrial sector?*

- Industrial sector continues to be the highest energy consuming domain where energy conservation would play a vital role.
- There is also huge potential for energy conservation and technology enhancement for efficiency in key intensive industries.

- With an aim of energy efficiency improvement, Bureau of Energy Efficiency (BEE) is implementing Perform, Achieve and Trade (PAT) scheme under the National Mission for Enhanced Energy Efficiency (NMEEE).
- **Perform Achieve and Trade (PAT)** : It is a regulatory instrument to reduce specific energy consumption in energy intensive industries, with an associated market based mechanism to enhance the cost effectiveness through certification of excess energy saving which can be traded.
- PAT cycle - I had 478 DC's covering total 8 sectors including Aluminum, Cement, ChlorAlkali, Fertilizer, Iron & Steel, Paper & Pulp, Thermal Power Plant, Textile, which were mandated to reduce their specific energy consumption (SEC) i.e. energy used per unit of production.
- Overall, the SEC reduction targets envisaged to secure an energy saving of 6.686 million tonnes of oil equivalent (MTOE).
- The implementation of PAT in designated industries has led to energy saving of 8.67 MTOE in year 2015 which is about 7.25 per cent of total primary energy supply to the country in the "first cycle".
- This energy saving also translates into mitigating about 31 million tonne of CO<sub>2</sub> emission.
- The "second cycle" of PAT was notified in March, 2016 covering 621 DCs from 11



sectors which include eight existing sectors and three new sectors, viz. Railways, Refineries and DISCOMs.

- PAT in its second cycle seeks to achieve an overall energy consumption target of 8.869 MTOE.

### ***What are the measures taken to achieve energy efficiency in Real Estate sector?***

- The real estate sector consumes over 30 per cent of the total electricity consumption in India annually and is second only to the industrial sector as the largest emitter of greenhouse gases; of which around 75 per cent is used in residential spaces.
- The building envelope thus will impact both the thermal comfort as well as electricity used for space conditioning.
- In this context, BEE has two programs (1) Eco Samhita, Energy Conservation Building Code for Residential Buildings, and (2) Labeling for Energy Efficient Homes.
- **Eco Samhita (Energy Conservation Building Code for Residential Buildings):** The Eco-Niwas Samhita (Part I: Building Envelope) aims to set minimum building envelope performance standards to limit heat gains (for cooling dominated climates) and to limit heat loss (for heating dominated climate) as well as for ensuring adequate natural ventilation and day lighting.
- The code is applicable to all residential use building projects built on plot area > 500 m<sup>2</sup>.

- The code has been developed with special consideration for its adoption by the Urban Local Bodies (ULBs) into building bylaws.
- This strategy enables most of the new urban housing stock to be brought into the net for capturing the opportunities and the benefits of energy efficiency in residential buildings.
- **Labeling Programme for Energy Efficient Homes:** To enable consumers to compare building performances from a sustainable energy point of view, a comprehensive labeling scheme is important.
- Energy labels help consumers to make efficient decisions through the provision of direct, reliable and cost less information.
- This is expected to save substantial energy through improving energy efficiency to houses nationwide.
- The estimated energy saving potential through proposed labeling program is around 388 BU by the year 2030.

### ***What are the measures taken to achieve energy efficiency in Consumer Appliances sector?***

- Consumer appliances are one of the important areas of energy consumption. Daily household electronic appliances like AC, Microwave, Washing Machine etc. are included in this sector.
- Bureau of Energy Efficiency (BEE) has been promoting energy conservation through optimum temperature settings



for Air Conditioners.

- According to the study of BEE, one degree increase in the AC temperature setting results in saving of 6 per cent of electricity consumed.
- 24-26 degree Celsius default setting has been recommended by BEE for energy savings and also to reduce greenhouse gas emission.
- Measures to promote advancement of technology and energy efficiency in Microwave Ovens which is becoming a popular household gadget, are also being taken.
- Savings of over 3.0 Billion units of electricity are estimated at consumer-end through adoption of Star Rated Microwave Ovens and Washing Machines by 2030.
- This would be equivalent to Green House Gases (GHG) reduction of 2.4 Million-ton of CO<sub>2</sub> by the year 2030 through these recent initiatives.

## **2. TAPPING SUSTAINABLE ENERGY ALTERNATIVES**

### ***What is sustainable development?***

- Sustainable development is "development that meets the needs of the Present without compromising the ability of future generations," which otherwise means "economic development that is conducted without depletion of natural resources."
- India, which became a sovereign nation, had to develop its agricultural resources and national infrastructure to meet

sustenance of approximately 330 million people and take the country on a development trajectory.

- Until the 1970s, sustainable development had never attracted the imagination of the global community. At the 1972 UN Conference in Stockholm, the world body raised concerns for preserving and enhancing the environment and its biodiversity to ensure human rights for a healthy and productive world.
- The developing countries including India, argued that their priority was development, whereas the developed countries made a case to bring environmental protection and conservation in the forefront of global agenda.

### ***What is the need for finding sustainable sources of energy?***

- Globally, there is a realization on the need to move fast to find solutions to arrest climate change, which would trigger more intense storms, dangerous heat waves, more frequent and longer-lasting droughts and rising seas.
- It also has a direct effect on food production, livelihood, health and environment. According to World Health Organisation, climate change affects the social and environmental determinants of health clean and safe drinking water, food security and shelter.
- Between 2030 and 2050, climate change is expected to cause approximately 2,50,000 additional deaths every year from malnutrition, diseases like malaria,



diarrhea and heat stress.

- Its cost to health is estimated to be between 2-4 billion US dollars a year by 2030.
- Since climate change is the defining issue of the present times, the world body has taken the initiative to reduce emissions of greenhouse gases through better transport, food and energy-use to bring in improved health, particularly reduced air pollution.

### ***What is the status of energy scenario in India?***

- Emissions in India were estimated to have grown by 6.3 per cent in 2018, pushed by strong annual economic growth of around 8 per cent.
- According to recent projections by the Global Carbon Project. India was among the four major emitters in 2011 (1 per cent) along with China (27 per cent), the US (15 per cent) and the European Union (10 per cent) and the rest of the world contributed 40 per cent.
- Coal is still the mainstay of Indian economy.
- Though global coal use is lower than its historical high, it is expected to grow in India, driven by growth in energy consumption.
- Its GDP and industrial production would continue to drive electricity demand and the expected electricity generation.
- Crude import is a key factor in India's current account deficit (CAD), which is

currently 49 billion dollars or 1.9 per cent of the Gross Domestic Product (GDP).

- The increasing CAD is a cause of concern for the country and if it crosses the threshold of 3 per cent of the GDP it would badly affect the economic stability.
- Road transport sector accounts for 6.1 per cent of India's Gross Domestic Product (GDP).
- Currently, diesel alone meets an estimated 72 per cent of transportation fuel demand followed by petrol at 23 per cent and balance by other fuels such as CNG, LPG etc. for which the demand has been steadily rising.

### ***What are the measures taken by India in this regard?***

- India has now embarked on a mission to bring down the share of fossil fuel in its energy basket, by tapping non-conventional sources.
- India being the founding nation of International Solar Alliance, has the leverage to switch over to cleaner energies and clean-up its smog-choked cities.
- The National Solar Mission promotes ecologically sustainable growth, while addressing the country's energy security challenge and contribute to global effort to meet climate change.
- India has set an ambitious renewable capacity expansion programme, with a projected growth of achieving 40 per cent of its total power generation from non-fossil fuel sources by 2030, to meet NDC target.



- A sewage treatment plant (STP) launched in Delhi would convert 10 lakh liters of sewage into three tonnes of bio fuel per day.
- A strategy for gradual reduction of import dependency has been initiated, as the country would continue to retain vulnerable to international situations.
- The strategy targets to reduce import dependency by 10 per cent by 2022.
- India's National Mission for Electric Mobility seeks to mitigate the adverse impact of economic development, by completely switching over to electric vehicles by 2030.

### 3. STEPS TO ACHIEVE INDIA'S SOLAR POTENTIAL

#### *What is the status of Solar Power in India?*

- The Indian Government has set the renewable capacity target at 175 GW, to be achieved by the Year 2022, with the highest percentage, 100 GW to be contributed by solar power.
  - The Government has accorded prime focus to this sector, with several initiatives and incentives to attract more players and ramp up capacity.
  - As a result, in the past years, we have already added 28 GW solar capacity while the compound annual growth rate has reached as high as 55 per cent.
  - Launch of the International Solar Alliance, was also a significant step to strengthen the sector.
- By setting up solar parks, providing viability gap funding support and introducing schemes like KUSUM (aiming to harness solar power for agriculture) and SRISTI (catalyzing adoption of rooftop solar solutions), the Government has shown its keenness to fast track growth of solar industry.
  - However, there is room for more strategic interventions to fully realize India's solar potential and plenty of groundwork is needed to help us move closer to the ambitious target of 100 GW solar power capacity by 2022.

#### *What are the areas that need attention?*

- **Technology:** While solar is becoming an important contributor to energy needs in India, there is still a huge gap to be filled.
- Rooftop solar solutions, for example, can add large capacities but certainly need a push from respective state governments.
- Newer advancements in the field like floating solar (solar panels mounted on structures that float on water bodies), and BIPV (wherein the conventional materials used for facades and roofs of buildings are replaced by photovoltaic systems) can play a vital role in increasing capacity.
- Considering the huge potential in the sector, both the Government and private entities must emphasize and support R&D and adoption of latest technology and innovations in this area.
- This will not only help shape the future course but also yield benefits in the form of reduced costs - in turn facilitating



adoption.

- **Policy Push:** Thanks to technology evolution and government policy.
- Solar power tariffs have decreased over the past few years making solar energy more accessible to the common man.
- However, tariff margins discovered in reverse auctions have been pushed lower in recent years leading to a squeeze in Profit margins.
- Considering that tariffs are now significantly lower than other sources of energy, we need to move towards healthier tariffs to help private players work with sustainable business models and attract a higher capital inflow.
- This will eventually lead to augmented supply and further lowering of prices for the common people.
- Respective state governments should also accentuate the rate of solar power generation with regular capacity addition.
- **Discom Health:** Despite the government's initiatives to reinvigorate power distributing companies, the health of state discoms has not improved much over the years.
- These distribution companies form a crucial link in the cycle of energy generation and have an impact on the overall process.
- Hence, maintaining discoms in good shape forms an extremely important link on the road to 2022.
- Steps should be taken to strengthen the discoms such that they are able to support higher tariffs, honour RPOs and settle power producer's dues on time.
- **Financial reforms:** Reforms in the banking sector will go a long way in assisting the renewable energy sector.
- Deeper and diverse bond markets will help in securing the affordable finance for cleaner energy projects in the future.
- The government should continue its mission of cleansing the banking system and help them regularize bad loans while also reviewing lending norms so they are less stringent.
- A healthy banking system will be able to provide more funds at a competitive cost to propel the Renewable sector.
- **Ease of doing Business:** The Government's pursuit of reforms has created a more conducive environment for investments in India, reflected in our steady rise in the rankings of World Bank's Ease of Doing Business rankings.
- However faster processing of approvals for project implementation across the value chain, especially the conversion approvals of land in different states would be of great help to the renewable sector.
- It has been seen that lack of proper power evacuation has resulted in investor disinterest in the past.
- Considering this, the Government should work upon building more robust transmission systems.





- This will not only invest investor faith in the overall process but will also ensure no MW loss / leakage during power distribution.

#### 4. GEOTHERMAL AND OCEAN ENERGY TECHNOLOGIES

##### *What is Ocean Energy?*

- Oceans cover 70 percent of the earth's surface and represent an enormous amount of energy in the form of wave, tidal, marine current and thermal gradient.
- A variety of different technologies are currently under development throughout the world to harness this energy in all its forms.
- Deployment is currently limited but the sector has the potential to grow, fuelling economic growth, reduction of carbon footprint and creating jobs not only along the coasts but also inland along its supply chains.
- As Government of India steps up its effort to reach the objectives to contemplate its Renewable Energy and climate change objectives post 2022, it is opportune to explore all possible avenues to stimulate innovation, create economic growth and new jobs as well as to reduce our carbon footprint.
- India has a long coastline with the estuaries and gulfs.
- MNRE looks over the horizon at development of new technology and considers the various options available to support its deployment.

##### *What is the potential of Ocean energy?*

- Total identified potential of Tidal Energy is about 12455 MW, with potential locations identified at Khambhat & Kutch regions, and large backwaters, where barrage technology could be used.
- The total theoretical potential of wave energy in India along the country's coast is estimated to be about 40,000 MW – these are preliminary estimates. This energy is however less intensive than what is available in more northern and southern latitudes.
- OTEC has a theoretical potential of 180,000 MW in India subject to suitable technological evolution.

##### *What are the technologies of Ocean Energy?*

- **Tidal Energy:** The tidal cycle occurs every 12 hours due to the gravitational force of the moon.
- The difference in water height from low tide and high tide is potential energy.
- Similar to traditional hydropower generated from dams, tidal water can be captured in a barrage across an estuary during high tide and forced through a hydro-turbine during low tide.
- The Gulf of Cambay and the Gulf of Kutch in Gujarat on the west coast have the locations in the country where potential exists.
- **Wave Energy:** Wave energy is generated by the movement of a device either floating on the surface of the ocean or moored to the ocean floor.



- Wave conversion devices that float on the surface have joints hinged together that bend with the waves.
- This kinetic energy pumps fluid through turbines and creates electric power.
- Stationary wave energy conversion devices use pressure fluctuations produced in long tubes from the waves swelling up and down.
- This bobbing motion drives a turbine when critical pressure is reached. Other stationary platforms capture water from waves on their platforms.
- This water is allowed to runoff through narrow pipes that flow through a typical hydraulic turbine.
- **Current Energy:** Marine current is ocean water moving in one direction.
- This ocean current is known as the Gulf Stream.
- Tides also create currents that flow in two directions.
- Kinetic energy can be captured from the Gulf Stream and other tidal currents with submerged turbines that are very similar in appearance to miniature wind turbines.
- Similar to wind turbines, the movement of the marine current moves the rotor blades to generate electric power.
- **Ocean Thermal Energy Conversion (OTEC):** Ocean thermal energy conversion, or OTEC, uses ocean temperature differences from the surface to depths lower than 1,000 meters, to extract energy.
- A temperature difference of only 20°C can yield usable energy.
- Research focuses on two types of OTEC technologies to extract thermal energy and convert it to electric power: closed cycle and open cycle.
- In the closed cycle method, a working fluid, such as ammonia, is pumped through a heat exchanger and vaporized. This vaporized steam runs a turbine.
- The cold water found at the depths of the ocean condenses the vapor back to a fluid where it returns to the heat exchanger.
- In the open cycle system, the warm surface water is pressurized in a vacuum chamber and converted to steam to run the turbine.
- The steam is then condensed using cold ocean water from lower depths.

### **What is Geothermal Energy?**

- Geothermal Energy is heat stored in earth crust and being used for electric generation and also for direct heat application worldwide since beginning of last century.
- USA, Philippines, Indonesia, Turkey, and New Zealand are leading countries availing commercial exploitation with worldwide installation of 12800 MW at end of 2017.
- Geothermal electricity generation is site and technology specific and India is in Low Geothermal Potential Region with



low/medium heat enthalpy.

- Government is planning to encourage the industry lead demonstration projects at the first stage to assess the technical viability of the project before going to the commercial models.

### **What are the different technologies in Geothermal Energy?**

- **Dry Steam Power Plants:** They draw from underground resources of steam.
- The steam is piped directly from underground wells to the power plant, where it is directed into a turbine/generator unit.
- **Flash Steam Power Plants:** They use geothermal reservoirs of water with temperatures greater than 360°F (182°C).
- This very hot water flows up through wells in the ground under its own pressure.
- As it flows upward, the pressure decreases and some of the hot water boils into steam.
- The steam is then separated from the water and used to power a turbine/generator.
- Any leftover water and condensed steam are injected back into the reservoir, making this a sustainable resource.
- **Binary Cycle Power Plants:** They operate on water at lower temperatures of about 225°-360°F (107°-182°C).
- These plants use the heat from the hot water to boil a working fluid, usually an

organic compound with a low boiling point.

- The working fluid is vaporized in a heat exchanger and used to turn a turbine.
- The water is then injected back into the ground to be reheated.
- The water and the working fluid are kept separated during the whole process, so there are little or no air emissions.

## **5. BIOGAS - A STORY UNTOLD**

### **What is Biogas?**

- Bio-gas is produced naturally through a process of anaerobic decomposition from waste / bio-mass sources like agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc.
- After purification, it is compressed and called CBG, which has pure methane content of over 95%.
- Compressed Bio-Gas is exactly similar to the commercially available natural gas in its composition and energy potential.
- With calorific value (~52,000 KJ/kg) and other properties similar to CNG, Compressed Bio-Gas can be used as an alternative, renewable automotive fuel.
- Given the abundance of biomass in the country, Compressed Bio-Gas has the potential to replace CNG in automotive, industrial and commercial uses in the coming years.
- The potential for Compressed Bio-Gas production from various sources in India is estimated at about 62 million tonnes



per annum.

- The 1,500-strong CNG stations network in the country currently serves about 32 lakh gas-based vehicles.

### **What are the benefits of turning agricultural wastes in CBG ?**

- Responsible waste management, reduction in carbon emissions and pollution.
- Additional revenue source for farmers.
- Boost to entrepreneurship, rural economy and employment.
- Support to national commitments in achieving climate change goals.
- Reduction in import of natural gas and crude oil.
- Buffer against crude oil/gas price fluctuations.

### **What are the measures taken by GOI to promote this sector?**

- It is planned to roll out 5,000 Compressed Bio-Gas plants across India in a phased manner, with 250 plants by the year 2020, 1,000 plants by 2022 and 5,000 plants by 2025.
- These plants are expected to produce 15 million tonnes of CBG per annum, which is about 40% of current CNG consumption of 44 million tonnes per annum in the country.
- At an investment of approx. Rs. 1.7 lakh crore, this initiative is expected to generate direct employment for 75,000 people and produce 50 million tonnes of bio-manure for crops.

- The National Policy on Biofuels 2018 emphasises active promotion of advanced bio-fuels, including CBG.
- The Government of India had launched the GOBAR-DHAN (Galvanising Organic Bio-Agro Resources) scheme earlier this year to convert cattle dung and solid waste in farms to CBG and compost.
- The scheme proposes to cover 700 projects across the country in 2018-19.
- The programme will be funded under Solid and Liquid Waste Management (SLWM) component of Swachh Bharat Mission-Gramin (SBM-G) to benefit households in identified villages through Gram Panchayats.
- The Ministry of New and Renewable Energy has notified Central Financial Assistance (CFA) of Rs. 4 crore per 4,800 kg of CBG per day generated from 12,000 cubic metres of biogas per day, with a maximum of Rs.10 crore per project.
- SATAT is an initiative aimed at providing a Sustainable Alternative Towards Affordable Transportation as a developmental effort that would benefit both vehicle-users as well as farmers and entrepreneurs.
- SATAT was launched with a four-pronged agenda of utilizing more than 62 million metric tonnes of waste generated every year in India, cutting down import dependence, supplementing job creation in the country and reducing vehicular emissions and pollution from burning of agricultural / organic waste.