

# E WASTE TO ENERGY POWER PLANTS IN INDIA: ISSUES AND CHALLENGES

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*“With transparency in renewable, the prices of renewable are coming down.” \_Piyush Goyal*

## **Introduction:**

As the world saw industrial revolution in the late 18<sup>th</sup> century, more and more goods were made in industries which increased the electricity consumption so as to grow in the international markets. Therefore many electricity generation units have been setup to meet the needs of the growing industries. One of the most important aspect was the price of electricity, as the industries aimed to compete with the international markets, they were in need of cheap but reliable electricity. These needs were by the abundance of coal, gas and fossil fuels. These resources were proving to be effective but had an adverse effect on the environment instead. Many scientists saw the repercussions of over use of these resources. The environment round thee industries saw a very drastic change. Also the wastes that were generated by the industries was harmful and was let in the river streams nearby, and in open lands which in turn caused health hazards for the people living the in the vicinity.

Energy sector mainly refers to electricity sector and its various other policies. Energy generation in today’s times is very important so as to meet the demands of the households and also the demands of industrial sector so as to facilitate them to compete in the international markets. Another important thing in the energy sector is not only continuous generation of electricity but also supply of electricity at reasonable prices so a major portion of the households can afford it and to give extra advantage to the industrial sector.

In today’s times, there is a lot of demand of everything as all brands have become global and here lies the main issue of waste generation, its segregation and its management in such a way so as to not harm the environment. The supreme court of India has also applied the principles of sustainable development in various cases but in was established in Vellore Citizens Welfare Forum vs. Union of India<sup>1</sup>.

Waste generation is now an important aspect of everyday life which should we dealt in a way that does not harm the environment in any way so as to not only live a pollution free life but also give this opportunity to future generations. Therefore waste management is now an important goal for the governments of all the countries as all the countries in the world are facing the

<sup>1</sup>1996 5 SCC 647

problems of effective waste management. The increasing industrialization, urbanization and changes in the pattern of life, which accompany the process of economic growth, give rise to generation of increasing quantities of wastes leading to increased threats to the environment. In recent years, technologies have been developed that not only help in generating substantial quantity of decentralized energy but also in reducing the quantity of waste for its safe disposal.

The Ministry is promoting all the technology options available for setting up projects for recovery of energy in the form of Biogas/BioCNG/Electricity from agricultural, Industrial and urban wastes of renewable nature such as municipal solid wastes, vegetable and other market wastes, slaughterhouse waste, agricultural residues and industrial/STP wastes & effluents.

Sustainable development mainly refers to development that is not harmful to the environment and to the future generations. It consists of various types of technologies like electric cars, solar energy or basically any renewable energy in consonance with environment protection can be said as sustainable development. Supreme Court of India also stated the importance of sustainable development and polluters pay principle in its various judgment<sup>1</sup>. The principle was first laid down in Stockholm during the convention on environment protection which India is a signatory to and in 1980s, the Indian Judiciary also entertained many PILs on environment protection. Indian Judiciary also recognized “Right to a Wholesome Environment” under the extended interpretation of Article 21 of the Constitution of India.

## **Statement of Problem**

Electricity supply shortage is a very big hurdle in India’s economic and infrastructural development. The elephant in the room that need no address is the waste management which is a concern for not only backward counties but also for developed countries as well. Waste to energy serve both the purposes and seems to be the most developing area of science and technology. Therefore, there is a dire need to frame appropriate laws and their enforcement so as to facilitate the development process. The central government should to make a legislation to specifically deal with waste to energy plants as it has two purposes.

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<sup>1</sup>Narmada BachaoAndolan v. Union of India (2000) 10 SCC 664.

Central government should make appropriate authorities with sufficient knowledge in this sector so as to enable them for faster reconciliation of technologies introduced in waste management, and waste for the right process which if left unattended, has the potential to harm the environment further to such an extent so as to have an irreversible impact.

### **Rationale Behind the Study**

Based on the above discussion, the researcher aims to facilitate the reader to understand the importance of waste management, legal provisions pertaining to it and its present issues and challenges which hinder the development of the country. The researcher also wants to shine light on the shortage of electricity supply in the country, which majorly can be solved by the waste to energy plants. These plants will serve a dual purpose of waste management and will also generate electricity to curb the shortage in supply of electricity. Therefore these kind of projects should be encouraged by the government as will serve a long the development tool for the country.

### **Research Methodology**

The present research work is a work based completely on the doctrinal pattern of research. The topic of the research is a field which is relating to Waste to Energy plants also deals with its issues and challenges for which various drastic steps are being taken by Government of India and also various State Governments. So the research is guided by the information obtained on the basis of various secondary sources like the documentaries, research articles, books etc. though the data consists of most of the information from the secondary sources, the use of various primary sources like International convention and various rules passed by the Ministry of Power (MoP) and Ministry of New and Renewable Energy (mnre) are also referred for assistance. The researcher has also made utilization of the credential databases for collection of credible information so as to satisfy the demands of the research.

In the proposed research an analysis will be done on the basis of the statistical data provided by appropriate authority dealing with Waste to Energy Plants under electricity sector and waste management sector so as to understand the loopholes in the existing mechanism.

## **Research Objectives**

The research would be conducted so as to give suggestions for reforms in the various institutions or authorities under the various rules to reduce the problems of waste management for the people, increase the awareness about waste and its disposal and ways for generation of electricity by waste, etc. The Research objectives are as follows:

- To study and understand legal framework of waste to energy.
- To study the role of appropriate commissions in development of waste to energy plants.
- To discuss in detail the issues and challenges faced by the Governments and appropriate authorities.

## **Research Questions**

In the light of the of the above research objectives, the following are the broad research questions framed by the researcher. They are as follows:

1. What are the various types of wastes and technologies for its effective management?
2. What is the role of CERC and SERC in developing and promoting Waste to Energy power plants?
3. What are the current Issues and Challenges in this sector?

## **Hypothesis**

The provision pertaining to Waste and its management under various Acts and Rules framed by different ministries are not sufficient enough to deal with the new upcoming issues and challenges.

## **Chaperizations**

### **Concept of WtE plants**

Lately due to development of technology and scientific vigor, many ways have been developed by many countries to generate energy from waste disposal. These techniques can go a long way as it will reduce the wastes and also generate power. These techniques have paved a way to a sustainable future so as to help the upcoming generations to meet their needs. As there is an

abundance of waste and its generation, the power supply can increase substantially and the management waste in an effective way.

## Waste

To accomplish the objectives of research we first have to understand what to we mean by waste. Waste is an unavoidable byproduct of human beings in their day to day conduct which is a leftover of the things thrown after use. This waste generation was not a lot during the early times but due to industrialization, and many other aspects, the waste has increased a lot and is now harming the environment we are living in.

## Types of waste

There are different types of wastes generated from human activities in households, industries which contribute to various types of wastes. These different types of wastes are to be managed in a different way so as to have an effective waste management.<sup>2</sup> Therefore classification and segregation of the waste is important to as to its proper treatment. The following are the types of wastes:

- **Organic waste:** this kind of waste is mainly consisted of living organisms which play a certain role in the making of the product. This waste can then be further classified into 2 types i.e. Biodegradable and non-biodegradable. Biodegradable waste is mainly disposed of with other wastes in incarnation but it is also used for composting and making manure out of it. Non-biodegradable waste is mainly not easily compostable to be used in incarnation process with other waste in landfills. Eg cloth etc.
- **Inorganic waste:** It can either be non-hazardous or hazardous in nature. Inorganic non-hazardous waste mainly comes from mining process where its remains are considered waste whereas inorganic hazardous waste is generated during the extraction of specific metals like zinc, copper, uranium etc.
- **E-waste:** It can be understood as a collection of all the waste electronic items that are thrown out of households or industries. Many substances that can cause harm to the environment are all found in the e-wastes if not handled properly. It mainly includes refrigerators, cellular phones, personal stereos, air conditioners, computers, and consumer electronics.

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<sup>2</sup> <https://mnre.gov.in/waste-to-energy/current-status>

- **Combustible and non-combustible wastes:** Wastes which generally have low moisture content and is highly organic is non-combustible waste such as remains of fruits and vegetables, green leaves etc. combustible waste mainly consists of paper, wood, etc which can easily catch fire.
- **Bulky waste:** This kind of waste mainly includes but is not restricted to refrigerators, cupboards, tables, waste cars, and big engines etc, which are now waste to the owner. This kind of waste takes up a lot of space that's why the importance of segregation is highlighted here.
- **Hazardous waste:** This kind of waste can be anything which has the potential of harming the environment in many ways causing to have long term effects on the global environment. This kind of waste does not decompose easily and also has a lot of hazardous substances like chemicals, or certain metals which has a tendency to harm the health of human being by polluting the environment.
- **Municipal Solid Waste (MSW):** is a term usually applied to a heterogeneous collection of wastes produced in urban areas, the nature of which varies from region to region. Solid waste consists of all kind of liquid and non-liquid waste but sometimes nappies and faces of kids can be mixed with solid waste.<sup>3</sup> Today the MSW is a major problem faced by the nations around the world as the process to handle it is very wide and time consuming.

### **Technologies for Waste to energy (WtE):**

- **Biomethanation:** Biomethanation is anaerobic digestion of organic materials which is converted into biogas. Anaerobic digestion (AD) is a bacterial fermentation process that operates without free oxygen and results in a biogas containing mostly methane (~60%), carbon dioxide (~40%) and other gases. Biomethanation has dual benefits. It gives biogas as well as manure as end product. This technology can be conveniently employed in a decentralized manner for biodegradation of segregated organic wet wastes such as wastes from kitchens, canteens, institutions, hotels, and slaughter houses and vegetables markets. The biogas generated from Biomethanation process can be burned directly in a gas boiler/burner to produce heat for thermal application industries and cooking or burnt in a gas engine to produce electricity. Alternatively, the biogas can be cleaned to remove the carbon dioxide and other substances, to produce BioCNG. This can be injected into the national gas grid to be used in the same way as natural gas, or used as a vehicle fuel<sup>4</sup>.

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<sup>3</sup>SnehaMaji, Collaboration of Technology and Law for Solid Waste Management in India,6 INDIAN J.L. & PUB. POL'y 48 (2019).

<sup>4</sup> <https://mnre.gov.in/waste-to-energy/current-status>

- **Incineration:** It is a technique of complete combustion of waste in an environment of less oxygen which causes development of steam which rises up and move the turbine thereby producing electricity. The flue gases produced in the boilers have to be treated by an elaborate air pollution control system. The resultant ash from incineration of solid waste can be used as construction material after necessary processing while the residue can be safely disposed of in a landfill. This technology is well established technology and has been deployed in many projects successfully at commercial level in India to treat solid wastes like Municipal Solid Waste and Industrial solid Waste etc. and generate electricity.<sup>6</sup>
- **Gasification:** It is a process whereby all the carbonaceous elements in Municipal Solid Waste or Liquid waste, or carbon based elements are turned into energy without actually burning it. Instead of burning the waste, the process converts the waste into energy in the form of a gas by a chemical reaction.
- **Thermal Depolymerization:** It is a process which uses hydrous pyrolysis for the reduction of complex organic materials (usually waste products of various sorts, often biomass and plastic) into light crude oil. It mimics the natural geological processes thought to be involved in the production of fossil fuels. Under pressure and heat, long chain polymers of hydrogen, oxygen, and carbon decompose into short-chain petroleum hydrocarbons with a maximum length of around 18 carbons. It is a method of recycling the energy content of organic materials without first removing the water. It can produce liquid fuel, which separates from the water physically without need for drying.<sup>7</sup>
- **Pyrolysis:** It is the thermochemical decomposition of organic material at high temperature and in the absence of oxygen or in an atmosphere of inert gases. In practice, the processes of thermal treatment of waste can operate with a small amount of air present. is most commonly used in the treatment of organic materials. It is one of the processes involved in charring wood. In general, pyrolysis of organic substances produces volatile products and leaves a solid residue enriched in carbon, char.
- **Plasma Arc Gasification:** Plasma gasification is an emerging technology which can process landfill waste to extract commodity recyclables and convert carbon-based materials into fuels. ... Plasma arc processing has been used for years to treat hazardous



<sup>6</sup> <https://en.wikipedia.org/wiki/Incineration>

<sup>7</sup> 52 JILI (2010) 412, Hazardous Substance and Waste Law: Lessons for India

waste, such as incinerator ash and chemical weapons, and convert them into nonhazardous slag.<sup>5</sup>

### **Process of Waste Management:**

This process consists of waste been taken from various public bins, waste collection points established by the Municipality to the waste disposal or waste to energy plants. The person handing over the waste should ensure that the waste is taken by the city authorities, its agents for proper handling of the waste put forth. The process of waste management is generally 4 fold. They are as follows:

- **Generation:** This is the very initial stage where the owner has used the good and collected the waste that is to be discarded. Globally the estimated quantity of wastes generation was 12 billion tones in the year 2002 of which 11 billion tones were industrial wastes and 1.6 billion tones were municipal solid wastes (MSW), about 960 million tons of solid waste is being generated annually as by-products during industrial, mining, municipal, agricultural and other processes. Of this 350 million tones are organic wastes from agricultural sources; 290 million tones are inorganic waste of industrial and mining sectors and 4.5 million tones are hazardous in nature.<sup>6</sup>
- **Storage:** The waste has to be stored somewhere until is it collected for final disposal. The waste is usually stored in drums, waste bins etc. as a storage for the waste so it gets easy for transportation.
- **Collection:** Form where the waste is stored to the place where it is taken for disposal, the step is collection of waste. There are a lot of steps included in the process of collection. From picking up the waste from various public bins to the place of disposal plant, the safe travelling of the waste etc. are some of the processes under collection.
- **Disposal:** As stated above by the researcher, there are various ways to treat different types of wastes. The disposal is the main step in the process of waste management. Proper disposal of such wastes will enable not only present generations but also the future

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<sup>5</sup> [https://en.wikipedia.org/wiki/Plasma\\_gasification](https://en.wikipedia.org/wiki/Plasma_gasification)

<sup>6</sup> Asokan Pappu et al, "Solid wastes generation in India and their recycling potential in building material".

generations to manage their waste and to produce electricity. Disposal of waste can enable

the government to convert energy from other countries waste thereby increasing their own energy sector.

## **Legal Provisions pertaining to renewable energy:**

Renewable sources of electricity are deemed to be the future of the energy sector. The RE sector is developing on a day to day basis as there is a lot of recognition is given to it by the central government. Renewable Energy sector in India has emerged as a significant player in the grid connected power generation capacity. It supports the agenda of sustainable growth, while emerging as a dominant part of the solution to meet the nation's energy needs and an essential player for energy access. Renewable energy has a share of 23.92% in the total installed generation capacity in the country i.e. 373.02 GW (upto 30th September, 2020). Modern renewable energy is not only used in electricity generation – the potential is also great for heating, cooling and transport. India needs a holistic strategy for renewable energy to tap into this potential and to make sure that market development can be beneficial for sustainable development more generally, including local air and water quality. Potential also exists to scale up the use of bioenergy, including Energy-from-Waste (EfW), which requires robust sustainability governance<sup>10</sup>

Indian Renewable Energy Development Agency Limited (IREDA) is a Mini Ratna (Category – I) Government of India enterprise under the administrative control of Ministry of New and Renewable Energy (MNRE). IREDA is a Public Limited Government Company established as a Non-Banking Financial Institution in 1987 engaged in promoting, developing and extending financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation with the motto: “ENERGY FOR EVER”<sup>11</sup>. It was established on March 11<sup>th</sup> 1987 as a ‘Public Financial Institution’ under section 4 ‘A’ of the Companies Act, 1956<sup>12</sup> and registered as Non-Banking Financial Company (NFBC) with Reserve Bank of India

<sup>10</sup> 33<sup>rd</sup> Annual Report 2019-2020, IRDEA<sup>11</sup>

<https://www.ireda.in/background>

<sup>12</sup>4A.Public financial institutions.

(1)Each of the financial institutions specified in this subsection shall be regarded, for the purposes of this Act, as a public financial institution, namely:-

(i)the Industrial Credit and Investment Corporation of India Limited, a company formed and registered under the Indian Companies Act, 1913 (7 of 1913 ); 1. Ins. by Act 65 of 1960, s. 3.

2. Ins. by Act 41 of 1974, s. 3 (w. e. f. 1- 2- 1975).

(RBI). Its mission is to develop and promote self-sustaining power plants with minimum adverse effects on the environment. It also has the powers for investments in these technologies for the better management and production of energy from renewable source of energy. IRDEA is established for various objectives just as:

- Financing, developing and promoting renewable sources of energy,
- Continue to remain a leader in financing renewable energy source projects,
- To increase the share of renewable energy generation in total energy generation,
- To strive for better service of electricity supply to household and industrial sector to compete with the international market.

Other than waste to energy sources of renewable energy, there are many other sources of renewable energy. They are as follows:

- **Solar Energy:** it is the most abundant source of energy as the sun's rays are available everywhere but it is not used to its full potential. It is the most aspired renewable energy as it is available and in renewable and does not have any harmful effects. The only disadvantage is that it takes up a lot of space at it needs solar panels to be set up.
- **Wind Energy:** It is usually generated from for the windmills placed mostly on the places where there is abundant wind flowing which will enhance the energy production. Example mountain top or the open lands where winds can flow easily.

(ii) the Industrial Finance Corporation of India, established under section 3 of the Industrial Finance Corporation Act, 1948 (15 of 1948 );

(iii) the Industrial Development Bank of India, established under section 3 of the Industrial Development Bank of India Act, 1964 (18 of 1964 );(iv)the Life Insurance Corporation of India, established under section 3 of the Life Insurance Corporation Act, 1956 (31 of 1956 );

(v)the Unit Trust of India, established under section 3 of the Unit Trust of India Act, 1963 (52 of 1963 ).

(2) Subject to the provisions of sub-section (1), the Central Government may, by notification in the Official Gazette, specify such other institution as it may think fit to be a public financial institution: Provided that no institution shall be so specified unless-

(i) it has been established or constituted by or under any Central Act, or

(ii) not less than fifty one per cent. of the paid-up share capital of such institution is held or controlled by the Central Government.]

- **Tidal Energy:** These energy is produced by the power of waves from the ocean. This types of energy generation has a lot of disadvantages because of the many whales been splashed up on the beaches may harm the fishes as well as the infrastructure.
- **Hydropower Energy:** This energy is usually generated from dams by installing turbines which rotate due the hydropower which in turn generates electricity. This type of energy generation has a very good prospectus as it is done in a controlled environment and can produce energy on a large scale.
- **Geothermal Energy:** It is an ancient practice of bathing in hot springs. Beneath the earths crust lies enormous amount of heat derived mainly from decay of radioactive elements. A natural flow of energy which reaches the earths surface by induction geothermal energy manifests itself in such a ways as geysers and hot springs<sup>7</sup>.

## Provisions pertaining to Waste to Energy (WtE):

There are various laws in place internationally and throughout the nation for the protection environment and produce energy from waste. Some of them are as follows:

### International Legal Provision:

- **Basel Convention:** The convention was adopted on March 22<sup>nd</sup> 1989, for prohibition of transport of hazardous substances transboundary so as to enable the countries to deal with their own waste rather dumping it upon the some other countries. These actions were mainly carried out by the developed nations i.e. the hazardous substances and wastes were dumped by developed nations on developing nations as their environment laws weren't strict and dumping waste was an easy task as they would do the hazardous waste

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<sup>7</sup>Bluebook 21st ed. S. Ramachandran & R. Ishwar Vidyasagar, Energy Enigma - India's Energy Problems and Efforts for Alternative Energy Sources, 11 INT'L Bus. LAW.19 (1983).

for cheap prices also. The Convention mainly dealt with a written consent from the government of developing country of receiving hazardous substances without any coercion, undue influence, etc. However the convention lacked enforceability as one of the main exporter of the hazardous waste was USA and it was not a signatory to the convention and it was only enforceable on the signatory members of the convention. Hence the convention went unenforceable, or not fully enforceable. The main object of the convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” - household waste and incinerator ash.<sup>8</sup> The Convention also provides for the establishment of regional or sub-regional centers for training and technology transfers regarding the management of hazardous wastes and other wastes and the minimization of their generation to cater to the specific needs of different regions and sub regions (article 14). Fourteen such centers have been established. They carry out training and capacity building activities in the regions.<sup>9</sup>

### **Legal Provisions in India:**

There are various laws that talk about environment protection, management of hazardous substances, production of energy from waste etc. they are as follows:

- **Environment Protection Act, 1986:** The Act specifically provides for improvement, protection and conservation of environment. The act establishes a legal framework for protection, planning and implementations of the scheme for environment throughout the country. The act is a kind of an umbrella legislation as the authorities established under this act has the powers for other acts such as water pollution act, noise pollution act, and air pollution act because the term “environment” under sec 2(a)<sup>10</sup> has a wide connotations such as land, water, air and living creatures. The authorities established under the act have the power to take action for upgradation, improvement of the environmental standards for the citizens health. The authorities established also have the power to punish the polluters

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<sup>8</sup> <http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx>

<sup>9</sup> <http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx>

<sup>10</sup> <https://www.mondaq.com/india/waste-management/624836/environment-laws-in-india>

buy paying the fine for pollution as well an compensatory amount for restoration of the environment.

- **Hazardous Wastes (Management, Handling and Transboundary) Rules, 2008:** Every person in generation, storage, collection, disposal, sale and purchase of hazardous waste shall require to collect a licensee or authorization from the state control board to handle, manage, disposal of hazardous substance in an environmentally sound manner i.e. not to harm the environment in any manner. Hazardous substances which by its means of being or containing chemical, reactive, toxic, combustible substances that's are harmful for the environment in many ways and its proper disposal is important so as to serve the greater good is highly important. Example: e- waste
- **Biomedical Waste (Management and Handling) Rules, 1998:** the rules covers the biomedical waste generated by clinics, hospitals, medical colleges etc. These wastes are to be separated from other wastes. The biomedical waste should be segregated at the point of its generation into containers/bags before its storage, collection, treatment and proper disposal. The rules were formulated along parallel lines, for proper disposal, segregation, transport, etc, of infectious wastes.
- **Municipal Solid Wastes (Management and Handling) Rules, 2000:** The present rules aims at enabling the municipalities to collect wastes from its jurisdiction in proper way and dispose it in a scientific manner which will not harm the environment. Although the municipalities have not been able to carry out this function effectively stating that due to lack of financial assistance, the function is not being able to carry out effectively.
- **E - Waste (Management and Handling) Rules, 2011:** The rule deals with effective handling of the e- waste by properly channelizing the e- waste and the hazardous substances it contained to proper disposal which will be environmentally sound. As the electronic equipments are used extensively in todays digital era, they are being produced on a large scale to meet the demands of the people. This leads to waste generation as the older version are been discarded by the people as them being older versions.The Rules apply to every producer, consumer or bulk consumer, collection center, dismantler and recycler of e-waste involved in the manufacture, sale, and purchase and processing of electrical and electronic equipment or components as detailed in the Rules.

- **THE PLASTIC WASTE (MANAGEMENT AND HANDLING) RULES, 2011:** The plastic means or essentially contains high polymers which are usually not disposed of easily. The act makes it obligatory for the municipal authority to assist and coordination of the process of waste management for safe disposal of the same under the provision of section-6 of the rules. The act states the types plastic bags to be used i.e. over 40 microns. The new amendment in the rules recognizes the importance of plastic waste pickers and give them a statutory status.

## **Role of CERC and SERC in promoting Waste to energy Plants:**

Electricity is stated under entry no. 38 under the concurrent list of the Constitution of India and therefore both, central and state governments have been given powers under the Electricity Act, 2003 to legislate matters relating to electricity. Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commission (SERC) are established under section 76 and section 82 respectively of the Electricity Act, 2003. CERC and SERC have been given wide powers to draft rules or legislate on various issues so as to find a definitive solution to a problem.

CERC have made rules pertaining to renewable energy specifically known as CERC(Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017<sup>11</sup> (Herein referred to as rules) in exercise of powers conferred under Section 61 read with Section 178 (2)(s) of the Electricity Act, 2003. The rules deals with tariff determination of various renewable energy project so as to have uniformity throughout the country. The rules have been made on April 17<sup>th</sup> 2017 and has come into force on 1.4.2017 and shall be in force for a periods of 3 years unless reviewed or extended by the commission. The rules defines MSW under section 2(p)<sup>12</sup> and also gives its useful life under section 2 (cc)<sup>13</sup>. The rules gives the eligibility criteria for each renewable energy source and also provides with tariff determination of each

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<sup>11</sup>1/21/2017-Reg.Aff./(RE-Tariff - 2017-20)/CERC

<sup>12</sup> Municipal solid waste' or 'MSW' means and includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated biomedical wastes.

<sup>13</sup> 'Useful Life' in relation to a unit of a generating station including evacuation system shall mean the following duration from the date of commercial operation (COD) of such generation facility, namely:- (e) Municipal Solid Waste (MSW)/ and Refuse Derived Fuel (RDF) based power project 20 years

renewable source separately. The main feature of the rules is that it specifies technology specific parameters and deals with MSW in great detail under chapter 11 of the rules.

Each state government has the power to establish its own State Electricity Regulatory Commission (SERC). The research paper will mainly deal with Maharashtra Electricity Regulatory Commission (MERC) and its rules pertaining to renewable sources. MERC has legislated its own rules known as Maharashtra Electricity Regulatory Commission (Terms and Conditions for Determination of Renewable Energy Tariff) Regulations, 2019 (Herein referred to as MERC rules) to deal matters pertaining to renewable source of electricity. The present MERC rules is on the lines of the rules drafted by CERC. MERC has legislated these rules in exercise of the powers conferred under Sections 61, 66 and 86 read with Section 181 of the Electricity Act, 2003. The MERC rules does not properly define the Waste to energy plants but gives power to MERC to deal with establishments of such plants on a case to case basis which facilitate MERC an in-depth knowledge about the power plant and its contents. These MERC rules were criticized initially because of this power stating that it will increase corruption. MERC had made these rules initially in 2010, and later brought its first amendment in 2017. But later MERC felt the need to legislate absolutely new laws and so were been legislated in 2019.

### **Issues and Challenges in Waste to Energy Power Plants:**

In the modern dynamic world, due to over pollution and due to increase in human greed, a lot of waste is generated by human being. As there is lack in education about the waste, the people tend to mix wastes, throw it on the streets, etc which can be harmful for the environment and indirectly harming the human beings health. There were various challenges faced by the state pollution control board while dealing with waste. They are as follows:

- **Lack of awareness:** There is a lack of awareness among the citizens regarding generation of waste, segregation of waste and which waste is hazardous in nature. This leads to mixture of waste which leads to improper disposal and have harmful effects over the environment indirectly harming the human health. The people also throw the waste on the side roads which remains unprocessed and causes harmful diseases by attracting various insects. This lack of awareness in protection of environment, and disposal of waste leads



to problems for the authorities because after all the people working are also human and cannot go in every nook and corner to look for waste. There should be an awareness among the citizens for proper disposal, collection and treatment of the waste so as to enable them to live in a pollution free environment.

- **Lack of Infrastructure:** There is a lack of infrastructure which the state pollution control board for not only disposal of waste but also for the collection and transportation of the waste as there is lack of financial assistance. There is a shortage of bins and plastics bags for the bins to be placed at public places for the disposal. And if there are bins kept for the disposal of waste, there is no timely collection of that waste by the authorities due to lack of availability and quality of vehicles for the collection and transportation of waste to disposal site from the collection places. Then there is lack of proper machines to carry out Incineration or for biomethanation which causes difficulties for the authorities, there is lack of protective gears for the workers working the management of hazardous substances and therefore faces a lot of direct exposure to these substances causing various disease like cancer.
- **Lack of capital investment:** There is a lack of investment by the private sector in setting up waste to energy plants because there is not very development in the process of waste to energy. There is lack of governmental support for such projects according to the private sector. The government should take initiatives for development of such plants as they are in a dominant position for investment in such type of technologies.
- **Expensive Setting up of plants:** The waste to energy plants goes not come cheap as is a renewable source of energy. The government should give incentives to the private investments as they bring a change in the cycle of energy generation. The waste to energy plants has two fold purpose i.e. to deal with wastes and produce energy for usage. Therefore private investments should be encouraged by the by the government which will bring competition to the market and the standard of performance of the energy sector will increase.
- **Lack of appropriate laws:** There is a lack in making laws that will encourage the private investments for the waste to energy sector. The government should pass such laws to give incentives, subsidies and feed-in tariff to the people practicing hence bring down its costs and encouraging more private players into this field.

- **Need of more scientific vigor:** The Government should promote more new technologies for the waste to energy plants as that will help to give private sector more viable options and decrease the costs of the machinery that was to be imported from foreign countries. As more and more development is made in the technological field for waste to energy plants, it will attract more private investment enabling them to produce more energy, thereby reducing the power deficit of the country.

## **Conclusion:**

Waste to Energy (WtE) is a renewable source of energy as waste is an unavoidable byproduct of human activities. Waste to energy power plants for their machinery are very useful for the development of a sustainable future as it fulfils dual purpose of managing wastes and also producing electricity thereby reducing the energy deficit of country for its better standard of performance. Waste to energy are seemed as a very good prospectus by the various governments as it solves the problem of waste and produces electricity which nations are thinking as a booming business to sell electricity. There are various laws in place internationally and in India for proper waste management as it is perceived the only way the human civilization can continue to live. Presently there are many through which waste can be handled which also generates energy in return. These ways are different for different types of wastes. Hazardous substances and wastes have a long term effect over the environment and therefore their management is of at most importance. The waste is first generated at either households in urban or rural places and is then stored in the bins nearby as set designation were the waste accumulates. From there the waste is collected by the concerned authorities (in this case state pollution control board) and takes it to the site for proper disposal or it sent to landfills to be stored for the time being.

All the nations throughout the world see waste to energy as a golden opportunity as it serves a dual process. India is not very far behind the European nations as they are considered as frontrunners in this service. Indian authorities and government are trying their level best to increase the waste management plants nut face a lot for problems. The main issue is segregation

of waste which is caused by the lack of awareness among the citizens regarding the dumping of waste in a manner so as to facilitate the authorities to get the job done speedily.

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