ELECTRICITY GENERATION AND SUSTAINABLE DEVELOPMENT.

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Abstract

The objective of our research study is to analyse the generation of electricity, its increasing demand, depletion of fossil fuels and a solution to take a step towards using green energy sources. This article mainly focuses on the production by different sources, energy consumption in various sectors and challenges and opportunities for power generating companies.

The data used in the article is secondary data, sourced from various trusted websites.

The focus of the article is on the challenges faced by the energy producers because of the depletion of fossil fuels and an opportunity for them to switch to producing electricity by using renewable resources.

Keywords

Electricity, Sustainability, Renewable, Non-Renewable.

Introduction

Electricity is the key factor in the development of any country, it would be better if done sustainably. India stands at no. 3 position in list of world's largest producer and consumer of electricity across the world.

Currently major part of electricity is produced by using non-renewable resources, out of which coal is the widely source. Electricity production when done by using NRES like coal, which releases a lot of exhaust in the air, is highly dangerous for surrounding regions and the environment as a whole.

As per the recent trends, the demand for electricity has been rising rapidly because of reasons like improved technology and also increasing human needs.

Electricity generation by using renewable resources like solar power, wind energy, hydro-electric energy etc. can be helpful for matching the demand levels. Not only the demands can be easily satisfied, but it would also help in reducing the rate at which global warming is taking place.

Currently domestic, commercial and agricultural sectors consume most of the electricity produced. The domestic sector includes usage of electricity in households, residential areas and buildings like shops, schools and hospitals. The commercial sector includes consumption in the industries and commercial sites. And the agricultural sector includes electric water pumps/motors to irrigate the land. A few years ago, electricity in transportation sector was only used in railways, but with the rise of EV industry there is a potential demand of electricity in the transportation sector in the upcoming days.

Main body

1. **India and energy production: -**

    India ranks no.3 in the list of largest producer of electricity across the world [1] (in the year 2019): -

    1. China- 7503 TWh.
    2. USA- 4401 TWh.

3. India- 1559 TWh.

Production by different sectors [2]: -

Till 31.03.2022 the total generation capacity that has been installed is,

Table 1

Sector	MW	% of Total
Central Sector	99,005	24.8%
State Sector	1,04,855	26.2%
Private Sector	1,95,637	49.0%
Total	**3,99,497**	**100.0%**

The above table represents the production of electricity by different production sectors.

Central sector involves the electricity generating companies which are owned by Central govt. of India. This sector alone has percentage share of 24.8 % of the total production in India. NHPC and NTPC are the two main companies. National Hydroelectric Power Corporation (NHPC), National Thermal Power Corporation(NTPC).

State sector involves the electricity generating companies owned by the different states of the country. This sector has a percentage share of 26.2%, which is combined figure of all the state electricity corporations across the country.

Private sectors have different electricity companies which are not public undertakings. These companies jointly hold a percentage share of 49% of total electricity produced in India. Few major producers are Tata Power Ltd., Adani Power Ltd., JSW Energy Ltd.

Production by different sources [3]: -

Till 31.03.2022 the total generation capacity that has been installed is(fuel wise),

Table 2

CATEGORY	INSTALLED GENERATION CAPACITY(MW)	% of SHARE IN Total
Fossil Fuels:		
Coal	2,04,080	51.1%
Lignite	6,620	1.7%
Gas	24,900	6.3%
Diesel	510	0.1%
Total Fossil Fuels	2,36,109	59.1%
Non-Fossil Fuel:		
RES (Incl. Hydro)	1,56,608	39.2%
Hydro	46,723	11.7%
Wind	40,358	10.1%
Solar	53,997	13.5%
BM Power/Cogen	10,206	2.6%
Waste to energy	477	0.1%
Small Hydro Power	4,849	1.2%
Nuclear	6,780	1.7%
Total Non-Fossil Fuel	1,63,388	40.9%
Total Installed Capacity	3,99,497	100%

Table 2 depicts the amount of electricity produced using different sources. It can be seen that there are two types of resources, one is renewable resources and the other is non-renewable resources. Renewable resources are those resources which can be used and they do not deplete. Wind energy, hydro-energy and solar energy are most commonly known renewable energy sources. Non-renewable resources are those which can be used only once and deplete with usage. Non-renewable resources

include fossil fuels such as coal, lignite, natural gas, etc. and non-fossil fuel i.e., nuclear energy.

Coal alone contributes 51.1% of the total electricity production. This shows the dependency of electricity producers on coal, which is a non-renewable resource. Total 60.8% (including 1.7 % of nuclear energy) electricity in the country is produced by non-renewable resources.

And the production using renewable energy resources is only 39.2%. Wind energy, solar energy and hydro energy contributes 35.3% out of 39.2%, which shows very poor production by BM energy and the Waste.

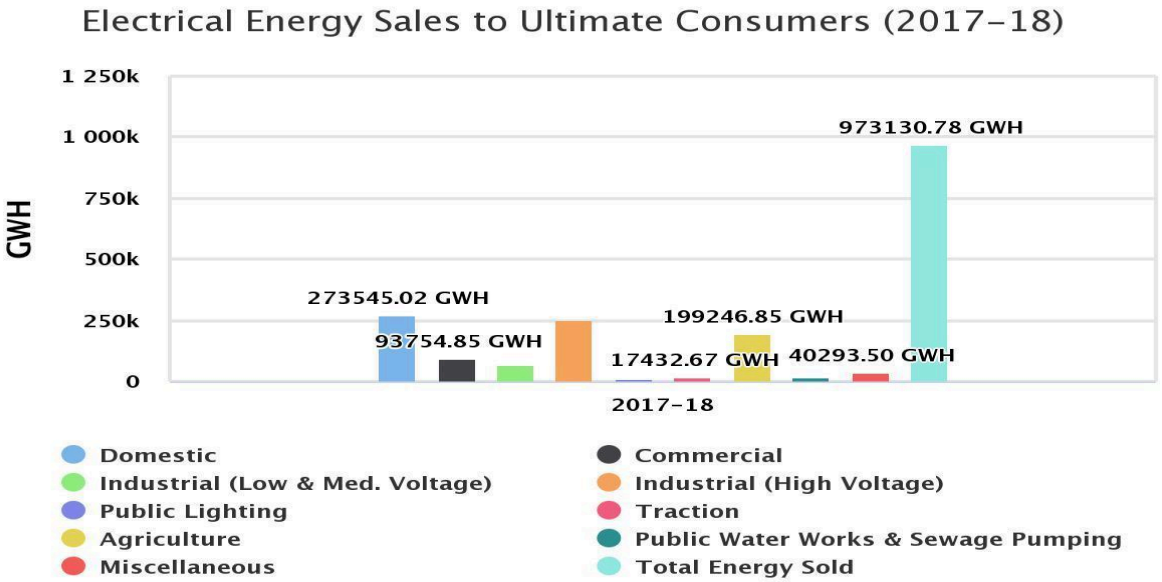
This dependency on NRES has to be reduced without sacrificing the demand for 0electricity. This can be done by increasing the production by using RES.

2. **India's energy consumption: -**

   India stands at no.3 position in the list of largest electricity consumers globally [4] (in the year 2019): -

   1. China- 83,12,800 GWh.
   2. USA- 39,89,566 GWh.
   3. India- 13,83,416 GWh.

   The energy consumption distribution [5] of 2017-2018 period is as follows,



The above graph depicts the demand of electricity in different sectors: -

The total demand of electricity in India for the FY 2017-2018 is 973.1 TWh and in the year 2019 the demand went up to 1383.4 TWh. The demand can be seen increasing with a very high rate with percentage of 142%.

The highest demand is in the domestic sector. This demand comes from households and residential areas. This becomes 28.1% of the total demand.

The other big sectors are industrial sector and agricultural sector.

Traction sector involves the electricity used in railways. This can be considered as transportation sector. From past few years, electric vehicles are becoming more popular. With this, the demand for electricity in traction sector will increase.

3. Which companies are leading in energy production?

a) By Renewable Energy Sources(RES): - Tata Power Ltd. is the part of Tata conglomerate businesses.

Tata Power Solar Systems Ltd. is the biggest energy producer by Renewable Energy Sources(RES).

Tata Power is currently producing 12.8 GW and 3.9 GW out of that is from renewable sources i.e. green energy. Tata claims to increase green energy production to 80% of its total production by 2030. [6]

b) By Non-Renewable Energy Source(NRES): - Adani Power Ltd. is a part of Adani group of industries.

Adani Power Limited generates electricity using coal based thermal power plants and is also involved in coal trading. The company has four major plants, which have capacities of 4,620 MW, 3,300 MW, 1,320 MW and 1200 MW at Mundra, Tiroda, Kawa and Udupi respectively and a 40 MW of green energy plant at Kutch. As it can be seen that Adani Power produces only 40MW of electricity by using i.e. RES, which becomes 0.38% of this company’s total production. [7]

Challenges and opportunities for the businesses:

Electricity demand is increasing rapidly, which as observed above, with a percentage of 142%. There is more potential in the demand increase and the major rising demand is expected from Electric Vehicles(EV) industry. Few other sectors which have great potential for electricity demand are chemical and metal industry, agricultural sector and construction industry.

Most of the production is dependent on Non-Renewable Resources (refer table no 2), but fossil fuels are depleting at higher rate, which may create scarcity of resources for energy production in future. In the past few months there has been a scarcity of coals across the country and this creates a shortage in the supply of the electricity, but the demand is ever rising. This all has forced for the price hike of electricity in the recent months.

By using NRES for electricity generation the companies will fail to contribute in the sustainable development of the country. The companies will be unable to give back to the society, which is one of the important aspects an organisation which functions across the entire country (this applies to both private companies and public undertakings).

There are various opportunities for the businesses to overcome these challenges and fight depletion of fossil fuels and also contribute to the society with sustainable development.

Businesses can use RES for electricity production at different sites: - Households, Educational institutions, Hospitals, Fields, Street lights, Commercial sites like Stadiums which have huge rooftops. These sites can be used as solar rooftops.

As mentioned earlier, rising EV industry gives an opportunity for these companies to earn by transmission of electricity in different regions and setup electric charging stations. This has already started in metro cities.

Conclusion:

Electricity is an essential part of everyday life as well as important for the industries to function. With the ever-increasing human population, needs of human beings and the advancements in technologies, the demand is also growing.

The boosting demand of electricity brings many challenges as mentioned above and also it brings good opportunity for energy producers to increase their production capacities. This demand can be met by generating electricity from RES. Production by RES promotes sustainable development. Companies must focus on switching from NRES to RES production method. This diversification can help to manage the scarcity of fossil fuels and fight the depletion of fossil fuels. Renewable resources are one of the best ways for sustainable development.

References:

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