Notes

18

MINERAL AND ENERGY RESOURCES

In the previous lesson you learned about the agricultural resources of India and how it is providing food security to its people. Prosperity of a country is based on the availability of resources. You have also learned how India is rich in its natural resources. The development of a country can not be imagined without optimum use of resources. The resources may be of various kinds. Minerals like land and water are invaluable treasures of the earth. Without these resources, we cannot think of industrialisation and hence the development of our economy. The social and economic development of a nation depends on its capacity to utilise its natural resources, reducing the misuse to the extent possible. The most important characteristics of minerals which have bearing on our present and future well-being is that they are not permanent and can disappear with time after use. These resources are non-renewable. Therefore, there is now more emphasis on judicious use of these resources to conserve and to recycle them.

In this lesson, you will study some of the important minerals and energy resources, their significance and distribution along with the need and way of conservation.

OUTCOMES

After studying this lesson, learner:

- states the significance of mineral and energy resources in the national economy;
- describes the spatial distribution of different types of mineral resources;
- differentiates between conventional and non-conventional energy resources;
- describes the spatial distribution of different types of energy resources and
- asseses the development of non-conventional energy resources.

Notes

18.1 MINERAL AND ENERGY RESOURCES: SIGNIFICANCE AND ROLE IN ECONOMY

India is rich in minerals possessing diverse varieties of minerals. But do you know that all minerals are not economically significant. Out of these minerals, about 30 minerals have economic significance. Some of the major minerals are iron ore, coal, manganese, bauxite, mica etc. Felspar, florides, lime- stones, dolomite and gypsum etc are some other important minerals. But there are some minerals which are not abundant in India i.e. petroleum and some non-ferrous metallic minerals especially copper, lead, zinc, tin and graphite. Country fulfils internal demands for these minerals by importing them from other countries.

Before independence, India was least industrialised if we talk about the modern industries and these minerals were less in demand. Hence, most of the minerals were exported during the British period. After independence, situations begin to change. However, the exports of these minerals were continued but also mineral production has picked up in consonance with the increasing industrial demands in the country.

India produces more than 90 minerals, which are suitable for the growth of the country. The total value of all minerals produced in the country in 1950-51 was Rs 892 million. We have seen multiple times growth in the production and utilisation of minerals in the last 75 years after independence. As per the Annual Report- 2021-22 of Ministry of Mine, Govt. of India, the total value of minerals produced (excluding atomic, fuel minerals and minor minerals) during 2021-22 was estimated at Rs.1,90,389 crores. Out of this total estimated value, 55.2% was from metallic minerals and 44.8 were from non-metallic minerals.

In metallic mineral category, iron ore, chromite, manganese, zinc, bauxite, copper, gold are important minerals whereas in non-metallic category lime- stone, phosphorite, dolomite, kaolin, magnesite, barytes and gypsum are important. India's contribution in the production of these minerals in the world is also significant as it holds very high ranks in world order. For example India ranks 3rd in Chromite, 5th in Bauxite, 4th in Iron ore, 7th in manganese ore and the list goes on. The huge reserves and production in big quantities has made India self-sufficient or partially self-sufficient in many minerals. For example, in the year 2019-20 India was self-sufficient in bauxite, chromite, iron ore, limestone and sillimanite. While in some minerals it was not totally self-sufficient and the remaining portion was imported. For example, we were 75% self-reliant in magnesite, 15% in rock phosphate and 51% manganese ore and remaining percentages were imported. The availability of these resources has helped in the growth of industry. Iron and steel Industries, petroleum industry, fertilisers industry, aluminium industry etc. has grown tremendously by using these resources. But in certain cases if minerals are imported then a large amount of foreign reserves are spent on such imports. India expends a huge amount on petroleum products as its reserves are not sufficient in India. The availability and concentration of these minerals also influence the concentration of industries in any specific area.

Notes

The same was with energy resources. Energy resources are the fuel for the development of any country. It may have varied form as per the utilisation. With changes and development in technologies, the form of energy has also been changed. It is useful for day to day life and we can not think about industrial development without optimum availability of energy resources. The total installed power generation capacity of India in 2022 was 410,339 MW. It includes 2,35,809 MW (57.5%) from fossil fuels and 1,74,530 MW (42.5%) from non-fossil fuels.

Till now we have discussed in detail about the minerals and energy resources that are found in our country and how they are significant to our economic growth. In the next section, we will find out their geographical distribution.

INTEXT QUESTIONS 18.1

1. The value of minerals produces in 1950-51 was:

   a. Rs 756 million

   b. Rs 852 million

   c. Rs 892 million

   d. Rs 1050 million

2. What was India's installed power generation capacity in 2022 ?

   a. 510,330 MW

   b. 410,339 MW

   c. 673,545 MW

   d. 234,534 MW

3. In which of the following minerals, India is not self - sufficient?

   a. Rock phosphate

   b. Bauxite

   c. Chromite

   d. Iron ore

18.2 SPATIAL DISTRIBUTION OF MAJOR MINERALS

If you observe the distribution of mineral and energy resources, you will find that they are not equally distributed. The reason behind it is that these are associated with certain types of

Notes

geological formation. For example, coal deposits are mostly associated with the Gondwana system while major metallic minerals are found in the area of Dharwad and Cuddapah. Most of the mineral bearing states are located in the peninsular plateau region of India. We can find three specific belts of mineral distribution in peninsular plateau region:

- **The North eastern plateaus:** It covers chota nagpur plateau, Odisha plateau and eastern Andhra plateau. This belt contains rich deposits of a variety of minerals, especially used for metallurgical industries. Prominent minerals that are large and widely distributed are iron ore, manganese, mica, bauxite, limestone, dolomite etc. This region also has rich deposits of coal, along the river valleys of Damodar, Mahanadi, Son etc. This region also has substantial deposits of copper, uranium, thorium, phosphate etc.
- **South-western plateaus:** This region extends over Karnataka plateau and adjoining Tamil Nadu plateau and is rich in metallic minerals particularly in iron ore, manganese and bauxite and in some non-metallic minerals. All the three gold mines of India are found in this region. However, coal is not found in this plateau region.
- **North-western region:** This belt extends from the gulf of Khambhat in Gujarat to the Aravalli range in Rajasthan. Petroleum and natural gas are principal resources of this belt. Deposits of other minerals are small and scattered. However, it is known for reserves and production of several non-ferrous metals particularly copper, silver, lead, and Zinc.

Minerals are broadly divided into two groups metallic and non-metallic minerals. Metallic minerals are further subdivided into ferrous and non ferrous minerals. Let's find some of the important minerals of India, their occurrence and distribution.

A. Metallic Minerals

The minerals under this category sufficiently contain metal content. It can be further subdivided into ferrous metallic and ferrous non-metallic minerals.

a. Ferrous Metallic Minerals: Ferrous minerals constitute one of the most important mineral groups. Iron, manganese, chromite, pyrite etc are included in this category. These minerals provide a strong base for the development of metallurgical industries, particularly iron, steel and alloys.

i. Iron Ore: India has vast reserves of good quality iron ore and comes among the one of the top countries of the world. It is estimated that India possesses over 20 percent of the world's total reserves of iron ore. The quality of ore found in India is very high, containing above 60% iron content.

Notes

India's reserves contain three types of iron ore- Haematite, magnetite and limonite. Haematite ore, referred to as 'red ore' due to its red colour, contains up to 68 percent of iron. The magnetite ore with dark brown to blackish in colour, and often referred as 'black ores' contains up to 60 percent of the iron. Third one is limonite which has an iron content of 35-50 percent and is yellow in colour.

DO YOU KNOW?

The classification of reserves/resources of various minerals is mostly based on United Nations Framework Classification (UNFC) and was done in April, 2010. It consist of three dimensional system with three axes - economic viability, possibility assessment and geological assessment.

As per UNFC system total estimated resources of hematite (as of 2015) are estimated at 22,487 million tonnes which includes 5442 million tonnes as reserve category while balance 17,045 million tonnes are under the remaining category. Another main iron ore is magnetite, which has a total resource of 10,789 million tonnes. Out of this resource 53 million tonnes is under reserve category while 10,736 million tonnes are under the remaining category. India was the 4th major iron ore producing country of the world in the year 2019-20 and its contribution was 8.09% of the total world's production.

Table 18.1 Production of iron ore in India

Year	Production (In million tonnes)
1950-51	3.0
1960-61	11.0
1970- 71	32.5
1980-81	42.2
1990-91	53.7
2004-05	140.46
2019-20*	246.0

* - As per Annual Report- 2021-22, Ministry of Mines, Govt. of India

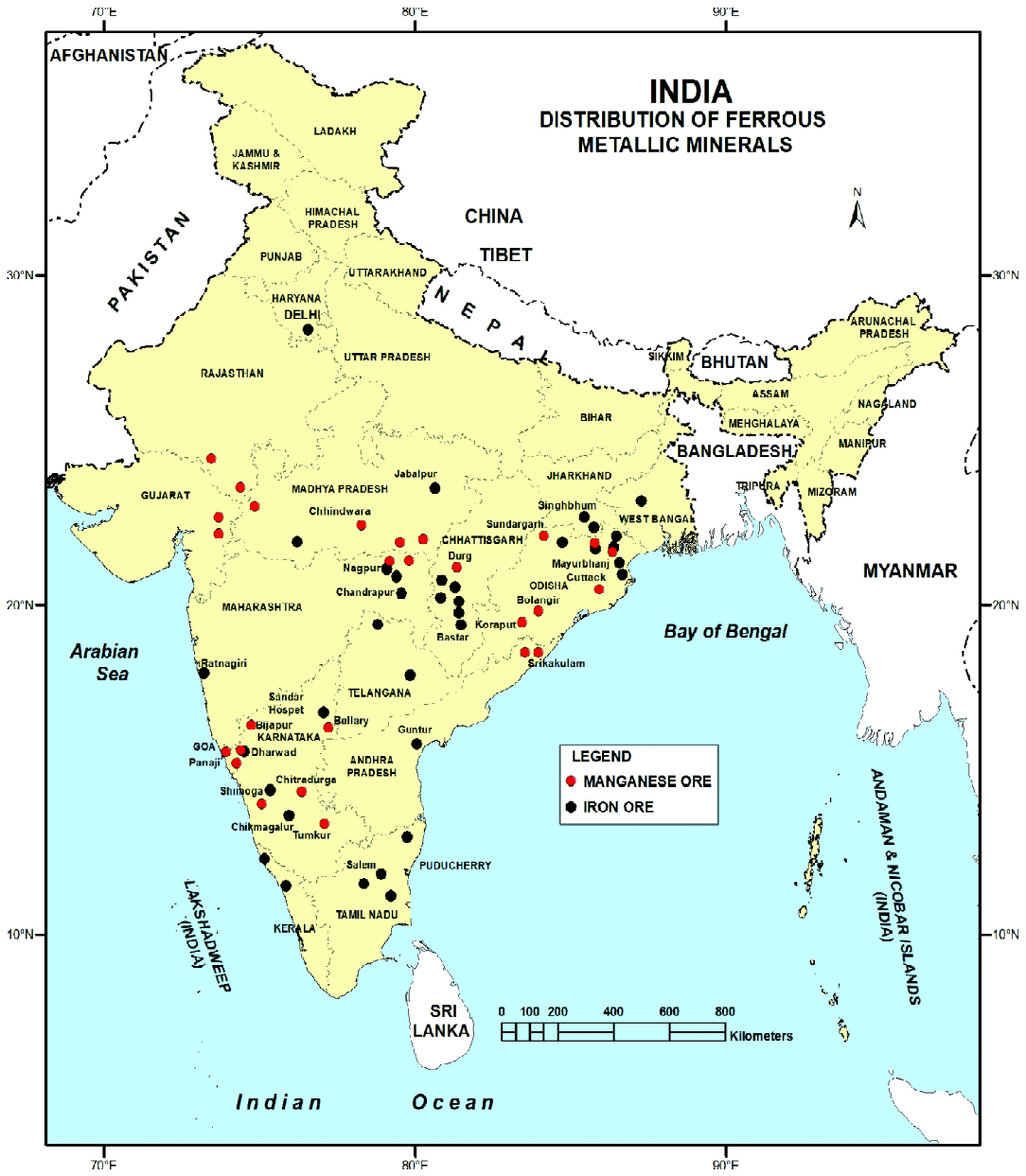


Fig. 18.1 INDIA : Distribution of ferrus metalic minerals

Distribution

We can find Iron ore deposits in almost every state of India. However, 96 percent of the total reserves are in Odisha, Jharkhand, Chhattisgarh, Karnataka and Goa. These states also account for 96 percent of the total production of iron ore in the country. About 3 percent of the country's total production comes from Tamil Nadu, Maharashtra and Andhra Pradesh.

Odisha and Jharkhand together possess about 50 percent of India's reserves of high-grade iron ore. The principal deposits are located in Sundargarh, Mayurbhanj and Keonjhar districts of Odisha and Singhbhum district of Jharkhand. The other important states are - Assam, Bihar, Madhya Pradesh, Meghalaya, Rajasthan and Uttar Pradesh.

Notes

ii. **Manganese Ore:** India ranks seventh (in 2019) in the production of manganese ore in the world contributing 5.13% of world's total production. A large part of the total production of India exported.

Manganese ore is an important ingredient for the manufacture of iron and steel. It is also extensively used for manufacturing dry batteries, in photography, leather and match industries. About 85 percent of total manganese consumption in India is used by metallurgical industries.

Distribution

The important areas of production are in Odisha, Madhya Pradesh, Maharashtra, Karnataka and Andhra Pradesh. Over 78 percent of total reserves of manganese ore of India occur in a belt stretching from Nagpur and Bhandara districts of Maharashtra to Balaghat and Chhindwara district of Madhya Pradesh. But these two states contribute only 12 and 14 percent of total production respectively. The remaining 22 percent of reserves are distributed in Odisha, Karnataka, Gujarat, Rajasthan, Goa and Andhra Pradesh.

b. **Non-Ferrous Metallic Minerals:** The second category of minerals are Non ferrous minerals. These minerals do not contain iron. Gold, silver, copper, tin, lead, zinc etc. are some of the important non ferrous minerals. These metallic minerals are highly important in day to day life. However, India is quite deficient in such minerals

i. **Bauxite:** Bauxite is a non-ferrous metallic mineral. It is the ore from which aluminium metal is produced. India's resources of bauxite are sufficient to keep the country self-reliant. Aluminium extracted from the ore is used in making aeroplanes, electrical appliances and goods, household fittings, utensils etc. Bauxite is also used for manufacturing of white colour cement and certain chemicals. India's resources of bauxite of all grades have been estimated at 3,897 million tonnes (in 2015).

Table 18.2 Production of Bauxite in India

Year	Production (in thousand tonnes)
1951	68.1
1961	475.9
1971	1,517.1
1981	1,954.6

1991	4,977.0
2004-2005	11598.0
2019-20*	21,824.0

* - As per Annual Report- 2021-22, Ministry of Mines, Govt. of India

Distribution

Bauxite has a wide occurrence in the country. Major reserves occur in Jharkhand, Maharashtra, Madhya Pradesh, Chhattisgarh, Gujarat, Karnataka, Tamil Nadu, Goa and Uttar Pradesh.

India exports bauxite to a number of countries. The leading importer of Indian bauxite is Italy, followed by the U.K., Germany and Japan.

Fig. 18.2 INDIA : Distribution of Bauxite ore

B. Non-metallic Minerals

India is also rich in non-metallic minerals as many are found in India. However, only a few of these are commercially important. Some of the important non-metallic minerals are limestone, dolomite, mica, kyanite, sillimanite, gypsum and phosphate. These minerals are used in a variety of industries such as cement, fertilisers and electrical goods. In this lesson we will be studying about mica and limestone. Lets learn about some of the important non-metallic minerals:

i. **Mica :** India is the leading producer in sheet mica. It was one of the indispensable minerals used in electrical and electronic industries till recently. As estimated in 2015, the total resource of mica in the country is 635,302 tonnes.

Distribution

Although mica is widely distributed, workable deposits occur in three principle belts. Andhra Pradesh has the highest share of mica resources with 40% followed by Rajasthan, Odisha, Maharashtra, Bihar, Jharkhand and Telangana.

ii. **Limestone:** Limestone is useful in a wide range of industries. Approximately two thirds of the country's total consumption is used in the cement industry. Iron and steel industry, chemical industries, sugar, paper, fertilisers and ferromanganese industries are some of the other areas where it is used in large quantities. Limestone with high silica content is preferred in the cement industry. It is estimated (in 2015) that India has 203,225 million tonnes of limestone resources.

Distribution

The major producing states are Madhya Pradesh, Karnataka, Chhattisgarh, Andhra Pradesh, Telangana, Gujarat, Rajasthan, Tamil Nadu, Maharashtra, Himachal Pradesh, Odisha, Bihar, Jharkhand, Uttarakhand and Uttar Pradesh. The remaining part comes from Assam, Haryana, Jammu & Kashmir, Kerala, and Meghalaya.

INTEXT QUESTIONS 18.2

1. Which of the following is not a belt of mineral distribution in India?

   a. North eastern plateaus

   b. South-western plateaus

   c. North-western region

   d. South-eastern plateaus

Notes

2. Which of the following mineral is a non ferrous mineral-

   a. Manganese,

   b. Bauxite

   c. Chromite

   d. Pyrite

3. The ore termed as 'red ore' is-

   a. Haematite

   b. Pyrite

   c. Magnetite

   d. Limonite

4. What was India's rank in producing iron ore in the world?

   a. 1st

   b. 7th

   c. 3rd

   d. 4th

18.3 ENERGY RESOURCES

Optimum availability of energy resources is essential for economic development and improving the quality of life. It is very difficult to imagine modern living without the use of energy resources. Day by day the consumption of energy has been increasing. It is available in various forms in India.

There are several sources of energy. They are classified in different ways. One way of classification is based on their longevity. For instance mineral resources such as coal, petroleum etc are all non-renewable or exhaustible resources while water, the sun, wind, tides, hot springs and biomass are all inexhaustible or renewable sources of energy.

Yet another classification of energy is based on conventional and non- conventional sources. The former includes coal, petroleum, natural gas etc. The non-conventional sources of energy include sun, wind, water, tides, hot springs and biomass. Let's learn about some forms of energy resources in India.

A. Conventional Source of Energy

Conventional energy resources includes coal, petroleum, natural gas etc

a. **Coal:** In India, coal is the primary source of commercial energy. It is used as fuel in industries, thermal power stations and also for domestic purposes in some parts of the country. It is also used as a raw material in chemical and fertiliser industries and in the production of thousands of items of daily use.

The Geological Survey of India has estimated the total coal reserves of the country stand at 326.496 billion tonnes. The total production of coal was 729.10 million tonnes in 2019-20. A large part of the Indian coal reserves are of rather poor quality. Therefore, coking coal is imported to meet our requirements. In India, emphasis is being laid on setting thermal and super thermal power stations on or near the coal fields and electricity generated is supplied to far off places through transmission lines. At one time Indian railways were the largest consumer of coal. Since they have switched on to the use of diesel and electricity they are no more the direct consumer of coal.

Distribution

Coal in India occurs in two important types of coal fields. They are the Gondwana coal fields and Tertiary coal fields. Out of the total coal reserves and production in India, Gondwna coal fields contribute 98% and the rest 2% is produced by tertiary coal fields. The Gondwana coalfields are located in the sedimentary rock systems of the lower Gondwana Age. They are distributed chiefly in the river valleys of the Damodar (Jharkhand - West Bengal); the Son (Madhya Pradesh-Chhattisgarh); the Mahanadi (Odisha), the Godavari (Andhra Pradesh and Telangana) and the Wardha (Maharashtra). Tertiary coalfields occur in the extra-peninsular areas which include Assam, Meghalaya, Nagaland, Arunachal Pradesh, Jammu & Kashmir and Sikkim. Besides lignite or brown coal are found in coastal areas of Tamil Nadu, Gujarat and in land basins of Rajasthan.

Fig. 18.3 INDIA : Major Coal Fields

Fig. 18.4 INDIA : Major Petroleum Producing Areas

b. Petroleum: Petroleum is one of the most important minerals in our modern civilization and is called liquid gold because of its value. Our agriculture, industry and transport system depend on petroleum in several ways.

Notes

The crude petroleum is a mixture of combustible hydrocarbons in solid, liquid and gaseous forms. Petroleum products used as fuel, lubricant, material for manufacturing synthetic derivatives and chemicals required in industries. Petrol, kerosene, diesel, detergents, synthetic fibres, plastics, cosmetics etc. are important products derived from petroleum.

Distribution

Petroleum occurs in anticlines and fault traps. In India, it is found in the sedimentary rock formation. Most of such areas lie in the Assam, Gujarat and off shore areas along the western coast.

The entire production of India till today comes from the Assam belt, Gujarat- Cambay belt and Bombay High. The Assam belt extends from Dehang basin in the extreme north-east of Assam along the outer flanks of hill ranges forming the eastern border of Bhitra and Surma Valley. The Gujarat-Cambay belt extends from Mehsana (Gujarat) in the north to the continental shelf off the coast right up to Ratnagiri (Maharashtra) in the south. It covers Bombay High which is the largest producer of petroleum in the country. In Assam, the oil producing area is located in the Lakhimpur and Sibsagar districts. The oil wells are located mainly around Digboi, Naharkatiya. Sibsagar and Rudrasagar. In Gujarat, the oil producing area covers Vadodara, Broach, Kheda, Mehsana and Surat Districts. Recently petroleum reserves were discovered in the state of Rajasthan covering major areas of Bikaner, Barmer and Jaisalmer and gas has been discovered along the east coast in the Godavari and Krishna deltas. The prospective areas lie in the Bay of Bengal, which covers the coastline along the state of West Bengal, Odisha, Andhra Pradesh, Tamil Nadu and Andaman and Nicobar Islands.

Oil Refineries in India

The crude petroleum taken from oil fields needs to be refined before it can be used. Oil refining is really a big chemical engineering industry involving a complicated process. Presently, there are a total 23 oil refineries in India. Out of these 18 are in the Public Sector, 2 in the Joint Venture and 3 in the Private Sector. India is becoming a global refining hub with the capacity of 248.9 MTPA and is the fourth largest refiner in the world after the United States, China and Russia. Although the annual production shows an increasing trend, the country has to import petroleum and petroleum products to meet its requirements.

Fig. 18. 5 India: Oil Refineries

c. **Natural Gas:** Natural gas is emerging as an important source of commercial energy. Most of the time it is found in association with petroleum.. But this quantity may be increased as more and more reserves are being discovered. Production of natural gas in 2020-21 was 23,579.54 MMSCMD.

Notes

d. Atomic Minerals : Atomic energy can be produced by fission or fusion of the atoms or rather the nuclear parts of radio-active minerals like uranium thorium and radium. India possesses the world's largest reserves of monazite, the principal source of thorium and some reserves of uranium.

i. Uranium: In India, uranium is embedded in the igneous and metamorphic rocks in Jharkhand, Rajasthan, Andhra Pradesh and some parts of Himalaya. A substantial source of uranium deposits is also found in the monazite sands along the Kerala coasts.

The production of uranium at present is confined to the mines at Jaduguda in Singhbhum district of Jharkhand. The total reserves of uranium in the country are enough to support more than 5,000-10,000 mw of electricity generating capacity.

ii. Thorium: Thorium is principally obtained from monazite. The beach sands of Kerala in Palakkad and Quilon district contain the world's richest monazite deposits. It also occurs on the sands of Visakhapatnam in Andhra Pradesh.

On the basis of the availability of these resources, electricity production has been transformed in India. Let's have a look at thermal power production in India.

Thermal Power

The thermal power includes the energy generated from coal, diesel and natural gas. It is the main and largest source of power supply in the country. Presently, the installed capacity of thermal power stations is four times more than the installed capacity of hydel power. During 2022-23, India has installed generation capacity of 2,36,469 MW thermal power out of 4,11649 MW of total capacity. This is approximately 57% of the total installed capacity in India. Thermal energy has shown a rapid growth in India after the creation of the National Thermal Power Corporation (NTPC) in 1975. Presently, NTPC has 26 coal based power stations. The company has a coal based installed capacity of 51,150 MW. It also has 7 coal based joint ventures and subsidiaries with a commissioned capacity of 7,004 MW.

Super Thermal Power plants have been established mainly very close to big coal mines i.e. Singrauli (U.P.), Korba (Chhattisgarh), Ramagundam (A.P.) etc. Most of these power plants have improved their efficiency and profitability through improved plant load factor (78% against the national average of 63%) with the electrification of trunk routes railways have also set up their own super thermal power stations in the regions lying away from major coal fields. In Tamil Nadu there is a big thermal power plant at Neyveli which is fed by local lignite coal fields.

Notes

Besides coal based thermal power plants, the latest trend is to encourage diesel and natural gas based thermal power plants. Such plants can be set near the distribution or market centres. The gestation period of oil or gas based plants is generally the shortest. These plants are also found to be more efficient than coal based plants. The oil and gas pipes have to be laid for continuous supply of petroleum and natural gas for such power plants. As India has very limited resources of mineral oil and proven gas resources, it has to import these raw materials including naptha etc. from other countries.

Petroleum based power units have been set up in the remote areas of North East and Himalaya region.

Fig. 18.6 INDIA : Thermal Power Plants

Notes

Nuclear Power

India had developed the technology of generating energy from nuclear minerals such as uranium and thorium. Installation of nuclear reactors for generating power requires huge capital and sophisticated technological skills. The share of nuclear power in the total energy produced in the country is hardly 1.6%. India has a total of 6,780 MW installed generation capacity for the nuclear sector. Nuclear power is a promising source of energy for the future. It would play a complementary role when the other sources of power like coal and petroleum would be exhausted.

Nuclear power programme was initiated in the 5th decade of the last century and an apex body for decision-making regarding atomic programmes, the 'Tata Atomic Energy Commission' was incorporated in August 1948. But progress in this direction could be made only after the establishment of the Atomic Energy Institute at Trombay in 1954. Which was renamed as the 'Bhabha Atomic Research Centre' (BARC) in 1967. Consequently, the first nuclear power station with 320 MW capacity was set up at Tarapur near Mumbai in 1969. Later, atomic reactors were installed at Rawatbhata in Rajasthan, Kalpakkam and Kudankulam in Tamil Nadu, Narora in Uttar Pradesh, Kaiga in Karnataka and Kakrapar in Gujarat also have nuclear energy plants. Thus at present, nuclear energy is produced at 7 centres. Requirements of fuel and heavy water of these power reactors are fulfilled by the Nuclear Fuel Complex located at Hyderabad and heavy water plant at Vadodara.

B. Non- Conventional Source of Energy

Conventional sources of power like coal, petroleum and natural gas are likely to exhaust in the near future. Therefore, there is a need to find and develop alternative sources of power. Hydel power is also a non-conventional energy resource. However, it needs to be utilised judiciously. Sun, wind, tides, biological wastes and hot springs are such sources which can be developed as the alternative sources of power. They are called the non-conventional sources of energy. These sources of energy are renewable and pollution free. Let's discuss some important non-conventional sources of energy. Around 40% generation capacity was from non conventional sectors in 2022.

a. **Hydroelectric Power:** Development of hydroelectric power started in the last decade of the 19th century with the establishment of a hydroelectric plant for supplying electricity to Darjeeling in 1897. In 1902, another hydropower plant was established at Shivasamudram waterfall on Kaveri river in Karnataka. Later, a few plants were established in the Western Ghats to meet the requirements of Mumbai. Hydropower plants were also commissioned in Uttar Pradesh, Himachal Pradesh in the north, and Tamil Nadu and Karnataka in the south in the 1930s. Total generation capacity reached 508 MW in 1947. Massive efforts were made

to develop waterpower during the Five Year Plans and several multipurpose projects were commissioned.

India has impressive shares of hydel electricity generation capacity in total installed capacity in India. The total installed capacity of hydel power in 2022 was 46,850 MW which was approx 11.4% in total installed capacity.

In spite of being a cheaper, pollution-free and renewable source of power, the significance of hydroelectricity has declined in the post-independence period. Its share in total power generation declined from 49 percent in 1950-51 to only 11.4 percent in 2022-23. Nevertheless, hydroelectricity plays a very significant role in northern, western and southern grids.

Fig. 18.7 INDIA: Hydro Power Plants

b. Solar energy: The Sun is the primary source of all energy on planet earth. Sun is the most vital, abundant and direct source of energy. India lies in the tropical zone and has plenty of sunshine, for long hours of the day and has large possibilities to develop solar energy. Solar energy is tapped through the system of Solar PhotoVoltaic (SPV) cells. The thermal heating system can be used for water heating, solar cookers for cooking meals and drying food grains etc. Solar energy can be developed in almost every part of the country but more so in hot, dry and cloud free areas. Karnataka is presently tops with most installed capacity. Other important states are Rajasthan, Madhya Pradesh, Telangana, Andhra Pradesh, Tamil Nadu etc. India has 63,894 MW installed capacity sharing 15.1% of total installed capacity.

c. Wind Energy: Wind can be used as a source of energy in those regions where strong and constant winds blow throughout the year. Wind energy can be used for pumping water for irrigation and also for generating electricity. India has about 41,983 MW installed generation capacity in 2022-23. Tamil Nadu tops with installed capacity followed by Gujarat, Maharashtra, Karnataka and Andhra Pradesh.

d. Bio Energy : Biomass is also an important source of energy for the country. It is a renewable resource, widely available and carbon-neutral also. It may also be useful in generating employment in the rural areas. The sources of Biomass are biogas, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc. The total installed capacity was 10,210 MW in 2022-23.

e. Tidal Energy: Energy can also be generated from high tidal waves. Some of the important sites identified for generating tidal energy are located in the Gulf of Kachchh and Cambay in Gujarat state and the coast of Kerala.

f. Geothermal energy: The potential of geothermal power is very limited in India. Important sites selected for generating geothermal power are situated in Himachal Pradesh (Mani Karan) and Laddakh (Puga valley in Ladakh). Assessment of geothermal energy potentials of selected sites in Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Jharkhand and Chhattisgarh is being undertaken.

INTEXT QUESTIONS 18.3

1. The river valley which is not included in Gondwana coal field-

   a. Godavari b. Jhelum

Notes

c. Son

d. Damodar

2. The mineral termed as 'liquid gold' -

a. Coal

b. Natural Gas

c. Petroleum

d. Thorium

3. How many oil refineries are established in India?

a. 26

b. 29

c. 23

d. 32

4. In which state Uranium is produced?

a. Rajasthan

b. Chhattisgarh

c. Jharkhand

d. Himachal Pradesh

5. The share of hydel power in total installed capacity was:

a. 15.4 %

b. 11.4 %

c. 22.0 %

d. 16.5 %

18.4 ENERGY CONSERVATION

As we learnt that many energy resources are not abundant and if we continue to extensively use them, these may be exhausted in near future. That is why the use of alternative sources of energy were explored. Even, the alternative resources of energy are non- exhaustible but still they require to be used wisely. Therefore, it's essential to use appropriate methods to conserve energy resources. Some of the ways can be adopted to conserve it:

Notes

i. Reduce; recycle and reuse are one of the most effective ways to conserve energy resources. Reducing the consumption has the direct impact on the utilisation of resources

ii. Some change in lifestyle may also reduce the uses. For example reduced use of electrical appliances, use of sunlight instead of artificial lights may reduce the demand causing reduced production.

iii. More efforts in exploring non-conventional energy resources. As a diverse country, India has a great potential to find alternative non-conventional sources of energy.

iv. A huge part of electricity is lost during transmission. By improving the efficiency of energy supply systems, it can be saved which will reduce the pressure on energy resources.

v. It can also be conserved by promoting effective public transport and public services. This will reduce individual consumption.

vi. Efforts should be made to spread awareness in schools and among the youth for the conservation of various energy resources.

As an individual we can also make some efforts to reduce the use of electricity, which finally saves precious energy resources. Some of these efforts are:

- Switching off electricity when not in use.
- Try to use public transport.
- Carpooling may also be used in place of private vehicles.
- Shut lights and television when leaving the room.
- Use the sunlight at home during day time instead of turning on the lights.
- Dry clothes in the sun instead of using the dryer during sunny days.
- Turn off the dishwasher right before the drying cycle and let the dishes air dry.
- Don't leave the refrigerator door open.
- Use compact fluorescent lights (CFLs) or other efficient bulbs.
- Cool the rooms to no less than 24°C as it will give you the most comfort.
- Use sleep mode in computer Computers instead of screensavers as it uses up to 70% less electricity.

18.5 NATIONAL ENERGY POLICY-2017

The National Energy Policy (NEP) has been drafted by the NITI Aayog in 2017. It has

Notes

extended to reforms and provisions further from the 2006 Integrated Energy Policy (IEP) to excel in the energy sector and continue the growth rapidly. There are four key objectives of National Energy Policy-

- Access at affordable prices
- Improved security and Independence
- Greater Sustainability and
- Economic Growth

Aims of National Energy Policy

- The National Energy Policy has been framed with the intention to devise a broad framework for the overall energy sector. It has talked about effective use of technology and fuel options.
- The National Energy Policy aims to electrify all the Census villages by 2018, and to achieve universal electrification with 24×7 electricity by 2022.
- The share of manufacturing in our GDP is to go up to 25% from the present level of 16%, while the Ministry of Petroleum is targeting reduction of oil imports by 10% from 2014-15 levels, both by 2022.
- NDC (Nationally Determined Contributions) targets a reduction of emissions intensity by 33 percent-35 percent by 2030 over 2005.
- Achieving a 175 GW renewable energy capacity by 2022, and share of non-fossil fuel based capacity in the electricity mix is aimed at above 40% by 2030.
- Mainstream emerging energy technologies and provide consumer energy choices.

INTEXT QUESTIONS 18.4

1. Who drafted National Energy Policy 2017?

   a. Niti Ayog

   b. NTPC

   c. BEE

   d. Ministry of Mines

2. National Energy Policy 2017 was based on -

Notes

a. Integrated Energy Policy 2003

b. Integrated Energy Policy 2002

c. Integrated Energy Policy1998

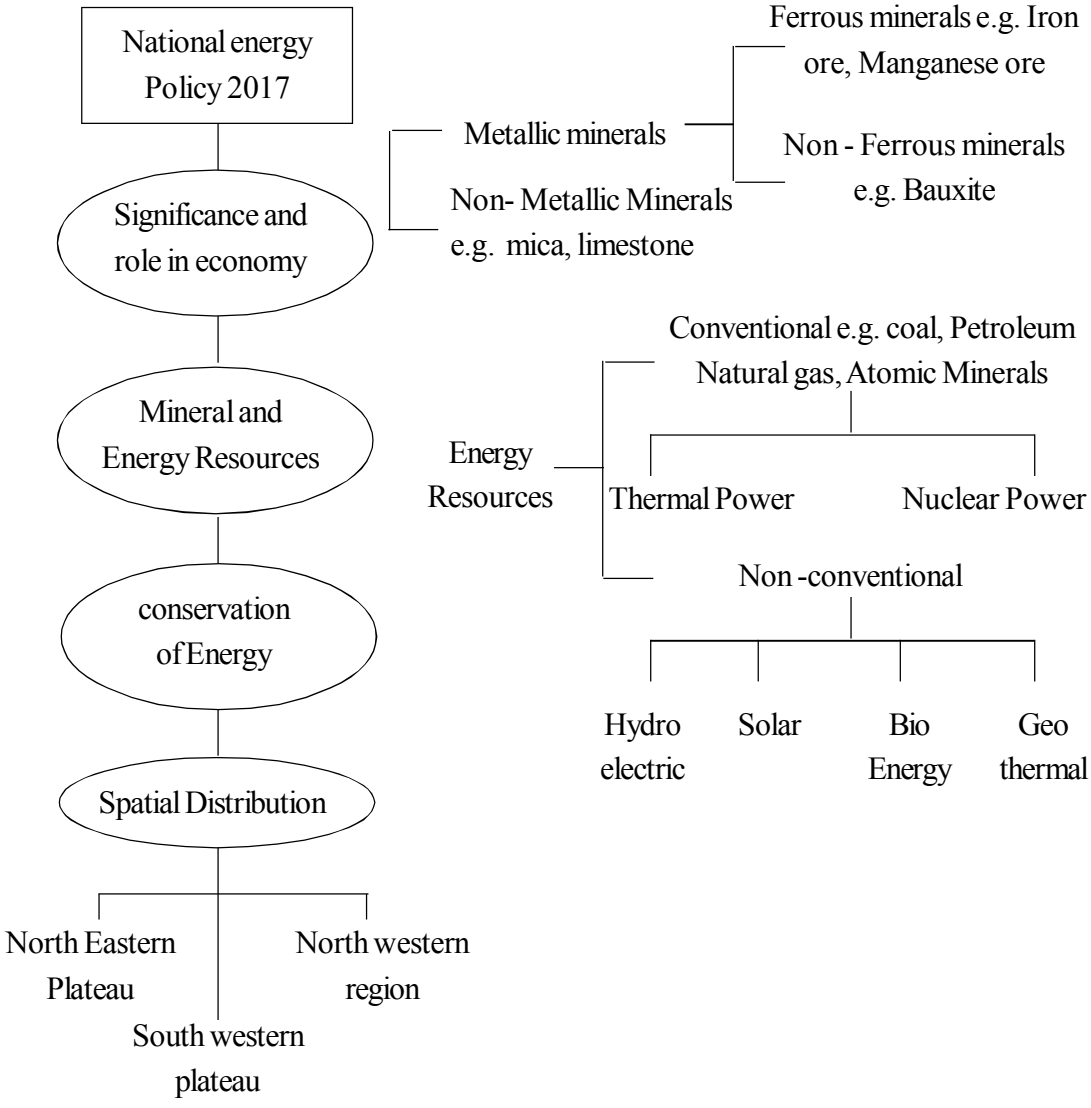
d. Integrated Energy Policy 2006

3. National Energy Policy 2017 aimed to achieve universal electrification with 24×7 electricity by:

a. 2018 b. 2019

c. 2025 d. 2022

WHAT YOU HAVE LEARNT



Notes

TERMINAL QUESTIONS

1. Why are mineral and energy resources significant for the Indian economy?
2. Describe the distribution and production of the following minerals and mineral fuels in India:
   (a) Bauxite
   (b) Iron ore
   (c) Petroleum
3. Differentiate between conventional and non-conventional energy with suitable examples.
4. Give any two reasons why we should prefer non-conventional energy resources.
5. Distinguish between wind and solar energy.
6. On an outline map of India show the following
   (i) Jharia and Raniganj coal fields.
   (ii) Ankaleswar and Digboi oil fields.
   (iii) Mathura and Panipat oil refineries.
   (iv) Talcher and Korba thermal power plants.
   (v) Kaiga and Kota atomic power plants.
   (vi) Bhakra and Nagarjuna Sagar hydro-electric plants.
7. On an outline map of India show the following
   (vii) Singhbhum iron ore fields
   (viii) Bauxite producing area of Tamil Nadu
   (ix) Tawa Valley and Neyveli coal field
   (x) Bombay High and Sibsagar oil fields.
   (xi) Bina and Tatipaka oil refineries.
   (xii) Talcher and Korba thermal power plants.

Notes

ANSWERS TO INTEXT QUESTIONS

18.1

1. c
2. b
3. a

18.2

1. d
2. b
3. a
4. d

18.3

1. b
2. c
3. c
4. c
5. b

18.4

1. a
2. d
3. d