

# ESI-2021-22 AND OTHER CA 2021-22 INDUSTRY (ESI – CHAPTER-8) – PART-2

## Table of Contents

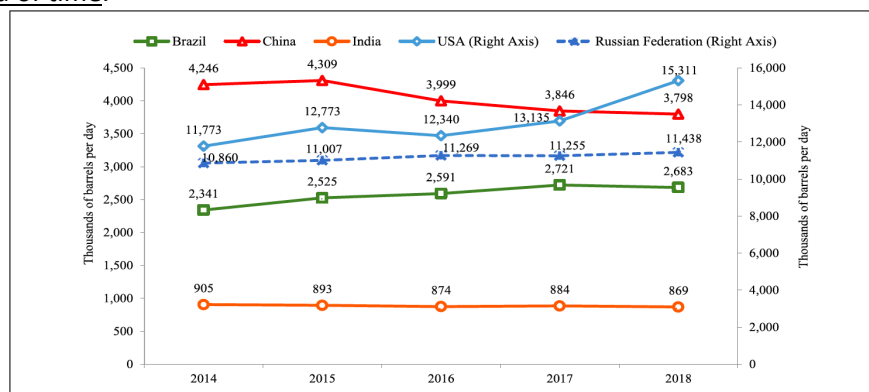
<b>1. Crude Oil, Petroleum and Natural Gas .....</b>	<b>2</b>
Current Situation .....	2
Government's Target .....	2
Various Crude Oil benchmarks .....	3
Rising Oil Prices .....	4
Oil Bonds .....	5
Strategic Crude Oil Reserves .....	6
Natural Gas.....	7
Recent steps to increase/Ease the production of gas/oil .....	7
a) Hydrocarbon Exploration and Licensing Policy (HELP) .....	7
b) Open Acreage Licensing Policy (OALP) .....	8
c) National Data Repository .....	8
Lakshya Bharat Portal (Sep 2021).....	9
Measures taken to develop National Gas Grid and City Gas Distribution Network .....	9
a) National Gas Grid .....	9
b) City Gas Distribution Network.....	9
c) North East Gas Grid.....	10
d) Pradhan Mantri Urja Ganga Gas Pipeline Project .....	10
<b>2. Renewable Energy .....</b>	<b>11</b>
India's Renewable Energy Targets.....	11
Institutional Framework .....	11
A) Nodal Body: Ministry of New and Renewable Energy .....	11
B) Renewable Energy Management Centres (REMCs) .....	12
C) Indian Renewable Energy Development Agency (IREDA) .....	12
Reports.....	12
a) Report by the Institute of Energy Economics and Financial Analysis (Sep 2021) .....	12
b) Global Status Report by Ren21 Secretariat .....	13
Recent Steps to Promote Renewable Energy.....	13
a) Green Energy Corridor (GEC) Projects .....	13
b) Renewable Energy Certificates .....	13

<b>3. Solar Energy .....</b>	<b>14</b>
<b>Introduction .....</b>	<b>14</b>
<b>Various Initiatives.....</b>	<b>14</b>
a) Jawaharlal Nehru National Solar Mission .....	14
b) Grid Connected Solar Rooftop Program.....	14
c) PM KUSUM (Pradhan Mantri Kisan Urja Suraksha Evan Uttham Mahabhiyan).....	15
d) International Solar Alliance to Promote International Cooperation.....	15
e) Floating Solar Power Plants.....	15
<b>Promoting Domestic Manufacturing in Solar Sector .....</b>	<b>16</b>
a) National Programme on High Efficiency Solar PV Modules .....	16
b) Other Older Steps: .....	16
c) Custom Duties:.....	17
<b>Saral (The State Rooftop Solar Attractiveness Index) Index: Promoting Competition Among States .....</b>	<b>17</b>

# 1. CRUDE OIL, PETROLEUM AND NATURAL GAS

## CURRENT SITUATION

- India's oil production is one of the lowest among the major economies of the world and has been declining over a period of time.



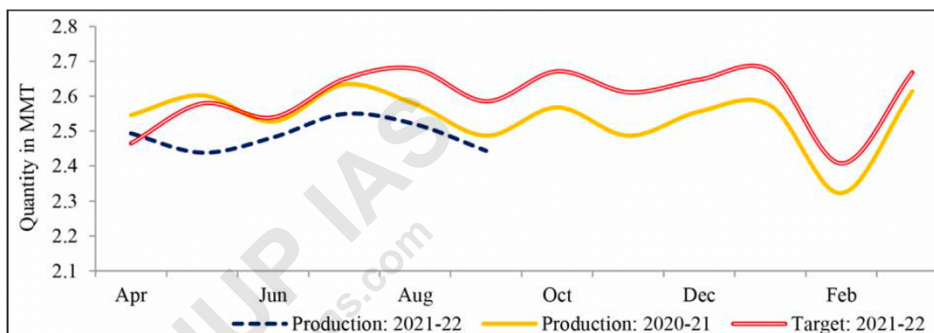
Source: BP Statistical Review of World Energy 2019.

Note: Oil Production Includes crude oil, shale oil, oil sands, condensates and Natural Gas Liquids (NGLs).

## Crude Oil

- » Domestic Crude Oil and condensate production during the year 2020-21 was **30.49 million metric tonnes (MMT)**, lower than the production of 2019-20 (32.6 MMT).

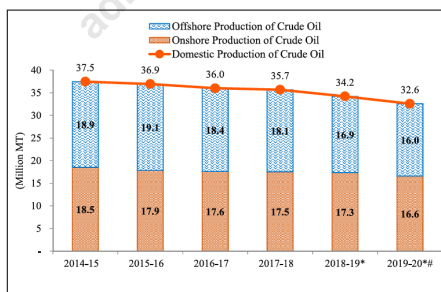
Figure 39: Production of Crude oil



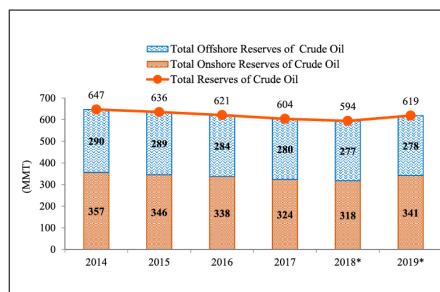
Source: M/o PNG

- » It has seen a continuous decline since 2014.
  - **Why? -> Natural decline and ageing and matured fields and no major discoveries.**
    - Proven reserves have decreased concurrently since 2014, with the steeper fall in onshore reserves. This fall has seen a reversal in 2019.

(a) Production of Crude Oil



(b) Reserves of Crude Oil



Source: Ministry of Petroleum and Natural Gas and Economic Survey calculations.

## GOVERNMENT'S TARGET



## RISING OIL PRICES

### - Why in news?

- » The western sanctions on Russia have affected the oil imports made by India and has therefore adversely impacted the economy.

### - Details

#### » Russian invasion of Ukraine and its impact on Oil Supply

- Western sanctions on Russia have affected the oil imports made by India and has therefore adversely impacted the economy
- US banned all crude oil and natural gas imports from Russia into the USA
- UK announced phase out of Russian oil by the end of this year.

### - How big a player is Russia in the global oil market?

- » There are three large players in the global oil market. At 18%-19%, the US has highest share in global output, followed by Russia and Saudi Arabia, each with a 12% share. In OPEC Saudi Arabia dictates the term.

- Together, USA, Russia and Saudi Arabia control almost 45% of all oil.

- **Russia's share** in global export is around 12% (around 5 million barrels/day). Cost of production of the Russia oil is also cheaper. (For e.g. most new oil fields in USA produce at \$40 a barrel, while those in Russia produce at around \$20 and those in Saudi Arabia at around \$15 a barrel.

- Russia supplies are not only the second biggest, but they are also the second cheapest and are of better quality (lesser impurities) than what a replacement like Venezuela may provide.

- Can't there be an increased supply from countries such as Venezuela and Iran?

- Though, **Venezuela** have the largest oil reserves in the world, the country's oil-producing apparatus is in despair partly due to the government's mismanagement, but also due to harsh US sanctions.
- **Iran** is not going to increase output unless it gets Nuclear deal from USA.

- **Dependency on Russia of US and its allies:**

- The USA imports less than 10% of its energy requirements from Russia, but European countries are much more dependent.
  - For e.g., Germany imports 40% of its oil needs from Russia. Germany is also highly dependent on natural gas, which is hugely imported from Russia.

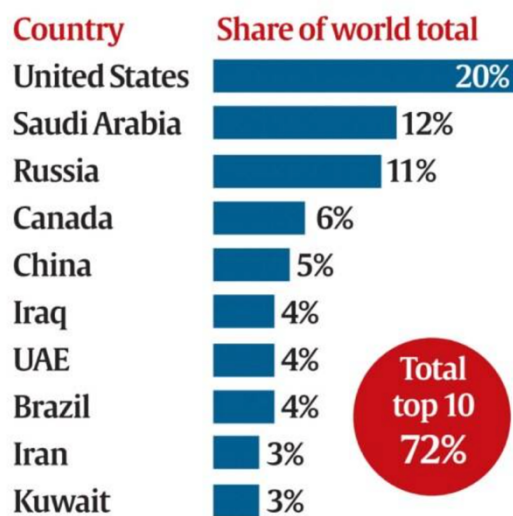
- **Impact on World:**

- Stokes inflation in countries like USA, which are already going through the worst phase of inflation in the last decade.

- **Impact of high oil prices on India:**

- **India is highly vulnerable** to oil prices as India imports over 84% of our oil needs.
- **Inflation**
- **CAD:**

## Largest oil producers (2020)



Oil includes crude, all other petroleum liquids, biofuels. Source: International Energy Statistics via US Energy Information Administration, as of December 2021



- The share of crude in India's total import (in terms of value), has remained above 25% over the last two decades.
- Note: **Supply driven oil-shocks contribute more to the increase in current account imbalances** than demand driven shocks, and the impact of supply driven shocks are closely related to the degree of energy dependence.
- **Hampers Economic growth:** Decrease in the productivity of the economy because of an increase in the cost of production could also negatively impact wages, employment and eventually the purchasing power of households.
- **If oil prices remain high for longer period**, second order effect on economy starts happening. The second-order effect essentially captures what may happen to investments in the economy.
  - High inflation will lead to faltering demands, which would remove the incentive among the private sector firms and entrepreneurs to spend money and invest in scaling up capacities.

## OIL BONDS

### - Why in news?

- Over the last one year, the retail prices of petrol, diesel, and other petroleum products have surged, and the government has attracted criticisms. However, on several occasions, including in April 2022, the Finance Minister of India has sought to counter the criticisms by claiming that the current government can't bring down taxes (and, as a consequence, prices) because it has to pay for the oil bonds issued by the Congress led UPA government. (April 2022)

### - Constituents of Oil Prices

- There are two components of oil prices - the price of crude oil and the taxes levied on the basic prices. Together they make up the retail price. These taxes vary from one product to another. For e.g., currently on petrol, around 50% of the price is due to taxes and on diesel the overall tax rate is 44%.

### - What are oil bonds?

- In the past, in order to subsidize oil prices, oil marketing companies were issued oil bonds (or a promissory note) by the government.
  - » An oil bond says that the government will pay the oil marketing company the sum of, say, Rs 1,000 crore in 10 years and will pay an interest of, say, 8% each year until the bond matures.
  - » Thus, by this method, government was able to protect/subsidize the consumers without either ruining the profitability of the OMC/ or running a huge budget deficit itself.
- Oil bonds were issued by several governments in the past. But the ones in question now are the ones which UPA government issued.

### - Is this amount large enough to restrict the Finance Ministry from bringing down the taxes?

- Compared to payout of the money that the government earned from all kinds of taxes that it levied on petroleum products, the annual interest payment on oil bonds is miniscule. The total

TABLE 1

#### OIL BONDS NDA INHERITED

DETAILS (INTEREST RATE, DATE OF MATURITY)	PRINCIPAL (₹ cr)
7.61% GOI spl. Bonds, 2015*	1,750.00
7.59% GOI spl. Bonds, 2015*	1,750.00
8.13% GOI spl. Bonds, 2021*	5,000.00
7.75% GOI spl. Bonds, 2021*	5,000.00
8.20% GOI spl. Bonds, 2023	22,000.00
8.01% GOI spl. Bonds, 2023	4,150.00
8.20% GOI spl. Bonds, 2024	5,000.00
8.20% GOI spl. Bonds, 2024	10,306.33
6.35% GOI spl. Bonds, 2024	22,000.00
7.95% GOI spl. Bonds, 2025	11,256.92
8.40% GOI spl. Bonds, 2025	9,296.92
8.40% GOI spl. Bonds, 2026	4,971.00
6.90% GOI spl. Bonds, 2026	21,942.00
8.00% GOI spl. Bonds, 2026	10,000.00
<b>TOTAL</b>	<b>1,34,423.17</b>

\*These bonds have been paid in full (total paid ₹13,500 crore)

Source (Table 1 & Chart 1): Union Budgets, Express Research

CHART 1

#### ANNUAL INTEREST PAYMENT ON OIL BONDS (₹ cr)

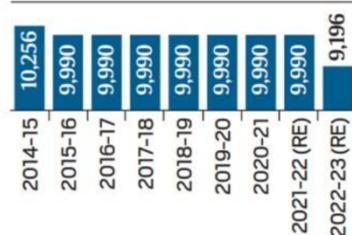
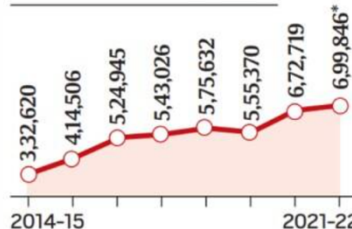


CHART 2

#### CONTRIBUTION OF OIL SECTOR TO EXCHEQUER (₹ cr)



\*Provisional Source: PPAC, Express Research

payout was just 7% of the total revenue in 2014-15 and it has come down because taxes generated from the sector have soared.

- Overall, Centre and State together have earned 43 lakh crore between 2014-22 from taxing petroleum countries. This brings down total payout by the NDA government till date on account of oil bonds to just 2.2% of the total revenues earned during this day.
- In other words, **while the NDA government has had to pay for oil bonds, the payout is not big compared to revenues earned in this sector.**

- **But, issuing this bond is a bad idea?**

- » Former PM Manmohan Singh was correct in noting that issuing bonds just pushed the liability to a future generations. But to a great extent, most of the government's borrowing is in the form of bonds. This is why each year the fiscal deficit (which is essentially the level of government's borrowing from the market) is so keenly tracked.
- » In developing countries, generally the governments are forced to resort to bonds. For e.g., the current NDA government itself has issued bonds worth Rs 2.79 lakh crores to recapitalize public sector banks. These bonds will be paid by governments till 2036.

## STRATEGIC CRUDE OIL RESERVES

- **Why in news?**

- » India to release five million barrels of crude oil from strategic oil reserves (Dec 2021)

- **Background**

- » The erstwhile Planning Commission in its Integrated Energy Policy, 2006, identified **supply market and technical risks as major threats to India's energy security** and recommended to "maintain a reserve equivalent to 90 days of oil imports for strategic-cum-buffer- stock purposes".

- **Need of strategic petroleum reserve**

- » Potential Supply crisis -> West Asia is very volatile; tension between major powers etc.
- » Price Fluctuations -> A situation like 1970s is very harmful for economies.
- » Exchange rate fluctuations

- **Crude Oil Storage facilities**

- » These are underground rock caverns. The rock must be strong enough for the cavern to be stable. A wide range of rock types are suitable, such as igneous (granite, diorite), metamorphic (gneiss, schists) and even sedimentary rocks (sandstones, limestone, chalk, shale)
- » **Why underground caverns**
  - Safety from hazard of leakage.
  - Lower capital cost and lower operating cost compared to conventional tanks
  - Inherent safety over the above ground storage systems
  - Safety from natural calamities and various forms of sabotage.

- **Locations**

- » Mostly coastally located - as imports are easy and suitable refinery capabilities

- **Strategic reserves in India**

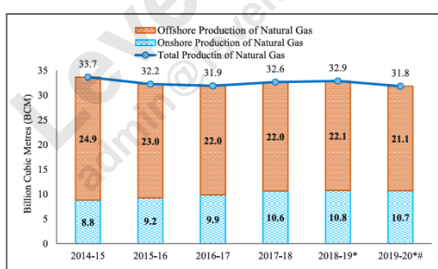
- » State owned Special Purpose Vehicle (SPV), India Strategic Reserve Limited (ISRL) has established Strategic Petroleum Reserve (SPR) facilities with total capacity of 5.33 Million Metric Tonnes (or 39 million barrels) at 3 locations under Phase-1.
  - **Vishakhapatnam** (1.33 MMT)
  - **Mangalore** (1.5 MT)

- **Padur** (Uduppi district, Karnataka) (2.5 MT)
- » **Under Phase-2 of Strategic Petroleum Reserve Program (SPR)**, the government has given 'in principle approval' in June 2018 at **two locations** namely
  - **Chandikhol** (Odisha) (4 MMT)
  - **Padur** (2.5 MMT)
- » In this phase, PPP model is being explored for creating commercial-cum-strategic reserve.
- » **Delays:** Phase-2 has not really moved forward. The key reason has been delay in getting land to build the capacities, which the state governments have to help with.
- **For how many days can India be served by these strategic reserves:**
  - » As per the consumption patten of 2019-20, the **total capacity in first phase** (5.33 MMT) is estimated to provide for about **9.5 days of crude oil requirement**.
  - » Further, the **oil marketing companies** have a storage capacity of **64.5 days** requirements
  - » The **Phase-2 reserves** with a total capacity of **6.5 MMT** will be able to serve 12 days of India's requirement.
- **In Dec 2021**, it was announced that India will release five million barrels of crude oil from its strategic reserves in line with other major global energy consumers including US, Japan, South Korea and China, a move aimed at cooling global oil prices.
  - » **Why?**
    - It is part of a concerted effort to negate upward pressure on crude prices from OPEC+ - a 13 country grouping of oil exporters that has been joined since 2016 by 10 others led by Russia to decide production quotas - keeping supply below demand, even though the action is largely symbolic in nature

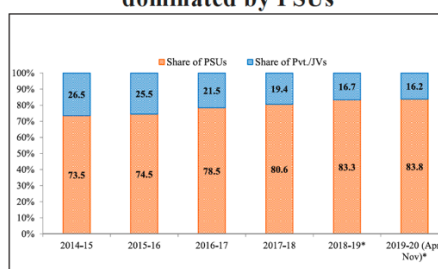
## NATURAL GAS

- **ESI 2021-22:** Natural gas production during the year 2020-21 was **28.67 billion cubic meters** (BCM) as against production of 31.18 BCM in 2019-20.
  - » **Reasons for decline:** Declining production from old and marginal fields; unplanned shutdown and operational losses from few producing wells.

(a): Production of Natural Gas



(b): Production of Natural Gas dominated by PSUs



Source: Ministry of Petroleum and Natural Gas and Economic Survey calculations.

## RECENT STEPS TO INCREASE/EASE THE PRODUCTION OF GAS/OIL

### A) HYDROCARBON EXPLORATION AND LICENSING POLICY (HELP)

- Approved in March 2016
- It is aimed at increasing exploration in new sedimentary basins.
- **Four key provisions**
  - i. Uniform license for exploration and production of all forms of hydrocarbon



- It will enable the contractor to explore conventional as well as unconventional oil and gas sources including CBM (coalbed methane), shale gas/oil, tight gas and gas hydrates under a single licenses.
  - ii. An **open acreage policy**: Enable the Exploration and Production (E&P) companies choose the blocks from the designated areas.
  - iii. Easy to administer **revenue sharing model** (unlike the profit sharing system of NELP)
  - iv. **Marketing and pricing freedom** for crude oil and natural gas produced
- **Other important Provisions**
- **Graded System of Royalty**
    - Royalty rates decrease from the shallow water to deep water and ultra-deep water.
  - **Royalty rate for on-land areas kept intact**
    - So that revenues of the state governments are not affected.
  - **Cess and Import duties not applicable**
    - Like NELP, cess and import duties will not be applicable on blocks awarded under the new policy
  - **Marketing and Pricing freedom**

## B) OPEN ACREAGE LICENSING POLICY (OALP)

- **Why in news?**
  - India has offered 8 oil and gas blocks for bidding in latest round (Dec 2021)
- OALP new oil and gas block licensing policy inaugurated in June 2017.
  - It is part of HELP.
- **Option to select the exploration block:**
  - Does away with the concept of government offering pre-demarcated blocks to bidders.
  - Gives exploration companies the option to select the exploration blocks on their own, without having to wait for the formal bid round from the government, which puts that block up for bid.
    - Exploration companies will be made National Data Repository data available for taking decisions to choose the blocks
  - The company then submits an application to the government, which puts that block up for bid.
- **Bidding twice a year initially, more frequent in future**
  - More frequent as the industry become used to the new model.
- **Extra five points to bidders for an acreage if they have already invested** in the exploration and development of that area
- **Expected Impact** - More investment in exploration, ease of doing business, reduce import dependency etc.
- **In Dec 2021, 8 oil, gas blocks were offered:**
  - These 8 blocks are spread over 6 sedimentary Basins, 5 states covering 15,776 sq. km of area.
    - Out of the 8 blocks, 5 blocks are Onland type, 2 Blocks are Shallow Water type, and 1 Block is Ultra Deep-Water Type.
      - **On Land Type:** Three of the five blocks are in Assam Arakan or Assam Shelf while one is in Rajasthan. One block is in Satpura basin.
      - **Two Shallow Water Blocks** are located in Cambay Off the Gujarat coast while one ultra-deep-water block is in the Cauvery basin.
    - This is the **seventh bid round** under OALP.
  - The last bid round (**OALP-VI**) attracted just three bidders, two of whom were state owned explorers - OIL and ONGC.

## C) NATIONAL DATA REPOSITORY

- It is envisaged as centralized database of geological and hydrocarbon information that will be available to all.

- **Key Benefits**
  - Allow investors to take decision making.
  - Open up new sector of exploration in India.
    - There are number of companies around the world that makes it their business to simply explore hydrocarbon basins and sell the information they gather.
- **Investors can take informed decisions:** It is a huge step in offering information about the country's sedimentary basins, which will enable investors to take informed decision about expressing interest in exploration

## LAKSHYA BHARAT PORTAL (SEP 2021)

- The Lakshya Bharat Portal has been launched to provide clear demand projections by oil and gas organizations.
- It requires all oil and gas organization to upload details of various items procured by them including the future requirements. This portal is planned to mature into a Central Information Pool for sourcing of capital good and MRO (maintenance, repair, and overhaul) of items of the oil and gas companies which in turn is expected to provide clear demand projections to enable the manufacturers to enhance their capacity and scope.
- This portal is accessible to all stakeholders and is an important step towards Atmanirbhar Bharat.

## MEASURES TAKEN TO DEVELOP NATIONAL GAS GRID AND CITY GAS DISTRIBUTION NETWORK

### A) NATIONAL GAS GRID

#### - Why in news?

- ESI 2021-22: Various measures taken to develop National Gas Grid and City Gas Distribution Network

#### - Basics

- Share of **natural gas** in India's energy basket is 6.2% as against 23.4% globally and is expected to increase.
  - Government has set a target of raising the share of natural gas in primary energy basket to 15% by 2030.
- **To increase the availability of natural gas across the country**, Natural Gas pipelines are being developed.

#### - About National Gas Grid

- The **aim** of the National Gas grid is
  - To remove regional imbalance in the country with respect to availability of natural gas.
  - Connect gas source to major demand centres.
  - Develop City Gas Distribution Network in various cities for supply of CNG and PNG.
- It is also expected to help revive a number of declining fertilizer industrialized units and other sectors like power and automotive.
- For this purpose, Petroleum and Natural Gas Regulatory Board (PNGRB) has authorized approximately 33,764 km natural gas pipeline network across the country, as on 31st March 2021.
  - As of 31st March 2021, 19,998 km of natural gas pipelines are operational and 15,369 km are under various stage of construction

### B) CITY GAS DISTRIBUTION NETWORK

- **PNGRB has authorized 232 geographical areas (GAs) for development of CGD network across the country** covering more than 400 districts in 27 states/Uts which cover around 71% of India's population and 53% of area. As on 31st July 2021, a total of approx. 79.47 lakh PNG domestic connections and 3323 CNG stations have been commissioned in the country.

- **City Gas Distribution** responsibility is provided to entities who win CGD rights under the bidding rounds.

### C) NORTH EAST GAS GRID

- **Why in news?**
  - Cabinet Committee on Economic Affairs (CCEA) has approved the North East Gas Grid Project of Indradhanush Gas Grid Ltd (IGGL) with viability gap funding at 60% of the estimated cost of Rs 9,625 crore i.e. Rs 5,559 crore. (Jan 2020)
- **Details**
  - The total length of the pipeline is 1,665 km. It will be developed in eight states (7+Sikkim).
  - It will connect Guwahati in Assam to major cities in the region such as Itanagar, Dimapur, Kohima, Imphal, Aizwal, Agartala, Shillong, Silchar, Gangtok, and Numaligarh.
  - The project will be implemented by Indradhanush Gas Grid, a joint venture of state-owned GAIL India, Indian Oil Corporation, Natural Gas Corporation, Oil India Limited, and Numaligarh Refinery Ltd.
- This is the **second time that a gas pipeline project** in the country is funded by the government.
  - In 2016, the government had provided a grant of Rs 5,176 crore, or 40% of the project cost of the 2,655 km Jagdishpur-Haldia and Bokaro Dhamra (JHBDPL) gas pipeline project (also known as Urja Ganga Project), which GAIL is currently executing.
- **Significance of the project**
  - Ensuring reliable and uninterrupted natural gas supplies to consumers
  - Boost industrial growth and reduce environmental pollution (as natural gas is cleaner than coal and petrol)

### D) PRADHAN MANTRI URJA GANGA GAS PIPELINE PROJECT

- In order to develop the national gas grid, the Government has taken a decision to provide a capital grant of Rs.5176 crore (i.e., 40percent of the estimated capital cost of Rs.12,940 Cr) for development of a 2655 Km long Jagdishpur-Haldia -Bokaro- Dhamra Gas Pipeline (JHBDPL) project. It will pass through 50 districts in the State of Uttar Pradesh, Bihar, Jharkhand, Odisha & West Bengal



## 2. RENEWABLE ENERGY

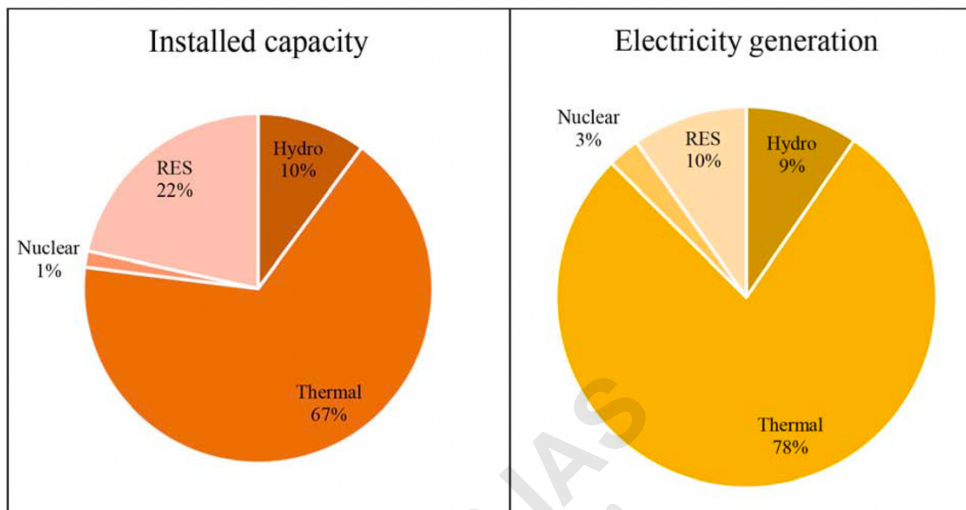
### - Why in news?

- India achieves 100 GW Milestone of installed Renewable Energy Capacity (REC) (Aug 2021)
  - Today, India stands 4th in the world in terms of installed RE capacity, 5th in Solar and 4th in wind in terms of installed capacity.

### - Basic Stats:

- As per **ESI 2021-22**, Renewable energy constitutes over **24.71% of the country's installed power capacity** and around **10.7 percent of the electrical energy generation for the year 2020-21**.
- As of 31st Oct 2021, India's total renewable energy installed capacity (excluding hydro power above 25 MW) has reached **103.05 GW**. If we include large hydro, the share of renewable energy in country's installed capacity becomes 38.27% (Oct 2021) and its share in electricity generation is estimated to be 26.96% (in Aug 2021).
- Difference in installed capacity share and electricity generation share** - Class discussion

Figure 44: Source of Installed Capacity and electricity generation 2020-21



Source: Survey Calculations based on data from Central Electricity Authority. Includes both Utilities and captive plants. Thermal includes gas, steam and diesel.

## INDIA'S RENEWABLE ENERGY TARGETS

- In 2015, India had set an installed renewable energy capacity target of **175 GW by 2022**. This included:
  - 100 GW** of Solar Energy Capacity
  - 60 GW** of Wind Energy
  - 10 GW** from biomass
  - 5 GW** from small hydro
- But, at COP26, India has set up a target of **450 GW installed RE capacity by 2030**.

## INSTITUTIONAL FRAMEWORK

### A) NODAL BODY: MINISTRY OF NEW AND RENEWABLE ENERGY

- The ministry was established in 1992 as the Ministry of Non-Conventional Energy Sources. It adopted its current name in Oct 2006.
- The broad aim of the ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country.

- The **mission** of the ministry is to ensure:
  1. Energy Security
  2. Increase the share of clean energy
  3. Energy availability and access
  4. Energy Affordability
  5. Energy Equity

## B) RENEWABLE ENERGY MANAGEMENT CENTRES (REMCS)

- **Why in news?**
  - Power Minister dedicates 11 REMCs to nation (March 2020)
- To enable forecasting and scheduling of renewable resources and efficient management of intermittent and variable generation, **POWERGRID** was entrusted by Gol to establish REMCs.
- **All 11 REMCs** were commissioned during 2019-20.
  - They are equipped with AI based RE forecasting and scheduling tools.
  - They provide greater visualization and enhanced situational awareness to the grid operators.

## C) INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY (IREDA)

- **Why in news?**
  - The Cabinet Committee on Economic Affairs, chaired by PM Modi, approved the equity infusion of Rs 15,00 crores in Indian Renewable Energy Development Agency Limited (IREDA) (Jan 2022)
- **About IREDA**
  - IREDA is a mini Ratna (category-1) company under the administrative control of MNRE. It was set up in 1987 to work with established non-banking finance agency for Renewable Energy Sector. It plays a catalytic role in the RE project financing which gives confidence to the FIs/banks to lend to the sector.
- **Equity Infusion (Jan 2022)**
  - The CCEA has approved an equity infusion of Rs 15,00 crores in IREDA. This will help in employment generation of approx. 10,200 jobs-year and CO2 equivalent emission reduction of approx. 7.49 million tonnes of CO/year.
  - Additional Equity will help IREDA do the following:
    - i. To lend Rs.12000 crore approximately to the RE sector, thus facilitate the debt requirement of RE of additional capacity of approximately 3500-4000 MW.
    - ii. To enhance its net worth which will help it in additional RE financing, thus contributing better to the Government of India targets for RE.
    - iii. To improve the capital-to-risk weighted assets ratio (CRAR) to facilitate its lending and borrowing operations

## REPORTS

### A) REPORT BY THE INSTITUTE OF ENERGY ECONOMICS AND FINANCIAL ANALYSIS (SEP 2021)

- **Lockdowns** slowed renewable energy installations in the country and the pace of such installations is lagging India's 2022 target.
- **Land use for renewable** energy in India can be environmentally sustainable.
  - Around 50,000 to 75,000 sq km of land will be used in 2050 for solar energy generation and an additional 15,000 - 20,000 sq km will be used for wind energy projects.
  - The resulting land use would cause a net release of carbon upto 50 grams of Co2 per kwh.



- **Recommendations**
  - **Minimising total land-use requirements** for renewable energy by promoting offshore wind, rooftop solar and solar on water bodies
  - **Identification and assessment of land for renewable generation** by limiting undue regional concentration and developing environmental and social standards for rating potential sites.
  - **Attention on Indian agri-voltaics sector** — securing benefits to farmers and incentivising agrivoltaics uptake where crops, soils and conditions are suitable, and yields can be maintained or improved

## B) GLOBAL STATUS REPORT BY REN21 SECRETARIAT

- In 2020, India was placed fourth in terms of addition of total renewable power capacity as of 2020.
  - India is placed third among countries that added the most solar water heating capacity in 2020. **China** was ranked first.
- **Ren21** (an international policy network) which provide up-to-date and peer reviewed facts, figures, and analysis of global developments in technology, policies and markets. Ren21 works with a goal of enabling decision makers to shift to renewable energy.

## RECENT STEPS TO PROMOTE RENEWABLE ENERGY

### A) GREEN ENERGY CORRIDOR (GEC) PROJECTS

- **Why in news?**
  - Cabinet approves Intra-State Transmission System - Green Energy Corridor Phase-II (Jan 2022)
- The GEC project aims at synchronizing electricity produced from renewable sources, such as solar and wind, with conventional power stations in the grid.
  - The **first component** of the Scheme, **Inter-State GEC** with target capacity of 3,200 circuit kms (ckm) transmission lines and 17,000 MVA capacity substation, was completed in March 2020.
  - The **second component** - Intra-state GEC with a target capacity of 9700 ckm transmission lines and 22,600 MVA capacity sub-stations is expected to be completed by June 2022.
    - It is estimated to be set up with total estimated cost of Rs 12,031 crores.
- The scheme will help in achieving the target of 450 GW of RE capacity by 2030.

### B) RENEWABLE ENERGY CERTIFICATES

- **Details**
  - » Renewable Energy Certificate (REC) mechanism is a market-based instrument to promote renewable energy and facilitate compliance of renewable purchase obligations (RPO). It is aimed at addressing the mismatch between availability of RE resources in state and the requirement of the obligated entities to meet the renewable purchase obligation (RPO).
  - » One Renewable Energy Certificate (REC) is treated as equivalent to 1 MWh
- **Types**
  - » There are two categories of RECs, viz., **solar RECs and non-solar RECs.**
    - **Solar RECs** are issued to eligible entities for generation of electricity based on solar as renewable energy source, and.
    - **Non-solar RECs** are issued to eligible entities for generation of electricity based on renewable energy sources other than solar.

- » The solar certificate shall be sold to the obligated entities to enable them to meet their renewable purchase obligation for solar, and non-solar certificate shall be sold to the obligated entities to enable them to meet their obligation for purchase from renewable energy sources other than solar.

### 3. SOLAR ENERGY

#### INTRODUCTION

- Government has an ambitious target of 1,00GW solar power generation by 2022. This is a steep goal and achieving it will require synchronized efforts on all fronts including financial, technical, and political fronts.
- **Advantages of Solar Energy**
  - » **Renewable Energy Advantages** (as discussed in previous section)
  - » **Solar's advantage over other renewable energy** (available during office hours; longer life equipment; low running cost; India's geographical suitability)
  - » **Solar Energy is becoming more and more competitive**

#### VARIOUS INITIATIVES

##### A) JAWAHARLAL NEHRU NATIONAL SOLAR MISSION

- It was launched in 2009 with a target for Grid Connected Solar Projects of 20,000 MW by 2022. In 2015, this target was revised to **100 GW by 2022** and in Aug 2021, the government has set a solar target of 300 GW by 2030 (450 GW of RE by 2030)
- The target principally comprises of 40 GW of rooftop and 60 GW through Large and Medium scale Grid Connected Solar Power Projects.
- The program aims at **reducing the cost of solar power generation** in the country through:
  - a. Long term policy
  - b. Large scale deployment goals
  - c. Aggressive R&D
  - d. Domestic production of critical raw material, components and products.
- **Currently** (As of April 2022), India ranks **fifth** after China, USA, Japan, and Germany in terms of **installed solar power capacity**.
  - As of Dec 2021, the cumulative solar installed capacity of India is 55 GW, which is roughly half the (RE) capacity (excluding large hydro power) and 14% of overall power generation capacity of India.
  - Of the **55GW**, grid connected utility-scale projects contribute 77% and the rest comes from grid-connected rooftop and off-grid projects.
- **Progress compared to target:**
  - As of April, only about 50% of the 100 GW target, consisting of 60GW of utility-scale and 40 GW of rooftop solar capacity has been met. Nearly, 19 GW solar capacity is expected to be added in 2022 - 15.8GW from utility scale and 3.5GW from rooftop solar.
  - This would mean that about **27% of India's 100 GW solar target would remain unmet**. It is mostly because of rooftop solar which is estimated to have a shortfall of 25 GW in the 40GW target.

##### B) GRID CONNECTED SOLAR ROOFTOP PROGRAM

- **Objective:** Achieving **cumulative capacity of 40,000 MW** from Rooftop Solar (RTS) Projects by the year **2022**

- **MNRE** is implementing the program for installation of grid connected roof top solar systems from 1 KWp to 500 KWp capacity in residential, social, Government/PSU and institutional sectors
- Under this, CFA of upto 30% of benchmark is provided in General category states and upto 70% of the benchmark cost in specialized category states.
  - » By an amendment in 2016, the commercial and industrial establishment in the private sector were **excluded** from obtaining CFA.
- **Target Missed:**
  - » It is estimated that by the end of 2022, only 15 GW of rooftop solar would be installed.
- **why?**
  - » In the early years, it was due to lack of consumer awareness, inconsistent policy frameworks of the Centre/State governments and financing. Recently, however, there has been sharp rise in rooftop solar installations. This is due to falling tech cost, increasing grid tariffs, rising consumer awareness and growing need for cutting energy cost.
  - » **Factor impeding rooftop solar:**
    - **Supply chain disruption** due to COVID-19 pandemic
    - **Regulatory roadblocks**
    - **Limits to net-metering** (of paying users who give back surplus electricity to the grid)
    - **Taxes on imported cells or modules**
    - **Financing issues** etc.
- **Future:**
  - » Rooftop solar adoption is expected to increase as land and grid connectivity for utility solar projects are expected to be hard to come by.

#### C) PM KUSUM (PRADHAN MANTRI KISAN URJA SURAKSHA EVAN UTTHAM MAHABHIYAN)

- It is an ambitious scheme aims at providing **water and energy security** to farmers and enhancing their income by making *Annadata* also a *Urjadata*.
- The scheme aims to **add solar and other renewable capacity of 25.7 GW by 2022** with total **central financial support of Rs. 34,422 Crore** including service charges to the implementing agencies.
- The Scheme consists of three components:
  - » **Component A: 10,000 MW of Decentralized Ground Mounted Grid Connected Renewable Power Plants** of individual plant size up to 2 MW.
  - » **Component B: Installation of 17.50 lakh standalone Solar Powered Agriculture Pumps** of individual pump capacity up to 7.5 HP.
  - » **Component C: Solarisation of 10 Lakh Grid-connected Agriculture Pumps** of individual pump capacity up to 7.5 HP

#### D) INTERNATIONAL SOLAR ALLIANCE TO PROMOTE INTERNATIONAL COOPERATION

- In Dec 2021, UNGA has conferred Observer status to the International Solar Alliance. It would help provide for a well-defined cooperation between the Alliance and the UN that would benefit global energy growth and development.
- At COP26, USA has also joined ISA.

#### E) FLOATING SOLAR POWER PLANTS

It is a new and emerging concept in India. In this system, the solar photo voltaic panels are installed on waterbodies such as lakes and ponds

- **Other advantages**
  - No land acquisition requirement
  - Easy plain terrain which is shadow free
  - Solar power panels accumulates less dust
  - Less evaporation of water
  - Ambient temperature ensure efficient utilization of solar power plant
- **NTPC commissions floating Solar PV Project at Simhadri Thermal Station (Aug 2021)**
  - » The National Thermal Power Corporation (NTPC) Ltd, has commissioned a floating solar PV project of 25 MW on the reservoir of its Simhadri thermal station in Vishakhapatnam, Andhra Pradesh.
    - This is also the first solar project to be set up under the Flexibilization Scheme, notified by Gol in 2018.
  - » **About Simhadri Power Station:**
    - The 2000 MW coal-based Simhadri Station is the first power project to implement an open sea intake from the Bay of Bengal which has been functional for more than 20 years.
- **Ramagundam Floating Solar Project (March 2022)**
  - » **Why in news?**
    - NTPC commissions additional capacity of Ramagundam Floating Solar Project: (March 2022)
  - » **Details**
    - The project is of 100 MW capacity:
      - Earlier the company had commissioned 17.5 MW (Part-1) and 20 MW (Part-2) of the project.
    - Now, 42.5 MW has been added, taking the total capacity to 80 MW

## PROMOTING DOMESTIC MANUFACTURING IN SOLAR SECTOR

### A) NATIONAL PROGRAMME ON HIGH EFFICIENCY SOLAR PV MODULES

- For Solar Energy Sector, in April 2021, the Cabinet approved a PLI Scheme, namely, 'National Program on High Efficiency Solar PV Modules', with an outlay of Rs 4,500 crores.
- The scheme has provisions for supporting setting up of integrated manufacturing units of high energy efficiency solar PV modules by providing Production Linked Incentives (PLI) on sales of such solar PV modules.
- The scheme targets an additional 10,000 MW of integrated domestic manufacturing capacity of high efficiency solar PV modules with an investment of around Rs 17,200 crores. It is also expected to generate direct employment of about 30,000 and indirect employment of about 1,20,000 persons.

### B) OTHER OLDER STEPS:

- **Modified Special Incentive Package Scheme (M-SIPS)** of Ministry of Electronics & Information Technology: The scheme mainly provides subsidy for capital expenditure - 20% for investments in SEZs and 25% in non-SEZs. It was receiving applications till 31st Dec, 2018
- **Preference to 'Make in India' in Public Procurement in Renewable Energy Sector:** MNRE has prescribed that in public procurement of items in respect of which there is sufficient capacity and local competition, only class-1 local suppliers would be eligible to bid. Class-1 local suppliers means as supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%. Solar PV modules are one of the products identified as having sufficient local capacity and competition.

- **Domestic Content Requirements:** Under some of the current schemes of MNRE, namely CPSU scheme Phase-II, PM KUSUM and Grid-Connected Rooftop Solar Program Phase-II, wherein government subsidy is given, it has been mandated to source Polar PV Cells and modules from domestic sources.

### C) CUSTOM DUTIES:

- Government has announced imposition of Basic Customs Duty on import of Solar PV cells and modules with effect from 1st April 2022.

### SARAL (THE STATE ROOFTOP SOLAR ATTRACTIVENESS INDEX) INDEX: PROMOTING COMPETITION AMONG STATES

- Launched by MNRE
- The index has been **designed by** MNRE, Shakti Sustainable Energy Foundation (SSEF), ASSOCHAM, and Ernst and Young.
- The index aims to incentivize rooftop solar by creating **healthy competition**, among the states. It is the first of its kind index, which provides comprehensive overview of state level measures adopted to facilitate rooftop solar deployment.
- It also helps other states to learn and adopt the best practices followed by top performing states.
- **Five key parameters used:**
  1. Robustness of policy framework.
  2. Implementation environment
  3. Investment Climate
  4. Consumer Experience
  5. Business Ecosystem
- **Note:** Under National Solar Mission, MNRE targets an installed solar capacity of 100 GW. The target principally comprises of 40 GW of rooftop and 60 GW through Large and Medium scale Grid Connected Solar Power Projects