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Revision Series Environment (Part - 3)

Topics to be Covered

Important Updates on –

- **Renewable Energy**

Flexible/Flex Fuel Vehicles

- Also known as dual-fuel vehicle.
- It is a well-accepted concept in Brazil, representing over 80% of the total number of new vehicles sold in the country (2019).
- It is a modified version of vehicles that which comprises of the internal combustion engine which could run both on gasoline and blended petrol with either ethanol or methanol fuel.
- Both of the fuels are stored in same common tank.
- The fuel injection and spark timing are automatically adjusted in accordance with the actual blend detected by the fuel composition sensor.
- Though technology exists to allow ethanol FFVs to run on any mixture of gasoline and ethanol, from pure gasoline up to 100% ethanol (E100), North American and European flex-fuel vehicles are optimized to run on E85, a blend of 85% anhydrous ethanol fuel with 15% gasoline.
- FFV is different from the bi-fuel vehicles as in the bi-fuel vehicle, two fuels are stored in the separate tanks and engine runs on one fuel at a time.

Ethanol Blending

- Recently, Roadmap for Ethanol Blending in India by 2025 was released by Ministry of Petroleum & Natural Gas (MoPNG) and Niti Aayog.
- The roadmap proposes a gradual rollout of ethanol-blended fuel to achieve E10 fuel supply by April 2022 and phased rollout of E20 from April 2023 to April 2025.
- The National Policy on Biofuels – 2018, provides an indicative target of 20% ethanol blending and 5% biodiesel-blending under the Ethanol Blended Petrol (EBP) Programme by 2030.
- Currently petrol with 10% ethanol blend (E10) is being retailed by various Oil Marketing Companies (OMCs) in India, wherever it is available.

- Prime Minister Narendra Modi's June 5 (World Environment Day) announcement of 20 per cent ethanol blending in petrol (E20) by 2025 can indeed be a game-changer for reducing its crude oil import by 10 per cent by 2022.

Energy Cane

- Energy cane is sugar cane that has been genetically modified to become more productive in the manufacture of biofuel, biochemicals and renewable energy generation.
- New variety of sugarcane used by Brazil for ethanol blending.
- It is low on sucrose but high on biomass.
- It is promising on drier and lower fertility soils.
- Brazilian sugarcane ethanol is designated as an advanced biofuel due to its 61% reduction of total life cycle GHG emissions.
- With a mandatory blending of 27% ethanol with gasoline, in 2019 alone Brazil saved about 0.5 million barrels per day of gasoline with a savings of $13 billion in imports.
- 78% of Brazilian automobiles today run on 27% of ethanol blend.
- The residual cane-waste (Bagasse) also become commercially valuable for power generation and other commercial uses.

SATAT Initiative

- Petronet LNG signed a non-binding memorandum of understanding with Ministry of Petroleum & Natural Gas for undertaking compressed bio-gas (CBC) projects.
- The MOU is signed under Sustainable Alternative towards Affordable Transportation (SATAT) initiative.
- SATAT initiative for boosting production and availability of CBG as an alternative and affordable clean fuel for transportation sector was launched by Government on 1 October 2018.
- The scheme envisages setting up of 5000 CBG plants by 2023-24 with a production target of 15 MMT, facilitating the creation of new employment opportunities and enhancing farmers' income towards further invigorating the rural economy.

- Petronet LNG was formed as a joint venture by the Government of India to import LNG and set up LNG terminals in the country, involving India's leading oil and natural gas industry players like GAIL (India) (holds 12.50% stake), Oil & Natural Gas Corporation (ONGC) (holds 12.50% stake), Indian Oil Corporation (IOCL) (holds 12.50% stake) and Bharat Petroleum Corporation (BPCL) (holds 12.50% stake).

Green Bonds

- A green bond is a fixed-income instrument designed specifically to support specific climate-related or environmental projects.
- Green bonds may come with tax incentives to enhance their attractiveness to investors.
- The World Bank is a major issuer of green bonds.
- It has issued 164 such bonds since 2008, worth a combined $14.4 billion.
- In 2013, corporates started participating, which led to its overall growth.
- In 2020, the total issuance of green bonds was worth almost $270 billion, according to the Climate Bond Initiative.
- The cumulative issuance since 2015 is over $1 trillion.
- In India, they are regulated by Securities and Exchange Board of India (SEBI) which has put in place disclosure norms for issuance and listing of green bonds.
- As per a recent study by the Reserve Bank of India (RBI), the cost of issuing green bonds has generally remained higher than other bonds in India, largely due to asymmetric information.
- For issuers, Green bonds increases their reputation and standing in the market, as it helps them in demonstrating their commitment towards sustainable development.
- It also provides them access to global investors who invest only in green ventures.
- Yes Bank was the first bank to issue Green Bonds worth Rs 1,000 crore in 2015 and other banks and corporates have jumped the bandwagon since then.
- As per RBI report, the outstanding amount of green bonds issued in India in February 2020 was $16.3 billion which constituted about 0.7% of all the bonds issued in the Indian financial market.
- Although the value of green bonds issued in India since 2018 constituted a very small portion of the total bond issuance, India was next only to China and was ahead of developed countries like the US and UK in issuing green bonds.

- A green deposit is a fixed-term deposit for investors looking to invest their surplus cash reserves in environmentally friendly projects.
- This new offering in the market indicates the increased awareness of the importance of ESG (Environmental, social and governance) and sustainable investing.
- With the momentum behind green banking products, many lenders like HSBC and HDFC have launched green deposits in India for corporates as well as individuals.
- The investment in this fixed tenure deposit will go towards financing eligible businesses and projects that promote the transition to a low-carbon, climate-resilient, and sustainable economy.

Renewable Energy Certificates

- Renewable Energy Certificates (RECs) are a market-based instrument that certifies the bearer owns one megawatt-hour (MWh) of electricity generated from a renewable energy resource.
- Once the power provider has fed the energy into the grid, the REC received can then be sold on the open market as an energy commodity.
- RECs earned may be sold, for example, to other entities that are polluting as a carbon credit to offset their emissions.
- In India, RECs are traded on two power exchanges – Indian Energy Exchange (IEX) and Power Exchange of India (PXIL).
- The price of RECs is determined by market demand, and contained between the 'floor price' (minimum price) and 'forbearance price' (maximum price) specified by the Central Electricity Regulatory Commission (CERC).
- Under the renewable purchase obligation (RPO), bulk purchasers like discoms, open access consumers and capacitive users are required to buy certain proportion of RECs.
- They can buy RECs from renewable energy producers to meet the RPO norms.
- The REC mechanism is a market-based instrument to promote renewable sources of energy and development of market in electricity.
- It provides an alternative voluntary route to a generator to sell its electricity from renewable sources just like conventional electricity and offer the green attribute (RECs) separately to obligated entities to fulfil their RPO.

Wind Solar Hybrid Parks

- The Union Ministry of New and Renewable Energy (MNRE) is planning on setting up new solar hybrid parks in the country.
- The solar power project is commissioned on contiguous land, while the wind power project requires scattered land on footprint basis.
- It not only increases the transmission cost but also increases the possibility of land-related issues.
- In order to overcome these challenges and to speed up the installation of wind power projects, the scheme – Development of Wind Parks/Wind-Solar Hybrid Park – with proper infrastructure including evacuation facilities in place has been proposed.
- The competitive bidding process has resulted in competitive tariffs which are much lower than traditional Feed-in Tariffs, a number of projects have been delayed due to land, NoCs and transmission related issues.
- These challenges and uncertainties have raised the concerns of investors in the sector.
- Wind Energy Park will provide a plug and play solution (availability of land, transmission, necessary infrastructure and necessary approvals) to the investors for installing wind/wind-solar power projects.
- The probable sites for the parks have been identified with the help of National Institute of Wind Energy (NIWE) on the basis of availability of mainly wind resource and suitability of land for such projects.
- If the site is found to be suitable, the park developer may consider developing a wind-solar hybrid park.
- The identified sites would be circulated to concerned state governments for their approval.
- The State government would designate park developer who would undertake the development of park including DPR preparation, land, transmission infrastructure, etc.
- Sites have been identified across seven states – Tamil Nadu, Andhra Pradesh, Karnataka, Telangana, Gujarat, Rajasthan and Madhya Pradesh – and the Concept Note has identified potential to install projects for a capacity of 53,495 MW (5 MW per sq. km).
- The capacity of each park should be 500 MW and more.

- The parks of lower capacity may also be developed depending upon the availability of land and resource.
- The capacity of each park shall not be less than 50 MW.
- MNRE will provide financial assistance of ₹25 lakh per park to the developer for DPR preparation and ₹30 lakh per MW or 30 per cent of the park development cost to park developer, whichever is lower.

Hybrid Renewable Energy Park

- A 30,000 MW (megawatt) hybrid renewable energy park is coming close to the Indo-Pak border in Kutch district.
- The project is billed as the largest of its kind in the world.
- With the Government of India committing itself to installing 175 GW of renewable energy capacity by 2022, the Gujarat government identified 1,00,000 hectares of wasteland near Khavda, 72 km north of Bhuj, close to the international border with Pakistan in Kutch, for an energy park.
- In April 2020, after taking into consideration the requirements of the defence forces, the Ministry of Defence (MoD) gave its approval to use 72,600 hectares of the identified land to build the park.
- The renewable energy park will have two zones -
    - 49,600-hectare hybrid park zone that will accommodate wind and solar power plants of 24,800 MW capacity;
    - An exclusive wind park zone spread over 23,000 hectares.
- The entire 23,000 ha at the exclusive wind zone park has been allotted to Solar Energy Corporation of India (SECI) to set up wind projects under the competitive bidding route policy.
- Power Grid Corporation of India will evacuate the power produced at this park.

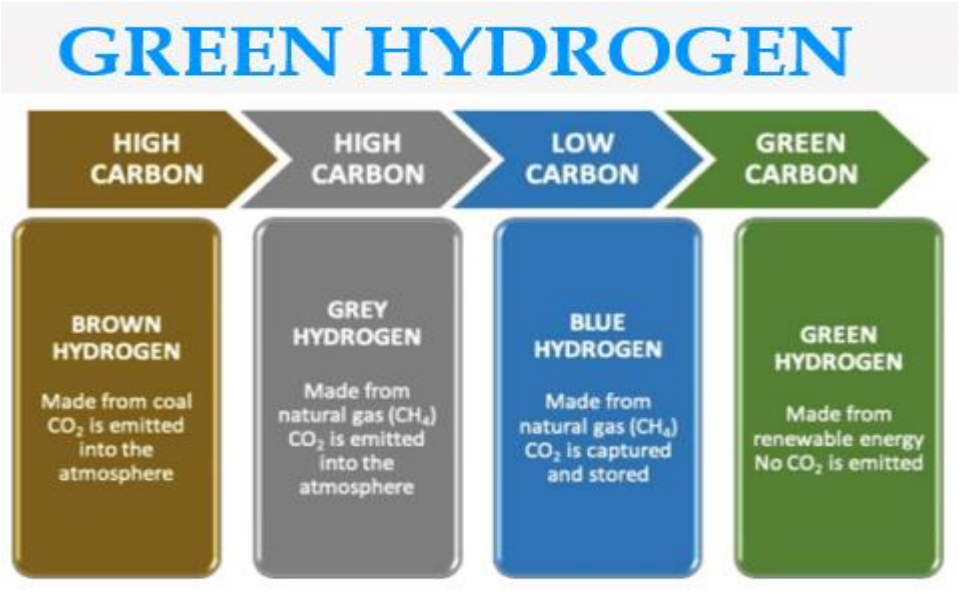
Bio Coal

- Swedish technology to reduce stubble burning.
- Done through the process of torrefaction.
- Torrefaction is a thermal process to convert biomass into a coal-like material, which has better fuel characteristics than the original biomass.

- The process involves heating up straw, grass, sawmill residue and wood biomass to 250 degrees celsius - 350 degrees celsius.
- This changes the elements of the biomass into 'coal-like' pellets.
- These pellets can be used for combustion along with coal for industrial applications like steel and cement production.
- The torrefied Biomass material has higher calorific value and higher durability.
- If scaled up, about 65% of the biomass could be converted to energy.
- Uttar Pradesh (UP) has begun the procurement of agricultural waste to wean away the farmers from the practice of stubble burning and to double the farm incomes.
- The UP government has setup its first biocoal production unit in Risia of Bahraich district which has successfully completed the trial-run of manufacturing fuel briquette pellet from agricultural waste.

Green Hydrogen

- Hydrogen will make up 12 per cent of the energy mix by 2050, according to the International Renewable Energy Agency (IRENA).
- About 66 per cent of this hydrogen used, must come from water instead of natural gas, the agency suggested
- Green hydrogen is produced by electrolysis of water using renewable energy and has a lower carbon footprint.
- At present, less than 1 per cent of hydrogen produced is green hydrogen, according to IRENA's World Energy Transitions Outlook.



- The country consumes about six million tonnes of hydrogen every year for the production of ammonia and methanol in industrial sectors, including fertilisers and refineries.
- India has favourable geographic location and abundance of sunlight and wind for the production of green hydrogen
- Green hydrogen production will also reduce the country's dependence on imports while also helping the cause of climate change.
- Green hydrogen currently costs $5-6 per kilogram (or Rs 371-446), which is nearly triple the cost of grey hydrogen, according to a recent study.
- By 2030, the cost of green hydrogen is expected to compete with that of hydrocarbon fuels.
- India will become a net exporter of green hydrogen by 2030 due to its cheap renewable energy tariffs, according to the Global Hydrogen Council.
- Green hydrogen can be used in a wide range of existing applications such as fertilisers, mobility, power, chemicals and shipping.
- Green hydrogen can be blended up to 10 per cent by city gas distribution networks for wider acceptance.

H - CNG

- It is hydrogen-enriched compressed natural gas (CNG.)
- An ideal blend of 18% hydrogen in CNG can be used as automotive fuel after compression.
- It is cleaner and more economical.
- HCNG will ensure 70% more reduction in carbon monoxide emissions compared to CNG.
- It reduces the engine's unburned hydrocarbon emissions and speeds up the process of combustion.
- The engine's fuel efficiency is improved by blending the CNG from hydrogen which lowers the fuel consumption of the vehicle.
- The thermal efficiency and fuel economy is also increased by HCNG.
- In a step towards promoting alternative clean fuel for transportation, the Union road transport and highways ministry has notified hydrogen-enriched compressed natural gas (CNG) as an automobile fuel.

- It is an intermediate but important step in our transition towards a hydrogen economy.
- The most promising aspect of this technology is that it will allow for the utilization of the existing infrastructure of CNG buses as well as the piping network and dispensing stations.
- Therefore, it can be seen as the next-gen CNG for cleaner air.

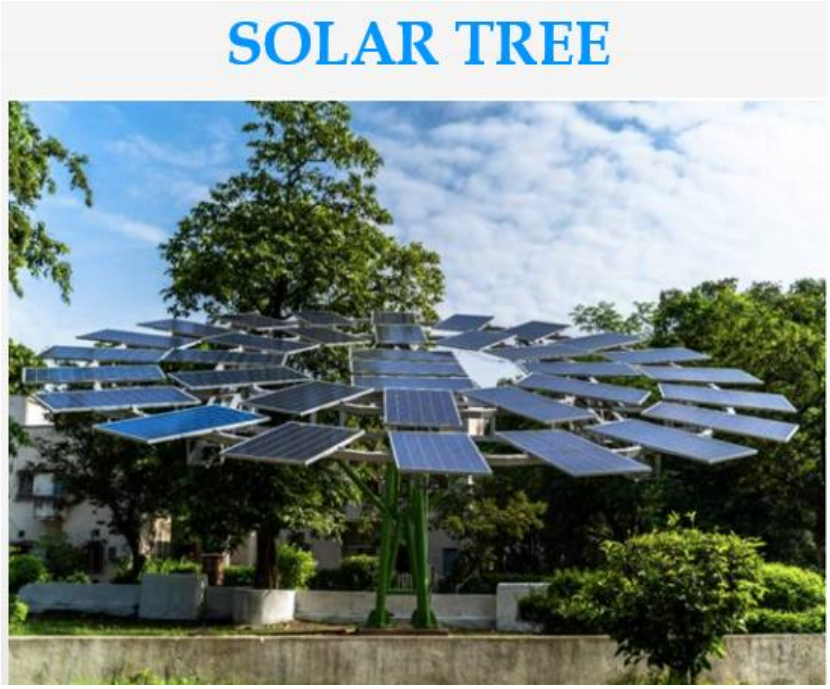
Floating Solar Power Plant

- It refers to the deployment of photovoltaic panels on the surface of water bodies.
- There are a large number of major reservoirs in the Southern Region which provides a huge opportunity to go for renewable energy in the floating solar method.
- Because of its inherent advantages over on land projects, which need large continuous stretches of non-farming, non-forest land, floating solar power projects are considered as a gamechanger in India's ambition to create 450 GW (gigawatts) of renewable energy capacity.
- Floating solar power plant of generation capacity (100MW) is being developed by the National Thermal Power Corporation Limited (NTPC) at Ramagundam in Peddapalli district of Telangana.
- State-run NTPC started operations at India's largest floating solar PV project at its Simhadri thermal station in Visakhapatnam in Andhra Pradesh.
- The floating solar facility is part of the coal-burning giant's aim to become green by 2032, when it plans to build a 60-gigawatt renewable energy capacity.

Solar Tree

- CSIR-CMERI has developed the World's Largest Solar Tree, which is installed at CSIR-CMERI Residential Colony, Durgapur in WB.
- The installed capacity of the Solar Tree is above 11.5 KWp.
- It has the annual capacity to generate 12,000-14,000 units of Clean and Green Power.
- The Solar Tree has been designed in a manner to ensure maximum exposure of each Solar PV Panel to Sunlight and also creation of the least amount of shadow area beneath.

- The inclination of the arms holding the Solar PV Panels are flexible and can be adjusted as per requirement, this feature is not available in Roof-Mounted Solar facilities.
- These Solar Trees can be aligned with Agriculture for substituting price-volatile fossil fuels.
- Each Solar Tree has the potential to save 10-12 tons of CO_2 emissions being released into the atmosphere as Greenhouse Gases when compared with fossil fuel fired energy generation.
- Besides, the surplus generated power can be fed into an Energy Grid.
- This Agricultural Model can provide a consistent economic return and help the farmers counter the effects of the uncertain variations in Agriculture related activities, thus, making farming an Economic and Energy Sustainable practice.



Sustainable Risk Mitigation Initiative

- SRMI aims to support countries in developing sustainable solar programs that will attract private investments and so reduce reliance on public finances.
- The World Bank has operationalised a Solar Risk Mitigation Initiative (SRMI) with $333 million for 22 African countries.
- The idea was incubated as the Common Risk Mitigation Mechanism by the International Solar Alliance.
- It offers development and climate financing for

- technical assistance to help countries develop evidence-based solar targets, implement a sustainable solar program, and maintain robust procurement processes with transaction advisors;
- critical public investments to enable the integration of variable renewable energy (VRE), finance solar park infrastructure, and increase access to electricity; and
- risk mitigation instruments to cover residual risks perceived by private investors.

Earth Overshoot Day

- Earth Overshoot Day marks the date when humanity's demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year.
- In 2021, it fell on July 29 as disclosed by Global Footprint Network (GFN).
- Humanity currently uses 74 per cent more than what the planet's ecosystems can regenerate – or 1.7 Earths.
- From Earth Overshoot Day until the end of the year, humanity operates on ecological deficit spending.
- This means that humanity is currently using nature 1.75 times faster than our planet's ecosystems can regenerate, equivalent to 1.75 Earths.
- Humanity first saw ecological deficit in the early 1970s.
- Overshoot is possible because we are depleting our natural capital, compromising the planet's future regenerative capacity.
- It is computed by Global Footprint Network, which is an international non profit organization founded in the year 2003.
- Andrew Simms of UK think tank New Economics Foundation originally developed the concept of Earth Overshoot Day.

Earth Hour

- Earth Hour is a worldwide movement organized by the World Wide Fund for Nature (WWF) since 2007.
- The event is held annually encouraging individuals, communities, and businesses to turn off non-essential electric lights for one hour, from 8:30 to 9:30 pm as a symbol of commitment to the planet.
- It is held every year on the last Saturday of March.

- It was started as a lights-off event in Sydney, Australia, in 2007.
- Since then, it has grown to engage more than 7,000 cities and towns across 187 countries and territories.

Energy Efficiency Report

- Ministry of Power and New & Renewable Energy released a report on the "Impact of energy efficiency measures for the year 2018-19".
- India has pledged in COP-21 that we will bring down energy intensity of economy by 33 to 35% compared to 2005 levels by 2030.
- Various energy efficiency initiatives have reduced the energy intensity of economy by 20% compared to 2005 levels.
- This report was prepared by an Expert agency PWC Ltd, who was engaged by Bureau of Energy efficiency (BEE) for an independent verification to assess the resultant annual savings in energy as well as CO 2 emissions through various initiatives in India.
- The findings of the report reflect that implementation of various energy efficiency schemes have led to total electricity savings to the tune of 113.16 Billion Units in 2018-19, which is 9.39% of the net electricity consumption.
- These efforts have also contributed in reducing 151.74 Million Tonnes of CO2 emissions, whereas last year this number was 108 Million Tonnes of CO2.
- The study has identified following major programmes, viz. Perform, Achieve and Trade Scheme, Standards &Labelling Programme, UJALA Programme, Municipal Demand Side Management Programme, etc.

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