General Studies-3; Topic– Infrastructure: Energy, Ports, Roads, Airports, Railways etc.

India's Renewable Energy Challenge

1) Introduction

- The focus on green energy is extremely laudable and India is on its way to achieving its 100 GW of solar energy by 2022.
- Solar energy will play the most prominent role in the push for green energy.
- Not only does it have a larger share of India's targets, it represents much of the growth of renewable energy.
- However, there are many hidden costs associated with green energy.

2) Background

- Production of electricity is responsible for about a quarter of global greenhouse gas emissions.
- The demand is poised to rise as underserved populations connect to the grid, and electronics and electric vehicles proliferate.
- So stopping global warming will require a transformation of electricity production.
- Replacing fossil fuel power plants with renewable energy sources, including solar, wind, hydropower and geothermal power, would reduce diverse types of pollution.
- However, No energy source is without adverse environmental side effects.

3) Social Cost

- Economic survey 2016-17 had raised the issue that investment in renewable energy would have social cost Rs 11 per unit of electricity generated.
- Shift to renewable energy would leave the conventional plants under-utilised, lower than maximum technically feasible limit.
- Investments made in these plants would be deemed as sunken cost due to revenue loss.
- Banking sector which has extended loans to Coal plants would come under stress.
- Opportunity cost of land used for solar power plant. It requires 5-6 acres per 1 MW as per Ministry of New and Renewable energy.
- Those employed in coal plants risk losing their jobs.

4) Hidden Costs / Challenges

- **Sunlight**
  a) Sunlight is available only during the day. Photovoltaics (PV) delivers electricity only when the sun shines.
  b) The peak demand in India is during the evening when solar energy (unless stored) is not available.
- **Plant Load Factor**
  a) The highest PLF (Plant Load Factor) for solar power plants is considered to be only about 20 per cent, and many rooftops give less.
  b) Load factor is a measure of the output of a power plant compared to the maximum output it could produce.
- **Solar panels**
  a) Solar panels require much more space to generate the same amount of power as fossil fuel or nuclear power generators.
  b) Additional worries include concerns on panel quality/lifespan, and whether costs will continue to fall

c) There are issues relating to maintenance of solar panels, especially in the context of dust and pollution.
d) The quality of solar panels manufactured on mass scale is already causing problems.

- **Rooftop Solar**
  a) Rooftop solar is far behind schedule to meet the 40GW goal.
  b) Small deployments cost more than grid-scale farms.
- Price "grid parity" will be another issue that will have to be resolved.
- We lack flexible markets and dynamic pricing — most power is sold via static power purchase agreements (PPAs).
- There are issues relating to setting up of solar plants as well as financing.
- Land costs, availability, and bankability are also growing concerns.
- The cost at which solar energy gets delivered is more than the cost at which it gets generated.
- **Hydro power**
  a) Hydro power generation is a good complement and India has enormous potential. However this potential has not been tapped on account of environmental considerations.
  b) The ongoing projects, like the one at Subhanshree in Assam, have languished and the delays have led to cost escalation that has made the project unviable.
  c) India even lags behind in deployment of pumped hydro capacity, the most proven and cost-effective large-scale storage technology.
  d) Environmental effects from hydropower vary widely.
  e) Some dams cause significant climate impacts through the emissions of methane from the decomposition of biomass in reservoirs.
  f) Other dams cause serious ecological problems through habitat destruction.
  g) They can also block the migration of aquatic species and reduce sediment flow and nutrient transport, which affects floodplains and deltas.
- **Wind Power**
  a) Wind is also seasonal, especially in coastal regions.
  b) Turbines might cause noise and aesthetic pollution.
  c) Birds have been killed by flying into spinning turbine blades
- **Bio Energy**
  a) Biomass power becomes more favourable to ecosystems only when used with carbon capture and storage.

5) <u>Way Forward</u>

- Storage and the cost shall be key determinants for sustainability of solar energy
- Time of Day (ToD) pricing—in which consumers are charged based on when power is consumed—will encourage not just dynamic load management but also boost energy storage technologies.
- Support distributed and off-grid generation systems, as well as the adoption of storage technologies
- Green energy is the way forward but it is not likely to end the need for coal-based thermal plants in India.
- The dependence of coal-based thermal power plants will continue for at least the next couple of decades.
- Hence, it would not be advisable to promote it at the cost of pushing thermal power plants to become unviable on account of solar power.
- The two have to co-exist and supplement each other.