Non-Conventional Sources of Energy

Non-conventional sources of energy, also known as renewable or alternative energy, provide sustainable alternatives to fossil fuels. These include solar, wind, tidal, geothermal, nuclear, and biogas energy, which are eco-friendly and abundant.

Solar Energy

India, with 300 sunny days annually, has significant potential for harnessing solar energy.

- **Solar Cells (Photovoltaic Cells):** Made from semiconductor materials like silicon, solar cells convert sunlight into electricity. They are used in calculators, streetlights, and water pumps. Solar panels, consisting of multiple cells, generate higher power.
- **Solar Cooker:** Uses a reflective mirror to concentrate solar heat onto an insulated box. The trapped heat helps cook food efficiently.
- **Solar Water Heater:** Consists of a black insulated box with a copper coil, heating water using sunlight.

Advantages:

- Renewable and clean energy.
- Reduces dependency on fossil fuels.
- Low maintenance and cost-effective in the long run.
- Useful in remote areas and for distilling water in scarce regions.

Wind Energy

Wind is a cost-effective and clean energy source.

- **Generation:** Windmills convert wind energy into mechanical energy, used for water pumps, flourmills, and electricity.
- **Wind Farms:** Clusters of wind turbines generate large-scale energy. Key locations in India include Tamil Nadu (Nagarcoil to Madurai), Andhra Pradesh, Gujarat, Kerala, and Maharashtra.

Advantages:

- Pollution-free and renewable.
- Reduces reliance on fossil fuels.
- Beneficial for rural economies as landowners can install turbines for additional income.

Tidal Energy

Tides, caused by the gravitational pull of the moon and sun, generate energy through tidal barrages.

- **Generation:** During high tide, seawater fills barrage reservoirs, spinning turbines that generate electricity. At low tide, stored water flows out, repeating the process.
- **Key Sites in India:** Gulf of Kutch, Cambay, and Sunderbans.

Advantages:

- Renewable and predictable.
- Low maintenance costs despite high initial investment.
- Effective even at low water speeds.

Geothermal Energy

Generated from Earth's internal heat, geothermal energy is an efficient and environmentally friendly power source.

- **Generation:** Hot water from deep underground is pumped to the surface, turning into steam that spins turbines to generate electricity. The cooled water is returned underground for reuse.
- **Key Locations in India:** Manikaran (Himachal Pradesh), Puga Valley (Ladakh), and regions in the Himalayan belt, Andaman and Nicobar Islands, and the Cambay Graben.

Advantages:

- Widely available and independent of weather conditions.
- Low greenhouse gas emissions.
- Reliable and cost-efficient.

Nuclear Power

Nuclear energy is derived from radioactive elements like uranium, thorium, and plutonium.

- **Generation:** Nuclear fission splits heavy atoms, releasing energy to heat water and produce steam. The steam turns turbines to generate electricity.
- **Types of Reactors:** Pressurized water reactors and boiling water reactors.
- **Key Locations in India:** India has 21 nuclear reactors, with rich uranium and thorium deposits in Kerala's monazite sands.

Advantages:

- High energy output with low raw material usage.
- Reduces reliance on fossil fuels.
- Continuous power supply with minimal transportation costs.

Biogas

A renewable source of energy produced by anaerobic decomposition of organic waste.

- **Generation:** Organic matter (dung, plant waste) is decomposed in a biogas digester, producing methane-rich gas for cooking and lighting.
- **Ministry Support:** The Indian government promotes biogas through various programs.

Advantages:

- Clean, cheap, and non-polluting.
- Provides direct gas supply, avoiding storage issues.
- The leftover slurry is a valuable organic fertilizer.

Non-conventional energy sources are crucial for sustainable development. They offer viable solutions to energy crises, reduce environmental degradation, and ensure a greener future.