



Coal Gasification

For Prelims: Coal Gasification, Syngas, Hydrogen Economy, Concerns Associated with Coal Gasification Plants

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Why in News

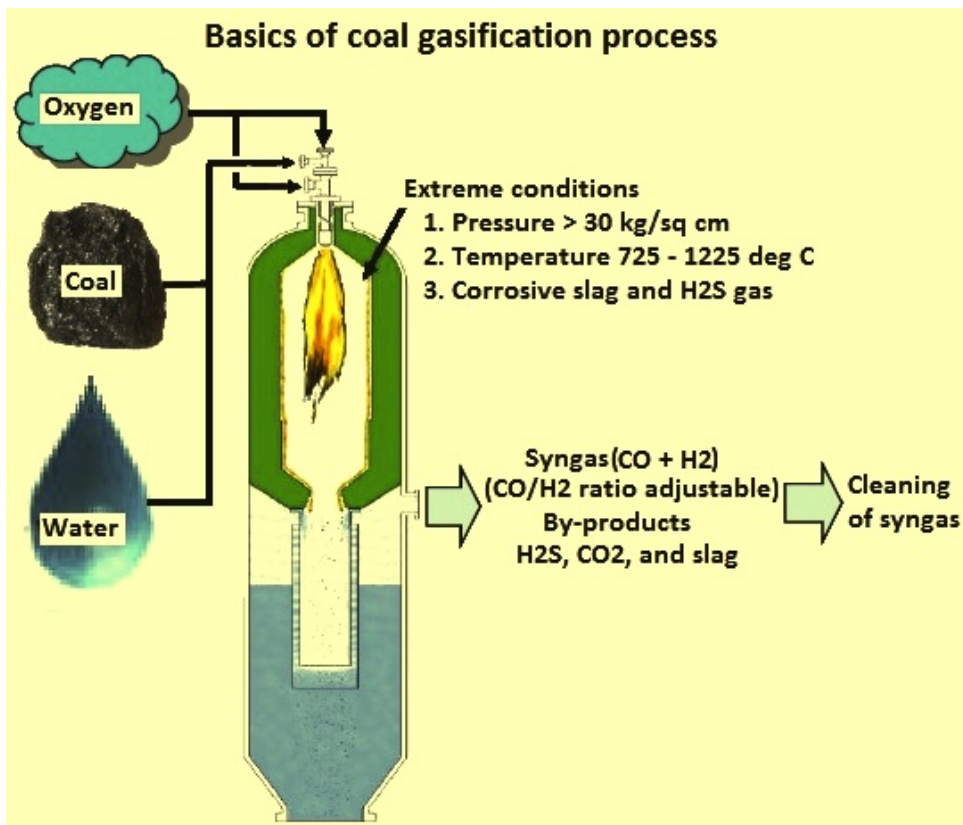
Recently, the Delhi-based non-profit, Centre for Science and Environment (CSE), has raised concerns about the Union Government's announcement on coal gasification projects in the [Budget 2022-23](#).

- The budget proposed four pilot projects for coal gasification and conversion of coal into chemicals required for the industry.
- According to CSE, the process of coal gasification is **not attractive from a climate change point of view**.

What is Coal Gasification?

- **Process:** Coal gasification is a process in which coal is partially oxidised with air, oxygen, steam or carbon dioxide to form a fuel gas.
 - This gas is then used instead of piped natural gas, methane and others for deriving energy.
 - In-situ gasification of coal – or **Underground Coal Gasification (UCG)** – is the technique of converting coal into gas while it is still in the seam and then extracting it through wells.
- **Production of Syngas:** It produces Syngas which is **a mixture consisting primarily of methane (CH₄), carbon monoxide (CO), hydrogen (H₂), carbon dioxide (CO₂) and water vapour (H₂O)**.
 - Syngas **can be used** to produce a wide range of fertilizers, fuels, solvent and synthetic materials.
- **Significance:** Steel companies **typically use coking coal** in their manufacturing process. Most of the coking coal is imported and is expensive.
 - To cut costs, plants can use syngas, which comes from coal gasification plants in the place of coking coal.
 - It is primarily used for electricity generation, for the production of chemical feedstocks.
 - The hydrogen obtained from coal gasification can be used for various purposes such as making ammonia, powering a hydrogen economy.

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What is the Hydrogen Economy?

- It is an economy that relies on **hydrogen as the commercial fuel** that would deliver a substantial fraction of a nation's energy and services.
- Hydrogen is a **zero-carbon fuel** and is considered an **alternative to fuel** and a key source of clean energy.
- It can be produced from **renewable sources of energy such as solar and wind**.
- It is an envisioned future where hydrogen is used as fuel for vehicles, energy storage and long-distance transport of energy.
- The different pathways to use hydrogen economy includes hydrogen production, storage, transport and utilization.
 - In 1970, the term '**Hydrogen Economy**' was coined by **John Bockris**.
 - He mentioned that a hydrogen economy can replace the current hydrocarbon-based economy, leading to a cleaner environment.

What are the Concerns associated with Coal Gasification Plants?

- **Environmental Perspective:** Coal gasification actually produces more carbon dioxide than a conventional coal-powered thermal power plant.
 - According to CSE estimates, one unit of electricity generated by burning gasified coal generates 2.5 times more carbon dioxide than what would result when burning the coal directly.
- **Efficiency Perspective:** The syngas process converts a relatively high-quality energy source (coal) to a lower quality state (gas) and consumes a lot of energy in doing so.
 - Thus, the efficiency of conversion is also low.

Source: DTE

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