

## Science and technology: COAL TO LIQUID TECHNOLOGY

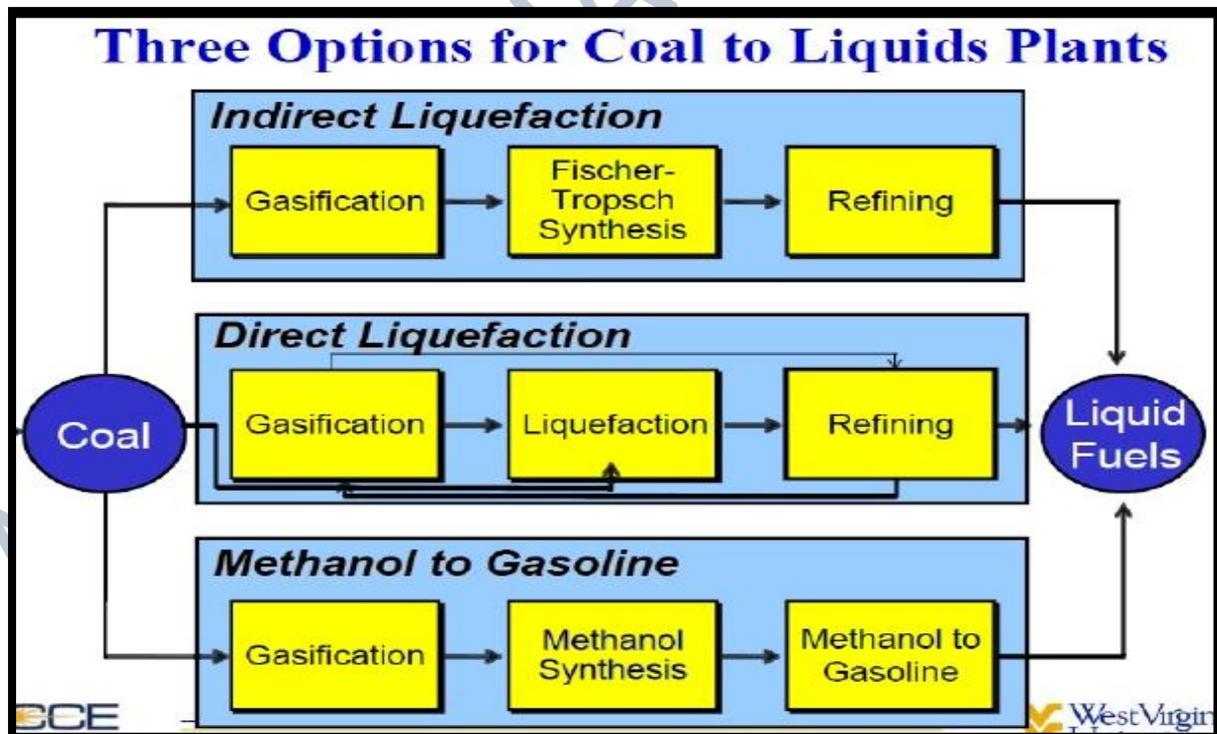
GS Paper 3: Science and technology- developments and their applications; developing new technology; awareness in the fields of biotechnology.

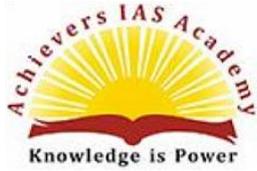
### What is CTL technology?

Coal-to-liquids (CTL) is a process of producing synthetic transportation fuels from coal. The process involves gasification of coal to produce synthesis gas which is then catalytically converted to liquid fuels in a Fischer-Tropsch (FT) reactors. Coal liquefaction, also called Coal to Liquid (CTL) technology is an alternative route to produce diesel and gasoline and makes economic sense only in a world of high crude oil prices.

### The process

It involves gasification of coal, which in turn will produce synthetic gas (a mix of CO+H<sub>2</sub>). The synthetic gas can be liquefied to its fuel equivalent in presence of cobalt/iron-based catalysts at higher pressure and temperature. However, liquefied coal emits twice as much CO<sub>2</sub> as burning oil.





# ACHIEVERS IAS ACADEMY

## The success of CTL technology

The best example of CTL was through the Fischer-Tropsch Method that was implemented in Nazi Germany in the 1940s to meet much of the country's demand for diesel during World War II, when oil supplies were limited. CTL technologies have steadily improved since the war. Technical development has resulted in a variety of systems capable of handling a wide array of coal type. South Africa has been producing liquid fuels from coal since 1955, using the indirect conversion process. Today, the South African company Sasol has three CTL plants that together produce more than 160, 000 barrels of liquid fuel per day from coal, which provides for about 30 per cent of South Africa's transport fuel requirements.

THE REASON FOR GROWING ACCEPTANCE OF CTL
Low cost and large reserves of coal in many countries
Increasing oil prices
Desire for energy independence and security
Potential for co-development of Carbon capture and storage
To reduce greenhouse gas emissions

## Why does India need to focus on CTL Technology?

India is heavily dependent on petroleum imports. It has been hit very badly due to the recent surge in crude prices and uncertainty over future supplies on account of proposed American sanctions on Iranian crude. India can overcome this problem through CTL and make the energy crisis go away.

India has significant coal reserves. CTL plants could be an alternative source of liquid fuels in India. It is reported that South African major, Sasol, was willing to invest in Indian coal liquefaction plants. Its proposed joint venture with the Tatas (in Odisha) for an 80,000 barrel per day capacity plant has not met with success due to the cancellation of coal blocks.

## Major benefits from CTL technology

One of the benefits of CTL is that the CO<sub>2</sub> emissions are more readily and cheaply captured from CTL plants than from conventional coal-fired power stations. The captured CO<sub>2</sub> can be



# ACHIEVERS IAS ACADEMY

transported and injected into underground storage reservoirs (a procedure known as “carbon capture and storage”—CCS—or “geosequestration”). Without CCS, the carbon footprint of CTL is at least 150–175 per cent higher than that of conventional petrol/diesel production from oil.

With sequestration, powering a car with liquid coal is approximately 30 per cent cleaner than using petrol. Another benefit of CTL technology is that the engines of cars need no modification to use the liquid fuel.

## Questions

1. Explain the process of coal liquefaction? Can Coal to Liquid Technology (CTL) be a breakthrough in India’s energy sector? Elaborate on the importance of strategic investments by the government in the mentioned technology in order to gain energy security.
2. India has significant coal reserves. Discuss how India can benefit from Coal to Liquid Technology (CTL). Enumerate the challenges and environmental implications of CTL, if any.