

DRAFT

Integrated Gasification
Combined Cycle (IGCC)

Option Type:

This is a set-aside approach designed specifically as an incentive package for those entities that wish to develop integrated gasification combined cycle (IGCC) projects in Illinois. IGCC allows the use of coal in a power plant that has approximately the same environmental benefits of a natural gas-fueled plant with the thermal performance of a combined cycle facility. To promote these goals, the Illinois EPA is considering giving entities that undertake IGCC projects in Illinois NOx allowances that can held, sold, or traded.

Note: This set-aside option is strictly available to IGCC plants, not coal gasification plants used to make synthetic gas that may have incidental generating capacity.

Issues:

IGCC is effectively a cleaner power plant by design, and is better described as a pollution prevention method rather than pollution control.

IGCC plants utilize a process that gasifies the energy content of the fuel into a synthesis gas, or syngas, that is then fired in a combined cycle power plant. Potential fuels include petroleum coke, high sulfur content coal, and even biomass. The term integrated refers to the secondary use of low-pressure steam in the gasification process that is then used to power the steam turbine. Today, there are only a few IGCC plants in operation for power generation, mainly due to the high capital cost of such a plant. Despite the high costs, IGCC by far provides the most environmentally friendly use for coal in a power plant.

Environmental Benefits:

IGCC provides several environmental benefits over traditional pulverized coal (PC) boilers. Since the gasification process takes place in a low-oxygen environment the sulfur in the fuel converts to hydrogen sulfide (H₂S) instead of SO₂, which is easier to capture and remove. In a PC boiler, the combustion zone is oxygen-rich and readily forms SO₂. SO₂ removal rates of 99% and higher are common using technologies proven in the petrochemical industry.

IGCC units can be configured to operate at very low NOx emissions without the need for a SCR by lowering the flame temperature. Flame temperature lowering techniques have been found to provide a significant reduction in NOx formation (15-20 ppmv) to just above the NOx emission rates from natural gas combined cycle units.

A PC plant with emission controls may approach IGCC's performance in one or two areas, but it cannot match the IGCC's overall environmental impact when including air, water, solids, and CO₂ emissions. A state of the art IGCC plant with enhanced sulfur removal technology can simultaneously achieve greater than 99.5% sulfur removal, essentially total volatile mercury removal (greater than 90- 95% removal), and very low PM levels of <0.004 lb/mmBtu. The state of the art IGCC plant will also produce only 40% as many solids byproducts as coal combustion processes, and will use almost 40% less total water. Importantly, CO₂ emissions can also potentially be effectively captured and sequestered.

Difference from model CAIR Rule:

The Model CAIR rule does not address IGCC as an available option.