

INDIRECT-FIRED POWER SYSTEMS (IFPS)

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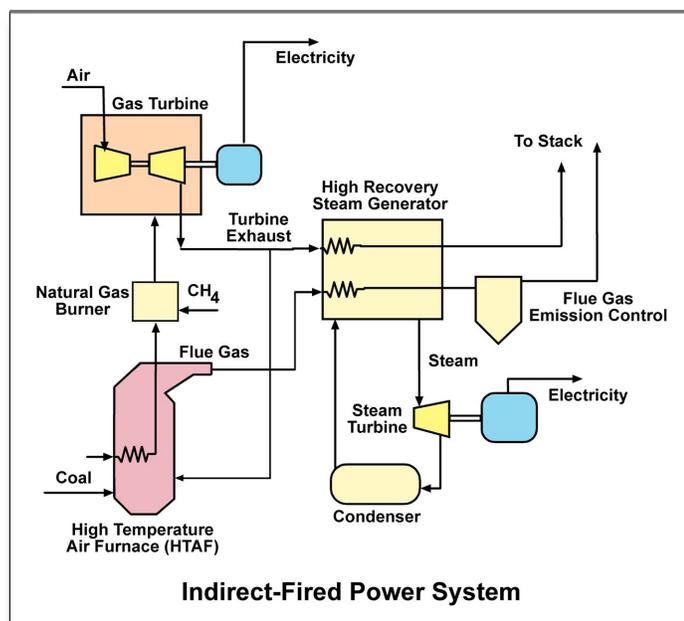
WEBSITE

www.netl.doe.gov

Description

Indirect-Fired Power Systems (IFPS) is based on the indirectly fired gas turbine combined cycle and uses technology even more advanced than low-emission boiler systems to achieve even higher efficiency and lower emissions. In an indirectly fired cycle the products of coal combustion do not contact the gas turbine. Indirectly fired cycles have an inherently high thermal efficiency; furthermore, since combustion gases do not flow into the gas turbine, cleaning of combustion gases at high temperatures is not necessary. High-performance power systems can achieve greater than 47% efficiency using today's gas turbines. With advanced turbines expected to be available, efficiencies of 55% can be expected.

The IFPS concept is shown in the figure below. Air compressed to the turbine inlet temperature would be heated in a coal-fired high-temperature air furnace (HITAF) to a temperature approaching the gas turbine inlet temperature. If necessary, natural gas, or a clean coal-derived fuel, could be fired into the clean, hot air exiting the HITAF to raise its temperature to the gas turbine inlet temperature. The vitiated air would be expanded in the turbine, producing more than half of the cycle's power output. Heat recovered from the turbine exhaust and from the HITAF flue gas would be used to raise steam for the steam turbine. A portion of the turbine exhaust air would be used as preheated combustion air. The only IFPS subsystem that requires development is the HITAF; all the other subsystems use technology available commercially or are based upon commercial technology.



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Goal

The goal is to develop IFPS that meet or exceed the following performance targets.

- **Emissions**

Constituent	lb/millionBtu
SO ₂	0.06
NO _x	0.06
Particulate matter	0.003

- **Efficiency**

47-50% total station, net, based on fuel HHV (Advanced IFPS will deliver 55% efficiency by 2010)

- **Cost of Electricity**

10% less than current coal-fired plant designed to meet New Source Performance Standards

Benefits

Coal is projected to remain a dominant source of fuel for electric power generation, both domestically and globally, well into the 21st century. Coal currently supplies more than 56% of U.S. electric-power needs. Part of DOE's mission is to foster the development and deployment of advanced, clean, affordable, fossil-based power systems that use coal to produce low-cost, reliable electricity.

In the early part of the next decade, U.S. power generators will select the next generation of baseload power plants. In an era of tight environmental standards, new plants will have to meet very stringent air-quality requirements. Coal is expected to remain a fuel of choice for many of these plants, and IFPS could provide an important option for a power company that must meet these air-quality standards while producing the most affordable electricity possible for its consumers.

The benefits of the IFPS program are to:

- Increase electric-generating efficiency to 47% or more.
- Lower emissions of sulfur and nitrogen pollutants to less than a tenth of current U.S. new-plant standards, an environmental performance that meets or exceeds the strictest world standards for coal-fired power plants.
- Reduce greenhouse gas emissions, specifically carbon dioxide, by as much as 30% in the first commercial plants and, as technology matures, by more than 35% overall.
- Produce electricity at costs at least 10% below those of today's plants.
- Repower existing coal-fired plants, producing a significant gain in operating efficiency.

PROGRAM PARTICIPANTS

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