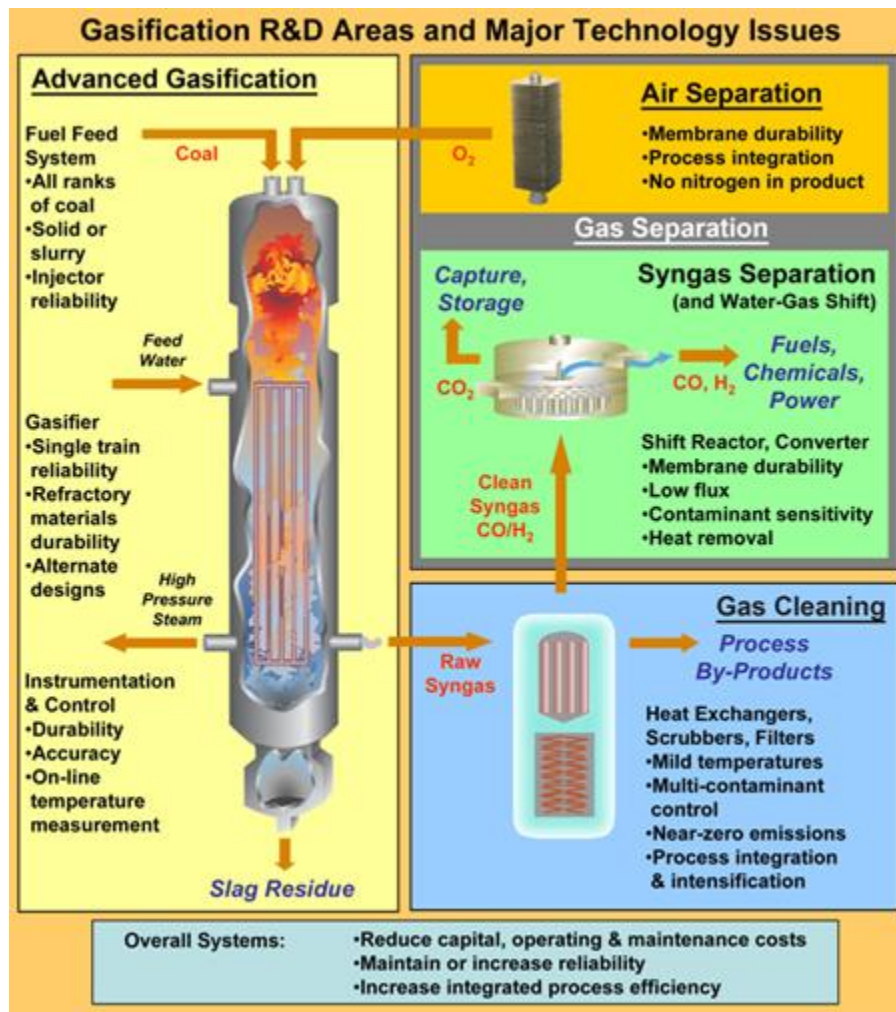


Gasification Technologies Research and Development

Gasification is a demanding process that involves injecting air or oxygen, and a suitable raw fuel (e.g., coal, petroleum, petcoke, and biomass) into the gasifier under high temperature and pressure, where numerous chemical reactions occur that convert the feedstock into synthesis gas (or syngas), a mixture of carbon monoxide and hydrogen, while simultaneously generating steam from the excess heat generated by the chemical reaction, as shown in the diagram. The raw syngas is then processed to remove contaminants such as particulates, sulfur, chlorides, etc., that would adversely impact the performance of downstream process. The clean syngas can then be fed to a gas turbine/steam turbine combined cycle unit to generate electricity or to various chemical reactors for the synthesis of fuels and chemicals. The process also allows for the efficient capture of carbon dioxide for the control of greenhouse gas emissions.



Gasification system improvements center on technology advances in the gasifier and associated systems. These advances are crucial to enhance feedstock flexibility; improve conversion efficiency, economics, and system reliability; and enable production of hydrogen and concentrated carbon dioxide, in order to meet the goals.

The Gasification Program is part of the Advanced Power Systems Program which also includes the Gas Turbines Program. The strategic objective of the Advanced Power Systems program is to create public-private partnerships to provide technology to ensure continued electricity production from the extensive U.S. fossil fuel resource, including control technologies to permit reasonable-cost compliance with emerging regulations. The near-term and long-term goals are:

by 2010, complete R&D for advanced gasification combined-cycle technology that can produce electricity from coal at 45 to 60 percent electrical efficiency (HHV) at a capital cost of \$1,000/kWe or less for a coal-based plant.

by 2012, complete R&D to integrate this technology with CO₂ separation, capture, and sequestration into a “zero” emission configuration(s) that can provide electricity with less than a 10 percent increase in cost.

| | TODAY | 2010 | 2015 |
|---|--------------|---|-------------|
| PLANT EFFICIENCY (% HHV) | 40 – 42 | 45 – 50 | 60 |
| ENVIRONMENTAL | < NSPS | >99% SO ₂ , >90% Hg removal; <0.01lb/mmBtu NO _x | Near Zero |
| PLANT CAPITAL COST¹ (\$/kW) | 1200 – 1300 | 1000 | 850 – 900 |

Many improvements are needed to overcome barriers to gasification system acceptance such as high capital and operating costs relative to competing technologies, questionable single train reliability resulting in added downtime and expense from using redundant components, and inability of current commercial gasifiers to economically process multiple feedstocks. Overcoming these and other technical and economic barriers requires close cooperation among government, industry, academia, and other program stakeholders.

Click here for Gasification related [Publications, Presentations and Reports](#).

The Gasification Technologies R&D program is subdivided into four areas, shown below.

[Advanced Gasification](#)

[Gas Cleaning & Conditioning](#)

[Gas Separation](#)

[Systems Analyses/Product Integration](#)

Source: DOE/NETL website, November 2009.