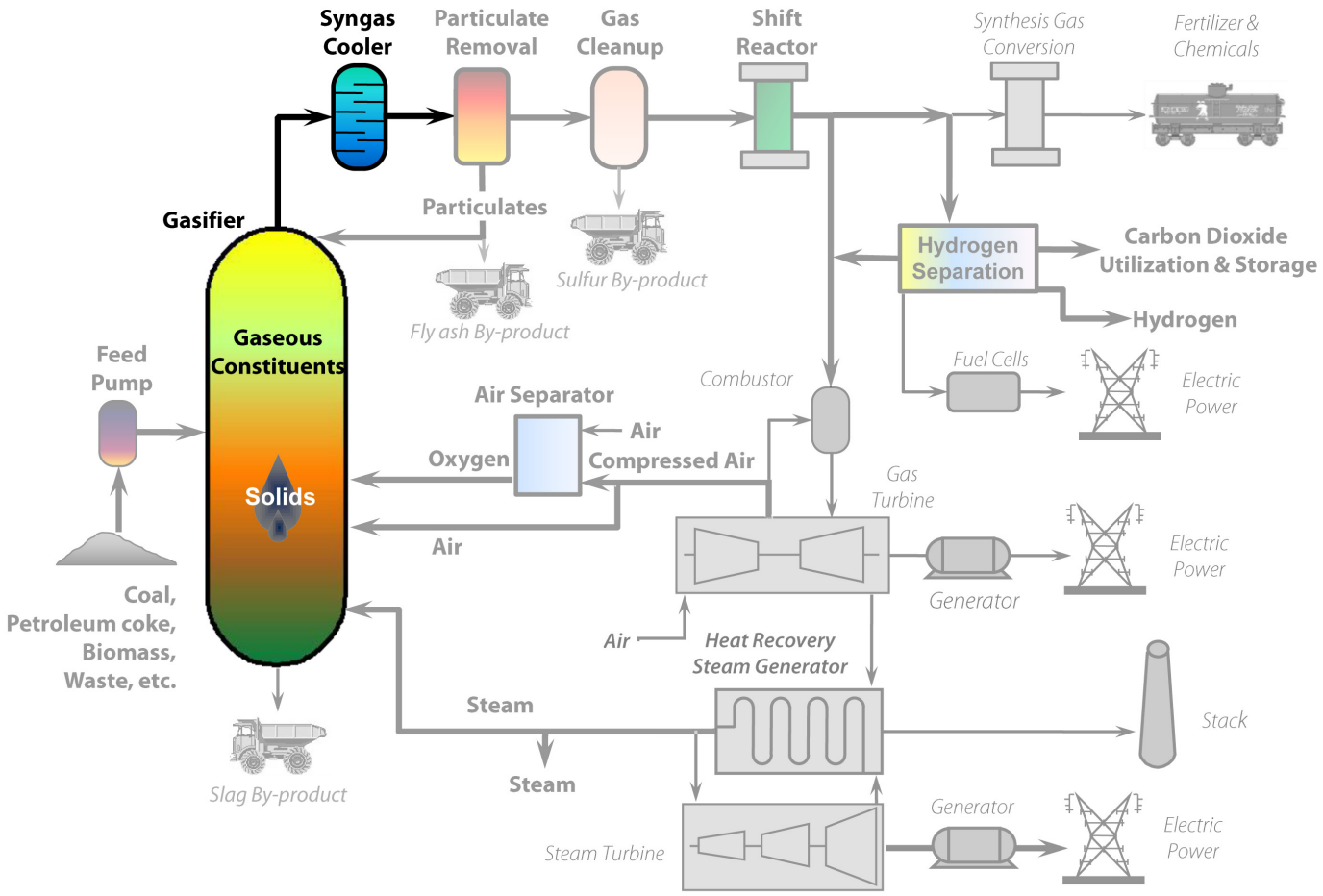
GASIFIER OPTIMIZATION and PLANT SUPPORTING SYSTEMS

Part of the DOE Gasification Systems Program to

- Reduce gasification costs so coal can support U.S. economic growth
- Ensure excellent environmental performance for coal gasification

The Gasifier Optimization and Plant Supporting Systems area focuses on the development of technologies and models to improve the performance of advanced gasifiers. Specifically, current projects focus on development of more durable refractory materials, creating models to better understand the kinetics and particulate behavior of fuel inside a gasifier, and developing practical solutions to mitigate the plugging and fouling of syngas coolers. The direction of this work leads toward development of a highly advanced gasifier, which would incorporate the most aggressive and successful technologies resulting from both Gasification Systems program and other Department of Energy programs. Anticipated improvements will allow much expanded use of low-cost, low rank coals, expanding opportunities for



Gasification Systems Program Research and Development Areas are in Color. Gasification Optimization and Plant Supporting Systems Research and Development Areas are Brighter. Grey sections are part of other closely aligned DOE/NETL Research Technology Programs.

gasification systems and lowering feedstock costs. Optimization also includes the aim of reducing water consumption in gasification plants, and systems integration to increase efficiency and reduce costs plant-wide.

Current on-going projects to further reduce the cost of gasification are in place; these are as follows:

TRANSPORT GASIFIER FOR LOW-RANK COAL

Transport Reactor Integrated Gasification (TRIG™), originally developed by Kellogg, Brown, and Root (KBR) based on the company's fluidized catalytic cracking technology, has been enhanced through extensive testing by Southern Company at the Power Systems Development Facility in cooperation with NETL. Testing corroborated that the gasifier effectively handles low-rank coals (e.g., Powder River Basin lignite), which account for half of the worldwide coal reserves but are often considered uneconomic as energy sources due to high moisture and ash contents.

ROBUST SENSOR DEVELOPMENT

Developed an accurate temperature measuring system that is capable of withstanding extreme conditions for use in commercial full-scale gasification systems. A prototype sensor survived and measured temperature for 7 months in a commercial coal gasifier. A flame monitor based on visible light sensing has been designed, built, and successfully tested in a commercial entrained gasifier. Continued work will include modification of the sensor software to enable real time temperature data acquisition, processing and display. Also, sensor hardware modifications needed to improve reliability will be made, and over six months of testing will be carried out to evaluate the sensor accuracy and durability. Finally, the project will evaluate the commercial viability of the sensor system.

REFRACTORY IMPROVEMENT

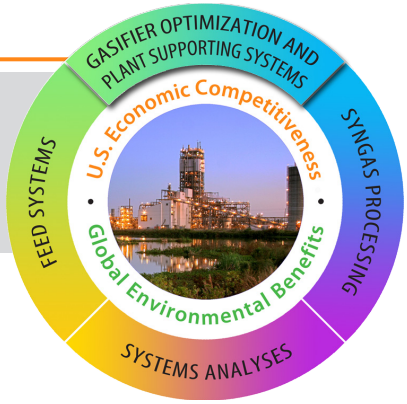
Researchers at NETL developed an advanced, durable refractory material for coal gasifiers that extends the refractory service life an estimated 50 percent beyond that normally achieved with conventional materials. The refractory also was found to have equivalent or better resistance to chemical deposition, a primary wear mechanism that impacts refractory service life.

CONVERSION AND FOULING

Research will establish how chemistry affects slag viscosity so that plugging and fouling throughout the syngas cooling system can be understood and ameliorated. Simulation tools will lead to confident use of low-rank coal and mixed feeds, aiding in gasifier design and performance.

LOW-RANK COAL OPTIMIZATION

Research in this area will focus on the development of gasification performance prediction models to reduce uncertainties associated with the use of low-rank coals and co-feeds, including biomass.



For more information on this R&D Area, visit this section of our website:

http://www.netl.doe.gov/research/coal/energy-systems/gasification/gas-optimization

Other Key R&D areas in the Gasification Systems program are Feed Systems and Syngas Processing Systems. More information on Gasification Systems Program R&D, on how systems analysis supports the program, on the benefits of gasification, and on individual projects can be found at the NETL website:

http://www.netl.doe.gov/research/coal/energy-systems/gasification

Or Google "Gasifipedia"