

CLEAN COAL TECHNOLOGIES

Clean coal technologies improve the performance of coal as an energy source and reduce its impact on the environment. They are being developed for all facets of coal production and use – from the extraction, preparation, storage and transportation, through to use in power stations, steel mills and other industrial applications. Examples of how clean coal technologies can be employed include:

In coal production...

- ♦ Reducing greenhouse gas emissions during mining by capturing methane gas and using it to provide power for the mine, for local communities, and for input to the electricity grid. Not only does this provide an additional source of energy but also helps to reduce the safety risks associated with potentially explosive methane build-up in mines.
- ♦ Using advanced preparation and cleaning techniques to eliminate impurities from coal, so that it burns more cleanly and efficiently and helps to reduce emissions to the atmosphere.

In coal use...

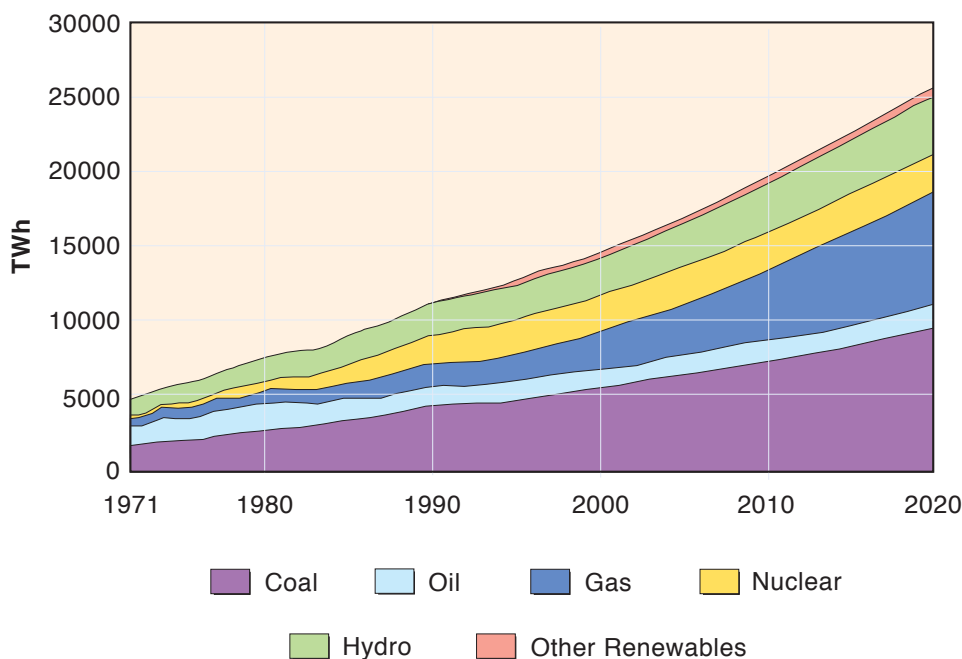
- ♦ Employing new combustion processes to improve thermal efficiency (the amount of useful energy that can be obtained from a given quantity of fuel). Increasing thermal efficiency reduces greenhouse gas emissions and other pollutants.

- ♦ Incorporating pollution control devices in power stations to capture gases such as oxides of sulfur and nitrogen, which are produced when coal is burned.
- ♦ Converting coal to gas (gasification), mainly hydrogen, and using this as the primary fuel source in power stations, instead of burning coal directly.
- ♦ Capturing the carbon dioxide (a greenhouse gas) that results from the burning of coal or coal gas, and storing it permanently underground (known as carbon sequestration).



Methane extraction system at Central Colliery coal mine, German Creek. Photo courtesy of NSW Minerals Council

World Electricity Generation, 1971-2020



TWh = terrawatt - hour

Source: International Energy Agency

A zero emission future for coal?

A number of advanced coal technologies for electricity generation are already being trialled throughout the world. Several of these have the potential to achieve electricity production from coal without emissions to the atmosphere.

One that shows great promise in terms of its high efficiency and environmental performance is the Integrated Gasification Combined Cycle (IGCC) system. In IGCC, coal is initially converted to gas, mainly carbon monoxide and hydrogen. Electricity is produced when the gas is burned in a gas turbine with the excess heat used to drive a steam turbine resulting in even greater efficiency.

Another advantage of IGCC is that a concentrated stream of carbon dioxide, a major greenhouse gas, can be produced. This can be readily captured and then stored in underground formations, resulting in zero emissions to the atmosphere.

This system also has the potential to produce chemicals and liquid fuels from the coal gas, in addition to electricity. In the future, hydrogen from coal gasification may also be used to generate clean power in fuel cells or to run hydrogen-powered vehicles.

Did you know?



Coal forms the most significant fossil fuel resource on Earth, much more plentiful than oil and gas and will therefore be the most significant source of energy for many years to come.

A zero emission coal plant of the future

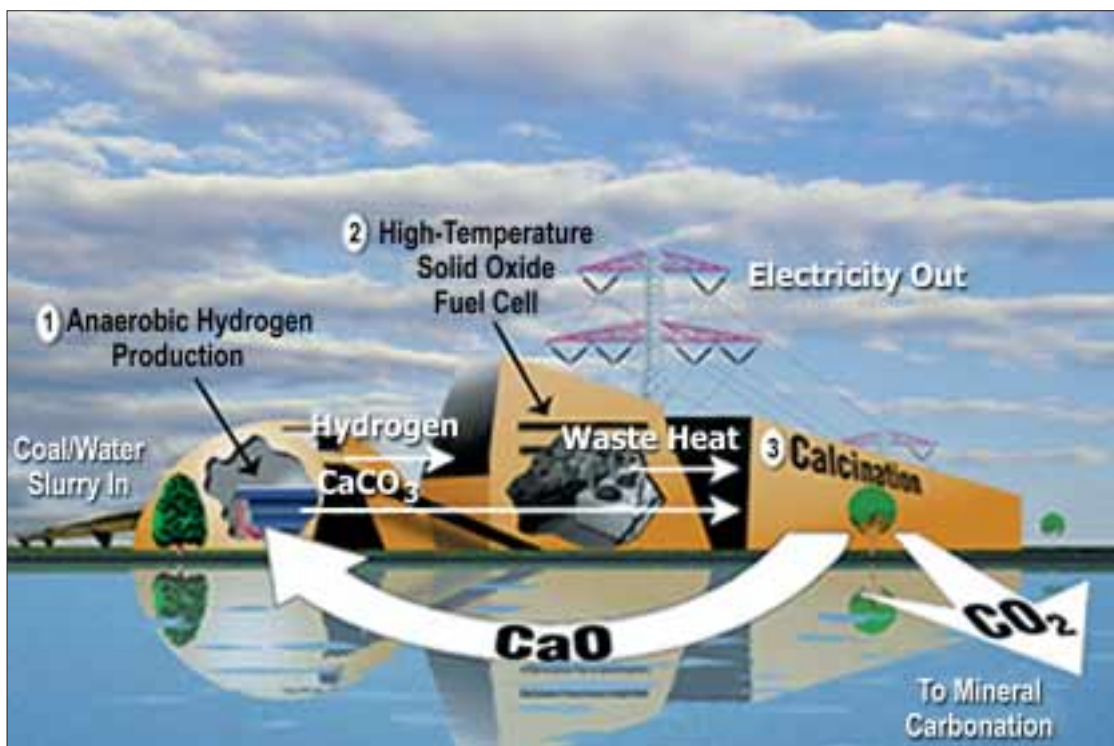


Photo Courtesy of Los Alamos National Laboratory, USA