



FOSSIL ENERGY RESEARCH BENEFITS

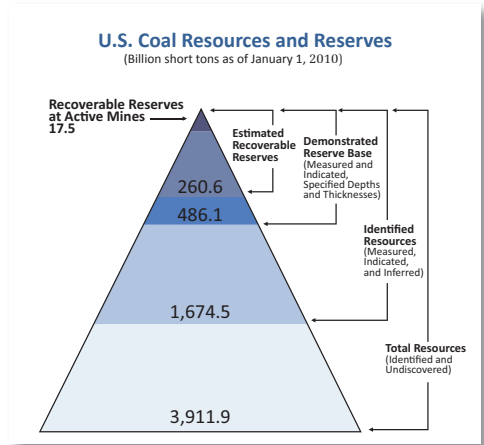
Sustainable Coal Use

Coal is a vital energy resource, not only for the United States, but also for many developed and developing economies around the world. Finding ways to use coal **cleanly** and more **efficiently** at **lower costs** is a major research and development (R&D) challenge, and an ongoing focus of activities by the U.S. Department of Energy's (DOE) **Office of Fossil Energy (FE)**.

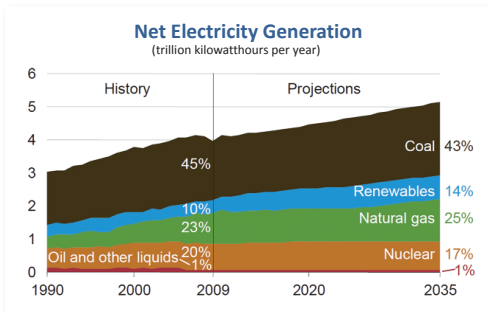
According to a Congressional Research Service analysis, coal represents **93 percent** of total U.S. — and over half of world — fossil fuel reserves (expressed in barrels of oil equivalent). Based on recent rates of domestic consumption (averaging **1 billion tons** annually, 2000–2010), estimated U.S. recoverable coal reserves of nearly 261 billion short tons are sufficient to last more than **2½ centuries**.

Even as the U.S. and other nations gradually transition to greater dependence on renewable and other energy forms, coal is expected to continue to play a prominent role. The U.S. **Energy Information Administration (EIA)** projects coal will still be the dominant energy source for domestic electricity generation (**43 percent**) in 2035. But in doing so, it must be used in a way that meets not only energy needs, but also expectations for a **sustainable environment**.

Starting with research in the 1970s, through its **Clean Coal Technology Demonstration**



Source: U.S. Energy Information Administration Form EIA-7A, Coal Production Report (February 2011)



Source: U.S. Energy Information Administration, Annual Energy Outlook 2011, Early Release Overview

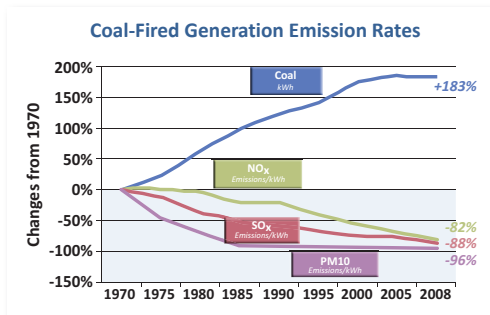
Program from 1986–93 (see separate fact card) and to the present day, FE's R&D has made substantial improvements in the cost, efficiency, reliability and environmental performance of coal-based power generation. According to a study by Management Information Services Inc. (2009), these cumulative benefits will result in a **13-to-1 return** from 2000 to 2020 on money invested in the program by the U.S. taxpayer.

Reducing Coal's Carbon Footprint

FE's R&D program is currently focused on a promising option for reducing coal-based atmospheric carbon dioxide (CO₂) emissions — **carbon capture and storage** (CCS — see separate fact card). This includes demonstrating **1st generation technologies** (integrated CCS operations in power and industrial plants) by 2016 with five-to-10 large-scale projects on-line; and simultaneously pursuing **2nd generation technologies** (demonstrating advanced pre- and post-combustion capture, improved efficiencies, competitive deployment costs) for 2020 and beyond.

Among the notable FE coal program successes:

- Commercialization of **advanced pollution controls** — improved nitrogen oxide (NO_x), sulfur dioxide (SO₂) and flue gas desulfurization (FGD) systems.
- Helping place first generation **advanced coal-based power systems** (fluidized-bed combustion (FBC), integrated gasification combined cycle (IGCC), etc.) in the marketplace.
- Demonstrating the readiness of **activated carbon injection** (ACI) for commercial use to control mercury in power plant flue-gas streams, in advance anticipation of expected air quality regulatory standards.
- Combined with other factors, FE R&D innovations helped contribute to a **substantial reduction in coal-based generation emission rates** since 1970, even as coal use for electricity generation increased substantially.



Source: Southern Company



U.S. Department of Energy

OFFICE OF FOSSIL ENERGY

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