Cleancoal USA

WINNING CLIMATE STRATEGY

A successful climate change strategy must include elements that address each major fuel contributing to the U.S. energy system. This paper describes three key principles that relate to coal—which is the largest source of domestic energy—and how they can be embodied in a successful climate change strategy.

Strategic Principles

Strategic Principle #1: Climate strategies must recognize that coal is the largest domestically produced fuel in the U.S., and is an essential global fuel as well. Coal is used primarily for electric power and produces approximately one-half of the electricity generated in the U.S. Other nations also rely heavily on coal. For example, China has fueled its 10 percent annual economic growth over the past decade largely with coal, and currently burns more than twice as much coal as the U.S. Last year China added over 90 GW of new coal-fired generating capacity, or nearly 30 percent of the total coal-based generating capacity in the U.S. Studies by the U.S. Department of Energy's Energy Information Administration (DOE/EIA), the International Energy Agency and others all concur that coal use will not only continue, but increase as U.S. and global energy demand soars to meet the needs of a prosperous planet.

Strategic Principle #2: A viable climate strategy must include the development and deployment of commercially deployable technologies for reducing or eliminating CO_2 emissions from coal plants. Improving the efficiency of current technologies can lead to significant emission reductions. However, to achieve the level of reductions advocated by many, carbon capture and storage (CCS) technology must be developed, and the integrity of underground storage must be demonstrated for multiple geologies.

Strategic Principle #3: Imposing stringent regulatory requirements for CO_2 management without commercially deployable technology for reducing CO_2 emissions from coal generation would be counterproductive to meeting environmental, energy, and economic goals. If power generators are provided a regulatory signal that large near-term CO_2 reductions are necessary, they will have no alternative to abandoning coal and embracing greater dependence on natural gas for their fuel supply. With declining U.S. production of natural gas, even in the face of unprecedented high prices for that fuel, the inescapable consequences of such actions will be sharp increases in the cost of electricity and the cost of energy-intensive products (which will drive the manufacturers of such products overseas, along with American jobs), and an increased dependency on imported fuel. These impacts would become severe as our demand for electricity doubles by mid-century, including greatly reduced reliability of electricity supply (risking repeated interruptions or loss of electricity to the nation). Consequences might also include adverse impacts on foreign policy, as the nation competes for limited global supplies of liquefied natural gas.

Winning Strategy

A core component of a winning climate change strategy is the development and deployment of commercially available technology for reducing or eliminating CO_2 emissions from coal generation. There is a body of scholarly literature that can be drawn upon to identify the scope and resource requirements for this technology commercialization strategy. The Coal Utilization Research Council (CURC) and the Electric Power Research Institute (EPRI) have developed a coal research, development and demonstration (RD&D) roadmap that provides a technology development pathway. The National Coal Council (NCC), an advisory committee to the Secretary of Energy, submitted a report this past June to the Secretary on "Technologies to Reduce or Capture and Store Carbon Dioxide Emissions." Based on these studies, the winning technology pathway is clear: a concerted government/industry effort to develop and deploy commercially available technology for improving coal-based power plant efficiencies and for capturing and storing CO_2 emitted by fossil fuel-based power generators.

Near-term Opportunity: Efficiency Improvement. Consistent with the CURC and NCC findings, there are some commercially available technologies today that can improve the efficiency of existing and new coal plants, and thereby reduce CO_2 emissions. Efficiencies of existing coal plants can be improved, on average, by 3-5 percent or more through improvements in plant control systems, turbine blade upgrades, improvements in condenser and boiler feed water systems, and other improvements. Improving plant efficiencies cost effectively allows for immediate CO_2 reduction and provides time for the development of CCS technologies. The principal challenge here is not the availability of technology, but the constraints imposed by new source review (NSR) regulations regarding existing plant modifications. Much larger efficiency improvements are possible with new plants. The average efficiency of the currently operating fleet of coal plants is about 33 percent (*i.e.*, one-third of the energy in the coal supplied to the power plant is converted to useful electric power). New coal plants can be built today with efficiencies in the 38-40 percent range, and as plant technology advances, those efficiencies can eventually reach 45-50 percent and higher.

Long-term Opportunity: Carbon Capture & Storage. There is no commercially available technology available today for capturing and storing CO_2. To be commercially viable, the cost of CCS technology must be greatly reduced and the integrity of long-term storage of CO_2 must be validated. Technologies now under development, such as oxygen membranes, hydrogen membranes, advanced turbines, advanced integrated gasification combined cycle systems, oxy-fuel systems and others, promise to reduce the cost penalty for capturing CO_2 to less than 10 percent of today's uncontrolled plants (and would reduce the energy penalty from 30 percent down to the 5 percent range). However, development time and funding is needed to make these technologies commercially available.

<u>Resource Requirements: What will it cost</u>? At today's RD&D investment rate, these technologies will not be commercially available until the middle of this century. In order to develop and deploy commercially available CCS technology by 2025-2035, current public and private investment in developing CCS and related clean coal technology must be increased to 1 billion dollars per year[1] and a government/industry partnership must be established to focus on the challenge. As part of this increase, R&D funding of $500 million annually is needed to accelerate the ongoing R&D program funded by DOE to develop innovative, low-cost CO_2 capture technology; to develop low-cost clean coal plant technology into which such capture systems would have to be integrated; to validate first-of-a-kind system integration and scale-up (the FutureGen project), and to validate the long-term storage of CO_2 through the conduct of large-scale CO_2 injection field tests in diverse geologic formations representative of U.S. geology as a whole (and monitoring, measuring, and verifying its storage). Commercially deployable CO_2 storage also will require addressing and resolving the issue of the associated liability for the long term storage of CO_2.

In addition to the increased RD&D funding, an aggressive commercial demonstration program must be funded at an annual level of $500 million to establish the commercial readiness of technologies coming out of the laboratory in a timely fashion, including technologies required for both coal gasification and combustion-based systems. Subsequent deployment of demonstrated technologies can be accelerated by financial and regulatory incentives such as tax credits and "fast track" permitting for advanced low-emissions power systems.

Dig deeper at www.cleancoalusa.org

[1] This figure and the additional technology research, development, and demonstration costs presented herein are in constant 2004 dollars. They also are based on analyses that preceded the recent, unprecedented worldwide run-up in costs for all heavy industry. If this pattern of cost escalation continues, the costs for future RD&D will likely be greater than the estimates in this paper.