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The Clean Coal Technology Program: Current Prospects

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Summary

The Clean Coal Technology (CCT) program, started in the 1980's and funded generously in the early 1990's, has completed most of its surviving projects and has not funded any new ones since 1994. However, President Bush's FY2002 budget outline proposed spending $2 billion over 10 years on a restructured CCT program. It is not clear what kind of projects would be included in the new program.

Background and History

The Clean Coal Technology (CCT) Program was started in 1984 as a vestige of the defunct Synthetic Fuels Corporation, a government corporation created to help develop new fuels from domestic sources. By 1990 Congress had appropriated approximately $2.6 billion for the program, and the Department of Energy (DOE) selected and made cost-sharing cooperative agreements for a large number of projects of varying size and technologies. By the mid-1990s, the potential for adoption of most CCT technologies by industry without government subsidy began to dim, and DOE in 1994 recommended that no further projects be funded. Since then, approximately $300 million of previously appropriated funding has been rescinded, and other funding has been deferred – including $67 million in FY2001. President Bush's FY2002 budget outline, however, proposed spending $2 billion over 10 years on a restructured CCT program, with the same industrial cost-sharing principle as the existing program.

CCT Technologies. The CCT program currently has 40 projects on its books, of which 24 have been completed and seven are operating. One is under construction, six are in the design stage, and two are on hold. (For details, see the CCT web site at [http://www.lanl.gov/projects/cctc/resources/library/bibliography/bibliography.html]) These projects fall into four general categories:

- Environmental Control Devices. Many of the early CCT projects were retrofits of existing powerplants to demonstrate emission control technologies as alternatives to traditional scrubbers or to conversion to

low-sulfur coal. The 19 projects in this category were designed to control nitrogen oxide (NO_x) emissions, sulfur dioxide (SO_2) emissions, or both. All but two of these projects are completed; one is still operating, and one is on hold at the design stage because the main participant is in bankruptcy.

- Advanced Electric Power Generation. The most expensive CCT projects are advanced power generating facilities, of three main types: atmospheric fluidized bed (AFB) burners, pressurized fluidized bed (PFB) plants, and integrated gasification combined cycle (IGCC) plants. Proponents of these technologies cited the potential of more efficient use of the energy content of coal, as well as their ability to burn coal cleanly without conventional scrubbers, as overcoming their higher cost than conventional coal plants. One AFB project was completed, and another is in the design stage. One PFB plant project was completed, and two are in design. Three IGCC plants were built and are in the operating stage, and one is in design.

- Coal Processing. Five current CCT projects were aimed at converting "run-of-the-mill" coals to high-energy, low-sulfur products. The projects were viewed as having both a domestic and an export market for the technology and the improved coal. Two projects were completed, two are operating, and one is on hold.

- Industrial Processes. Using coal to replace coke in steelmaking, enabling cement makers to use low-sulfur coal, and converting industry burners to coal from oil or gas, were some of the goals of the industrial CCT program. Three industrial projects were completed, and two are in the design stage.

Table 1
Status of CCT Projects, 2000

	Environmental Control			Power Generation				Coal Pro-cess	Indus. Appl.	Total
Status	NO_x	SO_2	Comb	AFB	PFB	IGCC	Other			
Completed	5	6	6	1	1	0	0	2	3	24
Operating	0	1	0	0	0	3	1	2	0	7
Construct.	0	0	0	0	0	0	1	0	0	1
Design	0	0	0	1	2	1	0	0	2	6
On Hold	0	0	1	0	0	0	0	1	0	2
Total	5	7	7	2	3	4	2	5	5	40

Program Analysis and Prognosis

For most of the 1990's, natural gas was viewed as the fuel of choice for electric power generation. The price of gas to utilities since 1986 was low compared to historical levels, and was projected to remain low in light of ample supplies. New technology, in the form of combined cycle turbine and steam generation, increased generating efficiency greatly, reducing fuel costs even more. Many utilities were recovering from two decades of financial disaster caused by trying to build large, capital-intensive nuclear and coal plants in times of high interest rates and slow growth in demand for electricity. If they needed new capacity, and many did not, they were attracted to gas plants, which could be built quickly in small units for relatively low capital investment. Federal legislation, especially the Energy Policy Act of 1992, also encouraged construction of powerplants by unregulated non-utility entities, and most of these were gas-fired.

In addition to these economic advantages, natural gas was also environmentally less objectionable than coal. The 1990 Clear Air Act Amendments imposed severe restraints on SO_2 emissions from both existing and new coal plants, and the growing concern about carbon dioxide (CO_2) emissions as a global climate change instigator put coal at a further disadvantage, since CO_2 emissions from coal are significantly higher than from gas.

In the context of these factors, the Clean Coal Technology program received little encouragement from the Clinton Administration and the Congress during the 1990's. Of the major categories of CCT projects, the Environmental Control and Coal Preparation technologies, even when successful, were not competitive with conventional scrubbing or switching to low-sulfur coal, and none were directed to the problem of CO_2 emissions. The Advanced Power Generation technologies, including fluidized bed and IGCC, could not compete with gas-fired combined cycle with natural gas prices as low as they were. Industrial Processes, with a small existing market for coal, also found it difficult to compete.

New Administration, New Economics. The summer of 2000 brought an abrupt end to the ample supplies and low prices of natural gas. The sudden and unexpected movement in prices was typically volatile behavior of large commodity markets, but the volatility tends to be forgotten in periods of long, steady price decline. Among other factors, the price increase precipitated the crisis in California's electric power sector. It also shattered expectations that gas would be reliably available at low prices whenever utility needs demanded it, and revived the traditional utility view that a variety of fuels and power sources may be worth investing in even if some of them are more costly than others.

Reasoning of this sort may be behind the Bush Administration's proposal to revive the CCT program. In addition, de-emphasis on CO_2 emissions and the repudiation of the Kyoto Global Climate Change Treaty have removed for the time being some the environmental pressures on coal. However, unless new restrictions on SO_2 and NO_x emissions are imposed on coal-fired generation – and some bills have been introduced to do that – there is not much demand for the new environmental control technologies that the CCT program has pursued so far. Pending regulatory requirements for existing coal-fired powerplants, such as the NO_x State Implementation Plan (SIP) call, can be met with currently demonstrated technologies such as selective catalytic reduction (SCR), and all new plants are effectively required to install conventional scrubbers and SCR, which are as effective as any of the CCT technologies in removing SO_2 and NO_x.

Similarly, the power generation technologies sponsored by the existing CCT program, while appearing more competitive with natural gas prices so unexpectedly high, will have to compete in a market which is likely to see gas supplies increase rapidly and prices fall once again. Nevertheless, the memory of gas price volatility and the advisability of a varied fuel mix for power generation may make that competition easier, especially if the new technologies can achieve the increased efficiencies hoped for by their proponents.

Legislation

In addition to the Administration's budget proposal to increase funding for CCT programs, the National Electricity and Environmental Technology Act (S. 60), introduced by Senator Byrd, is aimed at stimulating coal use. The main feature of S. 60 would allow tax credits for investments in CCT units and commercial applications of CCT technology.

On the other side of the issue, legislation has been introduced to require further reductions of emissions from powerplants. H.R. 25, introduced by Representative Sweeney, is aimed at reducing acid deposition by restricting SO_2 and NO_x emissions. H.R. 1335, introduced by Representative Allen, would reduce emissions of mercury, SO_2 and NO_x, and carbon dioxide from fossil-fired powerplants. As noted above, such legislation if passed could provide a market for some of the emissions control technologies sponsored in the CCT program.