The Heritage Foundation Issue Bulletin

No. 79 | The Heritage Foundation • 214 Massachusetts Avenue • N.E. • Washington, D.C. • (202) 546-4400

March 5, 1982

DOE'S EXTENDED BURN-UP PROGRAM: THE GOOD ATOM MISUNDERSTOOD

INTRODUCTION

The budget and tax cuts that are now being made are long overdue. Indeed, a better budget is a smaller budget and taxes only improve with their reduction.

There are, however, a few instances when even a small program cut sacrifices so much in future savings that it would be imprudent to make when funds could be shifted from larger, less pressing projects.

Just such an instance -- where $12 million cut today could mean at least $13 billion lost tommorrow -- is the Department of Energy's (DOE's) extended burn-up program, a budget line item to be reviewed this month in the House Science and Tecnology Committee's DOE authorization hearings.

Begun in 1976, the extended burn-up program is well on its way to developing nuclear reactor fuel that will safely release two-thirds more energy than existing designs.[1] It has several

---

[1] For a description of the program's history and objectives see Testimony presented by Dr. N. L. Shapiro of Combustion Engineering before the Subcommittee on Energy Conservation and Power of the Committee on Energy and Commerce and the Subcommittee on International Economic Policy and Trade of the House Committee on Foreign Affairs, October 6, 1981; "Industry Participants Fight to Save DOE's Uranium Conservation Program," Nuclear Fuel, October 12, 1981, pp. 6-9; the annually published DOE "Gold Books," Assistant Secretary for Energy Technology, Fission Energy Program of the U.S. Department of Energy (Washington, D.C.: GPO, 1978 and 1979), DOE/ET-0048 (78) and DOE/ET-0089 and Deputy Assistant Secretary for Nuclear Reactor Programs, Fission Energy Program of the U.S. Department of Energy

things going for it. It is cheap (the program will cost $33 million in 1981 dollars spread over the next seven years to complete). It is extremely cost effective (DOE and the General Accounting Office conservatively estimate that it will save the electric rate-paying public at least $13 billion before the year 2000 -- a cost benefit ratio of 1 to 385).[2] And those in the technical know -- the Edison Electric Institute, the Electric Power Research Institute (EPRI), the atomic vendors and utilities, the Nuclear Regulatory Commission, and the elite of the environmental groups -- favor it.

The trouble is that the program is so small and its benefits are so concentrated in the public sector that no private group is much willing publicly to resist the impulse to cut. The program is not terribly visible. Yet, to reduce it this year by $12 million, as the Office of Management and Budget (OMB) has suggested, or to eliminate it is a serious mistake. There are four reasons why:

1. Because of state regulations controlling the utilities and market imperfections influencing the atomic vendors, the program will not be picked up in a timely fashion by private enterprise. Indeed, the fuel with its improved efficiency initially would actually reduce the fuel vendor's sales. Currently, the fuel fabrication business is in a slump. Given that nearly 70 percent of fuel contracts for the next twenty-five years are already signed, the industry's incentive to assume completion of extended burn-up fuel's development is less than modest. Fuel in the 50,000 megawatts-per-day-per-ton range (the program's objective for 1989) would be developed eventually but only over a period of decades.[3] As for the utilities, they are no better equipped to complete the program. Here the reason is simple: Nearly 85 percent of the state public utility commissions (PUCs) require the utilities to pass their fuel efficiency savings on directly to the rate-paying public. With loaned money costing several percent more than the rate of return which the PUCs allow these utilities, the key motive for corporate action -- profit -- is lacking.[4] Finally, the accident at Three Mile Island and the

---

(Washington, D.C.: GPO, 1980 and 1981), DOE/NE-0006; and the Letter from the Comptroller General of the United States to Marilyn Lloyd Bouquard, Chairman, Subcommittee on Energy Research and Production, March 23, 1981 with enclosures, (EMD-81-51).

2 See Letter from Shelby T. Brewer, Assistant Secretary for Nuclear Energy to Richard L. Ottinger, Chairman, Subcommittee on Energy Conservation and Power, October 27, 1981, and the analysis by the U.S. General Accounting Office, "The Costs and Benefits of Alternative Funding Levels for the Department of Energy's Light Water Reactor Improvement Program," November 18, 1981 (EMD-82-16).

3 GAO, "Costs and Benefits," p. 8; and "Industry Participants Fight," Nuclear Fuel, October 12, 1981, p. 7.

4 Ibid. Also see GAO, "Analysis of Federal Funding for Electric Utility R&D Projects," September 28, 1981 (EMD-81-145) and Letter from Shelby T. Brewer to Richard L. Ottinger, October 22, 1981.

regulations that followed have reversed priorities at the utilities' own research and development organization, EPRI. Where EPRI before featured long-term projects such as the breeder, reprocessing, and advanced convertor reactors, it now has shelved these projects and taken on safety and reliability projects that must be completed to prevent plant shutdowns (these projects now account for more than 80 percent of EPRI's nuclear research). Although EPRI has praised the program and budgeted $2.5 million in 1982 on extended burn-up work, it will not be able to fund beyond this level for at least several years.[5]

2. Although OMB has approved federal support for the program in FY 1983, it has recommended specific cuts that ironically will create the very monopoly power and technology transfer difficulties that the progam was designed to avoid. In order to save $18 to $19 million in 1981 dollars stretched out over seven years, OMB is supporting completion of only one major fuel contract even though the program originally set out to complete eight or more. This looks like a money saver until one considers the billions of dollars in savings identified with widespread use of the fuel it would jeopardize. First, one fuel design is insufficient since it would need at least two different types of fuels -- one for boiling water reactors (they make up 30 percent of currently operating or planned reactors) and another for pressurized water reactors) -- simply to service the U.S. market. Second, given the number of long-term fuel contracts already in place and that the utilities tend to stick with fuel fabricated by the vendor that originally built their machines, one vendor alone will only be able to penetrate a small fraction of the future fuel market. Finally, this technology is unlikely to be transferred by data sharing alone. Indeed, significant variations in the five U.S. vendors' fuel designs and the vendors' need for hands-on experience to make engineering sense of any data they might receive almost assures that the funded vendor will have precious little to share with those vendors outside the program.[6]

3. Not to proceed with this program as originally planned is in effect to place an unnecessary and substantial tax on the American public as well as on the atomic power industry. Certainly, the billions of dollars of lost savings caused by taking OMB's one-vendor approach would have to be taken out of the rate payers' pockets in the late 1980s and 1990s. But it goes further than that. If nuclear power is to have a commercial future in the 1990s, it will at least have to maintain its present cost position relative to coal. Extended burn-up fuel, which will reduce total nuclear generation costs by 2.5 percent, can help. Indeed, if the Administration is serious about having the nuclear utilities begin in FY 1984 to finance their own waste disposal

---

5 See "OMB Lets LWR-Improvement Program Live as GAO Supports DOE on Program's Worth," Nuclear Fuel, December 21, 1981, p. 9.

6 GAO, "Costs and Benefits," p. 8.

program (a move estimated to add an additional 2 percent to the total generation costs of nuclear power), widespread use of extended burn-up fuel may be essential just to keep nuclear power from slipping behind its current fuel cost advantage. Finally, the ability of American nuclear reactor vendors to compete in foreign markets may ultimately depend on their ability to sell a better product. Right now extended burn-up fuel is the only major area where the U.S. is ahead of its foreign competitors.[7]

4. One of the program's most important contributions will go neither to private enterprise nor to the public directly, but rather to DOE's efforts to solve the nuclear waste disposal problem. DOE officials hope that the first licensed operating commercial spent fuel repository will come on line between 1997 and 2006. Yet, by 1986, several major utilities' spent fuel ponds will be constipated even with all fuel assemblies reracked. To buy more time, DOE is now considering consolidating these fuel assemblies and licensing on-site storage casks. These practices will help provide more storage space at the site of the reactor. But extended burn-up fuel, which reduces the amount of spent fuel reactors generate up to 40 percent, is the only way actually to reduce the future production of waste. Because implementation difficulties with either the consolidation or site cask programs could force power reactor shut downs in the late 1980s or 1990s, the extended burn-up program is a worthy insurance policy.[8]

There are other benefits to the program. It cuts nuclear reactor fuel cycle costs by 10 percent, reduces worker exposure to radiation, and when fully developed will significantly limit the occasions for fuel failure. It also is helpful for breeding. In fact, one of the reasons industry experts have been attracted to extended burn-up fuel is that when it is burned and becomes spent fuel, its higher plutonium content per fuel rod and greater abundance of "even isotope" plutonium over conventional fuel makes initiation of breeder easier. Thus, it would reduce plutonium recovery costs ($/kilogram of plutonium) by 17 percent, reduce start-up breeder fuel inventories by 3 percent, and increase breeder conversion ratios by 5 percent.[9]

---

7 See Testimony of Thomas A. Dillon, Executive Director, Office of the Assistant Secretary for Nuclear Energy, U.S. Department of Energy, before the House Subcommittee on Energy Conservation and Power, October 6, 1981; and Executive Office of the President, Office of Management and Budget, Major Themes and Additional Budget Details Fiscal Year 1983, "Fees for Commercial Nuclear Waste Disposal" (Washington, D.C.: GPO, 1982), pp. 222-223.

8 See Dillon testimony before the House Subcommittee on Energy Conservation and Power, October 6, 1981, and U.S. Department of Energy, "Statement of Position of the U.S. Department of Energy on the Storage and Disposal of Nuclear Waste," April 15, 1980, DOE/NE-0007.

9 Shapiro testimony before the House Subcommittee on Energy Conservation and Power, October 6, 1981, and Letter from the Comptroller General to Marilyn Lloyd Bouquard, March 23, 1981 (EMD-81-51).

All of this, however, is academic if the program is killed or proceeds along the one-vendor, one-design track. If the program is to remain on schedule and on budget, $15 million will be needed in FY 1983 to continue the remaining vendor contracts. This means $12 million is needed in addition to the $3 million allocated by OMB.

This money is small and can be found. The Science and Technology Committee, after all, must review over one half billion dollars worth of energy research and development projects. Are all of these projects more cost effective? Are they all beyond being cut or stretched or involve binding contract commitments with private industry? If not, extended burn-up is the place the money should go.

Henry Sokolski
Visiting Scholar

Henry Sokolski is a Public Affairs Fellow at The Heritage Foundation under the sponsorship of the Hoover Institution on War, Revolution and Peace.