

BRUCE BARTLETT

Who's fueling whom?

THE BELIEF THAT NUCLEAR power is cheap has long been the main force behind the drive to build nuclear power plants. Although heavy capital investments have always been necessary for construction of such plants, based on the cost per kilowatt-hour, electricity generated from nuclear power has been very inexpensive. As recently as 1977, for example, the Edison Electric Institute estimated that it cost an average of 1.5 cents to generate one kilowatt-hour of electricity at the nation's nuclear power plants, compared to 2 cents per kilowatt-hour for coal-generated electricity and 3.9 cents for oil-generated electricity. (These figures cover the cost of the electricity only up to the point that it leaves the power plant.) But these cost comparisons may well be invalid because of the implicit and explicit government subsidies to the nuclear industry. Unfortunately, until recently no one had calculated the cost and scope of such subsidies.

A recent study by Barry Weingast, who teaches economics at Washington University in St. Louis, notes that "the atomic power industry owes its existence to the creation of the Atomic Energy Commission (AEC) in 1946 and to Congressional subsidies that were doled out by the AEC until 1974."

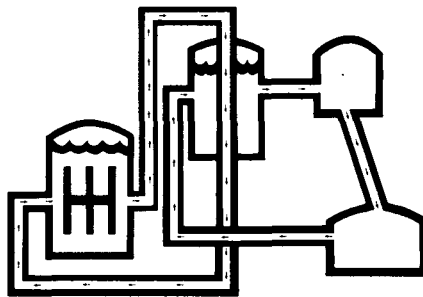
These congressional subsidies have taken various forms over the years. In the beginning Congress appropriated the funds necessary for research and development. After passage of the 1954 Atomic Energy Act the hope was that a private nuclear power industry would soon develop. This did not happen,

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however, because the risk of costly catastrophe inhibited firms from undertaking nuclear power projects. The congressional response was passage of the Price-Anderson Act, which limited total liability for any nuclear accident to \$560 million, \$500 million to come from federal tax money. If total damages exceed the ceiling the compensation is allocated on a proportional basis. This measure aided private firms by transferring to the public most of the costs associated with the risk. With the passage of the Price-Anderson Act, nuclear power was on the march, and the first civilian nuclear power plant was opened in 1957 in Shippingport, Pennsylvania.

By the early 1960s a new problem began to develop in the uranium mining industry. Until then the AEC had kept it going with purchases for the weapons program and research and development projects, but by that time the AEC had stockpiled more than enough material for its programs and its demand for uranium dropped. Most nuclear power plants did not come on line until the late 1960s, so the private demand for uranium was still light. This left the uranium suppliers in a serious financial bind. Congress responded by passing the Private Ownership of Special Nuclear Materials Act of 1964. It was designed to tide the mining industry over this period by limiting foreign competition through restrictions on imports and by purchasing materials years before they would be needed for power development.

"Even as late as 1970," Weingast points out, "producer protection seemed to characterize the pattern of Congressional intervention." He notes that in the late 1960s power pooling among the various producers in a given locale was a controversial issue. Small municipal power companies were concerned be-



cause their markets were too small to justify nuclear power plants economically, yet they wished to share in the benefits of this new technology. Congress resolved the issue in the 1970 Amendments to the 1954 Atomic Energy Act by requiring an "antitrust" review for each new nuclear facility. The solution in all

cases was to form power pools. An analysis of these pools cited by Weingast has shown that they are actually local cartels that share the rents of nuclear facilities among all the local suppliers. "In this respect," according to Weingast, "the action parallels the 1935 legislation which brought the trucking industry under the jurisdiction of the Interstate Commerce Commission (i.e., into the cartel)."

IN THE 1970S, BY CONTRAST, Congress has been reluctant to continue to intervene in the economy on behalf of nuclear power. As a result, the cost gap between nuclear power and other kinds of power has rapidly closed.

At the same time, increased government regulation is a major factor in the shrinking cost advantage of nuclear power. Although public safety was the basis for much intervention, many new provisions contributed little to safety and much to the cost of electricity. For example, utilities are required to submit reports to the Nuclear Regulatory Commission summarizing malfunctions in a vast array of reactor components and systems. Unfortunately, according to senior NRC scientist R. A. Brightsen, the NRC has no effective procedure for identifying which malfunctions are really important in terms of public health or safety. Moreover, the NRC requires that a vast amount of data be displayed in the control rooms of operating nuclear power plants—yet it has no clear idea of what information really enhances reactor safety.

According to a study released by the House Committee on Government Operations issued in April, 1978:

"Contrary to widespread belief, nuclear power is no longer a cheap energy source. In fact, when the still unknown costs of radioactive waste and spent nuclear fuel management, decommissioning and perpetual care are finally included in the rate base, nuclear power may prove to be much more expensive than conventional energy sources such as coal, and may well not be economically competitive with safe, renewable energy alternatives such as solar power."

The report goes on to point out that nuclear power is the only energy technology that has a major capitalization cost at the beginning and the end of its useful life. The "back-end" costs associated with waste management and decommissioning of nuclear power plants have yet to be determined, but are estimated to be very high. Nevertheless,

these costs are not reflected in the rate base for nuclear power. This has led many critics to believe that utilities ultimately intend to pass these costs on to the taxpayer. As Maurice Van Nostrand, former chairman of the Iowa State Commerce Commission, has said:

"I find totally distasteful even the possibility that some of those [waste disposal and decommissioning] costs are not being paid currently and that Iowans sometime in the future are going to be forced to pay not only the costs of the electricity they use but some carryover costs from some electricity consumed long ago. In the present situation, I think that is exactly what we're locking in for future taxpayers."

The costs associated with permanent disposal of radioactive waste generated by the nation's nuclear power industry are as yet unknown. The Department of Energy estimates them to be fairly small, approximately 0.1 cents per kilowatt-hour. The following schedule shows all the costs DOE believes will need to be recovered from this charge:

FACILITY OR SERVICE	COSTS TO BE RECOVERED* (millions)
Away from reactor storage	\$ 275
Transportation to repository	100
Encapsulation facility	1325
Geological repository	2141
Research and development	560
Government overhead	234
Total	\$4635

*1978 dollars

To this must be added the cost of decommissioning a nuclear plant at the end of its useful life. A study by the Battelle Memorial Institute's Pacific Northwest Laboratory put this cost at between \$42.1 million and \$50.2 million for a 1175-megawatt power plant. Commonwealth Edison, the nation's largest generator of nuclear power, puts these costs at 0.02 cents per kilowatt-hour.

OTHER ESTIMATES, HOWEVER, put the back-end costs of nuclear power much higher. The New York state attorney general's office, for example, put the total back-end cost at between 0.18 and 0.75 cents per kilowatt-hour, and for decommissioning alone, 0.13 to 0.58 cents per kilowatt-hour. Van Nostrand, in Iowa, put the costs at two to three times DOE's estimate. Costs of decommissioning the West Valley nuclear reprocessing plant in western New York may run as high as \$1 billion, so all these estimates may be on the low side.

Obviously, these back-end costs cannot yet be considered burdens on the taxpayer since they have not yet occurred. But because such costs may be far beyond the means of the nuclear industry, they could easily end up being paid for by the taxpayer, as Van Nostrand fears. At the West Valley plant, for example, which was operated privately, when the cleanup cost started running into the hundreds of millions of dollars the New York state government and the federal government were inevitably drawn in. Thus one might say that the current charges for nuclear power are understated because they do not allow for back-end costs, and that this is an implicit government subsidy to nuclear power.

Recently, efforts were made to calculate the overall government subsidy to nuclear power. Leaving out nonquantifiable subsidies such as the Price-Anderson Act, the Battelle report found that the federal government had expended \$18.0 billion between 1947 and 1977 in promoting nuclear power. (This represented only 15.8 percent of all the funds expended for promoting energy development, including hydroelectric, coal, petroleum, and so forth.)

The General Accounting Office, at the request of Senator John Melcher of Montana, attempted to calculate this subsidy on a per year, per kilowatt-hour basis. The GAO concluded that the subsidy may amount to as much as 0.62 cents per kilowatt-hour. The following table that appeared in the *Congressional Record* (June 18, 1979; pp. S 7863-6) shows this estimated subsidy:

FISCAL YEAR	1976²	1977	1978
Research & Development ¹	936	989	1196
Enrichment	120	180	220
Regulation	221	213	240
Total	\$1277	\$1382	\$1656

(Dollar amounts in millions)

Billion kilowatt-hours generated	228	243	265
Cents per kilowatt-hour	0.51	0.57	0.62

1. Includes \$31.2 million for uranium resource assessment . . .

2. Includes the three-month transition quarter.

Presumably, the 0.62-cent subsidy calculated by the GAO should be added to the estimated average cost for electricity generated by nuclear power plants, raising the cost per kilowatt-hour to 2.12 cents, or more than the cost for coal-generated electricity. Thus the subsidy represents 30 percent of the true cost of nuclear-generated electricity.

Although the data presented here are

incomplete, it is clear that the federal government has conferred economic benefits on the nuclear power industry that reduce the cost of nuclear-generated electricity below its real cost. However, to make a fair comparison between nuclear power and other kinds of power it would be necessary to calculate the government subsidies to all kinds of power. The Battelle study, for example, found that between 1950 and 1977, direct government subsidies to hydroelectric power amounted to \$13.53 bil-

New federal safety rules add more to the total costs than to the safety of nuclear power.

lion, \$5.68 billion for coal, \$50.9 billion for oil, \$0.46 billion for gas, and \$25.21 billion for electricity.

Those who defend nuclear power, like Petr Beckmann of the University of Colorado and Samuel McCracken of Boston University, unfortunately tend to gloss over the subsidy question. Beckmann, for example, has written, "Yes, the American taxpayer has paid \$1 billion to research nuclear safety, and I consider that a good investment; the American taxpayer also pays \$1 billion, not total, but year after year, to Black Lung victims." This is rather like saying, "Everyone else does it, why shouldn't I?"

A consistent position toward nuclear power would eliminate all subsidies, implicit and explicit, for nuclear power and all other types of energy as well. Each utility should bear the full costs associated with the form of power generation it adopts, and the market will decide which form is best. We may find some surprises when we unmask the costs of various fuels, including perhaps the discovery that the total cost of electricity is much higher than what consumers pay for it now. Under these circumstances, many so-called alternative energy sources may prove more cost-effective than previously believed, and many people may discover that they are using large amounts of electricity that they can really do without.

RALPH HORWITZ

The roots of apartheid

WHEN PRIME MINISTER Pieter Botha of the Republic of South Africa tells a regional congress of his governing National party in its diehard Transvaal heartland that black Africans are to be given trade union rights, and the very next day tells another regional party congress in the "liberal" Cape province that his apartheid government is ready to consider suggestions for changes in laws that ban marriage and sexual intercourse between whites and blacks, something unusual is going on.

Perhaps the pressures on politics are the pressures of business. One of the world's biggest hotel and shopping complexes, the Carlton Centre in Johannesburg, now has a multiracial restaurant, and a recent president of the Johannesburg chamber of commerce has recently echoed the major business leaders who over the years have vainly urged the South African government to end all forms of racial discrimination.

These encouraging—though still quite inadequate—developments stand in marked contrast to the trend of government policy since 1948. Over the last 30-odd years, the Afrikaners' segregationist politics have thwarted the integrationist economics of entrepreneurial capitalism.

The well-known sociologist Pierre L. van den Berghe once stated that "no other state has devoted as large a proportion of its energies and resources in imposing racial segregation as South Africa has done since 1948." After the death of Stephen Biko, Black Consciousness leader, under suspicious circumstances, the demonstrations that oc-

curred made it clear that blacks have become increasingly unwilling to accept their inferior status. The conflict between rapidly intensifying black nationalism and Afrikaner domination cannot be understood unless it is viewed historically.

Two centuries of denial of human dignity to blacks in South Africa have probably brought that country now to the point of inevitable explosion. South Africa emerged only very recently from a self-subsistence, non-exchange economy, and the current racial crisis stems from steps taken during the course of its economic development. In 1652 the Dutch East India Company ordered its "servant" Governor Jan van Riebeeck to develop no more than a fort and fresh vegetable garden at the Cape, and for two hundred years there was little capital accumulation or growth of domestic commerce or industry.

Until the mid-nineteenth century, land and labor were the only meaningful factors of production. Apart from a small region near Cape Town where Huguenot immigrants specialized in grapes and wine, the raising of cattle was the dominant economic pursuit. There was little cultivation of farms and a cash economy evolved very slowly. The only change was the spread of this stagnant way of life as it was carried further and further into the hinterland by migrant stockfarmers or "trekkers."

White-black contacts were limited to cattle wars. While the craftsmanship of Malay slaves and their Cape Coloured descendants provided modest amenities for white households, neither technology nor industry gave any sort of boost to production.

Two events in South African history may legitimately be described as epochal. The first was the Great Trek of Afrikaner frontiersmen from the Eastern Cape into the hinterland in 1836; this became the basis of the *volk* mythology of Afrikanerdom.

In those days, both Afrikaner pastoralists and African tribesmen, in their never-ending pursuit of more and more territory, were driven into lands of less and less productivity. Subsistence for humans depended on sustenance for cattle. Nomadic cattle-raising was the dominant way of life for both Afrikaner and African.

Although the territorial vastness of South Africa made land plentiful in principle, in fact land was scarce because no exchange economy of income-generating specialization had developed. Cattle-raiding and counterraiding

generated continuous conflict, escalating into the "kaffir wars," and the scattered Afrikaner communities withdrew into their lonely laagers encircled by ox-wagons to face the African assagai.

Meanwhile, an interfering British Colonial Office thousands of miles away was attempting to support human rights. It began by freeing the slaves (nonwhites, most of them non-Africans) owned by the white Afrikaners. In addition, influenced by human rights fervor in the British upper classes and the missionary zeal found in nonconformist religious circles, it decided that in South Africa there should be no color bar to the right to vote. Not surprisingly, this aroused outrage in the trekker republics of the Afrikaners, whose constitutions specifically prohibited "mixing in Church and State" between whites and nonwhites.

The second epochal event was the discovery of diamonds and gold under the Afrikaners' beloved veldt. The Afrikaners fought their "Freedom War," as they call the Anglo-Boer war, shortly after the diamond jubilee of Queen Victoria's British Empire. They fought against the *uitlanders*, the foreign capitalists whom they saw as exploiting and transforming their societies in pursuit of profits with total disregard for the proper Calvinist "ordering" of white-black life.

The mineral discoveries led to capital investment and immigration that overwhelmed the social systems of African tribalism and Afrikaner pastoralism. Migrant tribesmen could no longer support themselves on eroded cattleland; barred from further territorial expansion by the political power of the white man's government, they went to work for wages. Heretofore self-sufficient Afrikaner pastoralists became "poor whites," temporarily lost and adrift in an alien cash economy. In 1920, a Carnegie Commission study classified one-third of the Afrikaners as "poor whites" of this sort.

THE CULTURE OF AFRICAN tribalism virtually collapsed as blacks entered industrial and urban life. By the end of the Second World War, an unfettered, dynamic economy had virtually eliminated poor-white status among the Afrikaners. They had not yet themselves become entrepreneurial capitalists on a significant scale, but they were better off and more accustomed to city life, and they decided to create apartheid to prevent a similar rise by blacks.

Now, apartheid is both a coinage and

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