

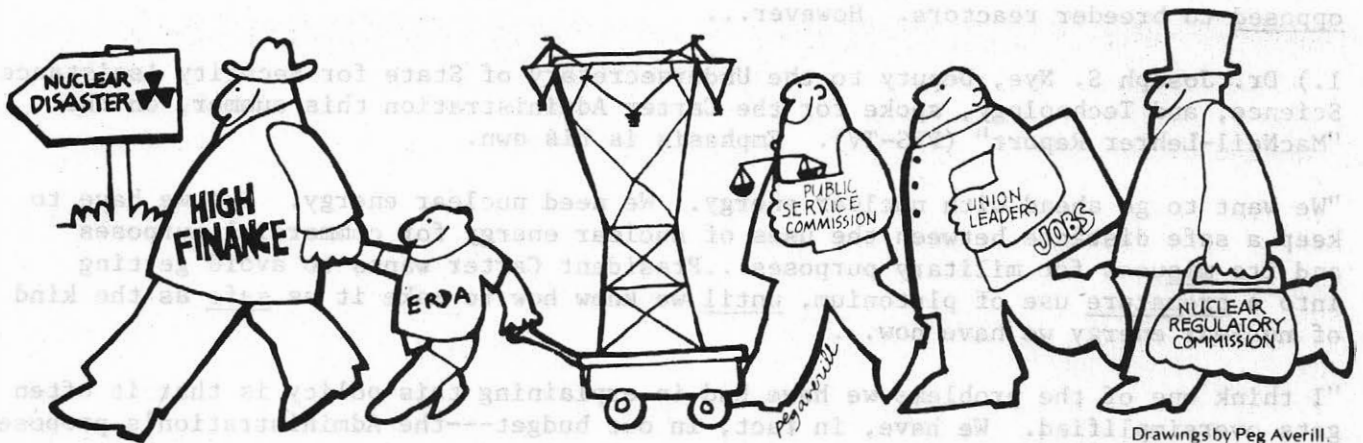
Jimmy Carter's Energy Plan: Myths vs. Realities

by John W. Gofman and Egan O'Connor

Part III: Nuclear Fission

*Nuclear fission as it is treated in "The National Energy Plan" issued by the White House, April 29, 1977.

- Myth No. 1:** Carter is treating nuclear power as "a last resort".
- Myth No. 2:** Carter's plan is a serious effort to prevent worldwide proliferation of atom-bombs.
- Myth No. 3:** Carter's plan rectifies "the disproportionate share of capital" consumed by expansion of energy facilities.
- Myth No. 4:** The U.S. has a big supply of uranium for light-water nuclear power plants.



From WIN magazine, 3/24/77

"...from an economic standpoint alone, to rely upon nuclear fission as the primary source of our stationary energy supplies will constitute economic lunacy on a scale unparalleled in recorded history, and may lead to the economic Waterloo of the United States."

---From a new book (\$16.50 from Praeger Publishers, Inc, 200 Park Ave, NYC 10017) entitled The Economics of Nuclear and Coal Power, by Saunders Miller, assisted by Craig Severance. Miller is a mergers and acquisitions specialist with Dain, Kalman & Quail of Minneapolis.

For the past 6 months, we have given the new President every benefit of the doubt on his nuclear power policy. But we think it is time to speak out, and on this we are taking Jimmy Carter's advice. Before his election, he wrote:

If the members of the Environmental and Conservation groups of this nation are willing to compromise ahead of time on tough decisions relating to the quality of the lives of the American people, then who in God's world is going to maintain a staunch position from which we can make proper decisions."

--- Jimmy Carter, candidate.

From an undated "Guest Opinion" column by Jimmy Carter, reprinted and distributed by his Atlanta campaign office.

ADDITION (BELOW) TO THE 5th PRINTING, September, 1977:

While the Carter Administration is now openly pro-nuclear with regard to Light Water nuclear power plants, many people still assume that Jimmy Carter is firmly opposed to breeder reactors. However...

1.) Dr. Joseph S. Nye, Deputy to the Undersecretary of State for Security Assistance, Science, and Technology, spoke for the Carter Administration this summer, on the "MacNeil-Lehrer Report" (PBS-TV). Emphasis is his own.

"We want to go ahead with nuclear energy. We need nuclear energy. But we have to keep a safe distance between the uses of nuclear energy for commercial purposes and its misuses for military purposes...President Carter wants to avoid getting into a premature use of plutonium, until we know how to make it as safe as the kind of nuclear energy we have now...

"I think one of the problems we have had in explaining this policy is that it often gets oversimplified. We have, in fact, in our budget---the Administration's proposed budget---\$483 million for breeder reactors. That's a lot of money. In fact, it's more than the European countries are spending...

"We believe the Clinch River project specifically is not one which we need nationally as a country...The point is that we do believe we should have a breeder reactor program, and we are going ahead..."

2.) Newton I. Steers, Jr., is a U.S. Congressman from Maryland's 8th District. On August 1, 1977, he issued a statement discussing the pros and cons of the Clinch River breeder, as he sees them. It says, "President Carter has stated to me personally that plutonium breeders may emerge some years from now as an integral part of our energy program."

Myth No. 1:

The President is treating nuclear power as "a last resort".

Facts:

Jimmy Carter is calling for accelerated licensing of additional light water reactors (National Energy Plan, p.31 & 72), in order that we may have a 3.8-fold increase in their energy-contribution as of 1985 (NEP p.96). This compares with a mere 1.1-fold increase in oil production, a decline in gas production, and a 1.8-fold increase in coal production during the same 1976-1985 period.

The National Energy Plan claims, of course, that "there is no practicable alternative" to using more light water reactors (NEP p.70).

The public might suppose that Carter's gung-ho promotion of nuclear power in spite of his campaign promise (to treat it as "a last resort") means that additional nuclear power can meet a significant fraction of the projected 1985 energy-need (Carter's projection).

This would be the biggest trick of all!

The truth is that a complete, nationwide, permanent ban on nuclear power expansion would cost the economy only 3.81 thermal Quads* /year of energy over the next 30 years. In terms of Carter's projection that we will consume 91.65 Quads in 1985, the loss of 3.81 Quads amounts to an insignificant 4.1% loss!***

(The calculations and assumptions for this finding---which disproves the common charge that a ban on nuclear power expansion would deprive the economy of a significant energy-source---are presented in CNR Report 1977-2, May 15, 1977.)

To state the situation another way: Carter's decision to press hard for 60,000 nuclear megawatts beyond what is already operable and underway*** will "solve" a pitiful 4.1% of his energy problem in 1985.

For this utterly trivial increment of energy, the President has renounced his promise to treat nuclear power as a last resort. It truly strains credulity, especially in an economy which wastes 45% of its energy through inefficiency, that there is "no practicable alternative" for solving 4.1% of his alleged problem. (See Myth #3, which deals with "co-generation" of power, if power is needed).

Instead of Carter urging his licensing staff to accelerate nuclear licensing, couldn't he at least have insisted that no new license be issued unless the hearing for each license showed that there was really no other way for the region in question to get the energy it will need?

Or could it be that the President's "last resort" is really his first choice?

* One Quad = 10^{15} BTU's, or the energy equivalent of 180 million barrels of crude oil.

** It should be noted that 3.81 Quads amounts to only 5.1% of the solution even if we never increase our annual energy consumption beyond the present 75 Quads per year. See CNR Report 1977-4 on Conservation.

*** Operable = about 50,000 megawatts. Underway = about 30,000 megawatts.

Fact:

The Plan barely disguises its enthusiasm for nuclear power.

It is startling to find the following remark in the National Energy Plan (p.72):

"A national industry-labor agreement could lead to a substantial reduction in construction time and increase the willingness of utilities to invest in nuclear power plants."

It sounds as if increasing that willingness were desirable, and again as if Carter is pushing nuclear power instead of reluctantly accepting it.

Another startling sign of the Administration's devotion to light water reactors is contained in the section on fusion! The budget for fusion is kept high (twice as high as for solar electricity), and when we examine the National Energy Plan (p.78), we find this astounding idea:

"Even without achievement of breakeven power [getting as much energy out of a fusion system as we put in], either fusion system [magnetic or laser] may be able to produce usable energy as part of a hybrid fusion-fission cycle. The fusion process produces neutrons which might breed fuel for light-water nuclear reactors more easily than it produces electricity."

"Fuel for LWR's" in this context has to mean either plutonium-239 or uranium-233, both of which are suitable for making atom-bombs without the obstacle of enrichment!

The unadorned love for fission is so great that, in writing no less, the National Energy Plan admits hoping for this expensive back-door way to sustain more light water reactors, while the President is out front advertising his efforts to prevent proliferation and to treat nuclear power as a last resort.

The National Energy Plan is riddled with statements (and Carter's budget is riddled with funds) indicating that the President has no intention whatsoever of discouraging the growth of nuclear power here or abroad. Far from it! The Plan is a ploy.

Fact:

The Plan promotes fission worldwide through uranium enrichment.

The Plan seeks to increase our capability to enrich uranium not only to expand nuclear power in the U.S., but to enrich uranium for the whole free world (NEP p. 71):

"The U.S. must restore confidence in its willingness and ability to supply enrichment services [to other countries]. The Administration, therefore, is prepared, in cooperation with the Congress, to take three steps...

---re-open the order books for U.S. uranium enrichment services;

---adopt legislation to guarantee the delivery of enrichment services to any country that shares U.S. non-proliferation objectives and accepts conditions consistent with those objectives;

---expand U.S. enrichment capacity."

Fact:

The Plan devotes more effort to the NEXT generation of nuclear reactors than to anything else.

"The President is proposing to reduce the funding for the existing breeder program and to redirect it toward evaluation of alternative breeders, advanced converter reactors, and other fuel cycles, with emphasis on non-proliferation and safety concerns...It is the President's policy to...seek a better approach to the next generation of nuclear power than is provided by plutonium recycle and the plutonium breeder". (NEP p.70).

The financing of these proposed alternative fission technologies will help guarantee the failure to finance non-fission alternatives. Indeed, the Carter budget allots \$656 million for the various breeders, \$433 for fusion, \$215 million for all the solar electric technologies combined, and \$90 million for solar heating and cooling.

The Plan's rhetoric may go to conservation and renewable energy sources, but the dollars go to nuclear fission.

Carter's approach makes his promise of treating nuclear fission as "a last resort" an absurd, cruel joke and travesty. Carter's Plan is a blueprint for a nuclear future. "And you can depend on it".

Myth No. 2:

Carter's energy plan is a serious effort to prevent worldwide proliferation of atom-bombs.

Fact:**The effect of promoting alternative breeders:**

The Administration is shifting its emphasis away from the plutonium breeder to "alternative breeders".

If this represents the Administration's full approach to non-proliferation, the Energy Staff might just as well have stayed in bed. The only breeder other than the one involving plutonium would be the thorium-uranium-233 cycle. Substituting fissionable uranium-233 for plutonium-239 does not eliminate the proliferation problem at all. For bomb-makers, U-233 shares the "advantage" of plutonium relative to U-235, for U-233 does not need enrichment either. (And as for toxicity, the U-232 and U-233 combination may turn out to be nearly as toxic as plutonium).

If proliferation were to be avoided, the effort would not be redirected toward more nuclear fission cycles, but rather toward renewable, non-fission sources of energy.

Fact:

The effect of promoting cheap & easy enrichment:

In its section on fuel enrichment for light water reactors, the National Energy Plan states (p.71):

"The time has come to move to the new gaseous centrifuge technology [for enrichment], which consumes less than 10% as much electrical power as a diffusion plant of equivalent capacity. In addition, a centrifuge plant has the potential for producing enriched uranium at lower cost."

The facilitation of cheaper and easier enrichment of natural uranium is a step toward nuclear proliferation, not away from it. If enrichment technology is made cheaper and easier, bomb-proliferation even via uranium-235 becomes a worldwide hazard---without any involvement with plutonium or reactors at all!

Again, Carter's approach to non-proliferation is to jump out of the plutonium frying pan into the uranium fire.

Fact:

The effect of promoting LWR's abroad:

With his proposed guarantee to supply fuel-enrichment services for any country which shares our non-proliferation objectives, Carter is hardly suggesting that other nations regard nuclear power as "a last resort". Instead, he is going out of his way to assure them that they will have no enrichment obstacles if they go ahead with light water reactors!

In time, the proliferation of light water reactors WILL result in atom-bomb proliferation, agreements or no agreements.

With every reactor goes technical training and expertise and know-how. With such knowledge, fuel can be reprocessed in batches locally to extract the plutonium, and bombs can be made.

Agreements made solemnly by one government can be repudiated by the next, and reactor-fuel consequently denied by one supplier-government can arrive nevertheless, well-laundered in the merry-go-round of international trade, with or without a black market.

Make no mistake...

...Cancellation of the Clinch River Breeder (LMFBR) and the Barnwell reprocessing plant would be major parts of a real non-proliferation effort, and we support this part of the Carter Plan loudly and often.

However, since the Carter Plan so amazingly turns to three other activities which would promote bomb-proliferation, it is fair to ask whether the decisions to cancel the LMFBR and plutonium reprocessing really had much to do with proliferation, or were the decisions based on some overwhelming technical and economic problems?



Myth No. 3:

Carter is doing all he can to rectify "the disproportionate share of capital" consumed by expansion of energy facilities.

Fact:

Although Carter expresses his concern over energy technologies which draw excessively on scarce capital, he has singled out the one most capital-intensive energy source, namely nuclear power, for accelerated expansion!

Innumerable studies show that investment of capital in energy-efficiency measures yields far more energy per-dollar-invested than does nuclear power.

Carter claims (NEP, p.97) that his Plan "could reduce new capacity requirements for electric utilities by as much as \$40 billion." Clearly none of this reduction is coming from the nuclear sector, since the Plan shows (p.96) more nuclear power with the Plan than without it!

The possible saving of \$40 billion is almost certainly associated with "co-generation" of electric power by industries which must generate process-steam for their own activities.

According to the study "Energy Industrial Center" by McCracken, Rosenberg, and Decker for the National Science Foundation, June 1975, U.S. industries with suitable steam requirements for their own purposes, could also generate 71,000 electrical megawatts of power for a capital cost about \$40 billion below the cost of equivalent new utility stations (and with at least 31% less fuel consumed per kilowatt-hour of power than from conventional stations).

Sweden is currently producing 29% of its total electricity through co-generation, and West Germany produces over 17% of its power that way. (See also "Energy Waste and Nuclear Power Growth" by von Hippel and Williams in the Bulletin of the Atomic Scientists, December 1976.)

IF the USA needs more power stations at all, clearly co-generation offers the best deal for sparing capital (and reducing energy-consumption per kwh).

But no case is made at all in the National Energy Plan for building additional power plants of ANY type.

The Plan deals not at all with studies like Dr. Amory Lovins' book, Soft Energy Paths (1977, from Friends of the Earth/Ballinger) in which Lovins points out (Chapter 4) that in the U.S., Britain, West Germany, and Canada, only 8% of end-use energy is needed in the form of ELECTRICITY.

With the methods and fuels used in the USA to generate electricity, about 20% of our primary fuel supply would be required to deliver 8% of the end-use energy supply in the form of electricity. With a shift to co-generation of power, plus use of currently unused small hydroelectric sites, we could reduce that 20% to a much lower number, and still generate all the electricity we need.

Instead, we are today devoting about 28% of all our energy to the production of electricity---which reflects about 40% ($8 \div 20$) over-use of electricity for uses which would be more efficiently served by the direct use of non-electric energy. And the Carter Plan proposes to divert a full 34% of our total energy supply into generating electricity by 1985! That would represent a 70% ($14 \div 20$) over-use of electricity, the most expensive of all possible energy sources.

According to Lovins, a more reasonable use of electricity (8% of end-use energy consumption) would provide all the power now used for "industrial electric drive, electric drive for home appliances, all lighting, electronics, telecommunications, electrometallurgy, electrochemistry, arc-welding, electric railways, etc." (This means preserving every electrical amenity we can think of---hardly back to the Stone Age!). Everything else we need energy for, doesn't require electricity.

Lovins has not been refuted when he says (Soft Energy Paths):

- "Electricity is a very expensive form of energy: it costs typically from \$50 to \$120 per barrel (of oil) equivalent today.
- "The premium applications in which we can get our money's worth out of this special kind of energy total only about 7-8% of all our end uses in all industrial countries.
- "With improved efficiency, that 8% would shrink to about 5%, which in the U.S. could be covered with present hydroelectric capacity plus a modest amount of industrial co-generation. That is, the U.S. could be advantageously operating with no central power stations at all---if she used electricity only for tasks that can use its high quality to advantage, so justifying its high cost in money and fuels.
- "Those limited premium tasks are already far oversupplied, so if we make more electricity, we can only use it for inappropriate low-grade purposes. That is rather like cutting butter with a chainsaw---which is inelegant, expensive, messy, and dangerous."

Myth No. 4:

The U.S has a big supply of uranium for light-water nukes.

The National Energy Plan states (p.71) that "Current estimates of U.S. uranium resources range between 1.8 and 3.7 million tons".

Fact:

These numbers are the same old unsupported guesses which were put forth under the Nixon and Ford regimes! They have been challenged by numerous papers from the U.S. Geological Survey, the General Accounting Office, and even from certain ERDA experts. They have been demolished in a thoughtful analysis by M.A. Lieberman (Energy and Resources Group, University of California at Berkeley) entitled "U.S. Uranium Resources--- An Analysis of Historical Data", which appeared in the journal Science, April 30, 1976.

Instead of speculating wildly, Lieberman analyzes the data from exploratory drilling, which shows the rate at which uranium discovery has been declining per foot drilled (not per year of drilling activity, or per dollar spent on drilling, or other meaningless measures).

Lieberman's estimate is that the ULTIMATE U.S. uranium resource for LWR's is 1,130,000 tons U₃O₈ INCLUDING the 640,000 tons already discovered.

This means that the U.S. can count on fueling only a limited number of light water reactors with its own fuel supply. What IS that limited number? Why do "experts" disagree?

In CNR Report 1977-2, "Gross Energy Available through Light Water Reactors", we have tried to clarify the various assumptions which go into such estimates so that there is no mystery about the disagreement.

Our conclusion is that the number of nuclear plants which Carter wants to accelerate into operation by 1985 may well exceed the fuel supply!

In Conclusion

The White House has issued an undated booklet entitled The National Energy Plan---Summary of Public Participation. It reports (p.26) on the response to this question:

"Which of the following energy sources presents the greatest risk to the environment?"

The choices given are coal, oil, gas, nuclear, hydroelectric, solar, geothermal, other. Responses are given by these groups: General public, Business, Industry, Public Interest Groups, State & Local Governments, Labor, Education, Other. Every single group rated nuclear as the riskiest!

It is positively amazing, with all the problems of nuclear power, that the Carter Administration is promoting it so unnecessarily. →

For laughs, read about the latest nuclear problem: ATTACK OF THE GREEN GRUNGE

Repairs to Shut Down 2 Nuclear Plants

By Joanne Omang
Washington Post Staff Writer

Virginia's two nuclear power plants, Surry I and II, will be shut down for \$60 million worth of major repairs next year because of a problem that has the nuclear energy industry worried nationwide.

The problem, called "denting" is the subject of a \$40 million research effort by the nuclear industry.

So far, over the last two years the problem has shown up in 14 of the 33 plants that are technologically susceptible to it, according to Vic Stello, director of the operating reactors division of the Nuclear Regulatory Commission (NRC). In four of those cases, including the two in Virginia, Stello described the damage as "extensive."

Denting is the term used to describe a buildup of a substance around pipes containing the water that is superheated by the nuclear reactor. The substance buildup eventually strangles the pipes, causing cracks and leaks.

VEPCO has already ordered six new Westinghouse steam generators — at \$10 million each — to replace the ones damaged by denting. The complex replacement operation, the first such one ever conducted in a U.S. utility, will involve cutting holes into the protective containment walls

of the nuclear reactors, removing portions of the steam generators, and cutting the pipes that cool the heart of the reactors.

"Installing the (steam) generators in the first place was a whole lot easier than this will be, because now we have to go through the containment wall to get to them," said James Wittine, electrical engineer of the Virginia State Corporation Commission, which oversees VEPCO.

He said the commission would decide how much of the cost of labor and materials would be borne by consumers when VEPCO makes some sort of proposal on it. "I expect they're not going to just ask their stockholders to pick up the tab," he said.

Some industry sources ridiculed VEPCO's repair estimate of \$60 million as too low and said it could cost five times that amount since labor costs will be substantial.

Denting occurs on the outside of the primary system pipes where they pass through support plates inside the steam generator, like spaghetti through a sieve.

For reasons that are still debated, a substance called magnetite or "green grunge" builds up around the holes in the plates, pinching and denting the primary system tubes. Eventually they

crack and leak and have to be plugged as useless.

"The question becomes an economic one very quickly," said Stello of the NRC. "When 20 per cent of the tubes are plugged, the plant might have to operate at less than 100 per cent of capacity. The Surry plants are at a point where further plugging could cause that." A VEPCO spokesman said 18.5 per cent of the primary system tubes were already plugged in Surry I and 16.8 per cent in Surry II.

Florida Power & Light Co. has the next most severe denting problem after the Surry plants. Its Turkey Point III and IV units have 5.5 per cent and 7.5 per cent of their primary system tubes plugged. Florida Power & Light has ordered six replacement steam generator "tube bundle assemblies" for \$10 million each from Westinghouse for delivery beginning in 1979. The company estimates total cost of the units and replacement fuel and labor at \$380 million.

A spokesman for Florida Power & Light said repairs there could take nine to 11 months for each unit. "We

See NUCLEAR, A15, Col. 1

'Green Grunge' Takes Nuclear Plant Toll

NUCLEAR, From A14

still hope the problem could be solved and the process arrested so that we won't have to replace the units," said Charlie Scheer, the spokesman. He called the \$60 million order for new units "a hedge" because of the 21-month delivery time.

Denting has also occurred in California's San Onofre nuclear power plant and New York's Indian Point, which use salt or brackish water—as do the Surry and the Florida plants—for the third cooling water (condenser) system. That was at first thought to be significant, but Stello of the NRC said denting has also been found at fresh water coolant plants: Palisades on Lake Michigan, Point Beach in Wisconsin and the Ginna plant on Lake Ontario.

Denting is much less in some plants than in others and just why perplexes officials. "The industry is kind of tied up in knots trying to answer that question right now," said Ron Britt of the San Onofre, Cal., plant headquarters.

There is general agreement that the culprit is bad chemicals in the second water system, the one that flows in and out of the steam generator and turns to steam to drive the turbines. The "green grunge" builds up on metals exposed to this water.

Efforts to stop denting have been complicated by the chemicals used to combat the corrosion that constantly eats away at all pipes that carry hot water. Westinghouse, manufacturer of the Surry, Indian Point, Turkey Point and San Onofre reactor plants, among others, has experimented with different types of water treatment, various pipe metals and different support plate hole sizes and shapes.

"We now believe the villain is chlorides which get into the (secondary) system as a result of condenser tube leaks," said nuclear division spokesman Paul Jones of Westinghouse. "The way you fix that is by operating the plant so as to maintain the (leak-free) integrity of the condenser."

The notion that the basic problem lies in the condensers, the third-water cooling system that cools steam back

into water for re-use, is currently not widely accepted within the industry. "It becomes more acceptable every day," said John Randazza, superintendent of the Maine Yankee atomic power plant in Augusta, Me.

His plant has one of the highest overall performance ratings in the industry. A major factor in that, he said, was "watching for the smallest kind of (condenser) leaks and repairing them right away." That prevents buildup of chlorides in the second water system and "green grunge" doesn't form, he said.

The \$40 million research effort on denting by 19 utilities will be conducted by the Electric Power Research Institute (EPRI) of Palo Alto, Cal. It will investigate the water chemistry problem as well as the kinds of metals involved, and will check design factors while trying to find a way to reverse the buildup of the "green grunge," according to company head Chauncey Starr.