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February 7, 1975

SECY - 75- 33

COMMISSIONER ACTION

Revised as signed 5-9-75

For: The Commissioners

Thru: Acting Executive Director for Operations

Subject: LETTER FROM RALPH NADER CONCERNING COST, RELIABILITY AND AVAILABILITY OF NUCLEAR POWER PLANTS AND USE OF OTHER ENERGY SOURCES

Purpose: Approval of proposed letter to Ralph Nader

Discussion: Mr. Nader's December 31, 1974 letter to Chairman Anders (Enclosure A) is highly critical of the reliability of nuclear power plants and presents an analysis of AEC published availability data. He concludes that the high capital costs of nuclear plants coupled with low availability "only serves to rob the consumer." Commentary is then provided in support of alternate energy sources based on the consequences of a nuclear accident compared with the non-nuclear energy sources and flatly states that a perfect technology is required to prevent nuclear accidents.

It appears that Mr. Nader would like to goad the NRC into taking a defensive or promotional role regarding the nuclear industry performance. Accordingly, we have proposed a response that affirms NRC's assigned role and avoids detail and arguments (Enclosure B). Chairman Anders' comments on an earlier draft have been taken into account; i.e., ERDA's role in LWR research has been pointed out.

Ed. Triner

Edwin G. Triner, Acting Director
Office of Planning and Analysis

NOTE: Commissioner comments should be provided directly to William J. Besaw by February 13, 1975.

Enclosures:
Nader letter dtd 12/31/75
Proposed response

RD-25

J. Besaw, PLA
7721

December 31, 1974

The Honorable William A. Anders
Chairman
Nuclear Regulatory Commission
Washington, D.C. 20545

Dear Chairman Anders:

The Atomic Energy Commission (AEC) has long promised that nuclear power plants will routinely be available to generate power 80 percent of the time. During the month of August, 1974, the nuclear industry reported that it achieved 86.3 percent availability and a 72.8 percent capacity factor. If these figures are accurate, August is the first month this year during which the industry as a whole broke the 80 percent barrier. Problems such as the cracks which recently developed in Boiling Water Reactor cooling systems are likely to make the August reliability figures the exception for the future as they have been for the past. The overall performance of the nuclear industry for this year once again demonstrates that the most reliable feature of nuclear power plants is their unreliability.

For the first eight months in 1974, the nuclear industry has achieved 68.1% average availability and 56.6% average capacity. These figures and the August figures above come from the AEC publication, "Operating Units Status Report," AEC Director of Regulation, September 27, 1974. The average figures reflect only plants which are operating commercially, and do not include units undergoing startup testing.

Availability measures the portions of time that a plant is producing electricity. Capacity is a measure of the electrical output that each plant actually produces. Capacity and availability are more exactly defined in Figure 1, which comes from page 4 of "Operating Units Status Report." Capacity is generally lower than availability because it reflects operating at reduced power as well as forced outages. Availability only reflects forced outages. Because capacity measures the actual amount of electricity delivered by each plant, it is a better measure of plant reliability than availability. At 56.5% average capacity, the nation's nuclear plants are producing slightly more than half of the electricity of which they could be capable.

ENCLOSURE A

The inability of the nuclear industry to attain promised levels of reliability is not limited to 1974 alone. The AEC publication, "Nuclear Power Plant Availability and Capacity Statistics for 1973," found that for the entire year of 1973, plant availability averaged 70% and plant capacity 58%. In addition, the Center for Science in the Public Interest (CSPI) reported on nuclear reliability during the height of the oil embargo (CSPI press release, June 2, 1974). CSPI found that for the period October 1, 1973 to December 31, 1973, American nuclear plants attained 65.3% average plant availability, 53.7% capacity for the industry as a whole, and 51.8% capacity for the average plant.

Nuclear plant proponents might argue that a national average for all plants is unfair, since it lumps new and old plants together. After a three or four year break-in period, the argument goes, all the bugs are ironed out of a new plant and from then on operation at 80% availability will be routine. But Figure 2 shows that this argument is invalid. The availability for old and new plants during the first eight months of 1974 is summarized below:

	Availability	Capacity
Plant startup before 1970:	68.0%	56.6%
Plant startup during 1970:	79.3%	66.3%
All plants:	68.1%	56.6%

These figures show that there does appear to be a break-in period, after which point nuclear plant reliability improves. The group of plants which started operation in 1970 has a greater reported reliability than the national average. The average for these plants comes very close to 80% availability, although they only produce two thirds of their potential electrical output.

But another trend is evident. After reaching a peak at the end of the break-in period, reliability drops. Nuclear power plants, like every other product of our imperfect technology, wear out and break down as they get older. The availabilities of pre-1970 plants are nearly as poor as plants going through their debugging periods. "Nuclear Power Plant Availability and Capacity Statistics for 1973" reported the same problem:

> An earlier conclusion [by the AEC] regarding attainment of, and continued performance at, availability factors equal to or greater than 80% after a three-to-four-year break-in period were not substantiated by 1973 data. The average availability factor for plants in this age group was 67%. (page 3)

One of the clearest examples of nuclear plant unreliability recently has been the Dresden 1 plant. This plant is the second oldest operating commercial reactor in the country. Plant startup was in 1959, so Dresden 1 has had 15 years to iron out its bugs. But the plant was shut down from October 1973 to June 1974 for "refueling and maintenance." Since refueling is supposed to be about a two-month operation, one has to assume that most of the shutdown was for maintenance and repair.

Poor nuclear plant capacity is economically costly to the consumer. Nuclear power plants require a much higher capital outlay than other types of power plants. This capital outlay will be passed on to the consumer whether or not the plant generates any power. Capital costs--costs for plant construction and related interest charges--are said to represent about 80% of lifetime nuclear plant costs. Using this 80% figure, if plant capacity is 50%, the consumer loses 40 cents out of every dollar he pays (0.8x0.5=0.4). Because the utility will charge for plant capital costs no matter what the capacity, the consumer gets only 60 cents worth of electricity for every dollar he pays. The construction of nuclear power plants, coupled with poor plant capacity, only serves to rob the consumer.

The problem of paying for ungenerated electricity is not nearly as great for non-nuclear plants. Typical capital costs for an oil-fired plant are 40% of lifetime costs, and for a coal-fired plant are 55%. Because of a nuclear plant's greater complexity and the problem of radioactive components, equipment breakdowns cost much more to repair for a nuclear than for a non-nuclear plant. Consumers served by fossil-fuel plants have been forced to pay increased rates for fuel adjustment costs, but at least they receive electricity for their money. The consumer at the mercy of a broken-down nuclear plant pays for extra construction costs, pay for the cost of nuclear repairs, and probably will pay for replacement power purchased from a fossil-fuel plant.

The unreliability of nuclear power plants also has serious implications for the nation's program for energy self-sufficiency. Nuclear power cannot be the cornerstone of Project Independence if plant capacity continues near 50%. This would mean that to deliver the full output of one plant, two plants would have to be built. If this were the case, a tremendous waste of energy and capital would result from building the extra plants.

Project Independence was launched on the assumptions that the nation will continue to consumed energy at pre-oil embargo rates, and that the only energy alternatives are coal, oil, and nuclear fuel. Both these assumptions are refutable. Even in the absence of a strong national conservation policy, some consumers and other users have demonstrated that significant energy

savings through conservation are possible. There are alternative energy sources which are technically feasible now and only need mass production economies and refinements. Solar and wind power presently sustain several homes throughout the country; power is being produced now from geothermal energy; and garbage is being used in more and more areas to supplement fossil fuels.

This is not to say that there may not be technical difficulties in creating large-scale solar power plants or heating units, geothermal power plants, wind power plants, or garbage-powered stations. But the consequences of any non-nuclear plant breakdown pale beside the consequences of just one catastrophic nuclear plant accident. If nuclear accidents are to be prevented, a perfect technology is required. The present unreliability of nuclear plants shows that such a perfect technology is a mirage.

1st question

Assuming that nuclear power plants continue to attain such poor availability and capacity levels, how long would you be willing to wait before you discarded the nuclear alternative in favor of simpler, safer, renewable energy sources? What developments do you foresee which will improve nuclear power plant reliability?

2nd question

I look forward to hearing from you.

Sincerely,

Ralph Nader

enclosures

cc: The Honorable Frank G. Zarb
Administrator
Federal Energy Administration
Washington, D.C. 20461

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Figure 1

Edito

9. Unit Availability Factor - the quotient of the time (hours) that the unit actually was operated with the turbine-generator on-line, during a given period, expressed as a percent. The Unit Availability Factor is computed as foll

$$UAF = \frac{\text{Time Generator was on-Line (hours)}}{\text{Time in the period (hours)}} \times 100$$

This definition differs from the EEI. Operating Availability is defined by EEI as the quotient of the time the unit actually was operated plus the time the unit was available but not operated in a given period divided by the total time in the given period, expressed as a percent. The EEI definition is not used in this report because of the difficulty in determining precisely when the unit actually could have been operated even though it was not operated.

10. Unit Capacity Factor - is the quotient of the actual net electrical energy output (MWhe-net) produced by the unit in a given period divided by the maximum net electrical energy output the unit would have produced if operated at the maximum dependable capacity for the entire period, expressed as a percent. The unit capacity factor is computed as follows:

$$UCF = \frac{\text{Actual Net Electrical Output (MWhe-net)}}{\text{Maximum Dependable Capacity (MWe-net) X Time in the period (hours)}} \times 100$$

This definition is identical to that used by the EEI.

11. Forced Outage - is the occurence of a component, system or structural failure, or other condition, which requires that the unit be removed from service immediately or within a period up to and including the next weekend.

12. Scheduled (Planned) Outage - is the removal of a unit from service for inspection and/or general overhaul of one or more major equipment groups. The activities

Figure 2

Reliability of older plants:
(figures in percent)

Jan-Aug 1974

Plant startup Before 1970:	Availability	Capacity
Dresden 1	22.6	10.6
Yankee Rowe	55.2	40.1
Big Rock Point	55.4	39.3
Indian Point 1	74.1	62.3
Humboldt Bay	99.5	81.8
Peach Bottom 1	81.0	59.0
San Onofre 1	80.6	78.0
Lacrosse	89.5	77.6
Conn Yankee	87.61	84.79
Oyster Creek	60.4	57.6
Nine Mile Point	61.2	53.3
Ginna	48.18	34.79
Average	68.0	56.6

Plant Startup During 1970:	Availability	Capacity
Dresden 2	83.3	64.1
Millstone 1	96.5	74.5
Robinson 2	77.04	71.03
Monticello	66.1	53.3
Point Beach 1	73.8	68.5
Average	79.3	66.3

Source: "Operating Units Status Report"
AEC Director of Regulation
September 27, 1974

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Mr. Ralph Nader
P. O. Box 1538
Washington, D. C. 20013

Dear Mr. Nader:

Thank you for your letter of December 31, 1974 which discusses cost, reliability, and availability of nuclear power plants and comments on the use of power sources other than nuclear. The Nuclear Regulatory Commission (NRC), chartered by the Energy Reorganization Act of 1974, is responsible for licensing of nuclear power plants and assuring that the plants are safely constructed and operated. Under the provisions of the National Environmental Protection Act, NRC will assure that the plants are environmentally compatible with the site area. Data and information will continue to be collected within these limits and made available to the public.

In accordance with the provisions of the NEPA, the NRC conducts a cost benefit analysis that is included in the Environmental Report prior to granting a construction permit for each plant. Records indicate that where nuclear plants are being built, the cost to the consumer for electrical power generated by nuclear energy is lower than for other viable energy sources at this time. We would certainly agree that increasing the capacity factor would further lower the cost of nuclear power.

In addition to reliability there are other factors that result in low capacity factors such as the uncertainties in predicting peak seasonal demands, daily and seasonal fluctuations in demand, and necessity to shutdown for major maintenance. However, reliability is an important factor that must be addressed and will require considerable study before an adequate response can be made to your question concerning technical developments that will improve reliability.

As you know by the Energy Reorganization Act of 1974, research and development relating to energy is assigned to the Energy Research and Development Administration (ERDA). NRC will continue to work closely with ERDA to assist them in their efforts to improve plant reliability. The immediate effort must be in development engineering to better implement the existing technology into more efficient commercial systems.

ENCLOSURE B

The Federal Energy Administration (FEA) also has a responsibility in this area and has appointed a task force to study the problem. Their preliminary report, which drew heavily upon the Edison Electric Institute statistics was published on December 16, 1974. The NRC is represented on the task force and will continue to work with FEA.

Your question concerning the selection of alternative renewable energy sources, contained in the next to the last paragraph of your letter, would be more appropriately directed to the Federal Energy Agency (FEA) and to the Energy Research and Development Agency. Further development of "simpler, safer, renewable energy sources" is not within the purview of an independent regulatory commission.

In regard to your second question in the same paragraph discussed above, engineering developments to improve power plant reliability fall within the responsibility (as discussed previously) of the utility companies and ERDA. The NRC will make judgments where the safety of the plant may be affected; however, further development of technologies is not within the charter of the NRC.

The NRC stands ready to discuss questions related to safety and licensing of nuclear power plants. Your helpful suggestions or constructive criticisms will be appreciated.

Sincerely,

William A. Anders
Chairman

cc: Honorable Frank G. Zarb
Administrator
Federal Energy Administration

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