

220-2012



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

AUG 24 1979

The Honorable Robert J. Lagomarsino
United States House of
Representatives
Washington, D. C. 20515

Dear Congressman Lagomarsino:

Thank you for your letter of July 24, 1979. The excerpts from a letter from your constituent, Mr. Mike O'Connell, contain a number of opinions concerning nuclear energy. In an August 16, 1979 letter from Mr. Carlton Kammerer, we provided our initial response to the issues raised by Mr. O'Connell. This letter contains further NRC staff comments.

1. With respect to the thermal efficiency of coal-fired and nuclear power plants, the enclosed study, which was prepared by United Engineers and Constructors, indicates that 800 MWe (megawatt-electric) coal-fired plants have efficiencies of 35% to 36% depending on whether they are designed to burn high sulfur or low sulfur coal. While 1200 MWe coal plants could operate at thermal efficiencies of about 37% to 38%, such plants are not built by most utilities. Nuclear plants have heat rates of about 10,250 Btu/kWh, which is equivalent to a thermal efficiency of about 33%. Mr. O'Connell appears to be interested in comparative thermal efficiencies as a means of reducing what he refers to as waste heat energy. The thermal efficiency of an electric power plant is the ratio of net electrical output to heat energy input (expressed in the same units, e.g. kilowatt-hours). That ratio must always be less than one. That fact follows from the Second Law of Thermodynamics. The Second Law of Thermodynamics says that no machine that converts heat energy to energy in some other form can operate at 100% efficiency. Some heat must be emitted as a by-product of the conversion process. Moreover, part of the electricity produced by the generators is used within the plant by circulating water pumps, cooling towers, scrubbers, electrostatic precipitators, lights, electronic control equipment, and a variety of other auxillary systems. Taken together, the auxillary systems can use as much as 10% of the gross plant output.

Except for the fact that both coal and uranium can be used to generate electricity, they are very different resources. Society has found disparate uses for them and values them differently as a result. Thermal efficiency measures only how much of a resource must be consumed to produce a given desired output; it says nothing about the social and economic value of the resource consumed. For example, by changing the design of an electric power plant, one might increase its thermal efficiency - say to 45%. The redesigned plant would require less fuel than one operating at 33% - 35%; however, it would also require a different allocation of natural and human resources than the original plant. It is quite likely that in toto the new allocation would be less desirable than the original from the standpoint of society.

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2. The amount of electricity generated by nuclear power that would be needed to implement currently proposed radioactive waste disposal methods is relatively small. The enclosed report, Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle, says that 530 megawatt-hours of electricity will be consumed in order to dispose of the waste generated during a year of operation of a 1,000 megawatt nuclear power plant. During that time the plant operating at a 65% capacity factor would produce 5,700,000 megawatt-hours of electricity. The amount consumed in waste disposal is less than 0.01% of the plant output.
3. The NRC does consider energy conservation in licensing the construction of nuclear power plants. As part of its responsibility under the National Environmental Policy Act (NEPA), the NRC analyzes the need for the plant. That analysis requires a forecast of demand for electricity, which in turn depends on the degree to which certain energy conservation procedures and appliances are used.
4. The NRC does not consider cost in making decisions concerning improved safety requirements. Such decisions are made on the basis of engineering judgment.

With respect to the Exxon study cited by Mr. O'Connell; while we have heard that it exists, we have not seen it and cannot comment on it. The enclosed NRC Staff study, Coal and Nuclear: A Comparison of the Cost of Generating Baseload Electricity by Region, finds that while relative costs of generation by these two energy sources vary somewhat by region, they are generally comparable.

Sincerely,

(Signed) T. A. Rehm

Lee V. Gossick
Executive Director for Operations

Enclosures:

1. NUREG-0116: Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle
2. NUREG-0248: Total Generating Costs: Coal and Nuclear Plants
3. NUREG-0480: Coal and Nuclear: A Comparison of the Cost