December 15, 1958

Honorable John A. McCone
Chairman, U. S. Atomic Energy Commission
Washington 25, D. C.

Subject: COMPARISON OF SAFETY FEATURES OF:
GE-Vallecitos Boiling Water Reactor (VBWR)
Sodium Graphite Reactor Experiment (SRE)
Shippingport Pressurized Water Reactor (PWR)
Rural Cooperative Power Association Reactor, Elk River, Minnesota

Dear Mr. McCone:

The following is in reply to your request for comparison of the standards applied in evaluating the Elk River site with those that were applied to the VBWR, SRE, and PWR sites. Pertinent data tabulations are attached. These were furnished by the Hazards Evaluation Branch.

It need scarcely be emphasized that the question of site evaluation is complex. A large number of variable factors, many not strictly comparable from site to site, must be considered. Exact, completely objective, numerical site criteria are difficult to formulate, however convenient and desirable these might be. But the Committee attempts to bring a consistent philosophy to the reactor hazards problem and to provide a common basis for site judgments.

Three distinct types of reactor are involved in the group in question. These are of the sodium graphite, pressurized water, and boiling water types.

SRE, a low power (5 Mw thermal) reactor of the sodium graphite type, operates at atmospheric pressure in an underground location. The primary coolant is contained in a stainless steel shell which is in turn contained in a sealed concrete structure. Secondary coolant from primary heat exchangers located within the containment structures gives up its heat in external steam boilers. A rupture of the primary system will not cause melting of fuel or release of fission products

therefrom. For these reasons, and because the SRE is located in a relatively large exclusion area (1.4 miles minimum radius), immediately surrounded by a sparsely populated district no containment vessel of the type used for pressurized reactors if employed.

The PWR reactor of the pressurized water type is provided with an exclusion distance of approximately 0.5 miles. It is fully contained and provided with biological shielding of the containment structures. It is designed to contain the vapor and energy released in the event of a rupture of the primary water system and one steam generator. In addition, the interconnected containment vessels are designed to contain the energy resulting from significant metal-water reactions.

The VBWR and Elk River reactors are of the boiling water type. In the VBWR, the coolant is vaporized and is used for the direct drive of turbo-generators. In the Elk River reactor, radioactive steam is taken to a heat exchanger, providing a barrier. Both are provided with containers designed to prevent release of vapors resulting from a break in the cooling system. The VBWR has been designed to contain the results of a metal water reaction. The Elk River reactor containment vessel is provided with significant missile and biological shielding.

In attemtping to decide for a particular reactor whether a given exclusion distance provides adequate protection for public safety, the Committee evaluates design features such as containment vessels, missile shields, biological shields, hydrology, meteorology, and geology, all of which affect reactor safety, particularly when a reactor is located near a populous area. Thus it was felt that the Elk River site would provide an acceptable degree of protection to the public, in view of the isolated primary system and the vapor containment provided. Like considerations were applied in the case of the PWR reactor. The SRE has somewhat less containment, but has a greater exclusion radius than the others mentioned.

Population density is of concern to the Committee. Consequently, the relatively low population density nearby the Elk River site was considered to be a generally favorable element. On the other hand potential growth of the community needs also to be taken into account. The extent of this growth at Elk River is problematical; but the Committee felt it appropriate to express its consideration for the eventuality and to recognize dependence on engineering features for minimizing risk.

The fact that a highway and a railroad run comparatively near the Elk River site is not considered to increase the risk significantly, and conversely acceptance of these features does not imply a reduction in standards of population protection. Since highway and railroad occupancy is transient and intermittent, both the probability and the intensity of the risk are greatly reduced over those applying to stationary, permanent populations at the same distance. Moreover, access to a highway or railroad can be restricted in the event of an accident.

Sincerely yours,

/s/
C. Rogers McCullough
Chairman

cc: Alvin R. Luedecke, GM
Harold L. Price, DLR

Attachment
a/s

Dist: Orig & 4 copies to Mr. McCone
1 copy to Gen Luedecke
1 " " Harold L. Price
1 " " H. H. Plaine (blind)