ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
UNITED STATES ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

March 14, 1967

Mr. Harold L. Price
Director of Regulation
U. S. Atomic Energy Commission
Washington, D. C.

Subject: GENERAL DESIGN CRITERIA FOR NUCLEAR POWER PLANT CONSTRUCTION PERMITS

Dear Mr. Price:

The Advisory Committee on Reactor Safeguards has reviewed the February 6, 1967, draft of "General Design Criteria for Nuclear Power Plant Construction Permits" and offers the attached comments. It is requested that these comments be incorporated into the criteria to the maximum extent practical. Any statement regarding ACRS review of the criteria should be cleared with the Chairman of the ACRS before release.

The Committee notes that the preamble to the criteria released on November 22, 1965, contained the following sentence in the second paragraph: "It should be recognized that additional criteria will be needed for evaluation of a detailed design, particularly for unusual sites and environmental conditions, and for new and advanced types of reactors." The Committee believes that these criteria should not be released without this or an equivalent sentence.

Sincerely yours,

/s/

N. J. Palladino
Chairman

Attachment:
Comments on February 6, 1967 Draft of "General Design Criteria for Nuclear Power Plant Construction Permits".

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Criterion 1. This criterion should call for the identification of vital from non-vital equipment.

Criterion 3. We are licensing a plant for a certain power; if at the construction permit stage we don't think that power is safe (under this criterion) we should say so. Hence, this should be in Category A.

Criterion 4. "process oscillations" should be clarified.

Criterion 5. Change to "The reactor shall be designed ...". Taken literally, the present wording allows, for example, an intrinsic positive power coefficient if some coolant temperature controller makes an "apparent" negative coefficient.

Criterion 6. Reinstate "exceedingly low probability of gross rupture ..." Suggested rewording: "The reactor coolant pressure boundary shall be designed and constructed so as to have an exceedingly low probability of significant leakage throughout its design lifetime."

Criterion 8. Add sentence at end of present criterion as follows: "It shall be possible to shut the reactor down and maintain it in a safe condition if access to the control room is lost due to fire or other cause."

Criterion 9. Delete the first "process".

Criterion 10. Needs to be reorganized and clarified. Original wording was clear. "Means ... for monitoring and maintaining control over ... disposition of fuel" could be instrumentation, fuel hold-down, or something else.

Criterion 11. Precede by a statement that the applicant shall establish acceptable fuel damage limits.

Criterion 13. This criterion still does not contain the thought that the instrument range must be extended to indicate large, large releases that the designers think incredible. Insert "anticipatory transients" after "normal operations".

Criterion 18. (a) Delete "process" everwhere.
(b) Change "shall not negate the minimum redundancy" (double negative) to "leaves intact a system satisfying all".

Criterion 21. Change "functional operability" to "that no failures or loss of redundancy have occurred". Delete "and to determine component or circuit failures".

Criterion 24. (a) "Subcritical" at "hot operating" - a contradiction.
(b) Do we enforce this on GE? Their liquid poison system is nominal only.
(c) This criterion is not clear. Under what circumstances are the reactivity control systems to work sufficiently fast?

Criterion 25. Even under loss-of-coolant transients?

Criterion 26. How does this differ from the last sentence of Criterion 25?

Criterion 27. We do not now enforce this for the rod-drop (GE) or rod-ejection (PWR) accidents. Are these "accidents" malfunctions? This is not clear.

Criterion 28. This is inadequate; there should be lots of margin.

Criterion 30. Suggested rewording of the first sentence: "The reactor coolant pressure boundary shall be designed to minimize the possibility of rapid propagation type failures."

Criterion 31. (a) Temperature-pressure restrictions should be imposed when the upper shelf of the Charpy transition curve shows a low energy value.

(b) In the first sentence, change "reactivity induced" to "rapid".

Criterion 33. Suggest some other word than "Accommodate", e.g., "cope with".

Criterion 34. Difficult to read.

Criterion 35. The old 9.1.2 was better. The alternate power sources must be provided before all off-site power is lost. "A capability" is not enough; where is redundancy, testing, capacity margin, etc., etc.?

Criterion 37. Delete "reliability and". This criterion is part of reliability. Why is the very important last sentence deleted?

Criterion 38. Now unacceptable. The design must be such that operation of safeguards can not make things worse. The revision implies that interlocks should prevent protective (engineering safeguard) action at the wrong time - a dangerous kind of safeguard indeed.

Criterion 39. Suggest adding two sentences as follows: "The performance of the ECCS shall be evaluated conservatively in each area of uncertainty. Independent and preferably diverse redundant methods of accomplishing abundant emergency cooling shall be provided."

Criterion 44. Suggested rewording: "The containment structure, including access openings and penetrations, shall be designed to accommodate or dissipate without exceeding the design leakage rate, the largest credible energy release, including a considerable margin to cover effects like metal-water or other chemical reactions that could occur as a consequence of improper function of emergency core cooling systems."

Criterion 47. Should state that each heat removal system should be full capacity.

Criterion 48. "multiple" should be "redundant".

Criterion 52. Why not work in a positive sense? The intent may be ambiguous in that testing under the conditions demanded in the accident case may not be possible. Change "whether" back to "that no". The point (often repeated, and many times reinstated in this document) is that a valve can fail and yet a test can show no leakage because the backup valve is tight. Tests must reveal the first flaw so it can be fixed, else redundancy doesn't pay.

Criterion 53. Add the "torus" to the list of example items.

Criterion 61. "Favorable" geometries are those favorable to criticality! "Geometrically safe configurations" is the correct term.

Criterion 62. Too many words between "ensure damage" and "is prevented". Reword.

Criterion 65. Add at the end of the last sentence, ...", except that reduction of the dosage levels recommended in these parts may be required where the location of a plant is such that effluents can affect large populations".

GENERAL COMMENTS

1. A suitable criterion covering leak detection from the primary system should be developed.

2. There is insufficient coverage on the need to design to minimize the possibility of fire or difficulty from fire.

3. Throughout the document, "protective" should be replaced by "protection" as preferred image; see the recent IEEE criteria. "Protective" means a coating.

4. It should be required that appropriately complete fabrication records of important components be kept.

5. It should be required that different principles be used where necessary to achieve true independence of redundant instrumentation components.

6. Restrictions for sharing redundant systems between reactors should be stated.

7. Capability of retesting the containment at design pressure should be required.

8. In the second paragraph of the preamble, change "unnecessary" to "inapplicable" (second sentence) and insert "acceptable" between "alternative" and "criteria" (third sentence).