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SUBJECT: Responds to NRC Question 010,068 re secondary missile generation resulting from spalling & scabbing of concrete walls & barriers upon impact by credible plant missiles. Survey indicates no secondary missiles can be generated.

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REG FILE 04	1 1	RGN5	3 3
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EXTERNAL: ACRS 41	6 6	BNL (AMDTs ONLY)	1 1
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Washington Public Power Supply System

P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000
February 23, 1983
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Docket No. 50-397

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
NRC QUESTION 010.068

- Reference:
- a) BC-TOP-9A, Rev. 2, "Topical Report: Design of Structures for Missile Impacts", Bechtel Power Corporation, San Francisco, California, dated September 1974
 - b) C. Berriaud et. al., "Local Behavior of Reinforced Concrete Walls Under Hard Missile Impact", Transactions of the 4th International Conference on Structural Mechanics in Reactor Technology, Volume J (b), San Francisco, dated August 19, 1977
 - c) C. Berriaud, Session 38, "Impactive Load Definition and Design of Structures to Resist Tornado Turbine, High Energy System Rupture, Missile Impact, Aircraft Impact and Pipe Whip-Panel Preserations", International Seminar on Probabilistic and Extreme Load Design of Nuclear Plant Facilities, Pages 194 to 197, San Francisco, dated August 22-24, 1977

NRC Question 010.068 concerned secondary missile generation resulting from spalling and scabbing of concrete walls and barriers upon impact by credible plant missiles. A survey of our plant was completed (exclusive of the RCIC turbine) which showed that no secondary missiles could be generated by the most energetic plant primary missiles which impact on concrete barriers or walls. The survey was based on industry and staff approved analysis methods, cited in Reference (a). The calculations and results are documented in our missile analysis packages.

As noted in the response to NRC Question 010.067, the RCIC turbine missiles are under evaluation utilizing the turbine vendor's data on maximum credible missile energy. This report was received in late January and is now being used to finalize the RCIC turbine missile analysis package. A final assessment of the RCIC turbine missiles on impacted compartment walls and the ceiling structures will be included in the analysis using the appropriate Reference (a) design formulas for concrete penetration, perforation, and spalling/scabbing. The results of this analysis will be reported to you via our final response to Question 010.067.

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Mr. A. Schwencer
Page Two
February 23, 1983
G02-83-164

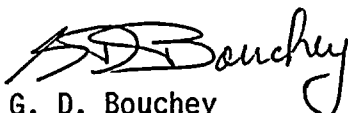
As part of our response to Question 010.068, we noted that the missile analysis paper referred to by the NRC reviewer as "CEA-EDF" was only available in French. Further literature surveys have located a summary paper (Reference (b)) and the proceedings of a seminar (Reference (c)) on the French studies of missile impacts on concrete. We reiterate that the full text of the French work, to our knowledge, is not available in the open english literature. The summary paper presented a power law relationship for determining a missiles' ability to perforate a concrete barrier. No information on secondary missiles was presented by Reference (b).

Even though the effects of secondary missiles at WNP-2 is a moot point (i.e., we've shown that these missiles are not generated at our plant), we, for heuristic reasons, tested the French formulation of CEA-EDF against the Petry equation referenced in our FSAR and detailed in Reference (a). The respective equations were applied to two missiles selected from the Standard Review Plan (SRP); the 42 m/sec, 130 kg, 6 inch schedule 40 pipe, and the 79 m/sec, 4 kg, 1 inch diameter rod. In both cases, the Petry equation conservatively predicted perforation thicknesses about twice that of the French formulation.

In summary we find that the French work is not sufficiently documented, provides no quantification on secondary missile generation, and on first examination is less conservative than the design basis used at WNP-2 for missile perforation of concrete slabs. We plan no further assessment of this French research.

The exterior walls of WNP-2's missile hardened buildings can sustain tornado missile impacts far in excess of the missile energies stipulated by SRP 3.5.1.4 for a Region III site; as is applicable for our plant location (see Regulatory Guide 1.76). However, the Supply System previously committed to the higher Spectrum A missile energies of SRP 3.5.1.4 as a design basis (i.e., the utility pole and rebar missiles as limiting cases). Utilizing the very conservative Spectrum A energies, WNP-2's exterior walls have been designed to prevent both missile penetration (i.e., perforation), and spalling/scabbing on tornado hardened surfaces. This design basis is delineated in our FSAR in Section 3.5.1.4 and missile penetration results are found in Table 3.5-5. Since tornado impacted walls at WNP-2 have been designed (Reference (a) methods) to preclude spalling or scabbing, secondary missiles are not generated.

Very truly yours,



G. D. Bouchey
Manager, Nuclear Safety and Regulatory Programs

DMB/jca

cc: R Auluck - NRC
WS Chin - BPA
A Toth - NRC Site

[The body of the document contains several paragraphs of text that are extremely faint and illegible due to the quality of the scan. The text appears to be a formal letter or report, but the specific content cannot be discerned.]