UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of ARIZONA PUBLIC SERVICE COMPANY, et. al. (Palo Verde Nuclear Generating Station, Units 2 and 3)	)))))))	Docket Nos: STN-50-529 STN-50-530

APPLICATION FOR AMENDMENTS
OF CONSTRUCTION PERMITS NOS. CPPR-142 AND CPPR-143

Construction Permits, Nos. CPPR-142 and CPPR-143, issued in the captioned dockets on May 28, 1976, authorize the construction of Palo Verde Nuclear Generating Station (PVNGS) Units 2 and 3, respectively, in accordance with the description thereof set forth in the PVNGS Preliminary Safety Analysis Report as amended to the date of issuance of such construction permits (PSAR). The PSAR includes description of certain pipe whip restraints and jet inpingement shields to be installed in PVNGS Units 2 and 3 as protective devices to guard against the dynamic effects of postulated double-ended guillotine breaks in the primary loop reactor coolant piping (RCP) of such units. This Application for Amendment of CPPR-142 and CPPR-143, as amended, is submitted by Arizona Public Service Company (APS), as Project Manager and Operating Agent of PVNGS, on behalf of itself as a named licensee in such construction permit and all other licensees named therein to seek authorization to modify the aforesaid description of PVNGS Units 2 and 3 by the deletion therefrom such pipe whip restraints and jet impingement shields. No other changes in the aforesaid description which might be associated with the elimination of a guillotine break in the RCP for PVNGS Units 2 and 3 as a design basis event are requested.

In support of this Application, APS states as follows:

1. PVNGS Units 2 and 3 incorporate and utilize nuclear steam supply systems (NSSS's) furnished by Combustion Engineering Company, Inc. (C-E) described in the C-E System-80 Safety Analysis Report, as amended (CESSAR-F) filed in Docket No. STN-50-470 which was approved by the Commission by the issuance of Final Design Approval No. FDA-2 on December 21, 1983 in said docket.

2. On June 14, 1983, C-E filed in Docket No. STN-50-470 its report entitled "Basis for Design of Plant Without Pipe Whip Restraints" which provided the technical bases for eliminating large ruptures of the RCP as a design basis for C-E System-80 plants. Such report was subsequently revised in a report filed in such docket on December 23, 1983. Each of such reports is incorporated herein by reference.

3. Subsequently, after discussions of the matter with the Office of Nuclear Reactor Regulation (NRR) Staff, APS submitted its Request for Partial Exemption to General Design Criterion 4 (GDC-4) pursuant to 10CFR Sec. 50.12(a) (Exemption Request). The Exemption Request sought authorization for the removal of pipe whip restraints installed in the RCP system for PVNGS Unit 1 and the elimination of the requirement to install such restraints in PVNGS Units 2 and 3. In this connection, APS requested that NRR complete action upon such exemption request prior to October, 1984, in order to maximize the cost-benefits ratio supporting the changes proposed for Units 2 and 3.

4. APS has recently been advised informally by NRR staff that the Exemption Request would be denied as to Unit 1 and that, as to Units 2 and 3, the consideration of the matter should be presented through the process of amendment of construction permits rather than through the exemption process under 10CFR Section 50.12(a).

5. With respect to the technical bases for the requested amendments, it may be said that the elimination of large ruptures in the RCP has been justified by the development of advanced fracture mechanics technology as reported in the C-E reports cited in paragraph 2 hereof. Such technological development coupled with the deterministic analyses, also presented in the C-E reports of available means of detection of small flaws in the RCP, i.e., in-service inspections and leakage detection systems, assure flaws in the piping are detected long before they can propogate to critical or unstable sizes that could lead to large breaks such as a postulated double-ended guillotine break.

6. The Advisory Committee on Reactor Safeguards has considered and approved the applications of the advanced fracture mechanics technology to the analysis of asymetric blowdown loads. See ACRS letter from J. J. Ray, Chairman, to W. J. Dircks, dated June 14, 1983, on the subject of "Fracture Mechanics Approach to Pipe Failure," where it is stated:

> "That is, there is no known mechanism in PWR primary piping material for developing a large break without going through an extended period during which the crack would leak copiously."

7. NRR staff evaluation of the C-E reports cited in paragraph 2 hereof is set forth in its report filed in Docket No. STN-50-470 on October 11, 1984, entitled "Safety Evaluation Report on the Elimination of Large Primary Loop Responses as a Design Basis." This report states:

> "The staff concludes that the probability or likelihood of large pipe breaks occurring in the primary coolant system loop of a CESSAR facility is sufficiently low such that protective devices associated with postulated pipe breaks in the CESSAR primary coolant system need not be installed."

In support of the foregoing conclusion, the NRR staff report cited probabilistic fracture mechanics studies performed by Lawrence Livermore National Laboratory on Westinghouse and C-E nuclear steam supply system main loop piping, which confirm the probability of undetected leakage and the probability of a DEGB are very low. The best estimate leakage probability for C-E main loop piping ranged from 1×10^{-8} to 3×10^{-8} per plant year, and the best estimate DEGB probability ranged from 5×10^{-14} to 5×10^{-13} per plant year. These results show that main loop piping undetected leakage and the DEGB are insignificant contributors to core melt probabilities.

8. The NRR staff report cited in paragraph 7 hereof requires that an applicant utilizing the C-E analysis as a basis for changing its design, must confirm that the as-built facility design substantially agrees with the design described in the analyses submitted by C-E, and that the RCS pressure boundary leak detection system is consistent with the guidelines of Regulatory Guide 1.45, which will allow the detection of a leakage of one gpm in one hour.

9. By letter dated October 3, 1984, APS informed the staff that the C-E analysis, referenced in paragraph 8 hereof, was performed using the PVNGS design, which therefore assures that the as-built design for PVNGS Units 2 and 3 substantially agrees with the analysis submitted by C-E, with respect to parameters such as piping loads, material properties, postulated crack leakage and size, seismicity, and leak detection system capabilities.

10. Approval of this application to amend CPPR-142 and CPPR-143 does not constitute a departure from GDC-4 which states:

> "These structures, systems, and components (important to safety) shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluid, that may result from equipment failures and from events and conditions outside the nuclear power unit."

The analyses and evaluations reported in the C-E reports, the ACRS letter, the NRR staff safety evaluation report, the Lawrence Livermore National Laboratory studies and the APS confirmation letter previously cited herein demonstrate that pipe whip restraints and impingement shields for the RCP for PVNGS Units 2 and 3 are not required to comply with GDC-4.

11. The elimination of pipe whip restraints and jet impingement shields from the design of PVNGS Units 2 and 3 will result in (i) significant reductions in the capital and operating costs that would otherwise be incurred in the construction, operation and maintenance of such units, and (ii) significant reductions in occupational radiation exposures that would otherwise result from the inspections and maintenance of such components. APS' estimates of such reductions in costs and occupational exposures are set forth in Attachment 1 attached hereto.

12. The amendments of CPPR-142 and CPPR-143, as requested by this application, do not involve a significant hazards consideration and is not inimical to the common defense and security or to the health and safety of the public.

WHEREFORE, APS requests that Paragraph 3.C of Construction Permits Nos. CPPR-142 and CPPR-143 be amended by order of the Nuclear Regulatory Commission to permit the elimination of pipe whip restraints and jet impingement shields from the reactor coolant piping design for PVNGS Units 2 and 3.

Respectfully Submitted,
ARIZONA PUBLIC SERVICE COMPANY

By: Edwin E. Van Brunt Jr.

Edwin E. Van Brunt, Jr.
Vice President, Nuclear Production
ANPP Project Director

On its own behalf and as agent
for all other PVNGS licensees

Dated: 12/10/84

ANPP-31417

VERIFICATION

STATE OF ARIZONA)
) ss.
County of Maricopa)

Edwin E. Van Brunt, Jr., being first duly sworn, upon his oath deposes and says:

That he is Vice President, Nuclear Projects, of Arizona Public Service Company, that the foregoing document has been signed by him on behalf of Arizona Public Service Company with full authority so to do, that he has read such document and knows its contents, and that to the best of his knowledge and belief, the statements made therein are true.

Edwin E. Van Brunt, Jr.

Edwin E. Van Brunt, Jr.

Subscribed and sworn to before me this 16 day of December, 1984.

Nora E. Meador
Notary Public

My commission expires:

My Commission Expires April 6, 1987

ATTACHMENT 1

COSTS AND OCCUPATIONAL EXPOSURE REDUCTION ESTIMATES

Construction and installation cost savings can be substantial. Cost estimates associated with the remaining work, as of November 30, 1984, are summarized as follows:

A) Unit 2

i)	Pipe Whip Restraints	
	a) Construction and Installation prior to pre-core hot functional testing (HFT)	$ 230,000
	b) Clearance Measurements during pre-core HFT	70,000
	c) Complete Installation	300,000
	d) Verify Clearances during post-core HFT	100,000
ii)	Jet Impingement Shields	
	Construction and installation	50,000
iii)	Total Construction and Installation Costs	$ 750,000

B) Unit 3

i)	Pipe Whip Restraints	
	a) Saddle Fabrication	$ 300,000
	b) Construction and Installation prior to pre-core HFT	230,000
	c) Clearance Measurements during pre-core HFT	70,000
	d) Complete Installation	300,000
	e) Verify Clearances during post-core HFT	100,000
ii)	Jet Impingement Shields	
	Construction and installation	100,000
iii)	Total Construction and Installation Costs	$1,100,000

This design change will also eliminate the need for removal and reinstallation of protective devices during in-service inspection. Over a 40-year life of each unit, this would result in labor savings of $300,000 per unit and a reduction of 560 man-rem per unit in occupational radiation exposure, which is equivalent to $560,000, per the interim cost-benefit measure provided in 10CFR50, App. I.