



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATING TO MODE 3 OPERATION WITH LESS THAN FOUR REACTOR COOLANT PUMPS  
ARIZONA NUCLEAR POWER PROJECT  
PALO VERDE NUCLEAR GENERATING STATION UNITS 1 AND 2  
DOCKET NOS. 50-528, 50-529

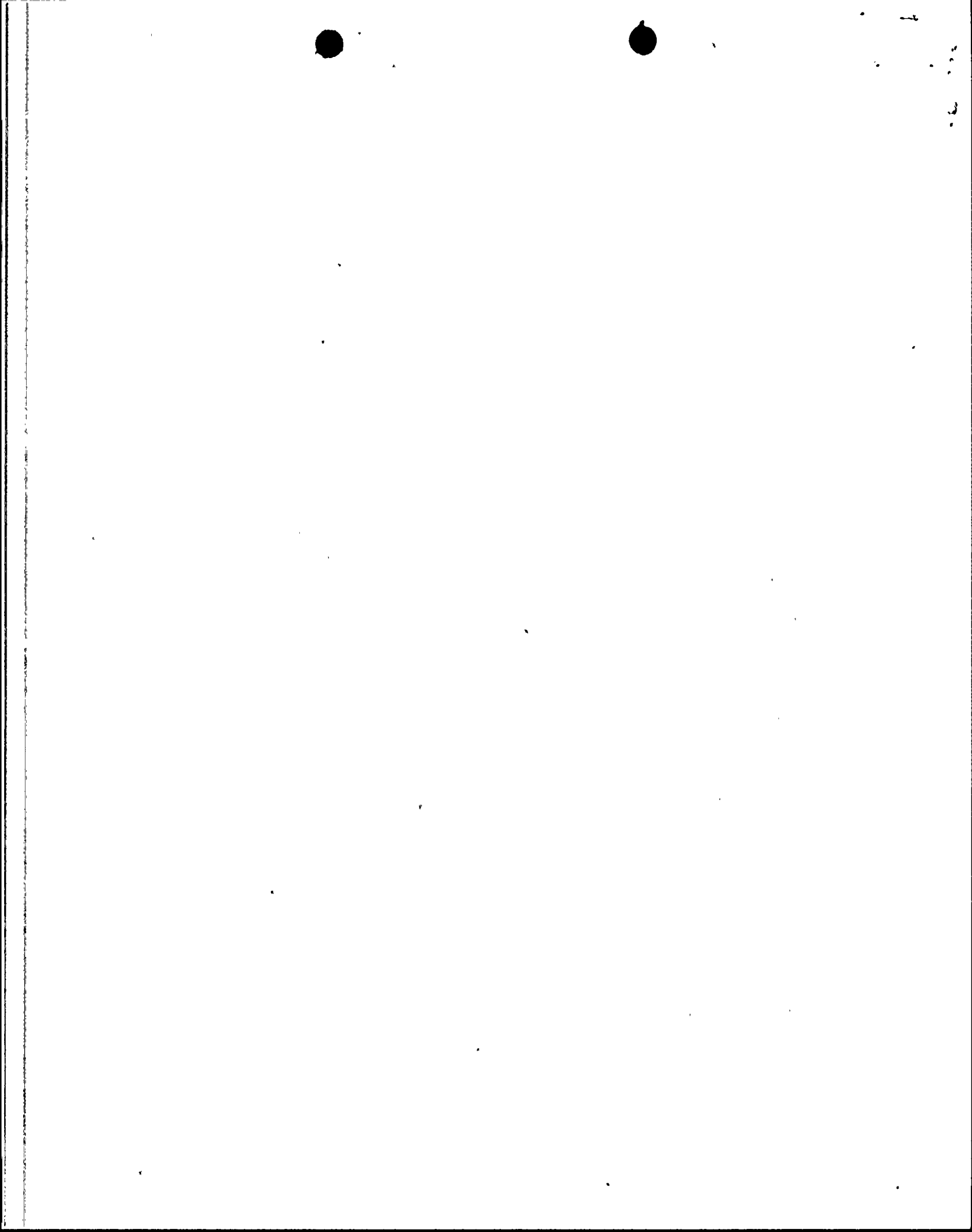
1.0 INTRODUCTION

By letter dated July 23, 1986, from Frank J. Mirgaglia (NRC), all power reactor licensees and applicants with Combustion Engineering and Babcock and Wilcox pressurized water reactors were advised of a potential inconsistency between plant Technical Specifications and FSAR safety analyses. Specifically when a plant is in Mode 3 of operation (hot standby), the Technical Specifications may have required only one reactor coolant pump (RCP) to be in operation whereas the reference safety analysis assumed that two or more RCPs were in operation for Mode 3 events. For some plants, the control rod bank withdrawal event from subcritical or low power conditions may result in violation of the required minimum departure from nucleate boiling ratio (DNBR) limit. Prior to this generic letter, the NRC requested Arizona Nuclear Power Project (ANPP) to provide additional information concerning the Palo Verde Nuclear Generating Station (PVNGS) Units 1 and 2 identifying any previous safety analyses that could be adversely impacted with only one RCP in operation (Ref. 1).

2.0 EVALUATION

Technical Specifications 3.4.1.2 and 3.4.1.3 of the PVNGS allow operation in Mode 3 with only one reactor coolant loop and its associated steam generator and one associated RCP. The PVNGS reference analysis of the control element assembly (CEA) withdrawal event, which appears in Section 15.4.1 of CESSAR (Ref. 2), assumed an initial condition of zero power in Mode 2 with four RCPs in operation. Therefore, in response to the staff's request, ANPP evaluated a CEA withdrawal event initiated from Mode 3 with less than four RCPs operating (Ref. 3).

B707280148 870713  
PDR ADOCK 0500052B  
P PDR

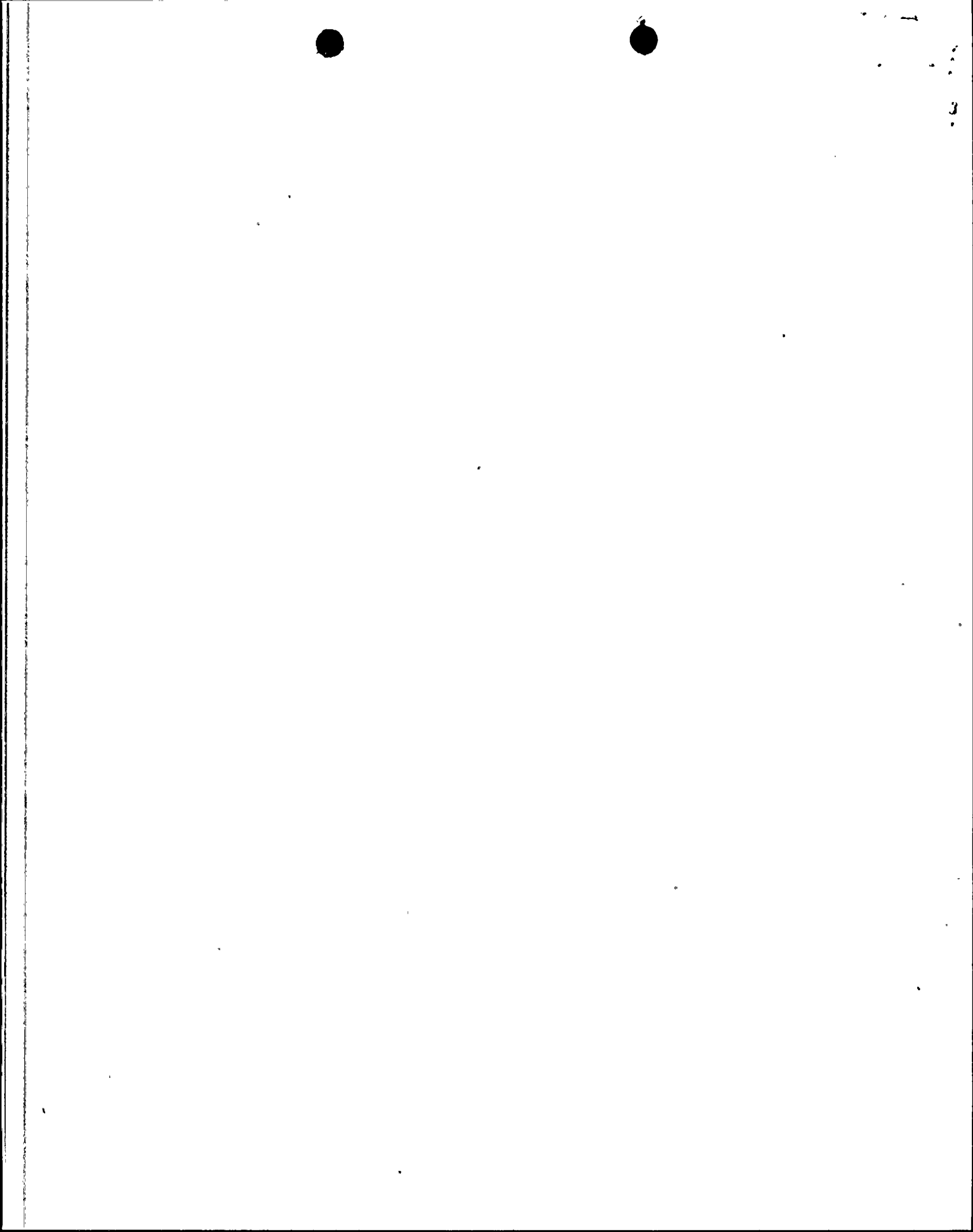


In Modes 3, 4, and 5, the PVNGS Technical Specifications require the high logarithmic power level trip to be in operation with a maximum trip setpoint of 0.895% power. Although this trip may be bypassed above  $10^{-4}\%$  power, this requires positive operator action. The core protection calculator (CPC) system would also provide protection during a CEA withdrawal event beginning in Mode 3. If fewer than four RCPs were operating, a continuous reactor trip signal would be generated by all four CPC channels. Although a CPC bypass could allow closing of the reactor trip breakers even with a trip signal present, this bypass is automatically removed at 1% reactor power. A reactor trip would, therefore, still terminate the event before significant power were generated.

Based on these available trips, and on the administrative and design controls which greatly reduce the possibility of having an accidental CEA withdrawal event while in a shutdown mode, the staff finds the event acceptable with less than four RCP operation. The Mode 3, 4, or 5 event would be less limiting than the reference analysis zero power CEA withdrawal from Mode 2 initial conditions with all four RCPs running which generated a variable overpower trip at 17% power and resulted in a maximum power of 43.5% and a maximum core average heat flux of 16.9%.

### 3.0 CONCLUSION

The most limiting event not previously analyzed and adversely impacted by less than four RCPs operating is the CEA withdrawal event. Based on the above evaluation, the staff has determined that a CEA withdrawal event initiated from Modes 3, 4, and 5, with only one reactor coolant loop and one associated RCP in operation, is bounded by the reference analysis zero power event initiated from Mode 2 with all four RCPs in operation. Therefore, the potential inconsistency between the Technical Specifications and the plant safety analyses has been satisfactorily resolved.



#### 4.0 REFERENCES

1. Letter from E. A. Licitra (NRC) to E. E. Van Brunt, Jr., (ANPP), Request for Additional Information - Palo Verde Unit 2 Technical Specifications, dated April 3, 1986.
2. "Combustion Engineering Standard Safety Analysis Report (CESSAR)", Combustion Engineering, Inc.
3. Letter from E. E. Van Brunt, Jr., (ANPP), to G. W. Knighton (NRC), Additional Information Concerning PVNGS Unit 2 Technical Specifications 3.4.1.2 and 3.4.1.3, dated May 21, 1986.

