

Palo Verde Nuclear Generating Station Atmospheric Dump Valves License Amendment Request

Arizona Public Service Company (APS)
Presentation to
U.S. Nuclear Regulatory Commission (NRC) Staff
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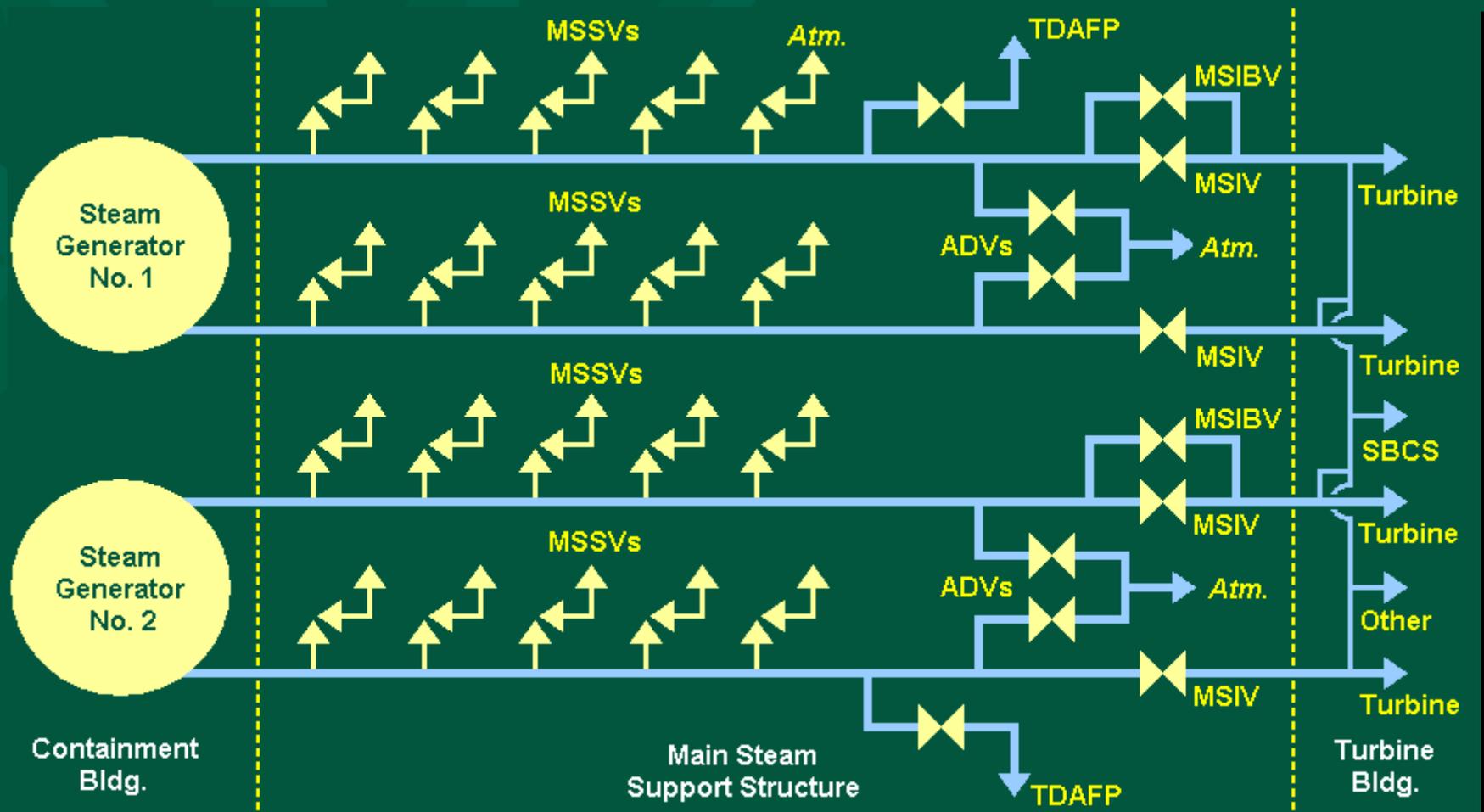
Presentation Topics

- **Introduction & Overview**
- **PVNGS Design and Licensing Bases**
- **ADV Tests & Performance History**
- **Standard Technical Specifications**
- **License Amendment Request**
- **Summary**
- **Questions**

Introduction & Overview

- PVNGS Technical Specifications (TS) allow continued plant operation with only one OPERABLE Atmospheric Dump Valve (ADV) per Steam Generator (SG)
- In-house review identified a credible single failure that could prevent remote manual operation of two ADVs (one per SG)
- Non-conservative TS determination entered in the PVNGS Corrective Action Program
- Interim actions taken to provide assurance of ADV operability (two per SG)
- License Amendment Request (LAR) submitted to NRC to request a more restrictive ADV TS Limiting Condition for Operation (LCO) and a new 7-day ACTION statement

PVNGS Design and Licensing Bases



PVNGS Design and Licensing Bases

- **Atmospheric Dump Valves**
 - ADV lines
 - Normally closed ADVs and normally open block valves
 - Operation
 - Remote manual (control room, remote shutdown panel)
 - Local manual (handwheel)
 - No automatic operation, bypasses, interlocks, or sequencing
 - Pneumatic control
 - Normal gas supply – instrument air system
 - Backup gas supply – safety grade nitrogen accumulators
 - 125 VDC solenoid valves (divisions “A” & “C”, or “B” & “D”)
 - 120 VAC current-to-pneumatic (I/P) converters (“A” or “B”)
 - Either DC or AC single failure – 2 ADVs (1 per SG) fail closed

PVNGS Design and Licensing Bases

- **Safe shutdown requirements**
 - Bases
 - PVNGS Construction Permits (1976)
 - PVNGS Full Power Operating Licenses (1985 to 1987)
 - Regulatory initiatives (Appendix R fire protection, BTP RSB 5-1 natural circulation cooldown, etc.)
 - Hot Standby safe shutdown (Mode 3)
 - Can be maintained from the control room or remote shutdown panel
 - End point for many deterministic UFSAR safety analyses
 - Cold Shutdown safe shutdown (Mode 5)
 - Additional equipment required, e.g., Shutdown Cooling (SDC) system
 - May require local manual operation of equipment using suitable procedures

PVNGS Design and Licensing Bases

- **Safe shutdown requirements**
 - Hot Standby safe shutdown (Mode 3)
 - Deterministic UFSAR safety analyses do not rely on ADVs to achieve Hot Standby conditions
 - Hot Standby may be maintained by prolonged cycling of Main Steam Safety Valves (MSSVs)
 - MSSVs tested for up to 250 cycles
 - ADVs designated as safe shutdown equipment so that plant operators do not have to rely solely on MSSVs
 - Each ADV is sized such that it can maintain Hot Standby conditions without cycling the MSSVs

PVNGS Design and Licensing Bases

- **Safe shutdown requirements**
 - Cold Shutdown safe shutdown (Mode 5)
 - Cold Shutdown achieved with Shutdown Cooling (SDC) system
 - ADVs designated as safe shutdown equipment so that plant operators can cool down the plant from Hot Standby to SDC system entry conditions
 - ADVs are the safety grade backup for the preferred cooling strategy (steam dump to main condenser using SBCS)
 - Emergency Operating Procedures (EOPs) include provisions for local manual operation of ADVs using handwheels

PVNGS Design and Licensing Bases

- **UFSAR safety analyses**
 - Radiological dose consequences
 - Analyses assume plant cooldown following ANSI N18.2-1973 Limiting Faults and Infrequent Events
 - Analyses account for steam discharge to the environment through MSSVs and ADVs
 - Bounding offsite and control room doses assume a Limiting Fault and a single failure (one ADV fails open, providing a containment bypass flow path)

PVNGS Design and Licensing Bases

- **UFSAR safety analyses**
 - Cooldown Analyses
 - Analyses model ADV operation and transition from Hot Standby to SDC entry conditions
 - Analyses examine accident mitigation strategies
 - Steam Generator Tube Rupture (SGTR)
 - Long-term cooling following a Loss of Coolant Accident (LOCA)

ADV Tests & Performance History

- **Testing**

- Manual stroke and indication verification testing every refueling
- Accumulator pressure drop and valve stroke timing testing every quarter, post-refueling
- Testing is typically performed on 2 ADVs at a time due to shared components

- **Performance history**

- The ADV control system is highly reliable with better than 99.5% reliability (one failure in last 360 demands)
- ADV positioner
- Leaks (piping, tubing, fittings, flanges, caps, etc.)
- Foreign Material Exclusion (FME) issues
- Maintenance evolutions can take very close to 7 days

Standard Technical Specifications

- **Combustion Engineering (C-E) plants**
 - 14 units at 9 different sites currently have full power Operating Licenses (OLs)
 - Construction Permits issued 1967 to 1977
 - Full power OLs issued 1972 to 1987
 - Variations in plant design and licensing bases
 - Vintage determines original design and licensing bases
 - C-E design philosophy not static
 - Some units equipped with feed and bleed capability
 - Some units equipped with automatic operation of ADVs
 - Effects of power uprates and other activities relative to installed equipment capabilities and safety analyses (margin management)

Standard Technical Specifications

- **Combustion Engineering (C-E) plants**
 - 8 of 14 units equipped and analyzed for feed and bleed
 - 5 do not have ADV TS
 - 1 has a TS for Mode 1 only
 - 1 has a TS for Modes 1, 2, and 3, but not Mode 4
 - 1 unit adopted ADV TS in 1999 while converting to Improved Technical Specifications (ITS)
 - 6 of 14 units not analyzed for feed and bleed
 - 3 equipped with 2 ADVs per unit
 - 3 equipped with 4 ADVs per unit (PVNGS)

Standard Technical Specifications

- **Application of C-E Standard Technical Specifications**
 - STS based on a “standard” plant that is a composite of plant designs, not any particular single unit
 - STS Bases describe a plant configuration with 4 ADV lines
 - STS LCO and ACTION statements imply that as few as “[Two]” ADV lines are “[required]” to be OPERABLE
 - STS do not necessarily address plant-specific considerations (e.g., ADV control system failure modes and effects)
 - STS do not include a 72-hour ACTION statement, although 7 of 9 C-E plants that currently have ADV TS also have 72-hour statements
 - STS include a 24-hour ACTION statement that does not differentiate between having 2 inoperable ADVs on 1 SG, and having 2 inoperable ADVs with 1 inoperable per SG

License Amendment Request

- **Proposed change to LCO 3.7.4**
 - Proposed LCO requires that 2 ADV lines per SG be OPERABLE
 - Current TS requires that 1 ADV line per SG be OPERABLE
 - Proposed change to LCO is more restrictive than current TS
 - Addresses the single failure vulnerability that could render 2 ADV lines (1 per SG) incapable of opening by remote manual operation
 - Ensures that the plant configuration during normal operation meets all General Design Criteria (GDC) requirements, including loss of offsite power and single failure assumptions
 - Proposed change to LCO derived from C-E STS for a plant with 4 ADVs (2 per SG)

License Amendment Request

- **Proposed Condition A**

- Allows continued operation for 7 days with 1 inoperable ADV line
 - Same condition and completion time as C-E STS for 1 inoperable ADV line
- Allows separate condition entry for each SG, so that 2 ADV lines (1 per SG) may be inoperable at the same time
 - Supports current testing and maintenance practices
 - Ensures 1 ADV line remains OPERABLE on each SG
 - Configuration consistent with safety analyses, assuming no additional single failure while in TS ACTION statement
 - Design function supported by the 2 remaining OPERABLE ADV lines

License Amendment Request

- **Proposed Condition B**
 - Allows continued operation for 72 hours when 2 ADV lines are inoperable on 1 SG, and there are either 1 or 2 OPERABLE ADV lines on the other SG
 - This is the same configuration and completion time allowed by current PVNGS TS Condition A
 - This configuration represents a loss of ADV redundancy, but not design function
 - Each ADV is sized to remove decay and sensible heat
 - Accident mitigation capability available through remote manual operation of the remaining OPERABLE ADV line(s), or through other measures in EOPs

License Amendment Request

- **Proposed Condition C**
 - Allows continued operation for 24 hours when there are no OPERABLE ADV lines on either SG
 - This is the same configuration and completion time allowed by the current PVNGS TS Condition B
 - This configuration represents both a loss of ADV redundancy and design basis function, hence the short completion time
 - Accident mitigation capability available through other measures in EOPs

Summary

- **Requested change to LCO requires 2 OPERABLE ADV lines per SG**
 - More restrictive than current ADV TS
 - Addresses the identified single failure vulnerability
 - Ensures adequate redundancy to meet all GDC requirements
- **Requested change to Condition A allows 1 inoperable ADV line per SG for up to 7 days, with separate Condition entry for each SG**
 - More restrictive than current ADV TS
 - Consistent with current ADV testing and maintenance practices
 - ADV redundancy maintains design function
- **Conditions B and C maintain the existing 72-hour and 24-hour TS completion times for other configurations of inoperable ADVs**

Questions