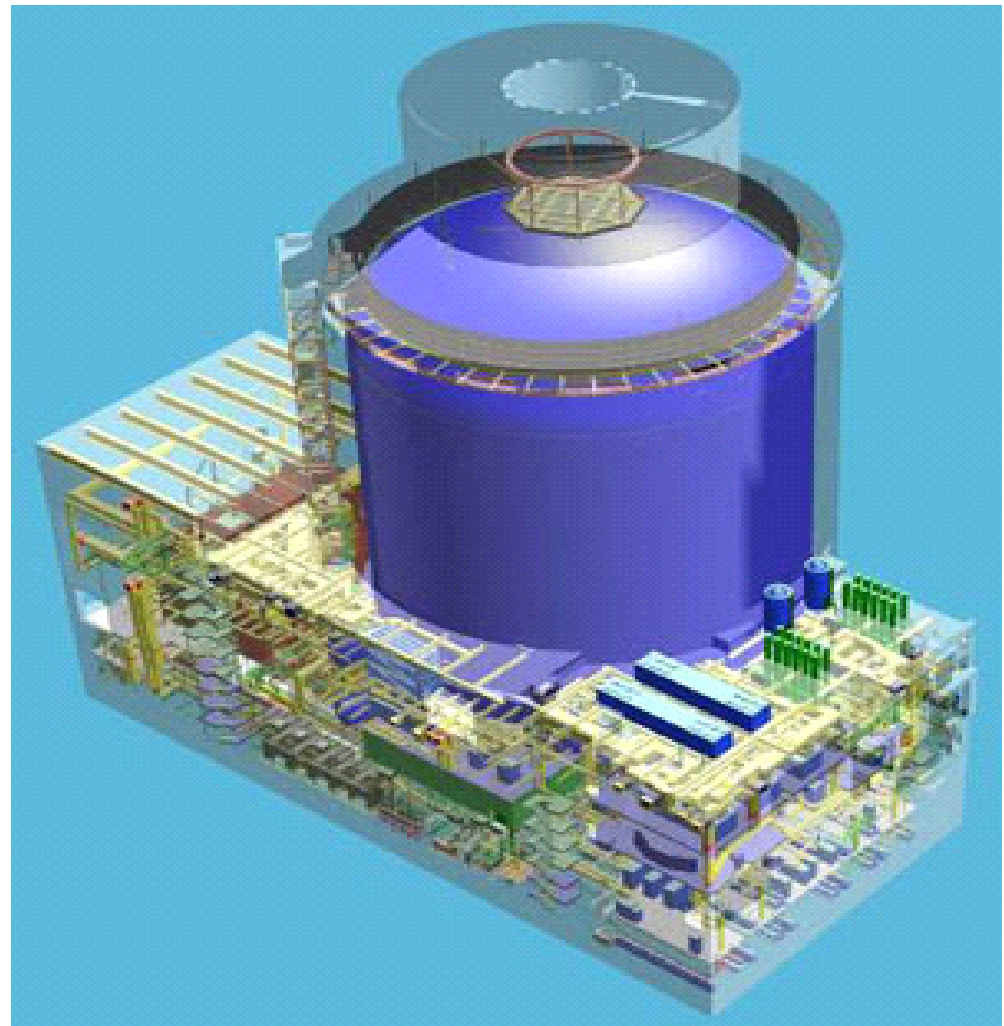

AP1000 Inservice Testing Development

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Outline

- **AP1000 IST Development**
 - Design / licensing discussions
 - During 1990's, AP600 design & licensing
 - DCD Revision 16 enhancements
- **Examples of AP1000 Check Valve IST Design**
- **Examples of AP1000 Power Operated IST Design**
 - Valve open / close requirements
 - Thermal binding / pressure locking

IST Development Approach

- **Developed During AP600 Design**
 - AP600 IST benefits from
 - Not having any safety related pumps
 - Not having any site specific safety related valves
 - US Utilities provided input / review of IST
 - Many NRC discussions / RAIs
 - Addressed / agreed on deferment of stroke testing
 - Documented in DCD Table 3.9-16 notes
 - Provide for check valve stroke testing
 - Eliminate need for disassembly
 - Documented in DCD Table 3.9-16 notes

IST Development Approach

- **AP1000 Enhancements (DCD Rev 16)**
 - Adopted power operated valve operability testing consistent with current industry practice
 - Use instrumented in-plant static test
 - Requires valve testing to define adequate margin
 - Test frequency based on margin and risk importance
 - Risk importance available from DCD PRA
 - DCD PRA applicable to COLA
 - Valve datasheets specify valve open / close requirements
 - Equipment Specifications require valves meet open / close requirements with high margin
 - Added information to IST table in DCD 3.9.6

PXS Check Valve IST Examples

- **Accumulator Check Valves**

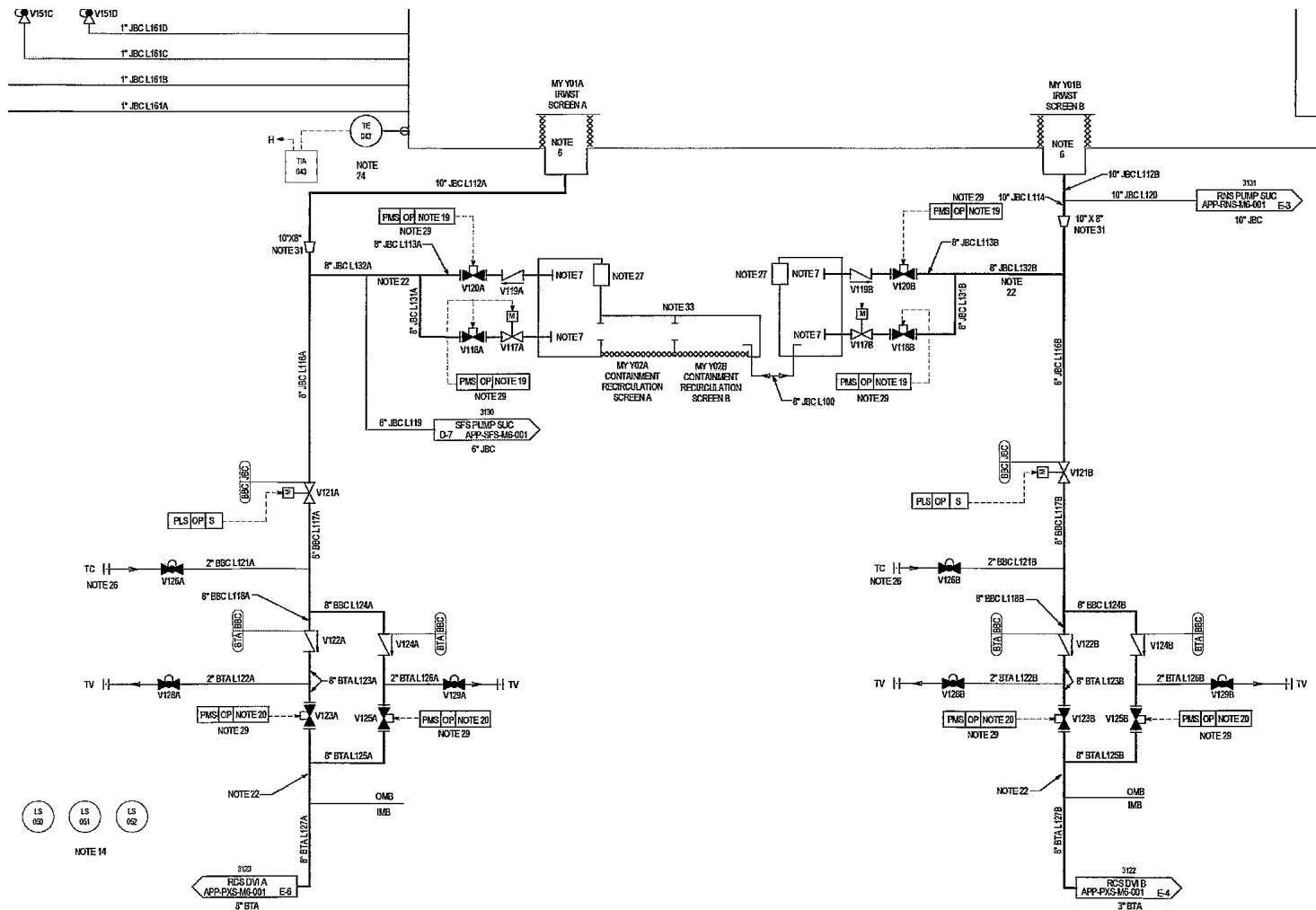
- At power stroke testing is not practical
- Every refueling shutdown, valves stroked full open
 - Test described in DCD Table 3.9-16, note 9
 - Accum pres reduced to slightly above RCS during shutdown cooling operation
 - Accum MOV opened to allow flow through check valves
 - Results in limited net injection to RCS
 - Valve position monitored by non-intrusive position indication
- Every cold shutdown, small leak test lines used to put some flow through check valves into RCS

PXS Check Valve IST Examples

- **IRWST Injection Check Valves**

- At power stroke testing is not practical
- Every refueling shutdown, valves stroked full open using air through test connections
 - Test described in Table 3.9-16, note 12
 - Air supply provided from test cart
 - Manual valve opened to initiate flow; closed to terminate test
 - Valve position monitored by non-intrusive position indication

PXS P&ID From DCD (Showing IRWST Check Valve Test Connections)



Specification of Power Operated Valve Requirements



- **Each Power Operated Valve Has Defined Open / Close Requirements, Including**
 - At least one open and one close case
 - Will include more cases as needed
 - Identify each case as safety or non-safety
 - Provide initial / final DP and flow
- **Thermal Binding and Pressure Locking Defined**
- **Both Included on Valve Data Sheet**

Specification of Power Operated Valve Requirements



- **Include In Valve Data Sheet Requirements**

- Data sheets included in Equipment Specifications used to purchase / design valves
- Equip Spec defines appropriate margins to be included by valve vendor in the valve design