

Southern California Edison
SONGS Alloy 600
Management Plan

July 6, 2006

SONGS Alloy 600 Management Plan Agenda

- Steam Generators
- Reactor Pressure Vessel Head
- Pressurizer Heater Sleeves
- Reactor Coolant System Penetrations
- Reactor Coolant System 82/182 Butt Welds

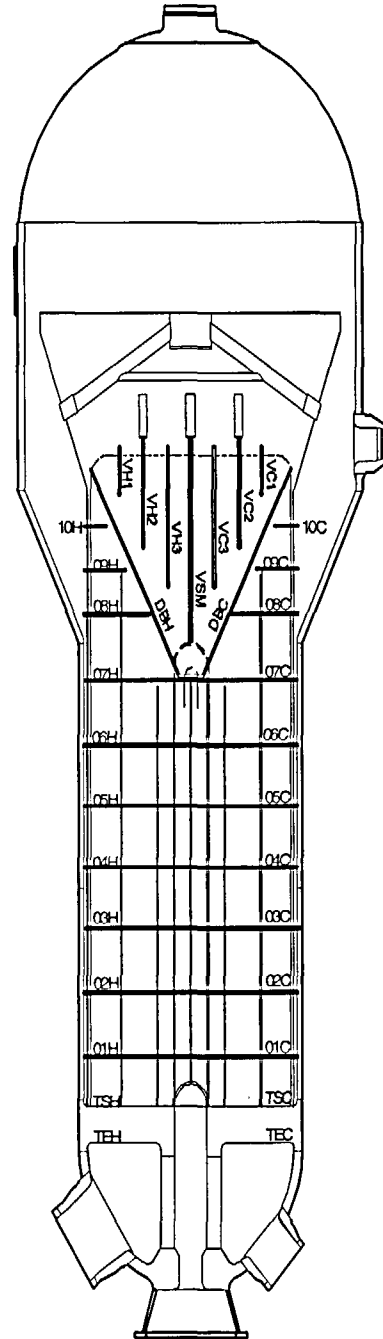
SONGS Steam Generator Tubing Discussion

July 6, 2005

Steam Generator Tubing Discussion

- **Non Destructive Examination Plan**
- **Repair Plans**
- **Technical Specification Change Requests**
- **Proposed Steam Generator Replacement**

SONGS Steam Generator



Next Planned Outage Dates

- SONGS 2
 - 2C14 - Start of Operating Cycle 14
 - Planned Start Date - January 3, 2006
- SONGS 3
 - 3C14 - Start of Operating Cycle 14
 - Planned Start Date - October 16, 2006

Non Destructive Examination Plan

Bobbin Exam

- Full length exam of in-service tubes (100%)

Rotating Exams (+Point)

- Hot leg top-of-tubesheet locations (100%)
- Cold leg top-of-tubesheet locations (~30%)
- Rows 1 thru 10 U-bend locations
- Special Interest Locations
 - Non-quantifiable bobbin indications (I-codes)
 - Dents ≥ 2 volts and Dings ≥ 4 volts (100%)
 - Tube wear at supports (100%)

Visual inspection for foreign objects

Rotating Exams (+Point)

Top-of-tubesheet Locations

Hot leg top-of-tubesheet locations (100%)

- Probable extent 4 inches above and 11.75 inches below top of tubesheet (Industry OE)

Cold leg top-of-tubesheet locations (~30%)

- Probable extent 2 inches above and 13 inches below top of tubesheet (Industry OE)
- 20% sample to include all tubes not examined in last three inspections
- All tubes adjacent to tie rods
- A 3-row pattern around the periphery and blowdown lane
- All possible loose part (PLP) locations

Rotating Exams (+Point)

U-bend Locations

U-bend Locations

- Rows 1 thru 4, 100%, (Industry OE)
- Rows 5 thru 10, 20% sample (Industry OE)

Rotating Exams (+Point)

Special Interest Locations

- Non-quantifiable bobbin indications (I-codes)
 - Typical exam 70-350 locations per SG
- Dents ≥ 2 volts (100%)
 - Typical exam 350-4000 locations per SG
- Dings ≥ 4 volts (100%)
 - Typical exam 350-500 locations per SG
- Tube wear at supports (100%)
 - Typical exam 700-1200 locations per SG

Rotating Exams (+Point)

Special Interest Locations

- Hot leg scallop bar supports (20% sample)
(Industry OE)
- Sleeve full length (100%)
- Parent tube of sleeve candidates in region of
sleeve joints (100%)

In-situ Pressure Testing

- Measures ability of tube to meet NEI 97-06 performance criteria during condition monitoring
- Utilizes latest EPRI guidelines for candidate selection and testing
- Have in-situ pressure tested ~80 tubes at SONGS during eleven prior inspections

Repair plans

- Repair
 - All indications exceeding Technical Specification repair criteria (44% throughwall)
 - All wear indications $\geq 30\%$ throughwall
 - All crack-like indications
- Circumferentially oriented indications will be stabilized
- Sleeve installation planned for tubes with repair indications at the top-of-tubesheet (SONGS 2)

SONGS 2 Current Repair Status

- SONGS Unit 2
 - One steam generator has 939 tubes plugged and 345 tubes sleeved for an effective plugging percentage of 10.2%.
 - The other steam generator has 960 tubes plugged and 189 tubes sleeved for an effective plugging percentage of 10.4%.

SONGS 3 Current Repair Status

- SONGS Unit 3
 - One steam generator has 704 tubes plugged and no tubes sleeved for a plugging percentage of 7.6%.
 - The other steam generator has 651 tubes plugged and no tubes sleeved for an plugging percentage of 7.0%.

Tube Plugging Limit

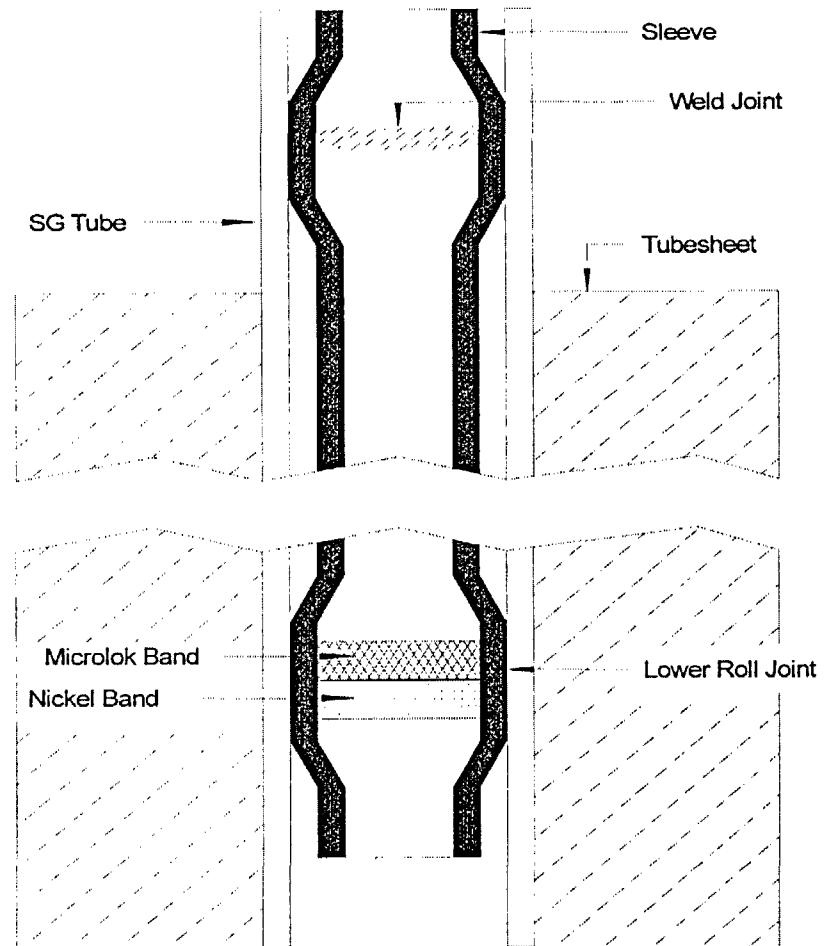
- The tube plugging limit for each unit is a maximum of 2000 tubes in any steam generator. This corresponds to a plugging percentage of 21.4%. The plugging limit is an input to the UFSAR Chapter 15 safety analyses and affects RCS flow and corresponding linear heat rate limits on the fuel. The plugging limit is not specified in the plant license, but the minimum RCS flow and linear heat rate limits are part of the plant license.

Obstructed Sleeves

- Water pressure buildup between sleeve and parent tube caused sleeve inner diameter to reduce and preclude eddy current inspection. Affected sleeves (10) were plugged. Safety analysis now assumes all sleeves fully collapse and act as plugs.
- Root cause of SONGS water ingress not determined. Lower joint is most likely source.
- Problem appears isolated to sleeves installed in 3rd of 4 installation campaigns.

Sleeve Design

For Illustration Purposes Only



Sleeve Obstruction – Potential Outcomes

- No further obstruction detected in any installed sleeves
 - Continue to sleeve as normal
- Additional obstruction limited to only 3rd batch
 - Conclude problem is limited to 3rd batch only and assume all 3rd batch sleeves are plugged for safety analysis
 - Continue to sleeve as normal
- Additional obstruction limited to only 4th batch
 - Conclude problem is limited to new batch only and assume all new batch sleeves are plugged for safety analysis
 - Continue to sleeve as normal
- Additional obstruction occurs in more than one batch
 - Consider discontinuing sleeving
 - May result in plugging all in-service sleeves

Sleeve Inspection Issue

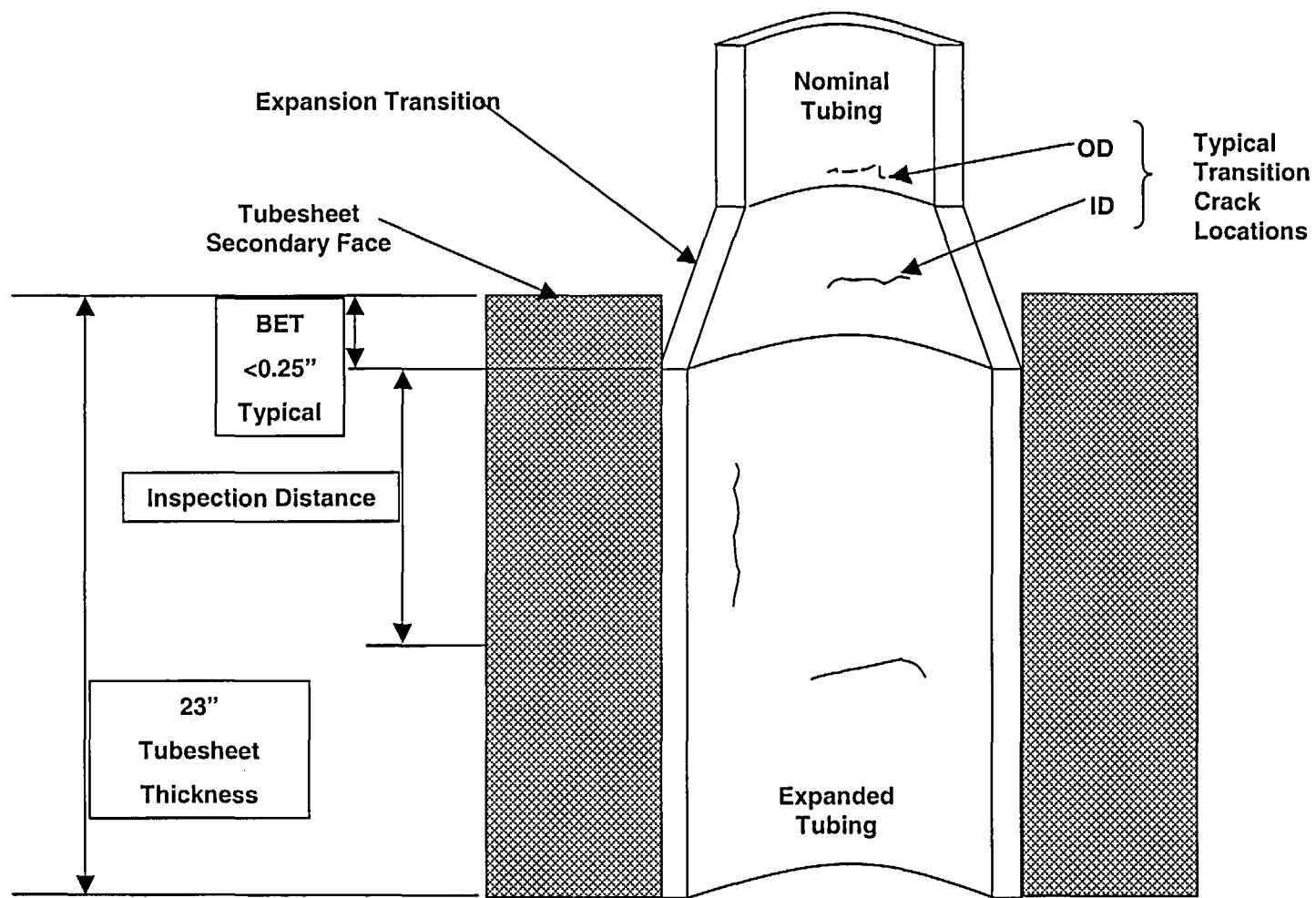
- Lower joint of sleeve has nickel band to enhance leak tightness. Nickel band degrades eddy current inspection capability of parent tube behind nickel band.
- Westinghouse updating position paper discussing acceptability of joint configuration. Updated position paper to be sent to the NRC as resolution of outstanding GL 2004-01 RAI questions.
- Targeted response submittal is September 2005

Technical Specification Change Request

- Tubesheet Inspection Extent
- Generic License Change Package
- SCE plans to request Technical Specification changes to address both issues in October 2005

Tubesheet Inspection Extent

- Generic Letter 2004-01 was issued outlining the NRC position with respect to inspections within the tubesheet.
- As part of an Owner's Group project, Westinghouse is updating a Topical Report to support and define an appropriate inspection extent for both hot leg and cold leg exams
- A license amendment request will be submitted to redefine the inspection extent consistent with the GL 2004-01 template.



For Illustration Purposes Only

Generic License Change Package

- The industry has been working with the NRC on a steam generator Generic License Change Package (GLCP). This has resulted in a Technical Specification Task Force proposed change to Standard Tech Specs (TSTF-449, Rev 4) issued April 2005. On May 6, 2005, the NRC issued a model application to allow utilities to implement TSTF-449, Rev 4 using the Consolidated Line Item Improvement Process (CLIIP)
- SCE intends to submit a license amendment utilizing the CLIIP process. Targeted submittal is October 2005.

Proposed Steam Generator Replacement

- In October 2004, replacement steam generators were ordered and are currently being fabricated by Mitsubishi Heavy Industries in Japan
- Design is similar to Arkansas 2 and Fort Calhoun replacements
- SCE requested California Public Utility Commission (CPUC) approval for ratepayer funding of replacement steam generators
- CPUC hearings held in February 2005. SCE expects a ruling by the end of 2005.
- SONGS 2 replacement scheduled for fall of 2009
- SONGS 3 replacement scheduled for fall of 2010

Summary

- We will continue to perform comprehensive steam generator inspections at the next refueling outage incorporating industry operating experiences
- The bounding conditions for sleeve issues will be defined by the results of the upcoming inspections.
- We are seeking approval of two Technical Specification change requests to be submitted in the near future

SONGS Alloy 600 RCS Pressure Boundary Management Plan

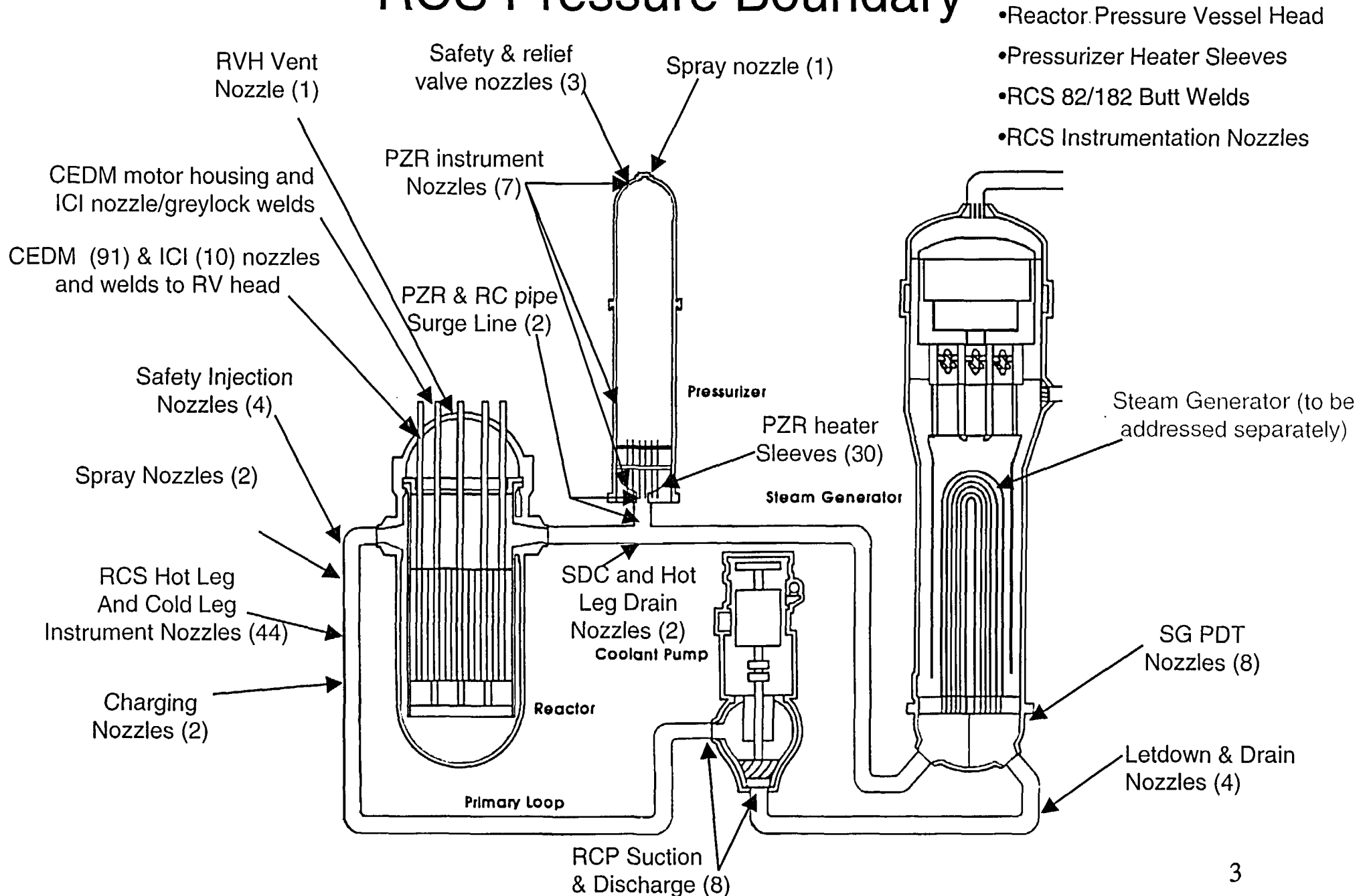
July 6, 2005

Purpose of Presentation

- Alloy 600 RCS Pressure Boundary locations at SONGS
- Current status of SONGS actions on Alloy 600 RCS Pressure Boundary components
- Outline of plans for future inspection and mitigation
 - Next refueling outages (Cycle 14: Unit 2 January 2006, Unit 3 October 2006)
 - Beyond Cycle 14

Nickel Alloy Locations in SONGS

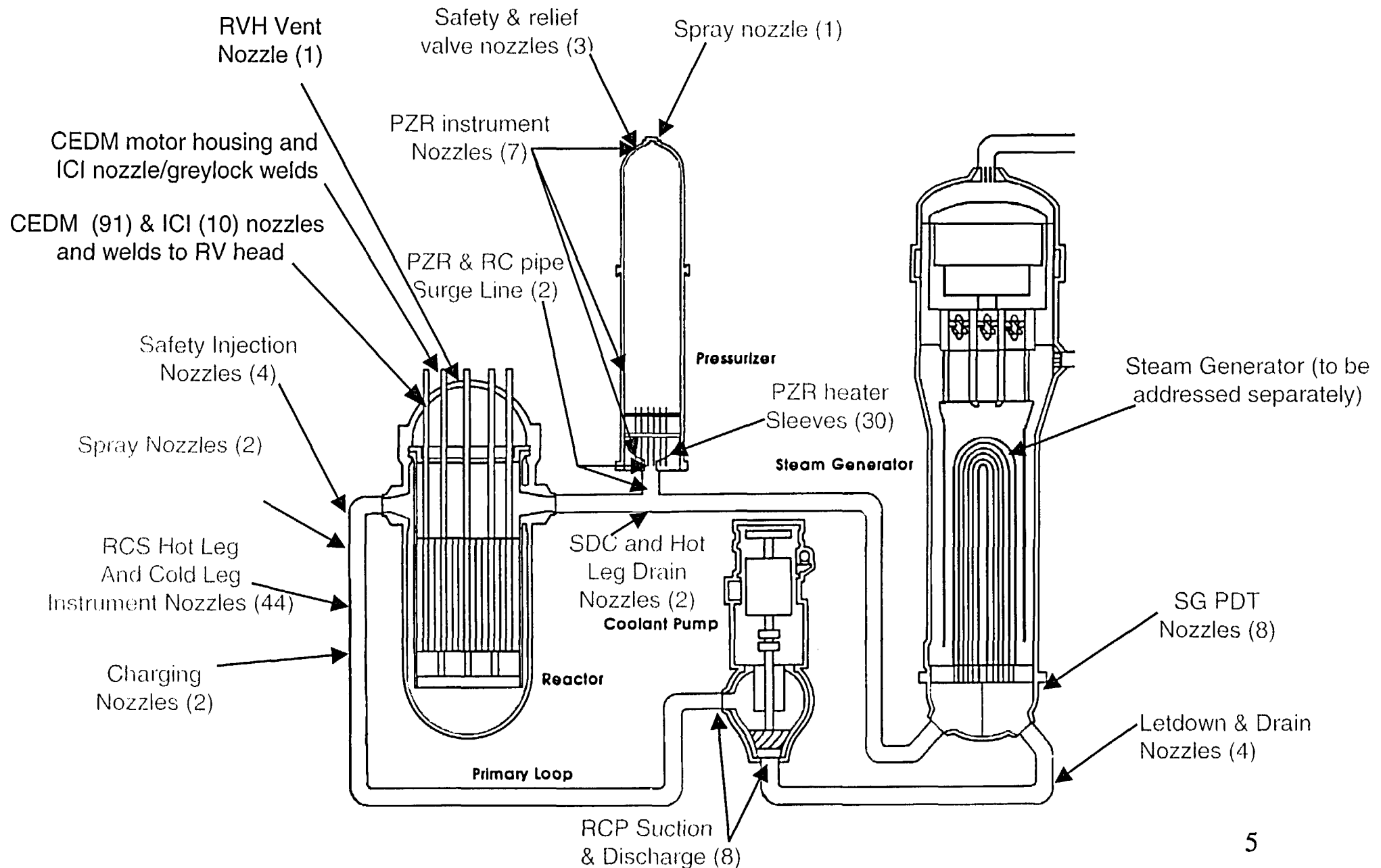
RCS Pressure Boundary



Overarching actions taken to address Alloy 600 in the RCS Pressure Boundary

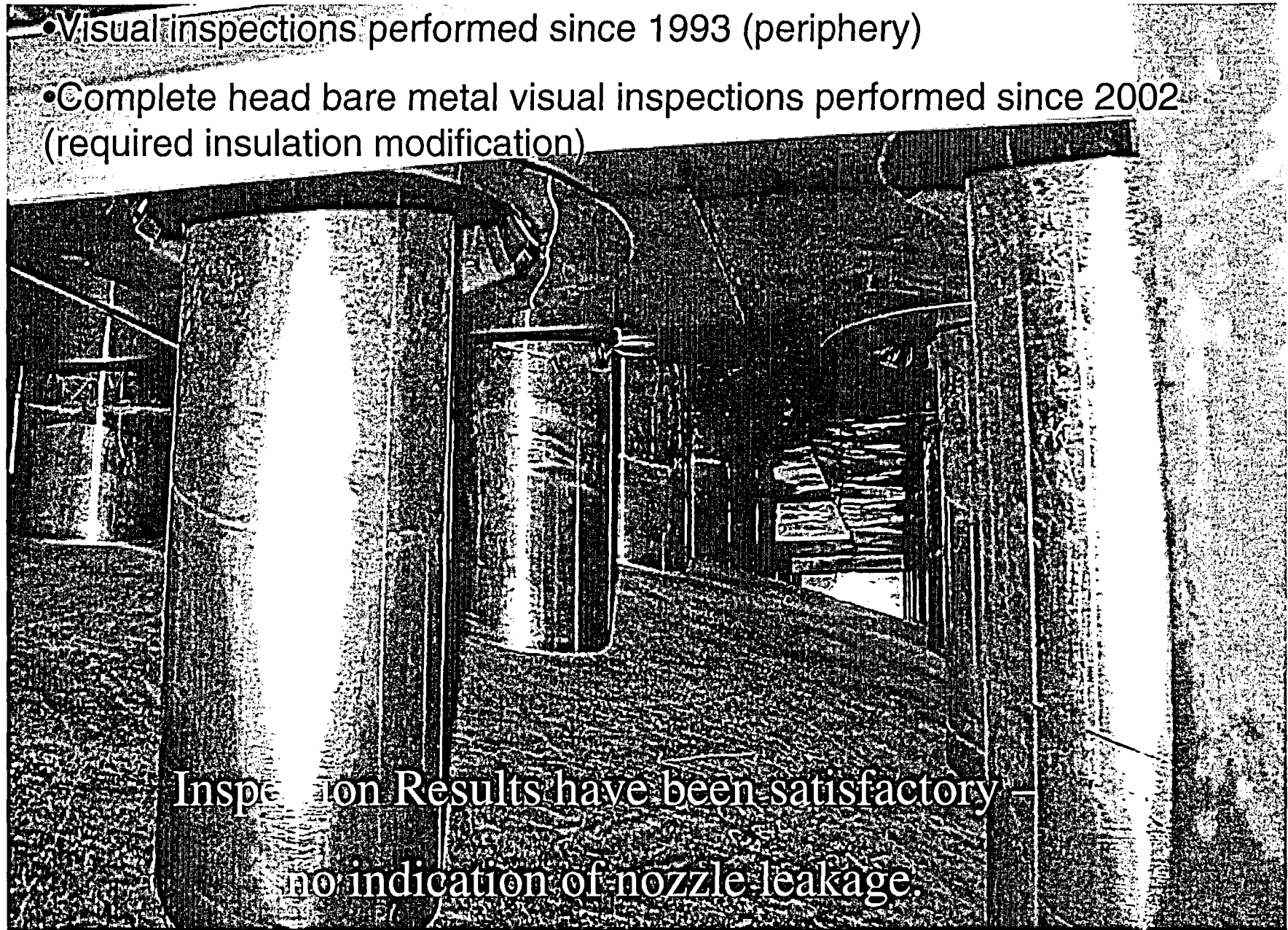
- RCS Temperature Reduction of 13°F in late 1990's
- Long-standing Alloy 600 visual inspection walkdown program

Reactor Pressurize Vessel Head Alloy 600 Locations



Reactor Pressure Vessel Head – Visual Inspections

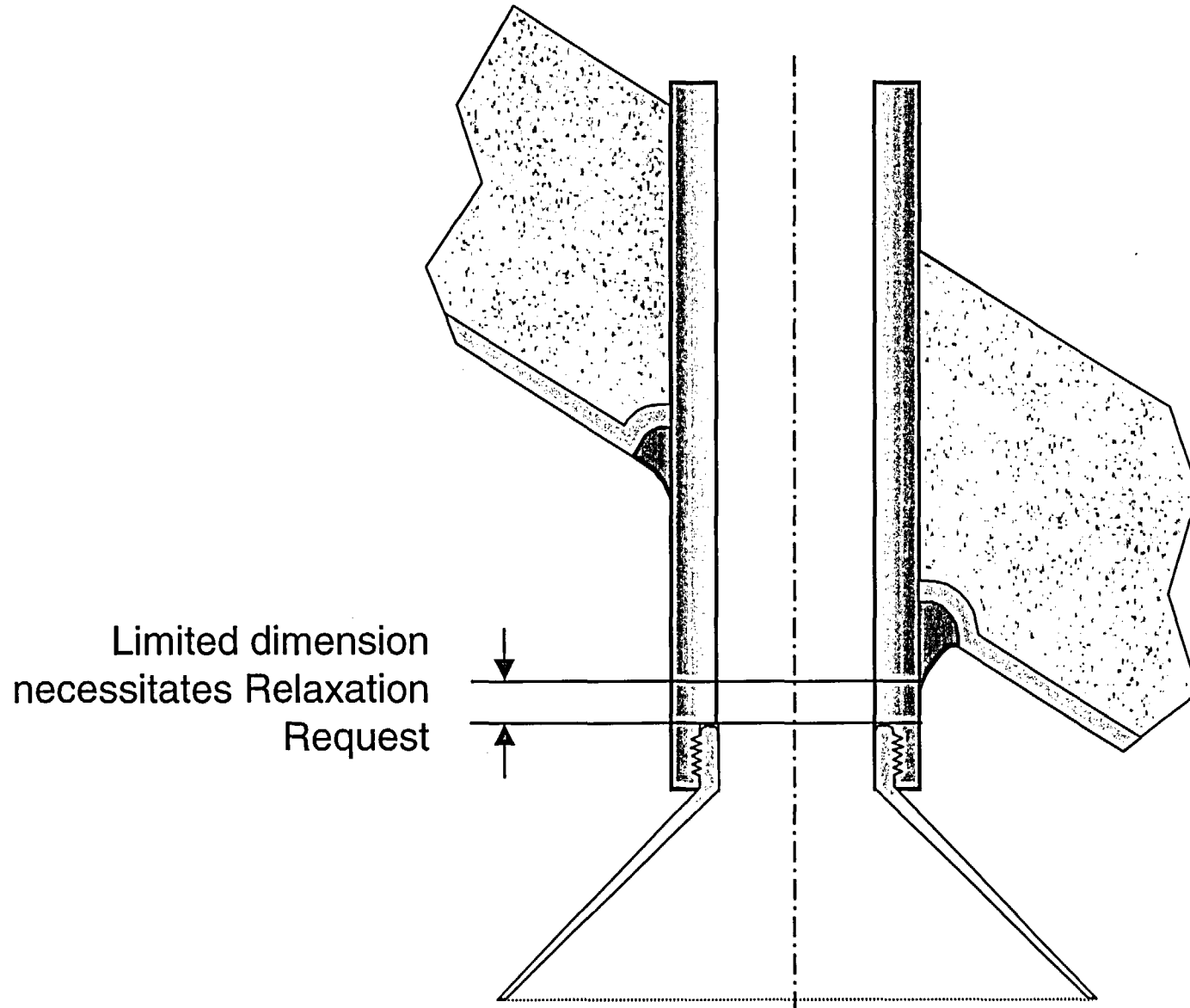
- Visual inspections performed since 1993 (periphery)
- Complete head bare metal visual inspections performed since 2002 (required insulation modification)



Reactor Pressure Vessel Head – NDE Inspections

- Underhead NDE inspections were performed on both Units in Cycle 12 (prior to the Order) and Cycle 13 outages
- Relaxation from the Order
 - Due to geometry associated with the guide cone attachment
 - Relaxation Request #2 granted for Cycle 13 NDE inspections
 - Relaxation Request #3 seeks the same relief that was granted for the SONGS Cycle 13 NDE inspections

Reactor Pressure Vessel Head – Relaxation Request



Reactor Pressure Vessel Head – NDE Inspection

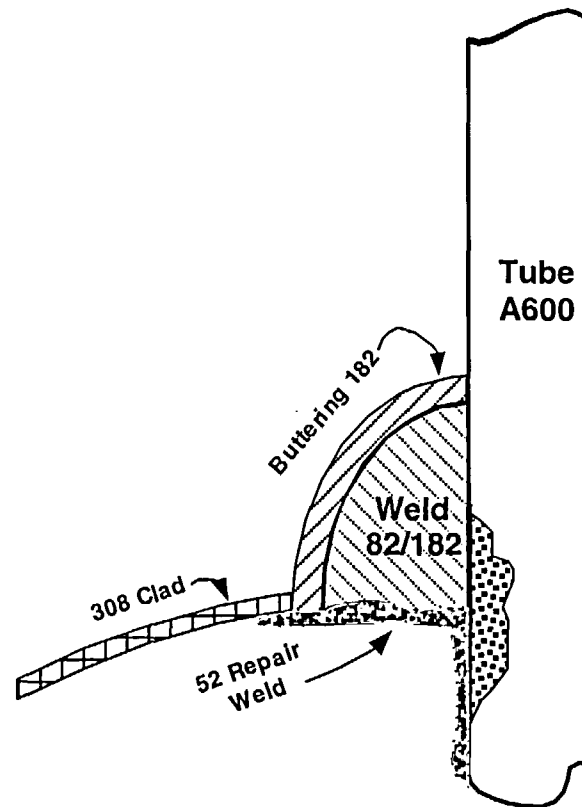


Reactor Pressure Vessel Head – NDE Inspection results to date

- Cycle 12 outages – no indications
- Cycle 13 outages
 - SONGS 2
 - 4 rejectable PT indications identified on 3 ICI J-groove welds
 - All indications removed by grinding
 - SONGS 3
 - 5 UT indications identified on 4 CEDM nozzles
 - Repairs made using Weld Overlay (Relief Request ISI-3-8)
 - Nozzle 56 required additional Relief Request (Relief Request ISI-3-13)

Reactor Pressure Vessel Head – Weld Overlay Repair

- The repair covers 360° of the penetration OD and J-groove extending ½” beyond the weld butter onto the cladding and to the bottom of the OD

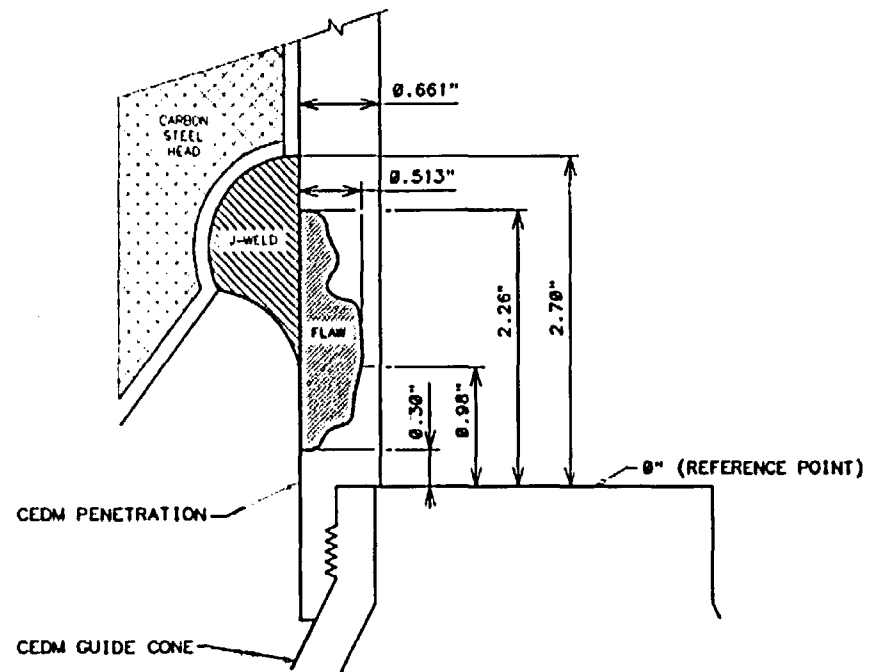


Reactor Pressure Vessel Head – Cycle 14 Plans

- Visual and NDE inspections continue to be performed per the Order and Relaxation Request
 - Supplemental J-groove eddy current inspections previously obtained as baseline data. No further inspections of this type are planned or required
- Contingency repair plan for CEDM or ICI Nozzles is weld overlay as performed on Unit 3 Cycle 13 (Relief Request ISI-3-8)
- Contingency repair plan for the vent line requires preparation of a Relief Request to allow ambient temper bead welding
 - Relief Request for ambient temper bead repair to be re-submitted
- Unit 3 Nozzle 56 previous repair to be addressed

Reactor Pressure Vessel Head – Unit 3 Nozzle 56 history

- As found indication 78% thru wall
- Weld overlay applied
- Relief Request approved for one cycle of operation
 - Analysis deemed repair to be within Code limits for “useful life”
 - Section XI, Appendix C for flaw analysis is limited to flaws less than 75% through wall



SKETCH
REACTOR HEAD
NOZZLE ID: 56

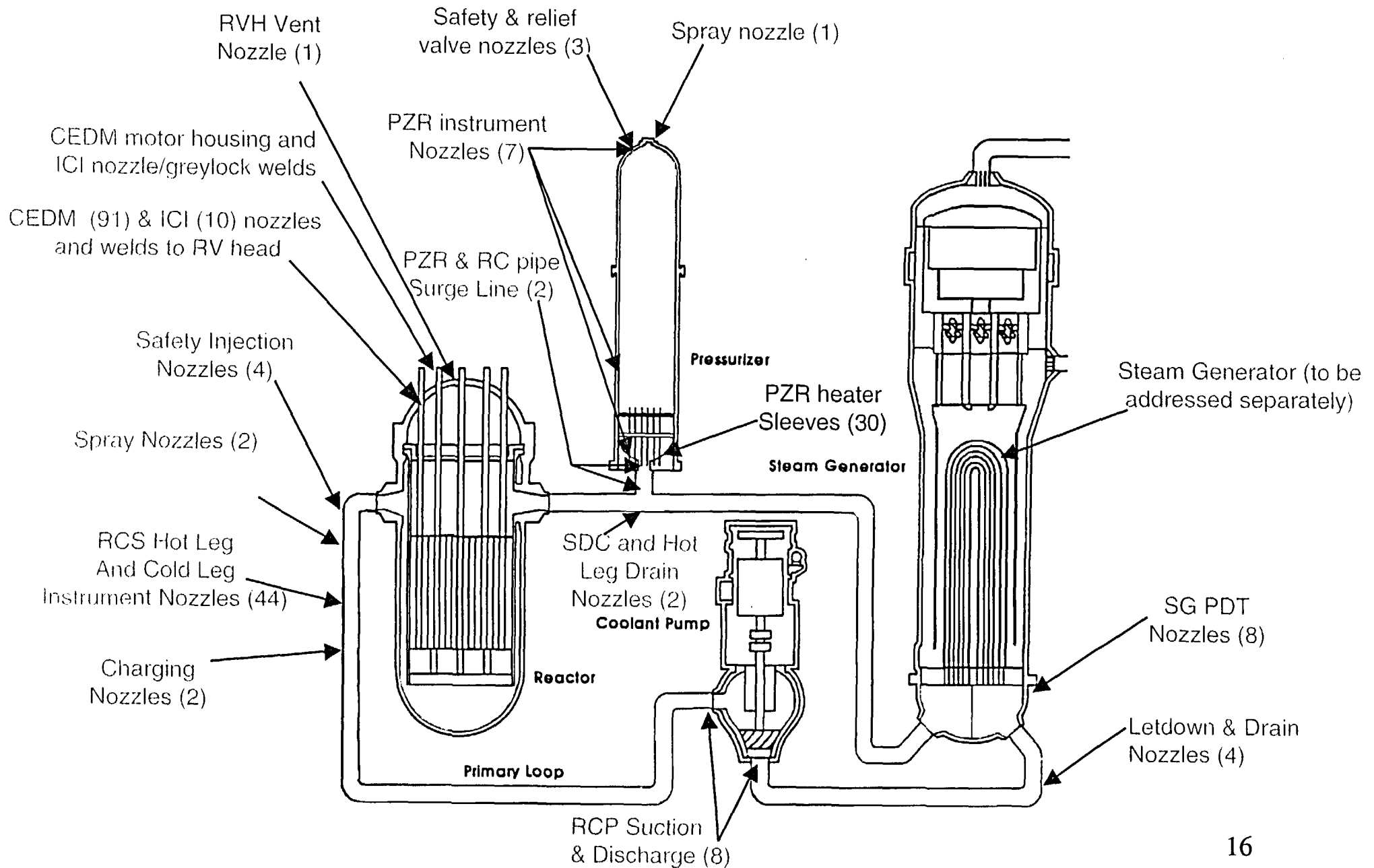
Reactor Pressure Vessel Head – Unit 3 Nozzle 56 Cycle 14 plans

- Options under consideration
 - ID excavation and weld inlay
 - Revised stress analysis
 - Mid-wall repair

Proposed Reactor Pressure Vessel Head Replacement

- The specification for the replacement reactor pressure vessel head is complete
- Award expected late 2005
- Reactor pressure vessel head replacement is currently planned for Cycle 16 refueling outage

Pressurizer Heater Sleeves – Nickel Alloy Locations

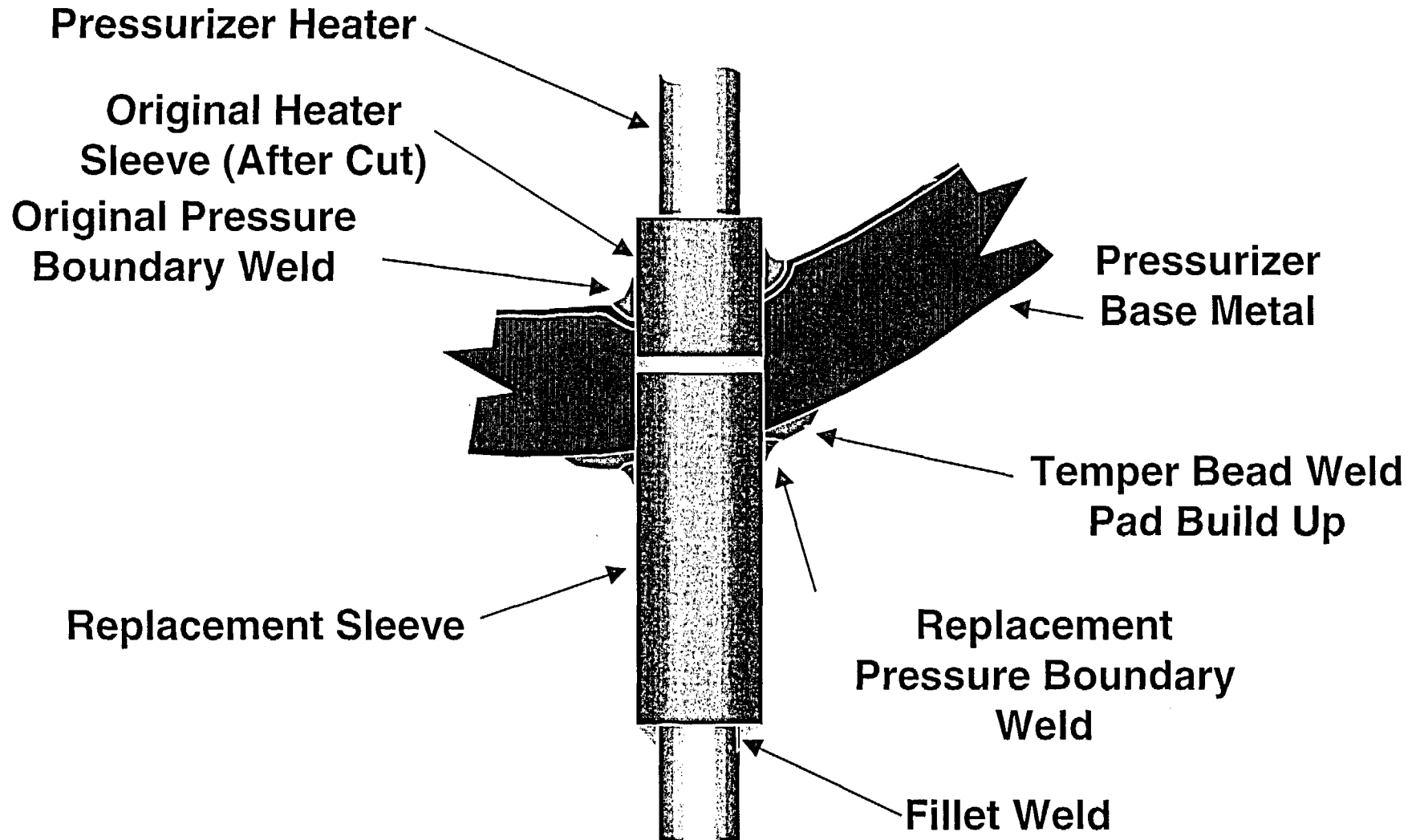


Pressurizer Heater Sleeves – SONGS History and Approach

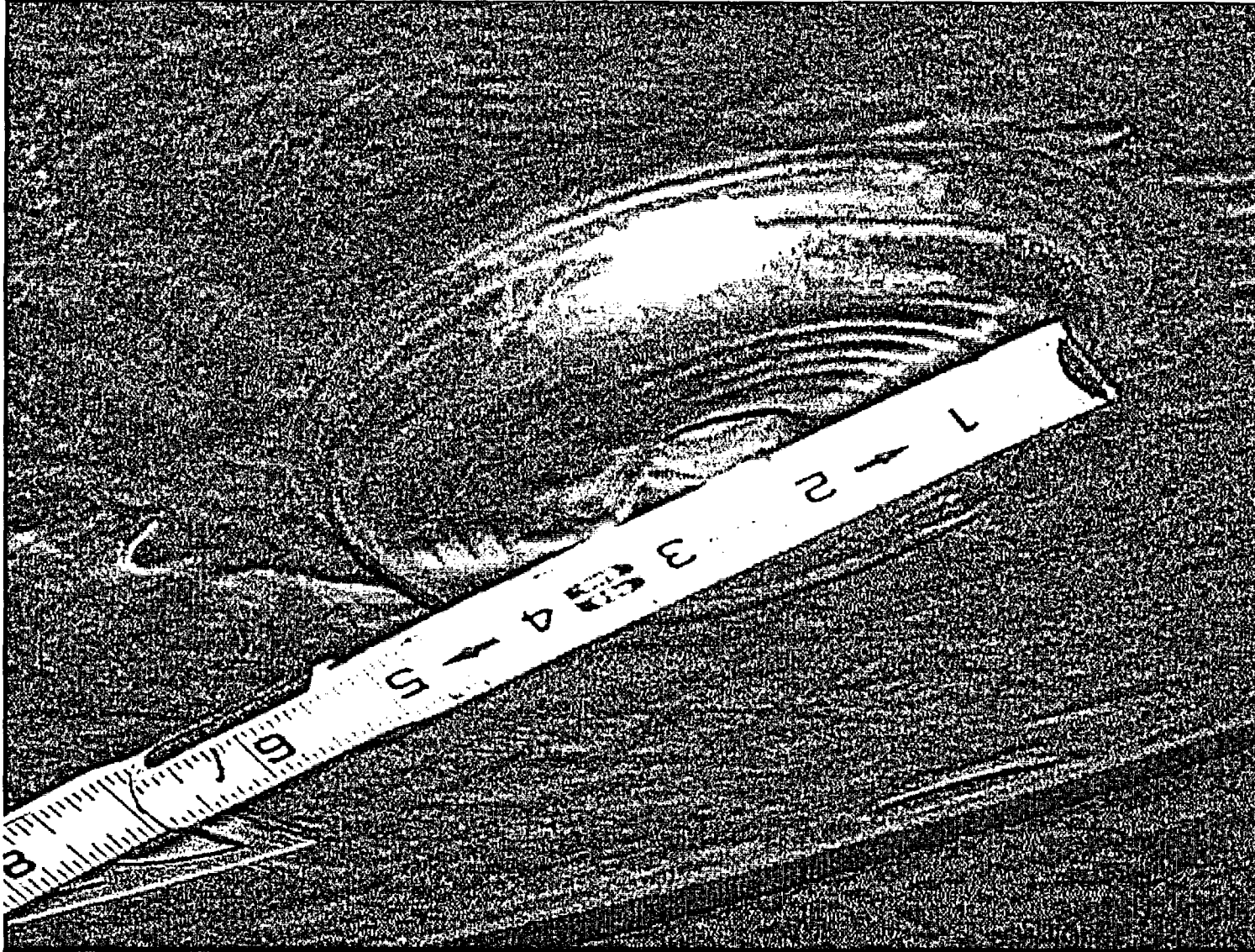
- Visual inspections have been performed at SONGS since 1993-
No leakage found on either Unit
- Impact of 2003 Palo Verde Inspection results
 - SONGS specific Operability Assessment issued in 2003
 - Pro-active repairs planned
 - SONGS agreement with NRC to opportunistically inspect Alloy 600 sleeves in locations where heaters have failed during plant operation
 - U2C13 – no heaters replaced - No inspections performed
 - U3C13 – 2 heaters replaced - Inspections performed and indications identified

As a result of these inspections, half-nozzle repairs were performed on the Unit 3 pressurizer nozzles in Cycle 13

Pressurizer Heater Sleeves – Half-Nozzle Repair

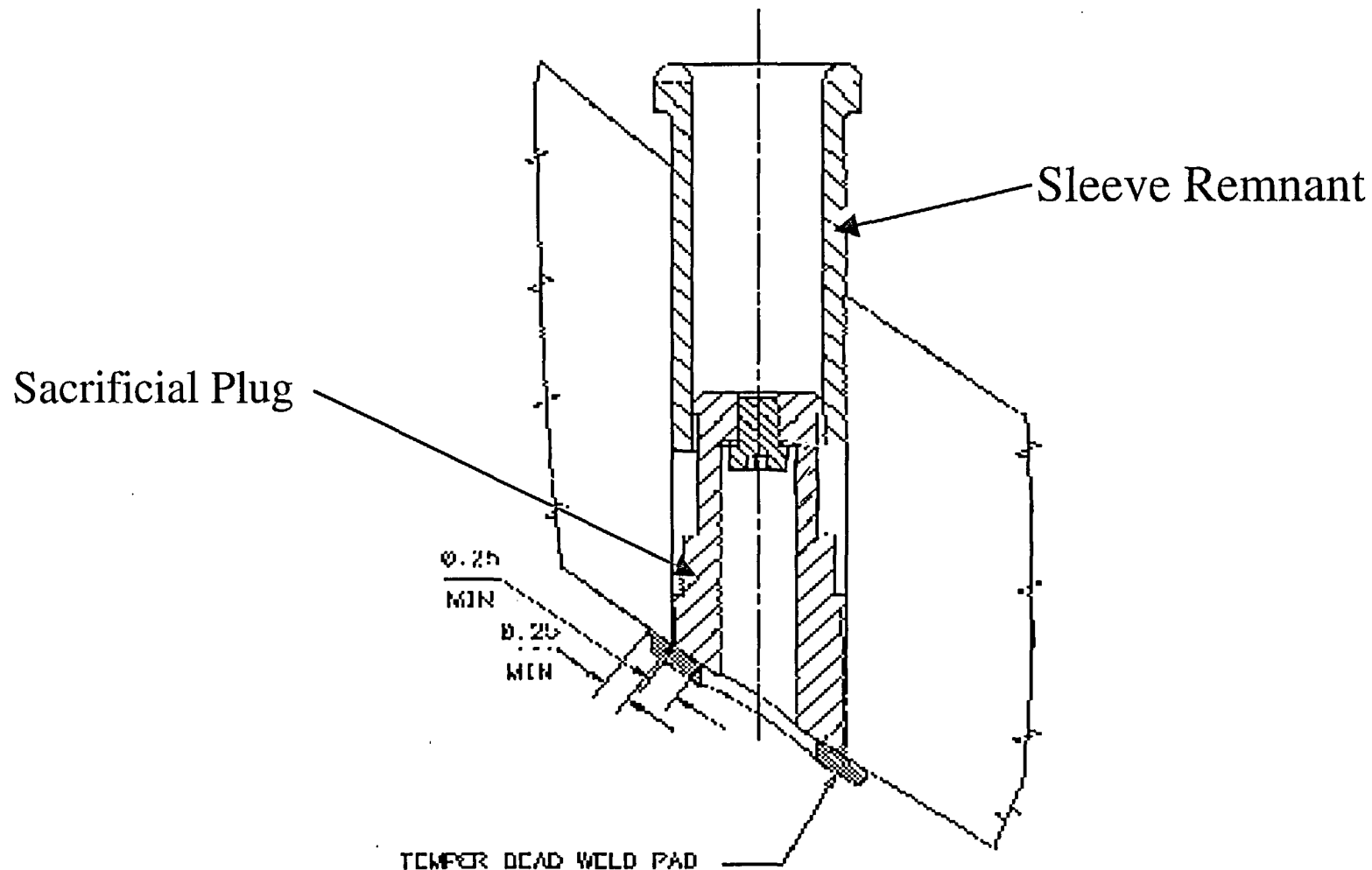


Pressurizer Heater Sleeves Half-Nozzle Repair Weld Pad



Pressurizer Heater Sleeves - Half-Nozzle Repair Weld Pad

Lessons Learned from Unit 3 Cycle 13 outage



Pressurizer Heater Sleeves – Cycle 14 Plans

- Unit 2

- Perform bare metal visual inspection of all heater sleeves
- NDE of any pressurizer heater sleeve that has indication of leakage
- Perform half nozzle repair on heater sleeves using lessons learned from Unit 3 sleeve replacement

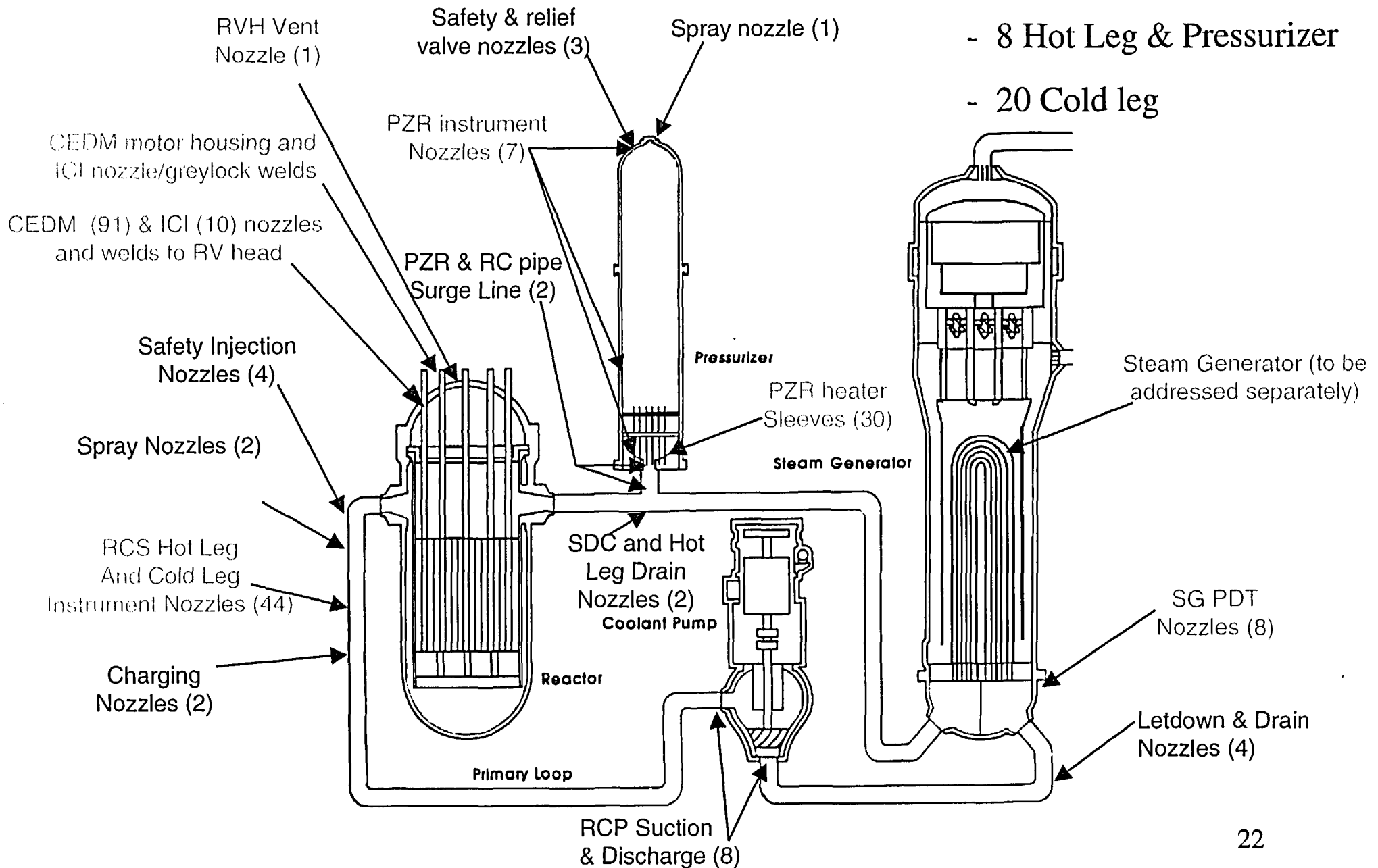
- Unit 3

- Perform visual inspection of all heater sleeves
- NDE of any pressurizer heater sleeve that has indication of leakage

RCS Butt Weld Alloy 600 Locations

28 RCS Butt welds per Unit

- 8 Hot Leg & Pressurizer
- 20 Cold leg



RCS Alloy 82/182 Butt Welds - Past Inspections

- RCS Alloy 82/182 butt welds covered by two previous In-Service-Inspection (ISI) intervals – no indications
- Unit 3 Cycle 12 PDI performed on the following nozzles – no indications
 - Pressurizer safety valve nozzles (3)
 - Pressurizer spray line nozzle (1)
 - Surge Line (hot leg)
- Visual Inspections
 - Unit 2 Cycle 13 -Pressurizer surge nozzles – no indications of leakage
 - Unit 3 Cycle 13 - 28 butt welds inspected – no indications of leakage

RCS Alloy 82/182 Butt Welds – Cycle 14 Planned inspections

- Unit 2

- Visual Inspections on 28 nozzles
- ISI program volumetric inspections (PDI) on five Alloy 82/182 butt welds:
 - Surge line (pressurizer end)
 - Surge line (hot leg end)
 - Hot Leg Drain
 - RCP Suction side weld (cold leg)
 - Safety Injection nozzle (cold leg)

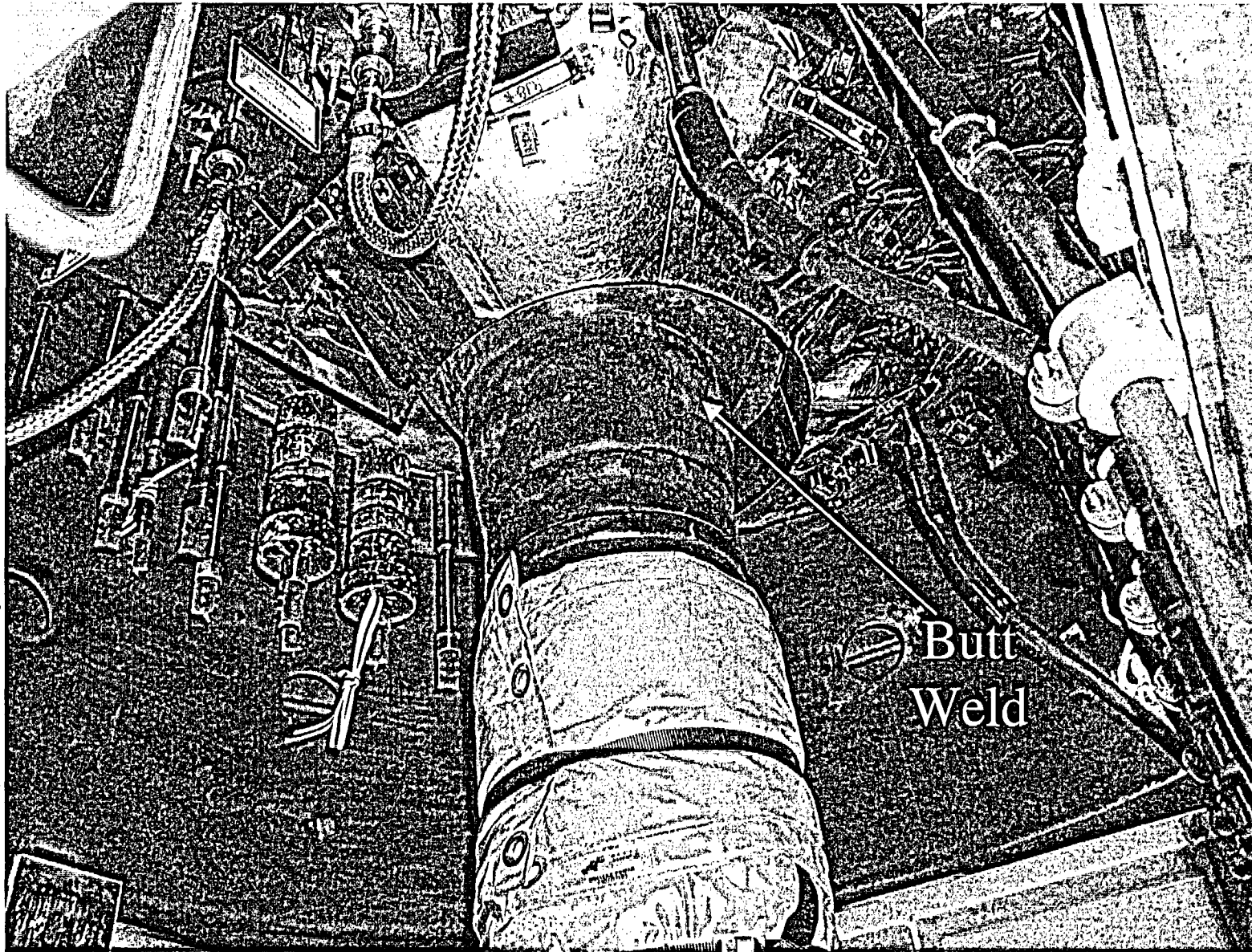
- Unit 3

- Visual Inspections on 28 nozzles
- ISI program volumetric inspections for Alloy 82/182 butt welds in review, expect similar scope to Unit 2 Cycle 14

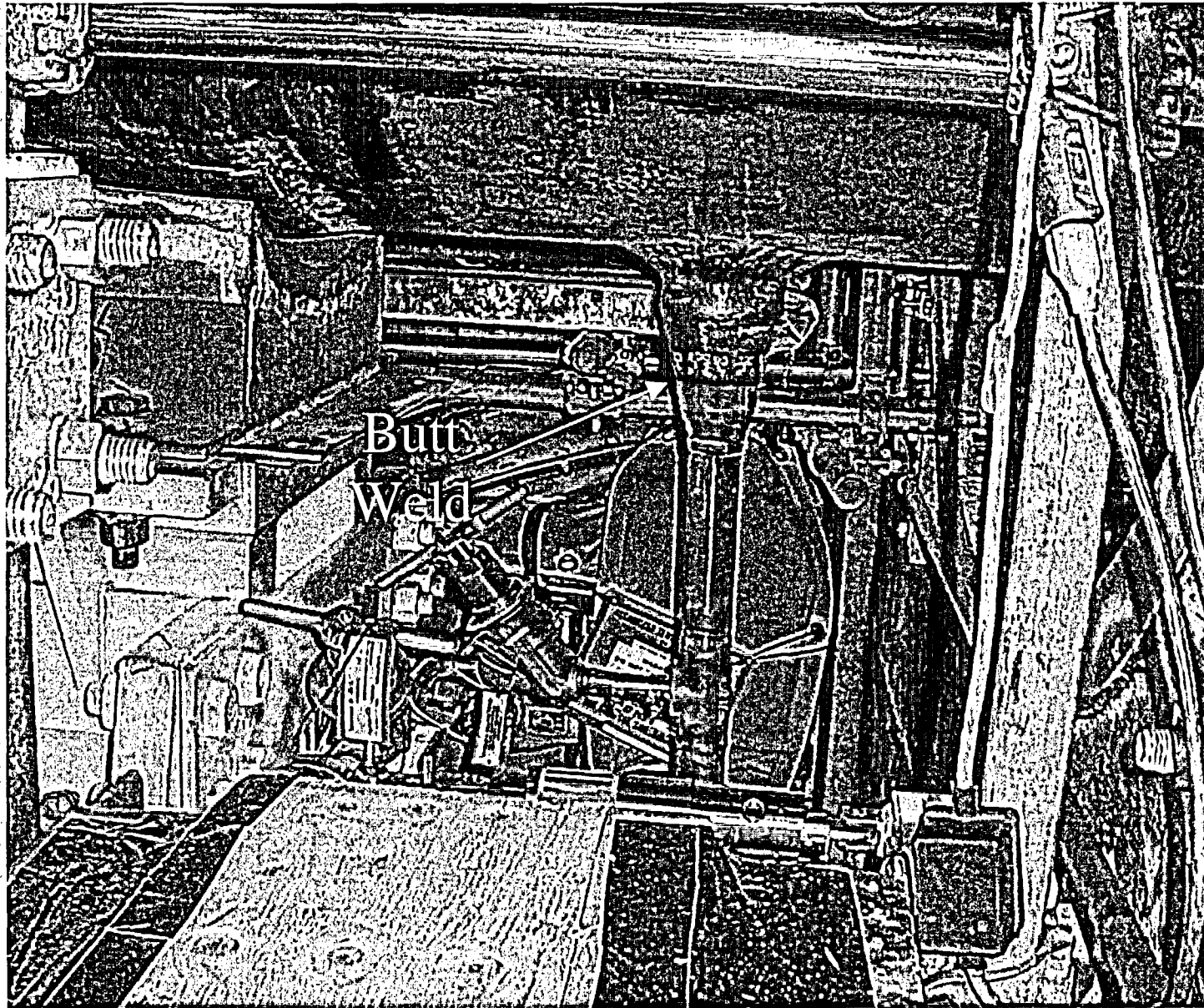
RCS Alloy 82/182 Butt Welds – Future Plans

- Visual inspections will continue to be performed
- Conform to industry inspection requirements
 - Adherence to EPRI MRP-139 'Primary System Piping Butt Welds Inspection & Evaluation Guideline' (when issued)
 - Additional NDE inspections
- Develop and implement proactive mitigation
 - Weld overlay
 - Contingency repair method for Cycle 14
 - Mechanical Stress Improvement Program (MSIP)

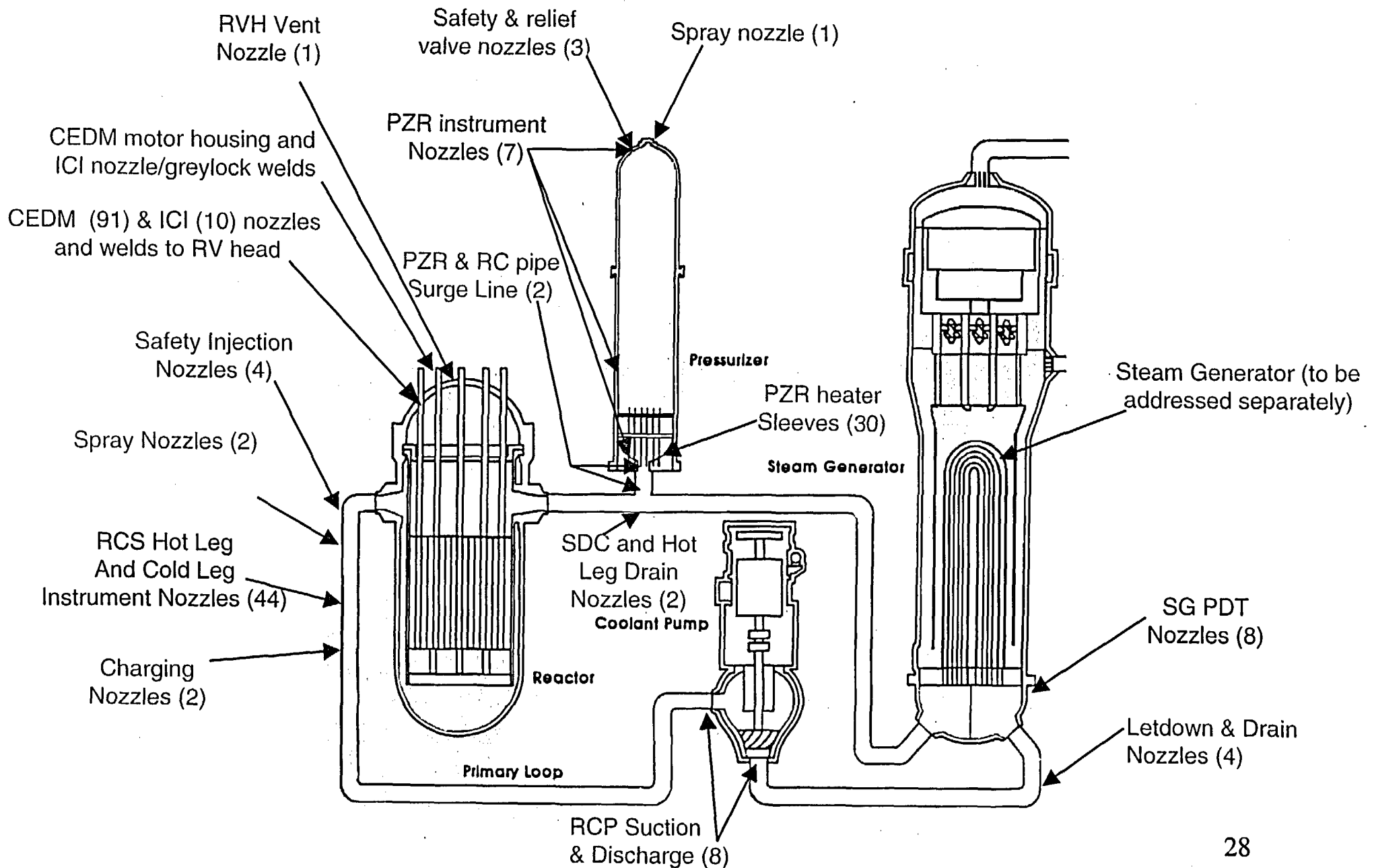
RCS Alloy 82/182 Butt Welds - Pressurizer Surge Line



RCS Alloy 82/182 Butt Welds - Hot Leg Drainline



RCS Instruments - Nickel Alloy Locations



SONGS RCS Instrument Nozzles- Mitigation Plans

Configuration	# of Nozzles	Cycle 14 Repair & Inspection Plan	Long Term Action
Nozzles previously converted to A690 (RCS & PZR)	U2: 49 U3: 48	Visual inspections	Continue visual inspections
S/G Cold leg primary side outlet plenum	U2: 8 U3: 8	<ul style="list-style-type: none"> •Visual inspections •Remove remaining MNSA clamps (2 on Unit 2) 	<ul style="list-style-type: none"> •To be replaced with Steam Generator replacement •Continue visual inspections
Pressurizer nozzles with MNSA clamps installed	U2: 2 U3: 3	<ul style="list-style-type: none"> •Visual inspections •Remove MNSA clamps •Replace w/ A690 	Continue visual inspections

Alloy 600 Cycle 14 Outage Plan Summary- Unit 2

- **Reactor Pressure Vessel Head**

- Reactor head inspection in accordance with NRC Order EA-03-009 and Relaxation Request #3

- **Pressurizer Heater Sleeves**

- Inspection in accordance with SCE response to NRC Bulletin 2004-01, NDE to be performed if leak identified
- Replace existing 30 pressurizer heater sleeves with Alloy 690 half nozzle

- **RCS 82/182 Butt Welds**

- Visual inspection of RCS Alloy 82/182 butt welds
- NDE inspections (5) in accordance with ISI program

- **RCS Instrumentation Nozzles**

- Remove 2 Steam Generator MNSAs
- Replace 2 Pressurizer MNSAs with Alloy 690 half nozzle repair

Alloy 600 Cycle 14 Outage Plan Summary -Unit 3

- **Reactor Pressure Vessel Head**

- Reactor head inspection in accordance with NRC Order EA-03-009 and Relaxation Request #3
- CEDM nozzle 56 repair

- **Pressurizer Heater Sleeves**

- Inspection in accordance with SCE response to NRC Bulletin 2004-01, NDE to be performed if leak identified (sleeve replacement complete)

- **RCS 82/182 Butt Welds**

- Visual inspection of Alloy 82/182 butt welds
- NDE inspections in accordance with ISI program

- **RCS Instrumentation Nozzles**

- Replace 3 Pressurizer MNSAs with Alloy 690 half nozzle repair

Summary

- Alloy 600 issues will be eliminated at SONGS by 2010 for:
 - Steam Generators
 - Reactor Vessel Head Nozzles
 - Pressurizer Heater Sleeves
 - Reactor coolant System Instrumentation Penetrations
- Action Plan for Alloy 82/182 Butt Welds will be started by 2010