Extremely Low Probability of Rupture (xLPR) Project

-- Inputs --

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Senior Materials Engineer
RES/DE/CIB

xLPR External Review Board Meeting
February 20, 2013

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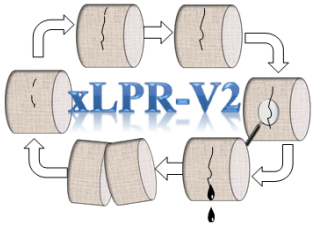

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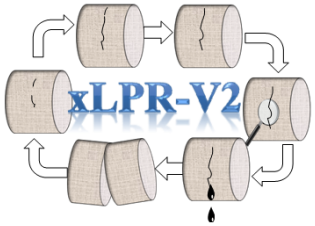
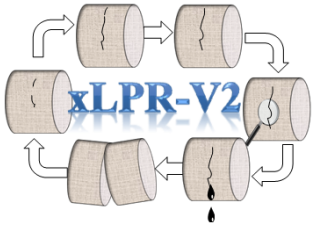
Selection of Weld locations



- **Two sample plants were selected for evaluation under the Version 2.0 Project**
  - **Westinghouse Sample Plant = 4-loop plant, Reactor Coolant Loop and branch lines > 6” nominal**
  - **B&W Sample Plant = Reactor Coolant System hot leg and cold leg piping**

- **Weld Selection Criteria:**
  - **The welds are limited to those from LBB piping systems**
  - **The welds are limited to those fabricated with material susceptible to PWSCC (i.e., nickel-based alloy welds)**
  - **The welds are limited to those from one of the two sample plants**

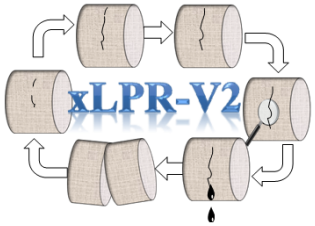
Selection of Weld locations (cont.)



- **Welds Selected from Westinghouse Plant (2):**
  - Hot-leg/RPV Nozzle Weld
  - SG Hot-leg Nozzle Weld to Hot-leg Elbow
  - Rationale for selection documented in "Westinghouse-plant-welds-FINAL.docx"
  - For picture, see Additional Info. Slides at end
- **Weld Selected from B&W Plant (1):**
  - Lower Cold Leg/Pump
  - Rationale for selection documented in "BW-plant-welds-FINAL.docx"
  - For picture, see Additional Info. Slides at end

Identification of Input Parameters

Inputs Spreadsheet



K-SOLUTION Module Inputs Used by xLPR Version 2.0

Reviewed by: *K-SOLUTION Subgroup Lead*

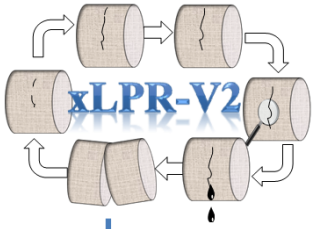
Source:

Last Revised: **Monday, January 28, 2013** *Mike Benson*

Input No.	Input Variable Name *(as used in Source Code)*	Framework Location and Name	Input Description	Module(s) Where Input is Used (SELECT FROM DROP-DOWN MENU)	Is This Input a User Input, or is it passed from another Module? (SELECT FROM DROP-DOWN MENU)	Input Engineering Units	Input Uncertainty Type (Aleatory or Epistemic) (SELECT FROM DROP-DOWN MENU)	Range of Validity for This Input	ADDED Who Will Collect This Input Variable?	Input Definitions	Default, Generic or Basecase Value
1	Ri	Pipe_Geometry Inside_Radius	Pipe inside radius. Used in both part through-wall crack subroutine and through-wall crack subroutine.	K-SOLUTION	User Input	m	Constant	2 ≤ Ri/t ≤ 20		*Value*	
2	t	Pipe_Geometry Pipe_Thickness	Pipe wall thickness. Used in both part through-wall crack subroutine and through-wall crack subroutine.	K-SOLUTION	User Input	m	Constant	2 ≤ Ri/t ≤ 20		*Value*	
3	a	State_variables Grow_depth	Crack depth. Used in part through-wall crack subroutine only.	K-SOLUTION	Calculated in the Crack Growth Module	m	Epistemic	0 < a/t ≤ 0.9 for part through-wall cracks		*Distribution Type* *Parameter 1* *Parameter 2* *Parameter 3* *Lower Trunc.* *Upper Trunc.* *Correlation?* *List of Correlations*	Defined in the Crack Growth Module
4	c		Half crack length. Used in both part through-wall crack subroutine and through-wall crack subroutine.	K-SOLUTION	Calculated in the Crack Growth Module	m	Epistemic	Unknown yet, but will have to be specified		*Distribution Type* *Parameter 1* *Parameter 2* *Parameter 3* *Lower Trunc.* *Upper Trunc.* *Correlation?* *List of Correlations*	Defined in the Crack Growth Module

Identification of Input Parameters

Attributes and Valid Ranges



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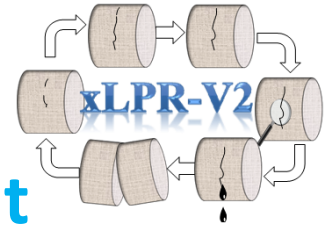
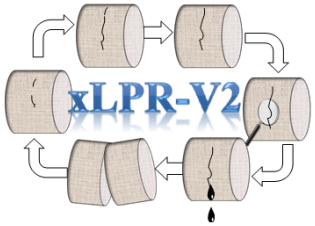
Identification of Input Parameters



Material Property Database Development

- xLPR "Inputs Library" will contain default material properties
- NRC has begun to assemble available data from PIPEFRAC database
- Using Uncertainty Spreadsheet Tool to establish uncertainties
- Requested additional available data from EMC^2
- Requested additional available data from Japan
- Progress on-going

Identification of Input Parameters

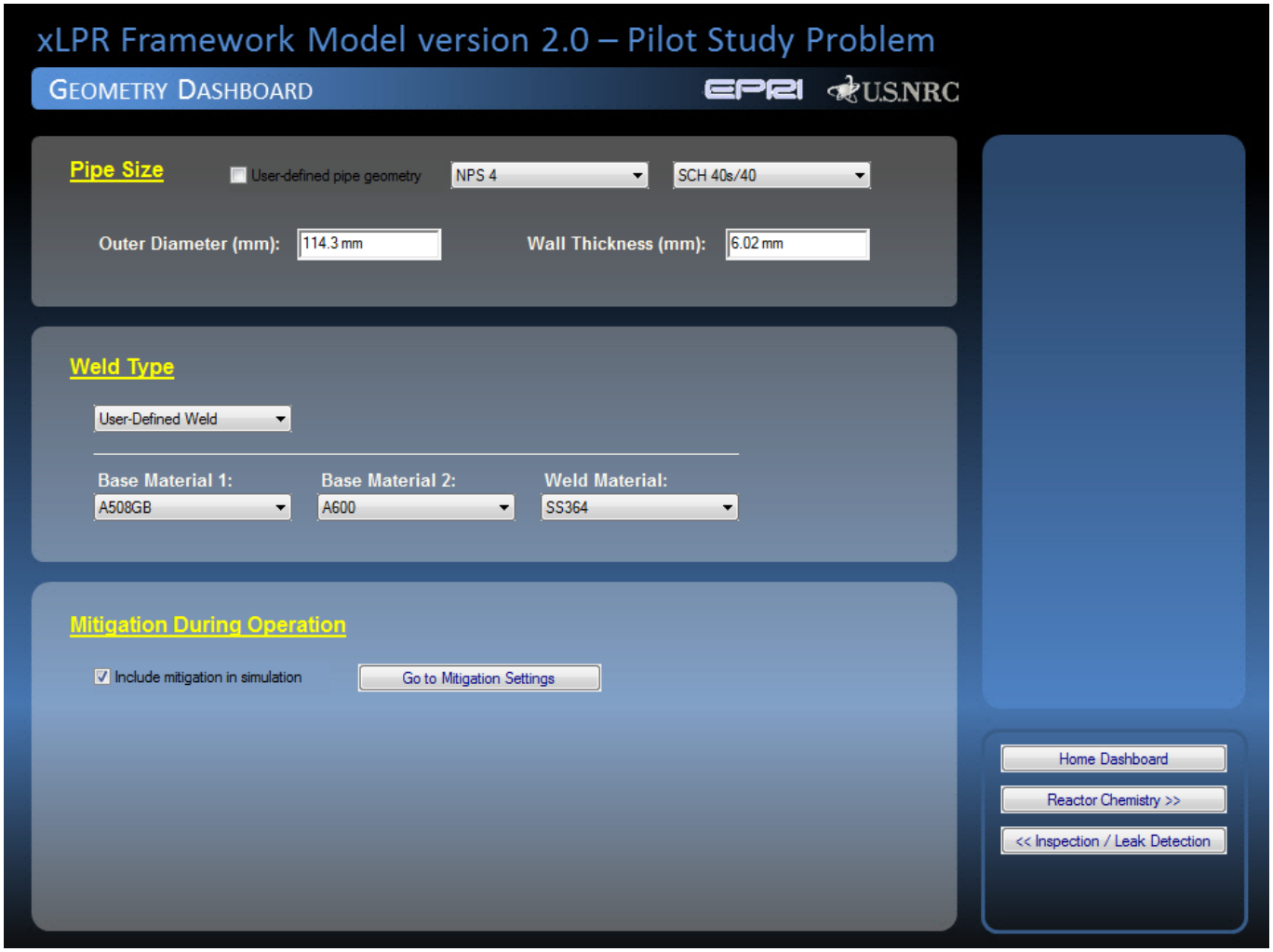


Collection of Input Values

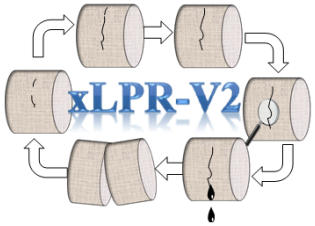
- **Plant Inputs:**
  - **So far, this has been limited to weld details (fab. records, etc.)**
  - **Other inputs from the plant not envisioned at this time**
- **Vendor Data:**
  - **Westinghouse and Areva are providing weld geometry and design details**
    - See "Westinghouse 4-Loop RPV Inlet-Outlet Nozzle Inputs (MCOE-LTR-12-63).pdf"
    - Areva Letter available
  - **Other Vendor Data TBD**

Identification of Input Parameters

Input GUI (by GOLDSIM)

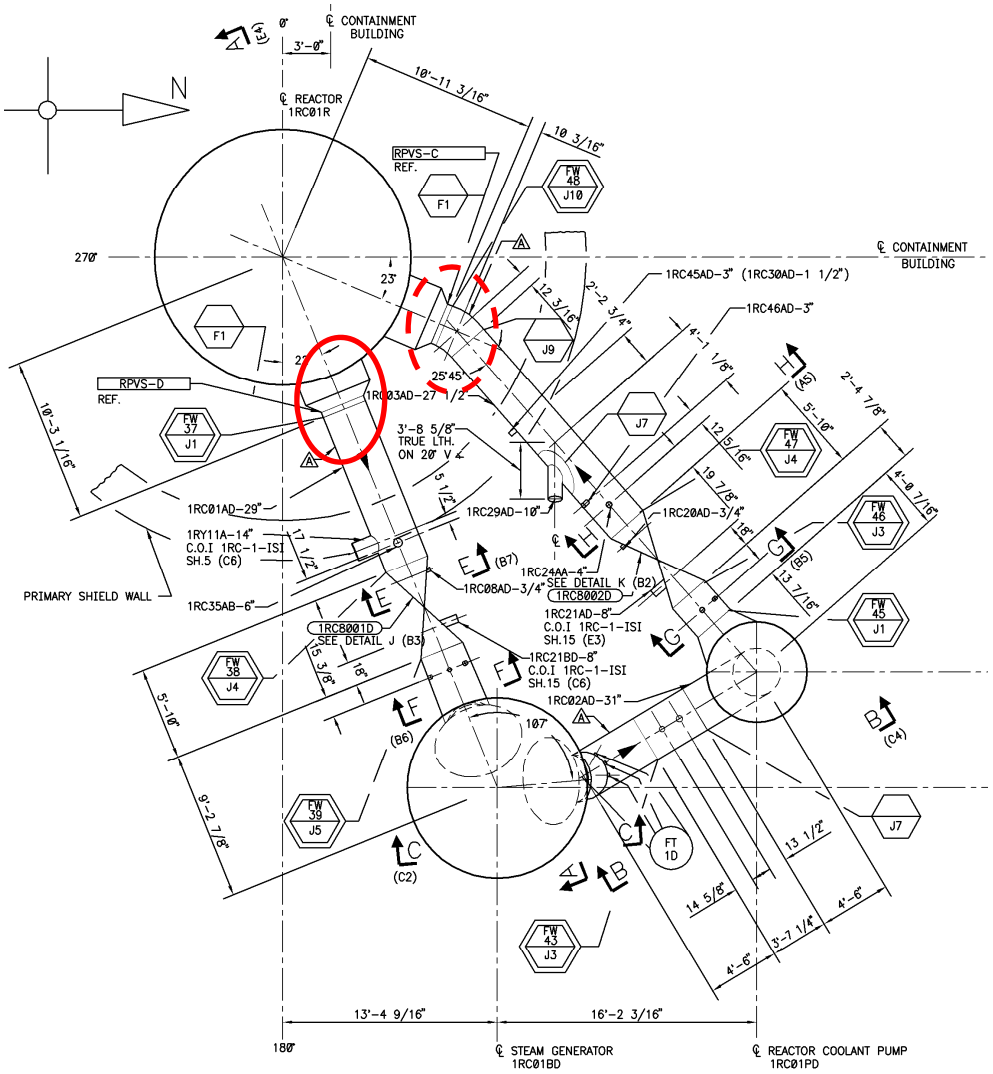


Additional Info. Slides



3 slides attached

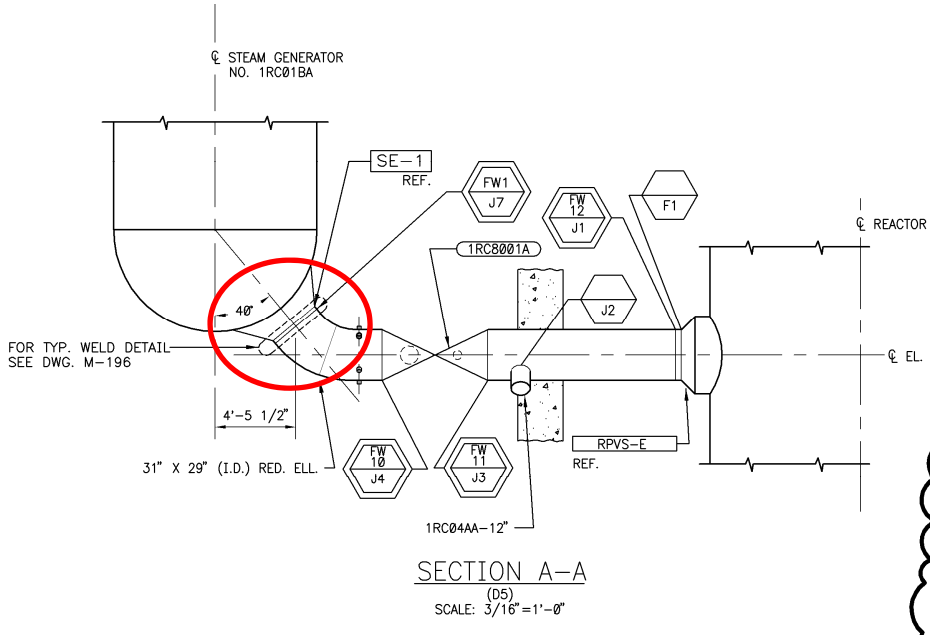
Westinghouse Plant Weld #1



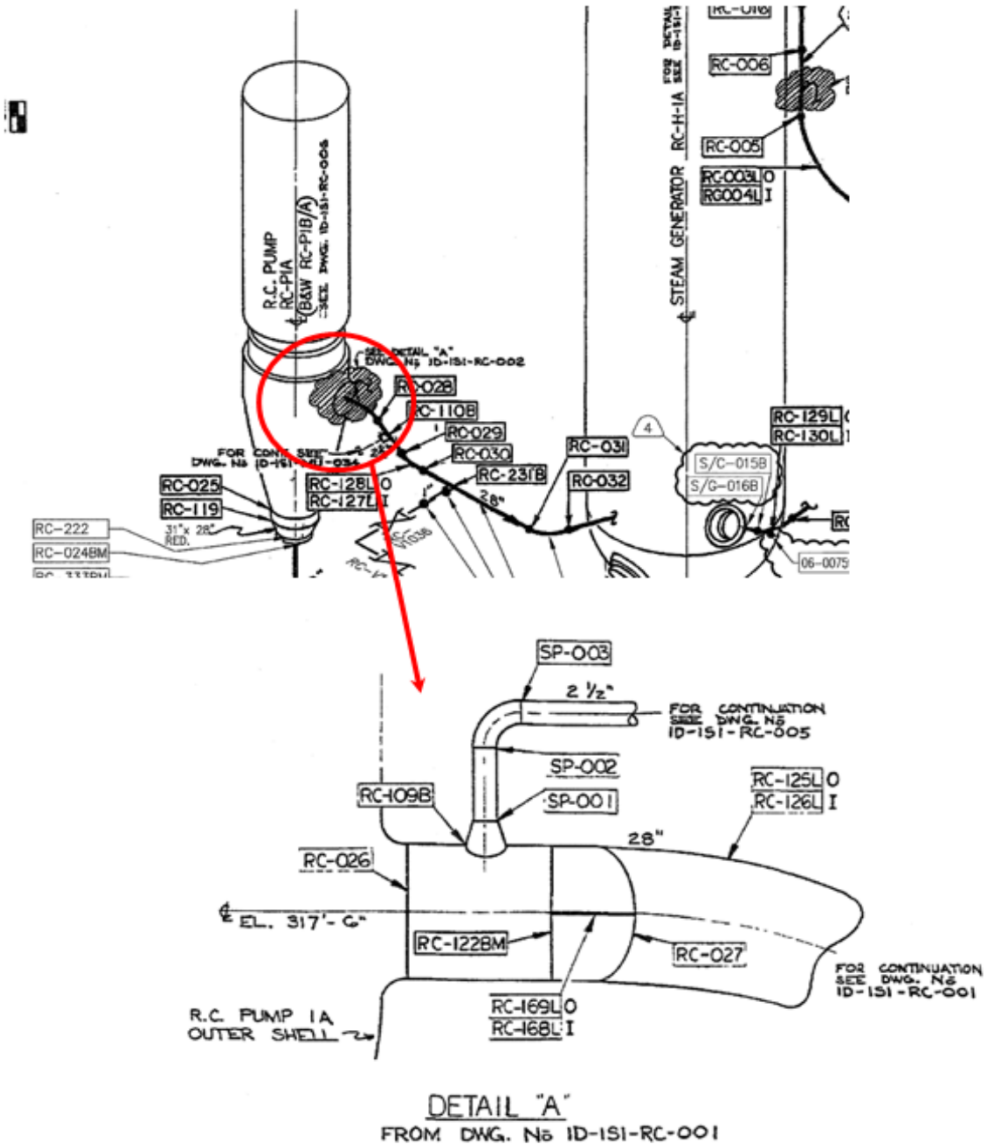
Westinghouse Plant Weld #2

Site Identification Code U from Draft NUREG-1903

Hot-leg to SG elbow to pump



B&W Plant Weld



DETAIL "A"
FROM DWG. NO ID-151-RC-001