

Task 2 Progress Overview

Wade Marcum

Oregon State University
School of Nuclear Science and Engineering

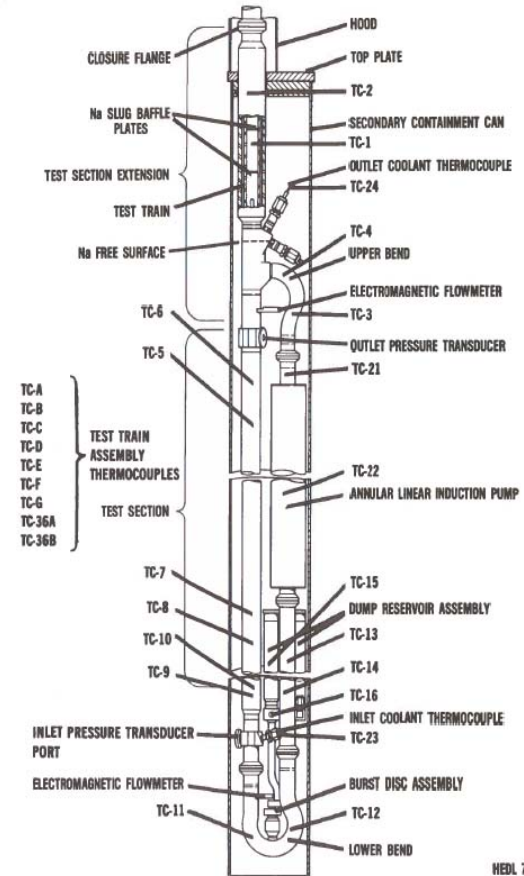
Project Task Outline

- Task 2.1 Status

Task ID [#]	Task Name	Year 1				Year 2				Year 3				Proposal Percent Complete	Actual Percent Complete
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4		
2	Loop Thermal-Hydraulics														
2.1	Sodium Loop														
2.1.1	Survey literature of existing sodium test data	█												100%	100%
2.1.2	Select two candidate problems	█												100%	100%
2.1.3	Organize and document data for two candidate problems	█	=											100%	90%
2.1.4	Identify and review industry needs for sodium loop data		█	█										100%	100%
2.1.5	Down-select to one problem for benchmark evaluation			+										100%	100%
2.1.6	Preliminary modeling with industry tool Star CCM+			█	█	█	█							50%	5%
2.1.7	Preliminary modeling with NEAMS code Nek5000			█	█	█	█							50%	10%
2.1.8	Comparison of experimental data & model results for problem					█	█	+						5%	0%
2.1.9	Benchmark level evaluation of problem						█	█	█	█				0%	0%
2.1.10	Evaluation of uncertainties in selected problem								█	█				0%	0%
2.1.11	Submission of benchmark for peer review										█	=		0%	0%

Problem Specification Report – HOP 1-6A

- Introduction
 - Complete
 - Discusses the Entire IRP project and the purpose of Task 2.1
- Test Case Evaluation and Identification
 - Complete
 - Methodology of down-selection to a single candidate problem



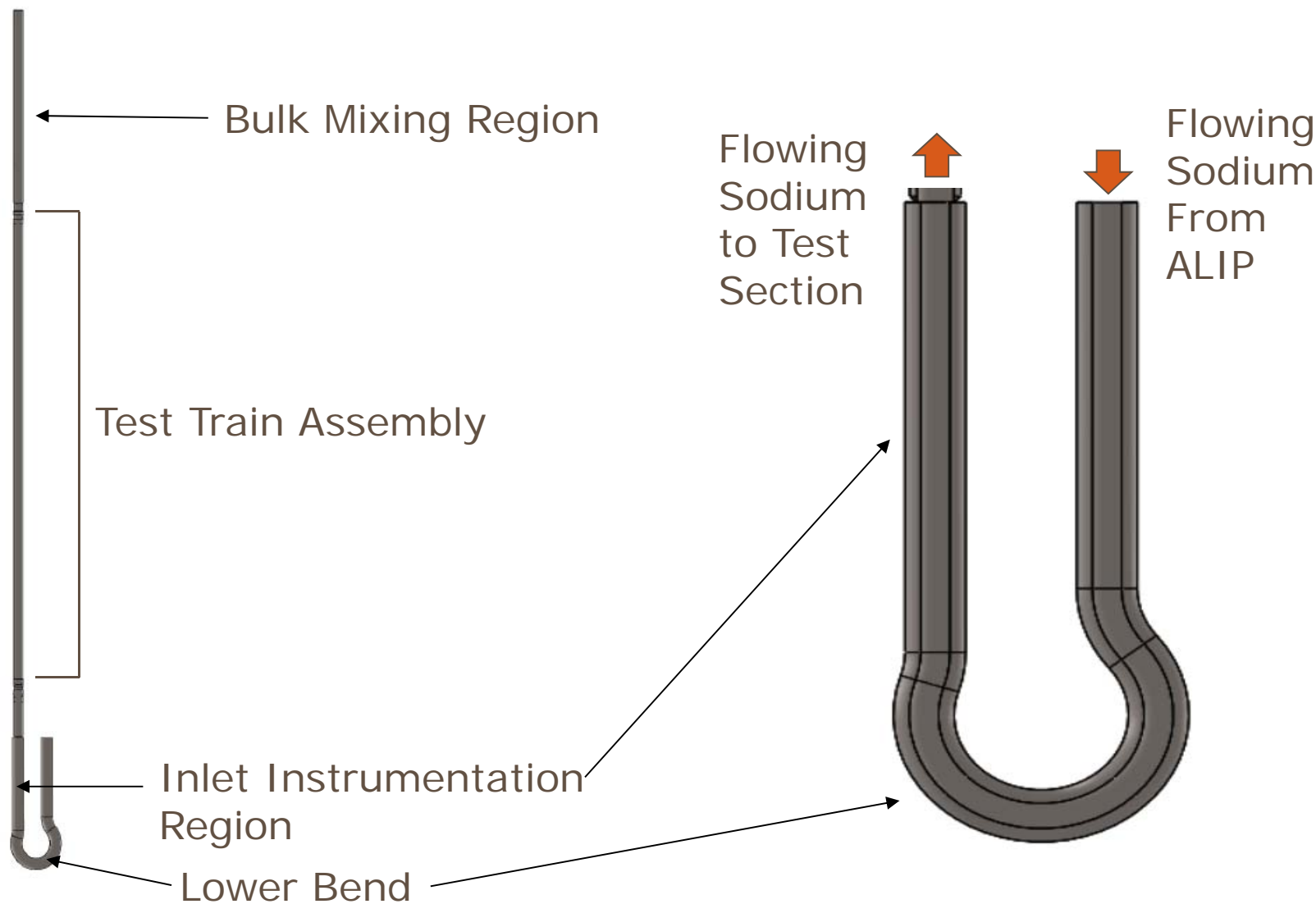
Problem Specification Report – HOP 1-6A

- Facility Geometry Data
 - Nearing Completion – Awaiting Final Reference Drawings
 - Detailed description of test section geometry with corresponding references to engineering drawings
- Material Data
 - Complete
 - Description of the material composition of the fuel and experimental apparatus
- Facility Instrumentation Plan
 - Complete
 - Locations of thermocouples, flow meters, and pressure transducers are provided

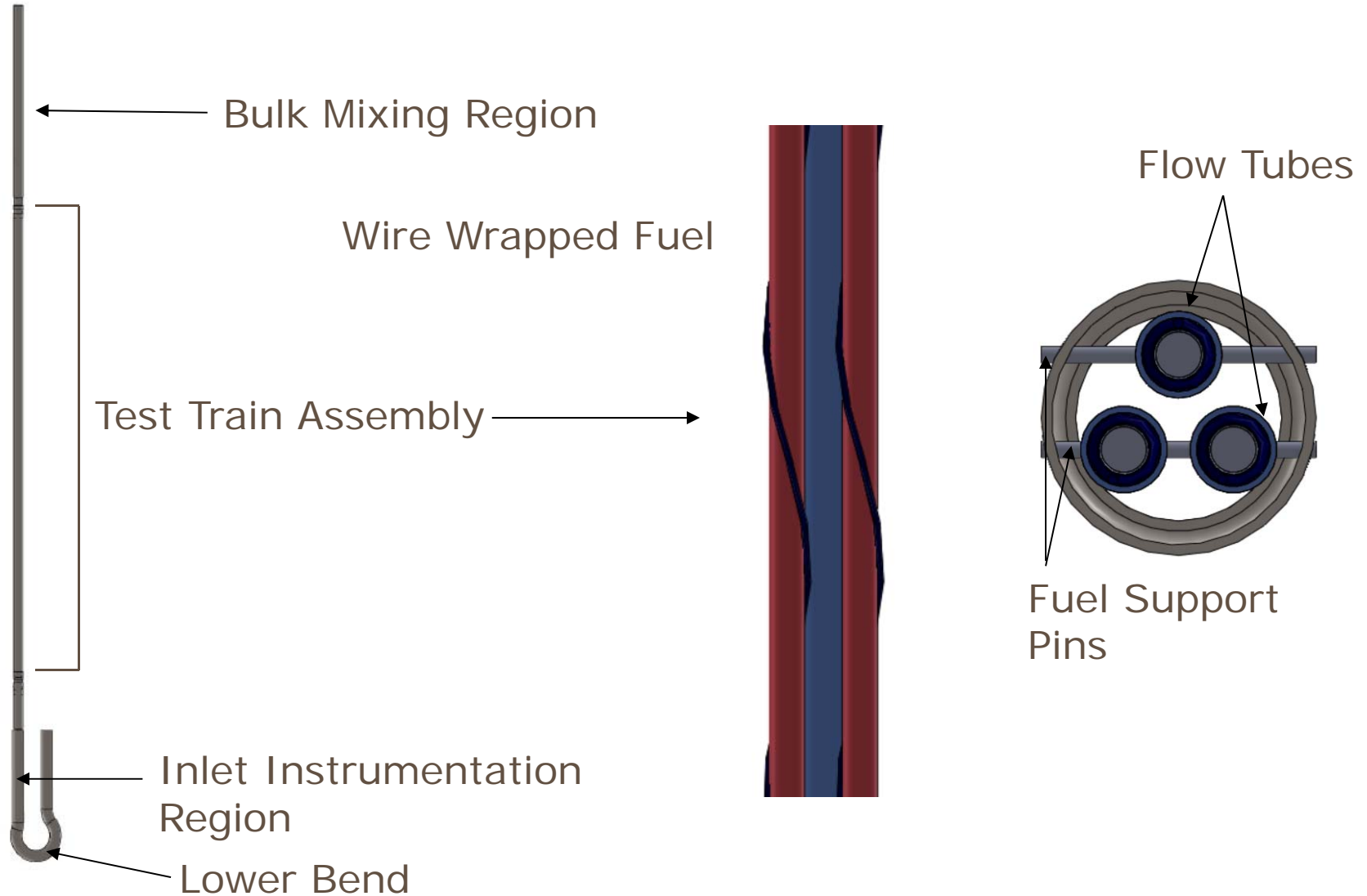
Problem Specification Report – HOP 1-6A

- Initial and Boundary Conditions
 - Complete
 - Expected flow rate, temperature, and pressure of sodium flowing in lower bend provided
 - Adiabatic conditions in fueled region provide little heat transfer out/in the test loop
- Parameters of Interest
 - Complete
 - Pressure across the flow tubes, temperature profiles, and sodium flow rates are of key importance
- Specified Format for Submittal
 - Near Complete
 - Participants will provide a data file of the agreed upon format for differences to be compared.

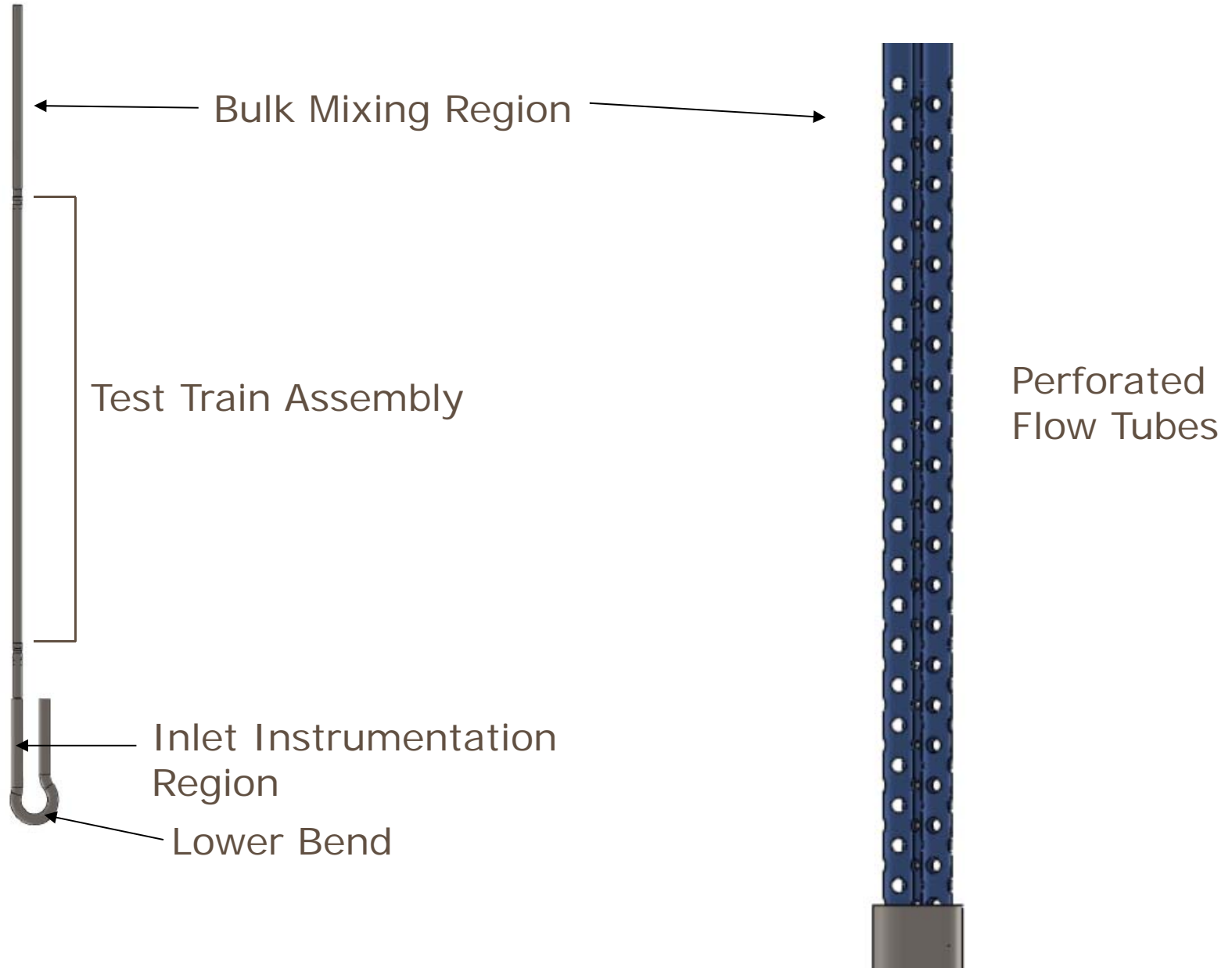
HOP 1-6A Solidworks Model – Lower Bend



HOP 1-6A Solidworks Model – Test Section

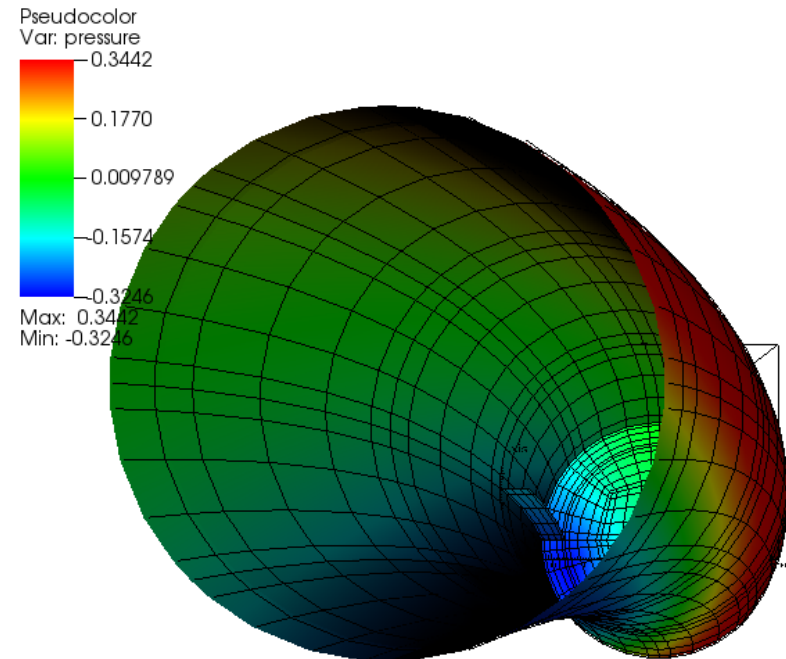


HOP 1-6A Solidworks Model – Bulk Mixing Region



Nek5000 Preliminary Modeling

- Still in the training phase
- With a complete solid model, CFD modeling will move quickly
 - Geometry created from the solid model
- VisIt will be used for post processing
- Comparisons to data will be provided in Final Summary Report upon completion



Summary of Task 2.1

- Solid model development more challenging than expected
 - Long lead time on drawing availability as well as challenges interpreting these drawings
- Preliminary training in Nek5000 promising, however still a lot of work to do once solid model is complete
- Problem Specification Report nearly prepared for initial release

Project Task Outline

- Task 2.2 Status

Task ID [#]	Task Name	Year 1				Year 2				Year 3				Proposal Percent Complete	Actual Percent Complete
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4		
2	Loop Thermal-Hydraulics														
2.2	Water Loop														
2.2.1	Identify and review industry needs for water loop	■												100%	100%
2.2.2	Develop loop technical and functional requirements	■	■											100%	100%
2.2.3	Loop design		■	+										100%	95%
2.2.4	Loop fabrication				■	■								50%	25%
2.2.5	Loop shakedown					■	■							5%	0%
2.2.6	Define flow loop 'operations tests' and 'benchmark tests'					■	+							5%	5%
2.2.7	Operations test conduct						■	■	■					0%	0%
2.2.8	Synthesis of operations tests data							■	■					0%	0%
2.2.9	Benchmark test conduct								■	■				0%	0%
2.2.10	Synthesis of benchmark test data									■	■			0%	0%
2.2.11	Modeling of benchmark test with U.S. NRC code TRACE					■	■	■	■					3%	10%
2.2.12	Modeling of benchmark test with RELAP5-3D					■	■	■	■					3%	10%
2.2.13	Comparison of experimental data & model results for problem										■			0%	0%
2.2.14	Benchmark level evaluation of problem										■			0%	0%
2.2.15	Evaluation of uncertainties in selected problem										■	■		0%	0%
2.2.16	Submission of benchmark for peer review											■	=	0%	0%

Task 2.2.1 – Identify and Review Industry Needs

- Operating Range of TRTL
 - Top-down approach with bounding TH attributes

Ops Conditions	TWERL	TRTL
System Pressure [psig]	2300	3000
Steady Fluid Temp [F]	atm – 575	atm – 625
Flow Rate [gpm]	~1 – 25	~1 – 45
Power Transient – FWHM [msec]	~60 – ∞	~10 – ∞

hypothesized 

Task 2.2.2 – Develop Loop T&F Requirements

- OSU NSE has compliant ASME NQA-1 Program
 - Program expanded to include TRTL
- Configuration management plan
 - Driving organization of all internal technical reports, procurement specifications, etc.

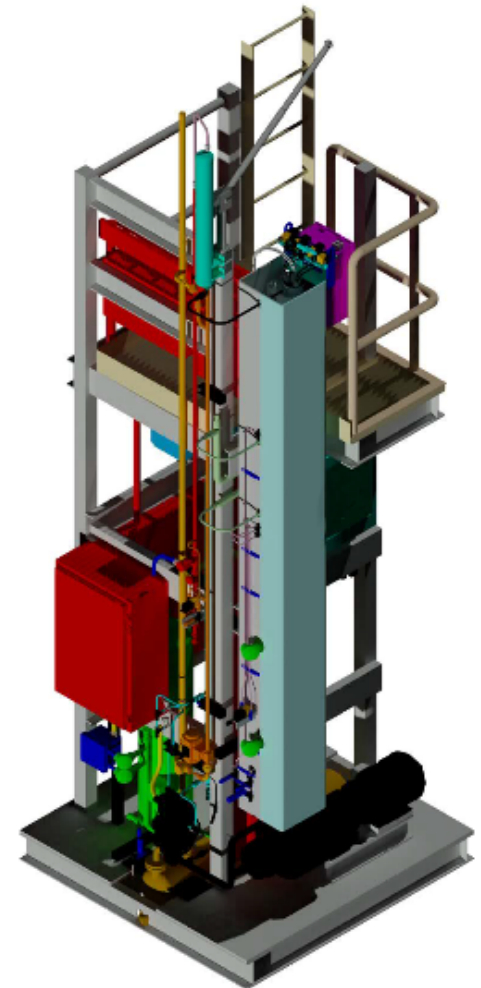
All work is a derivative of Technical and Functional Requirements Report



Drove the necessity of electrical utility upgrade in the high-bay building to meet TRTL power requirements

Task 2.2.3 – Loop Design

- All design aspects complete less DAS
 - Selection of DAS modules ongoing concurrently with development of control software.
- Recent change in secondary side coolant from water to Paratherm-HR ($T_{\text{sat}} 638 \text{ F @ } 1 \text{ atm}$)
- Finalized selection of 'blow-down valve' for LOCA-based transients

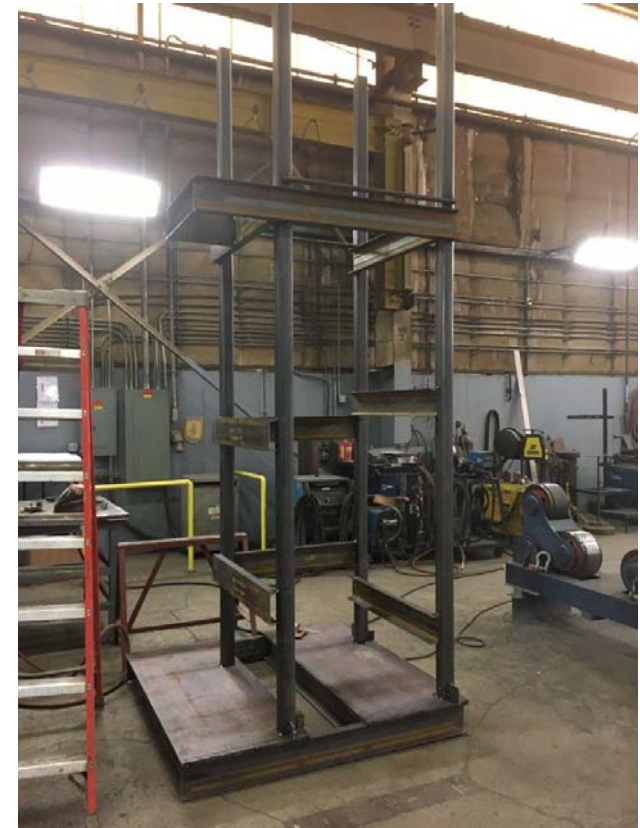


Task 2.2.4 – Loop Fabrication

- All hardware procured
- All instruments procured
- Primary structure fabricated
- Primary loop, presently being welded
- Building utilities being upgraded
- Software under development

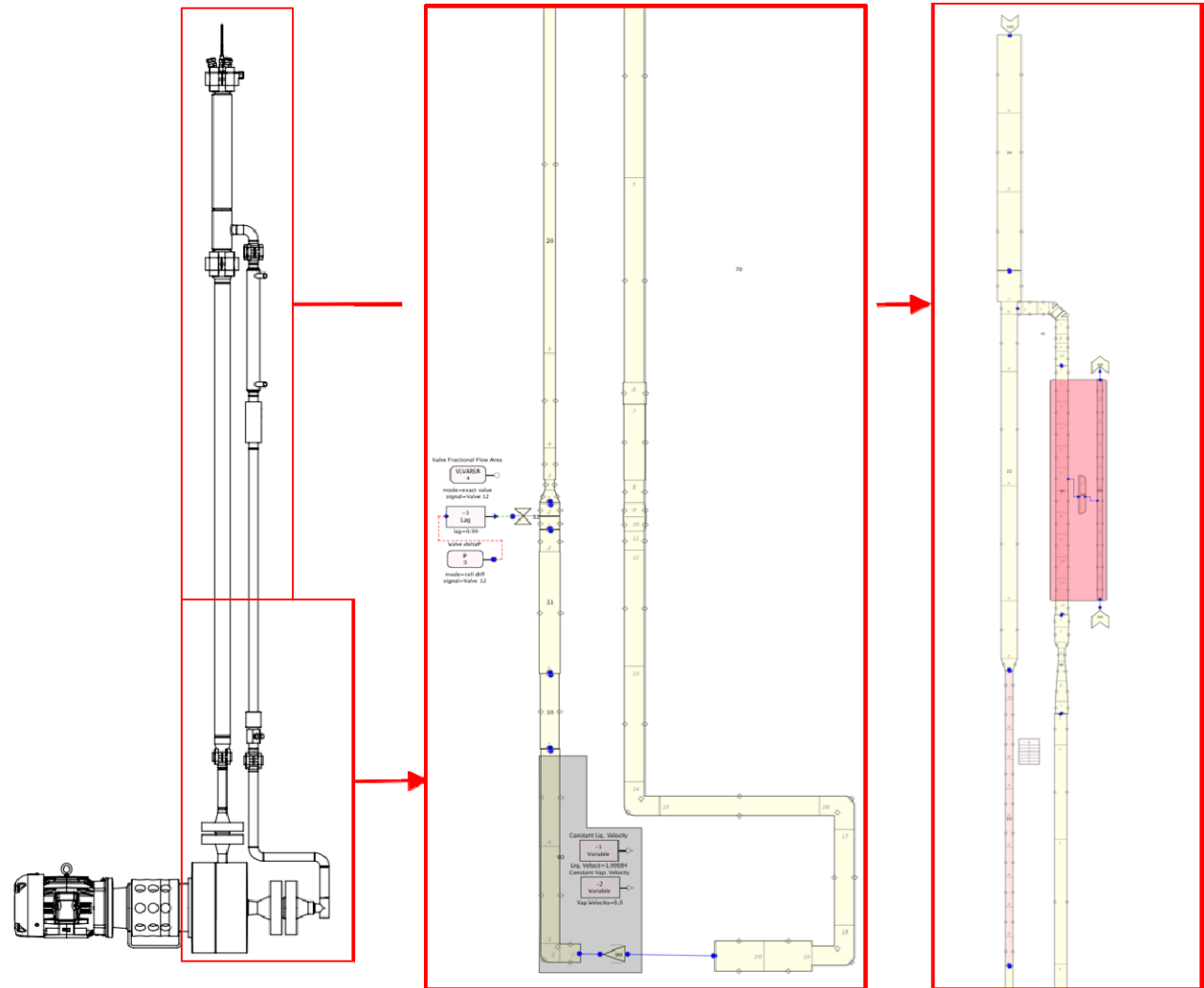


All activities conducted under QAP



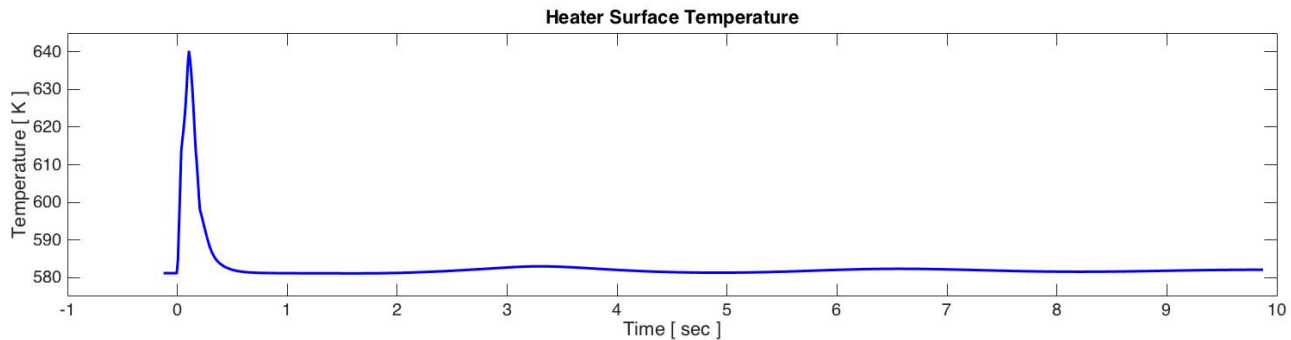
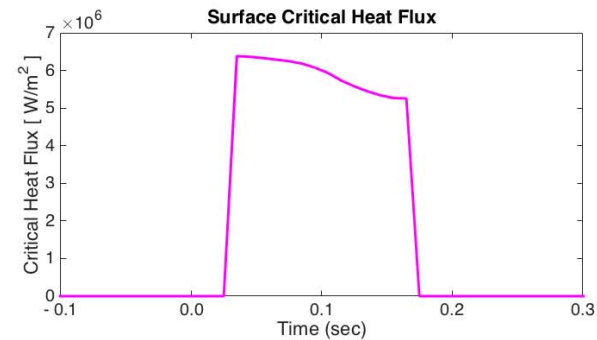
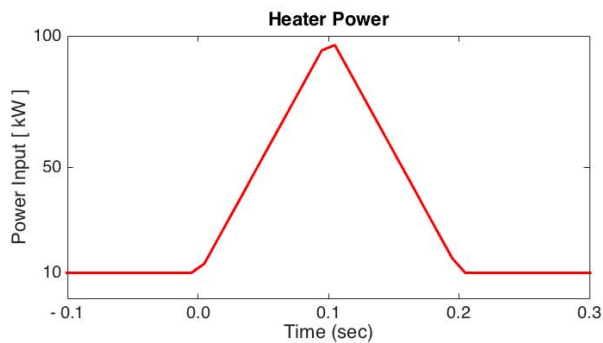
Task 2.2.11 – Modeling with TRACE

- Preliminary TRACE Model of TRTL Complete



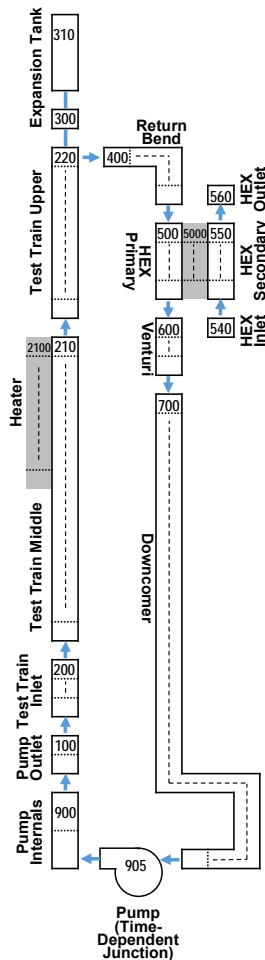
Task 2.2.11 – Modeling with TRACE

- Initial Results



Task 2.2.12 – Modeling with RELAP5-3D

- Initial Results



	Unheated SS		10 kW SS	
	TRACE	RELAP5	TRACE	RELAP5
Valve ΔP [psi]	5.564	1.43	7.374	0.892
Pump ΔP [psi]	8.621	13.6	16.505	8.99
Test Section Velocity [m/s]	2.568	5.00	5.043	5.04
Test Section ΔT [K]	0.00	N/A	2.76	3.06
Test Section T_{out} [K]	430.113	294	573.870	576

Project Task Outline

- Task 2.2 – Progress when we meet next

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Behind on operational tests ... all else on track

Thank You