Enclosure 1 Contains Proprietary Information.
Withhold from Public Disclosure Under 10 CFR 2.390(a)(4).

Shane Jurek
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PSEG | NUCLEAR

10 CFR 2.390
10 CFR 50.90

LR-N25-0076

September 9, 2025

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Salem Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket Nos. 50-272 and 50-311

Subject: **Pre-Submittal Meeting Slides for License Amendment Request to Add Data Validation and Reconciliation (DVR) Methodology to Existing Measurement Uncertainty Recapture Power Uprate**

References:

1. Letter from EPRI to NRC, “Use of Data Validation and Reconciliation Methods for Measurement Uncertainty Recapture”, TR 3002018337, dated November 2020 (ADAMS Accession Nos. ML21053A031 (Proprietary Version, Non-Publicly Available) and ML21053A030 (Nonproprietary Version, Publicly Available))

2. Letter from NRC to PSEG, “Salem Nuclear Generating Station, Unit Nos. 1 and 2, Issuance of Amendment Re: Increase Licensed Power Levels from 3,411 MWt to 3,459 MWt (TAC Nos MB05221 and MB0522)”, dated May 25, 2001 (ADAMS Accession No. ML011350051)

In accordance with the provisions of 10 CFR 50.90, PSEG Nuclear LLC (PSEG) is planning a license amendment request (LAR) for Salem Generating Station Unit 1 and Unit 2. The purpose of this LAR will be to add the recently approved Data Validation and Reconciliation (DVR) methodology using EPRI Topical Report 3002018337, “Use of Data Validation and Reconciliation Methods for Measurement Uncertainty Recapture”, Reference 1, to the methodology for the existing Measurement Uncertainty Recapture (MUR) power uprate. In Reference 2, the NRC approved a 1.4% MUR uprate for Salem Units 1 and 2 that changed rated thermal power from 3,411 megawatts thermal (MWt) to 3,459 MWt. This previous request was based on the installation of the CE Nuclear Power LLC Crossflow ultrasonic flow measurement system with its ability to achieve increased accuracy in measuring steam generator feedwater flow. The proposed change is a methodology change and will not request a change in power.

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Withhold from Public Disclosure Under 10 CFR 2.390(a)(4).

PSEG has requested a pre-submittal meeting scheduled for September 23, 2025. To support this meeting, PSEG is providing as enclosures to this letter, its presentation for this meeting.

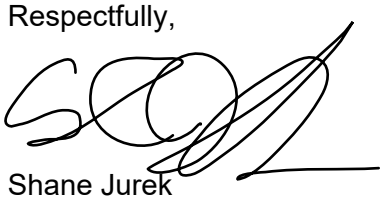
Enclosure 1 provides the proprietary presentation material for the meeting. Enclosure 3 provides a non-proprietary redacted version of the presentation material for the meeting. Enclosure 2 provides an affidavit related to the proprietary material in Enclosure 1.

Enclosure 1 contains proprietary information as defined by 10 CFR 2.390. GSE Performance Solutions LLC (GSE), as the owner of the proprietary information, has executed the Enclosure 2 affidavit identifying that the proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. GSE requests that the proprietary information in Enclosure 1 be withheld from public disclosure, in accordance with the requirements of 10 CFR 2.390 (a)(4), “Public inspections, exemptions, requests for withholding”.

This letter contains no new regulatory commitments.

Should you have questions concerning this submittal, please contact Peter Gohdes at Peter.Gohdes@pseg.com.

Respectfully,



Shane Jurek
Regulatory Programs Manager – Licensing
PSEG Nuclear

Enclosure 1: Pre-Submittal Meeting Slides (Proprietary)

Enclosure 2: Affidavit Supporting Withholding Proprietary Information from Public Disclosure

Enclosure 3: Pre-Submittal Meeting Slides (Non-Proprietary)

cc: Administrator, Region I, NRC
NRC Project Manager, Salem
NRC Senior Resident Inspector, Salem
Manager, NJBNE
PSEG Commitment Tracking Coordinator

LR-N25-0076

Enclosure 2

Affidavit Supporting Withholding Proprietary Information from Public Disclosure

GSE Solutions
September 8th, 2025

AFFIDAVIT

1. My name is Greg Kanuckel. I am the Manager of Thermal Performance at GSE Performance Solutions LLC (hereafter referred to as “GSE”) and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by GSE to determine whether certain GSE information is proprietary. I am familiar with the policies established by GSE to ensure the proper application of these criteria.

3. I am familiar with the GSE information contained in the presentation package submitted as Enclosure 1 to PSEG letter LR-N25-0076 for the PSEG Salem DVR for MUR Pre-Submittal Meeting and referred to herein as "Document." Information contained in this Document has been classified by GSE as proprietary in accordance with the policies established by GSE for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by GSE and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure . The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by GSE to determine whether information should be classified as proprietary:

(a) The information reveals details of GSE's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for GSE.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for GSE in product optimization or marketability.

(e) The information is vital to a competitive advantage held by GSE, would be helpful to competitors to GSE, and would likely cause substantial harm to the competitive position of GSE.

The information in this Document is considered proprietary for the reasons set forth in paragraphs 6(d) and 6(e) above.

7. In accordance with GSE's policies governing the protection and control of information, proprietary information contained in this Document has been made available, on a limited basis, to others outside GSE only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. GSE policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9 . The foregoing statements are true and correct to the best of my knowledge, information, and belief.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: September 8th, 2025

Digitally signed by Greg Kanuckel
Date: 2025.09.08 14:09:20 -05'00'

Greg Kanuckel
Manager of Thermal Performance
GSE Solutions

Enclosure 3

Pre-Submittal Meeting Slides (Non-Proprietary)

PSEG | NUCLEAR

Salem Generating Station – Update MUR Methodology to Include Data Validation and Reconciliation (DVR)

Nuclear Regulatory Commission License Amendment Request Pre-submittal Meeting

September 23, 2025

Agenda

- Part 1 – Open Meeting
  - Meeting Purpose
  - Salem Plant Overview
  - Current Licensing Basis
  - Proposed Change
  - Reason for Change
  - Technical Specification Changes
  - Precedent
  - Impact on Future Submittals
  - Schedule

Meeting Purpose

- Describe License Amendment Request (LAR) to update the methodology for the existing Salem Units 1 and 2 Measurement Uncertainty Recapture (MUR) uprate
- Establish common understanding of proposed change
- Establish common understanding of DVR methodology
- Establish common understanding of MUR methodologies relative to planned future power uprate LAR
- Establish a common understanding of the schedule
- Obtain NRC feedback

Salem Plant Overview

- **Westinghouse PWRs – 3459 MWt / 4-loop**
  - Unit 1 – 60-year License through August 2036
  - Unit 2 – 60-year License through April 2040
  - Subsequent License Renewal and Stretch Power Uprate (SPU) submittals in 2027
- **Feedwater Flow Measurement System Description**
  - Venturi nozzles in steam generator (SG) feedwater (FW) lines measure FW mass flow
    - Provide input to Control Room Indication and Recording and to FW control system
  - CE Nuclear LLC Crossflow Ultrasonic Flow Meter (UFM) installed on SG FW lines
    - Measures FW mass flow which is periodically compared to venturi nozzle mass flow to determine the correction factor
  - Correction factor applied to mass flow from venturi nozzles to determine corrected mass flow signal used to determine power

Current Licensing Basis

- **Existing MUR Uprate Based Upon Crossflow UFM**
  - Issued May 2001 (ML011350051)
  - Stated uncertainty of 0.5% on FW flow resulting in core thermal power uncertainty of ±0.6% justifying 1.4% MUR
  - Reduced 10 CFR 50 Appendix K required 2% uncertainty to 0.6% uncertainty
    - 102% analytical power level – 3479 MWt
  - Allowed for uprate of both units from 3411 MWt to Current Licensed Thermal Power (CLTP) of 3,459 MWt

Proposed Change

- **Add DVR as an MUR Methodology**
  - Salem DVR Methodology follows NRC-approved EPRI Topical Report (ML23285A311)
    - DVR models do not use Crossflow as measurement inputs
  - Proposed change is a methodology change for existing MUR; not a power uprate
    - Will not request change in CLTP
    - Analytically bounded by existing MUR
    - LAR to address RIS 2002-03, Attachment 1, relevant information regarding change of FW flow measurement instrumentation basis for MUR
- **Retain Crossflow as a Backup to DVR at CLTP**
  - Crossflow retained as an option to utilize if DVR non-functional until SPU
- **Remove MUR Methodology from TS 6.9.1.9, Core Operating Limits Report**
  - MUR methodology not used in determination of core operating limits
  - Consistent with most recently approved MURs

Reason for Change

- Replacing Crossflow with DVR allows for MUR to be used in combination with SPU and allow for further potential uncertainty reduction in SPU submittal
- NRC suspension of approval of Crossflow in RIS 2007-24 (ML063450261)
- Crossflow is intended to be phased out due to parts obsolescence and cost of maintenance
- First of a kind DVR for MUR submittal for the industry developed as part of PWROG pilot initiative
  - Salem DVR System and Methodology developed by GSE Solutions using Belsim software compliant with NRC-approved EPRI Methodology

Technical Specification Changes

- **TS 6.9.1.9, Core Operating Limits Report (COLR)**
  - Remove TS 6.9.1.9.b.6 reference to CENPD-397-P-A, Improved Flow Measurement Accuracy Using Crossflow Ultrasonic Flow Measurement Technology with no replacement

ADMINISTRATIVE CONTROLS

2. WCAP-8385, Power Distribution Control and Load Following Procedures - Topical Report, (W Proprietary) Methodology for Specification 3/4.2.1 Axial Flux Difference.

3. WCAP-10054-P-A, Westinghouse Small Break ECCS Evaluation Model Using NOTRUMP Code (W Proprietary), Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor.

4. WCAP-10266-P-A, The 1981 Version of Westinghouse Evaluation Model Using BASH Code, (W Proprietary) Methodology for Specification 3/4.2.2 Heat Flux Hot Channel Factor.

5. WCAP-12472-P-A, BEACON – Core Monitoring and Operations Support System, (W Proprietary).

~~6. CENPD-397-P-A, Improved Flow Measurement Accuracy Using Crossflow Ultrasonic Flow Measurement Technology.~~

Precedent

- **Use of DVR in Nuclear Power Plants**
  - DVR is utilized in many US plants as a method for power recovery
  - Power recovery process similar to how DVR is expected to be implemented for MUR
- **Existing MUR Methodology Change**
  - Update MUR FW flow measurement methodology not involving change in power level similar to amendment issued to South Texas Project for Crossflow to LEFM (ML15049A129)
- **Approval of MURs without Methodology Listed in COLR**
  - Recent precedents include Millstone Unit 3 (ML21262A001), Oconee (ML20335A001), Farley (ML20121A283), and Hope Creek (ML18096A542)

Impact on Future Submittals

- **Stretch Power Uprate**
  - — Anticipated to be submitted in 2Q2027
  - — SPU will include revalidation of DVR-MUR at the higher SPU power level
  - — DVR MUR portion of SPU likely to request further reduction in uncertainty
    - DVR model will continue to be developed and refined in the interim
    - Additional instrumentation will be identified and included to further lower uncertainty, which will be incorporated into proposed change for SPU
  - — Crossflow will be phased out as an MUR methodology in SPU LAR

Schedule

- **LAR Schedule:**
  - Projected submittal December 2025
  - Requested approval of January 2027
- **Project Schedule:**
  - DVR Model currently undergoing site testing (Unit 1 complete)
  - DVR System and servers installed in 3Q2026 under 50.59

Agenda

- Part 2 – Closed Meeting
  - DVR Methodology
  - DVR System Architecture
  - DVR Uncertainties
  - Unit 1 Site Acceptance Testing
  - Unit 1 DVR FW Verification (C&L #9)
  - DVR Measurement Uncertainties
  - Unit 1 DVR FW Uncertainty Contributions
  - DVR Correction Factor Implementation
  - Allowed Outage Time
  - Included Attachments/Enclosures
  - Questions / Discussion

DVR Methodology

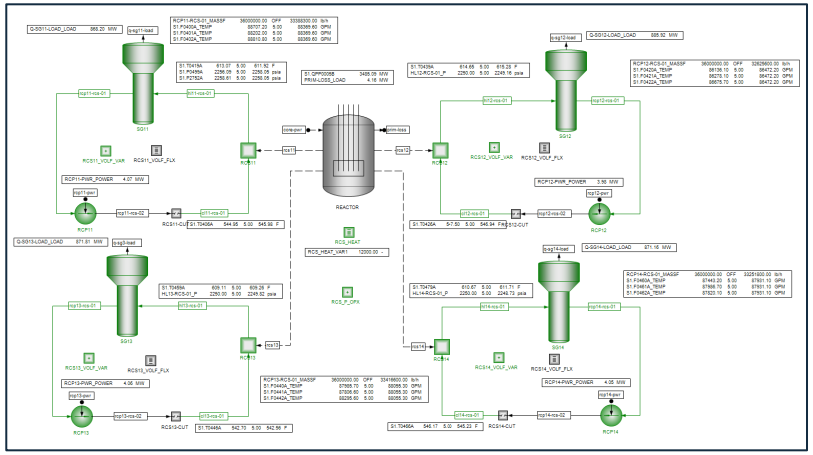
- **Reduction in Uncertainties**
  - The DVR calculation utilizes measurement uncertainty and first-principles (mass and energy balances) to identify and correct measurement errors in process systems
  - A typical nuclear plant DVR model will include measurement inputs from up to approximately 300 instruments in the plant
    - The contribution of these instruments to the reconciled output from the DVR model will be dependent upon the type and location of instrumentation, as well as the measurement uncertainties that are assigned to the instrument.
  - DVR models also employ non-measurement inputs (and associated uncertainties for these inputs) to establish additional redundancy between independent measurements, as well as to make the system of equations solvable

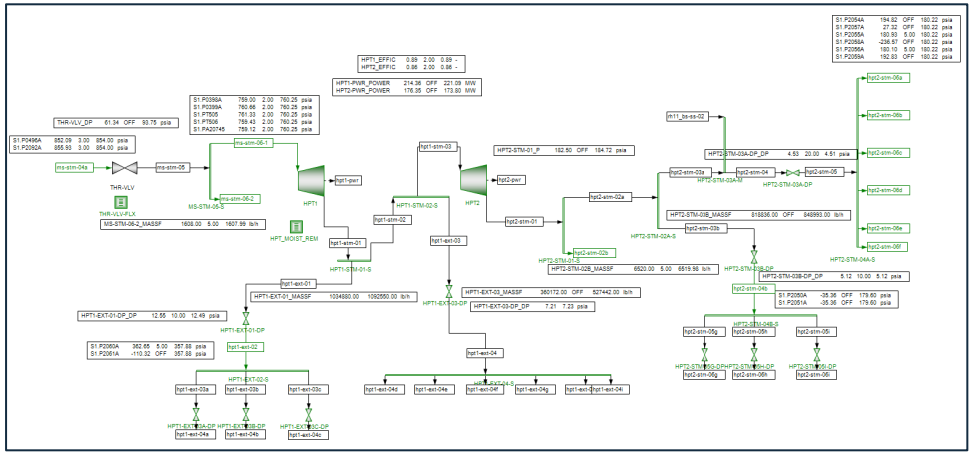
DVR Methodology

- **Reduction in Uncertainties – Continued**
  - Uncertainties for parameters that have multiple redundancies associated with them are reduced through the reduction in sensitivity that these parameters have to any single measurement
    - Final FW flow rate has, in general, significant redundancy in nuclear DVR models, and therefore is subject to significant uncertainty reduction
    - The reduced uncertainty for final FW flow rate in the DVR output can be used as the basis for MUR uprates, in the same principle as ultrasonic flow meters (LEFMs)

DVR System Architecture

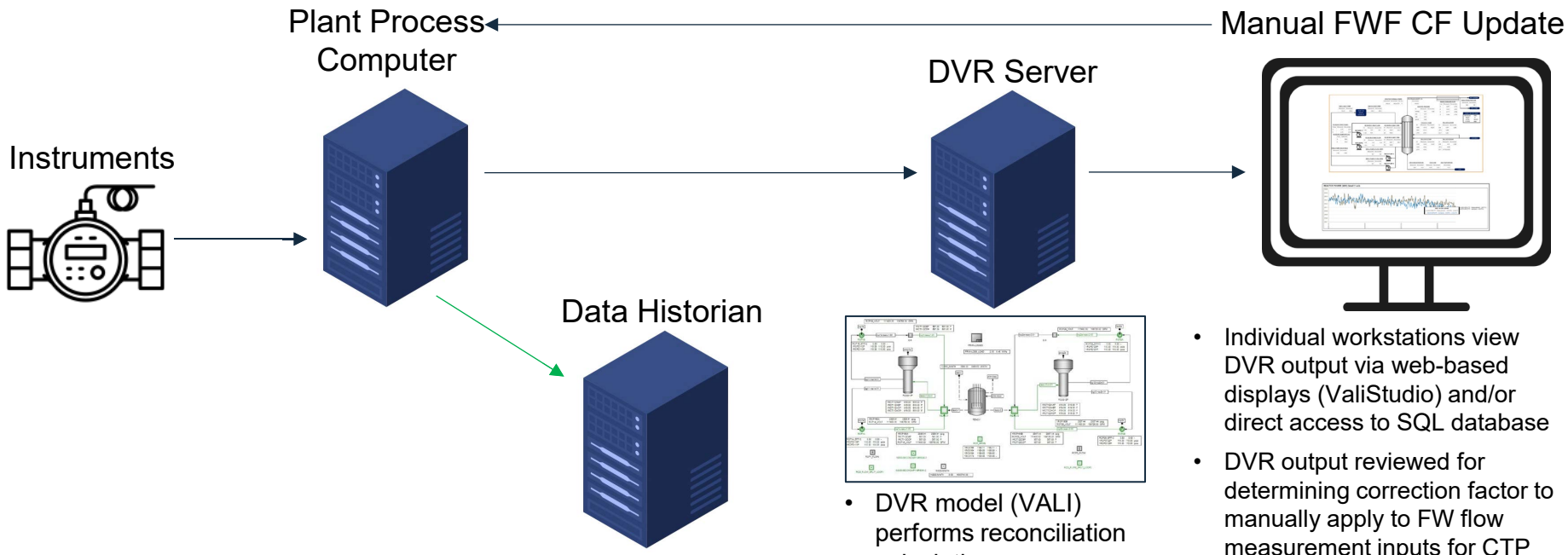
- DVR models developed using VALI™ software (compliant with VDI-2048 methodology)





- 251 instruments (tags) selected for use in each Salem unit's model
- Models will be configured on dedicated server
  - Receive hourly averaged data input from Plant Process Computer once per hour
  - Run data input through model for DVR calculation
  - Output stored in MS-SQL database

DVR System Architecture



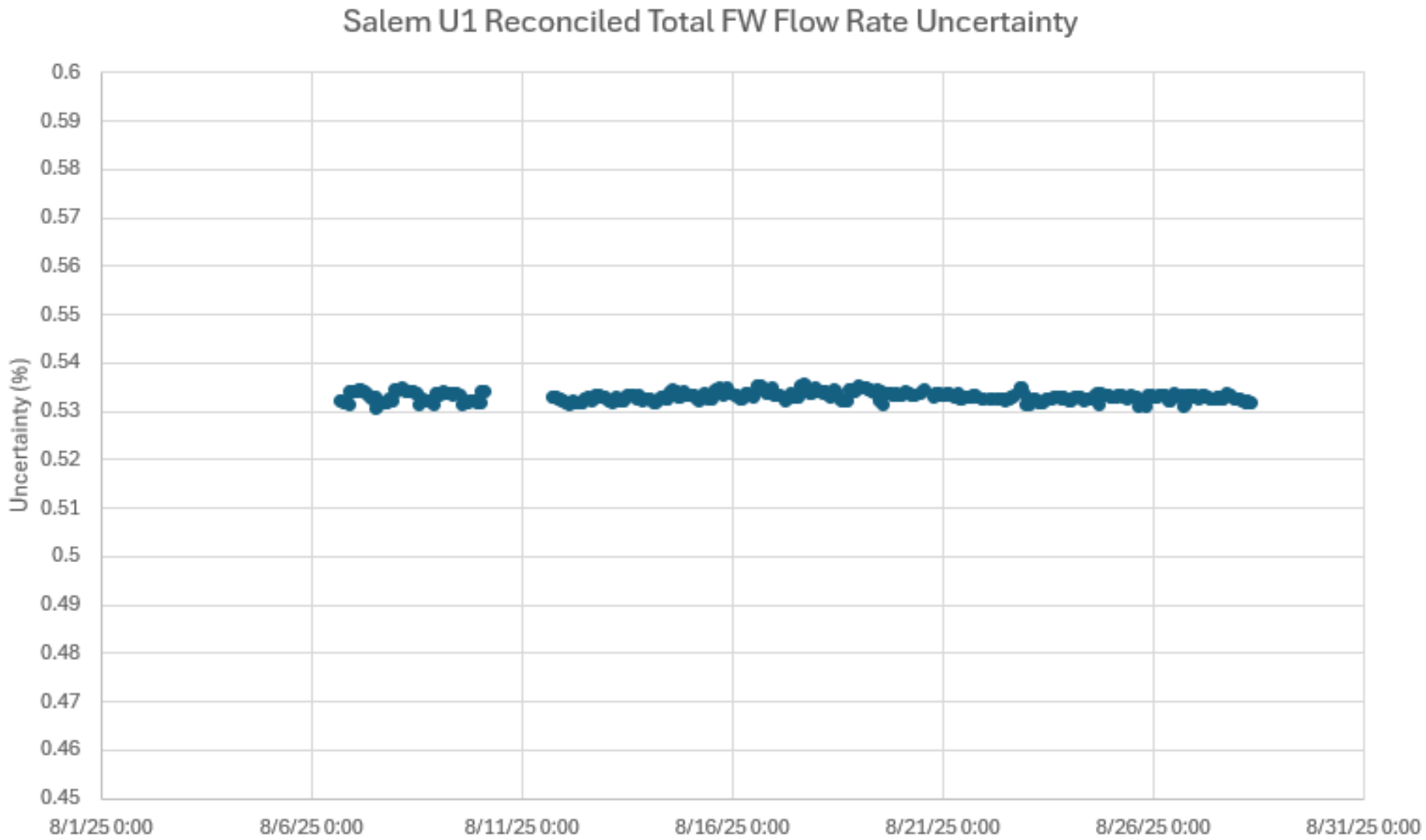
- DVR model (VALI) performs reconciliation calculations
- Stores model input and output files in SQL database

- Individual workstations view DVR output via web-based displays (ValiStudio) and/or direct access to SQL database
- DVR output reviewed for determining correction factor to manually apply to FW flow measurement inputs for CTP calculation

DVR Uncertainties

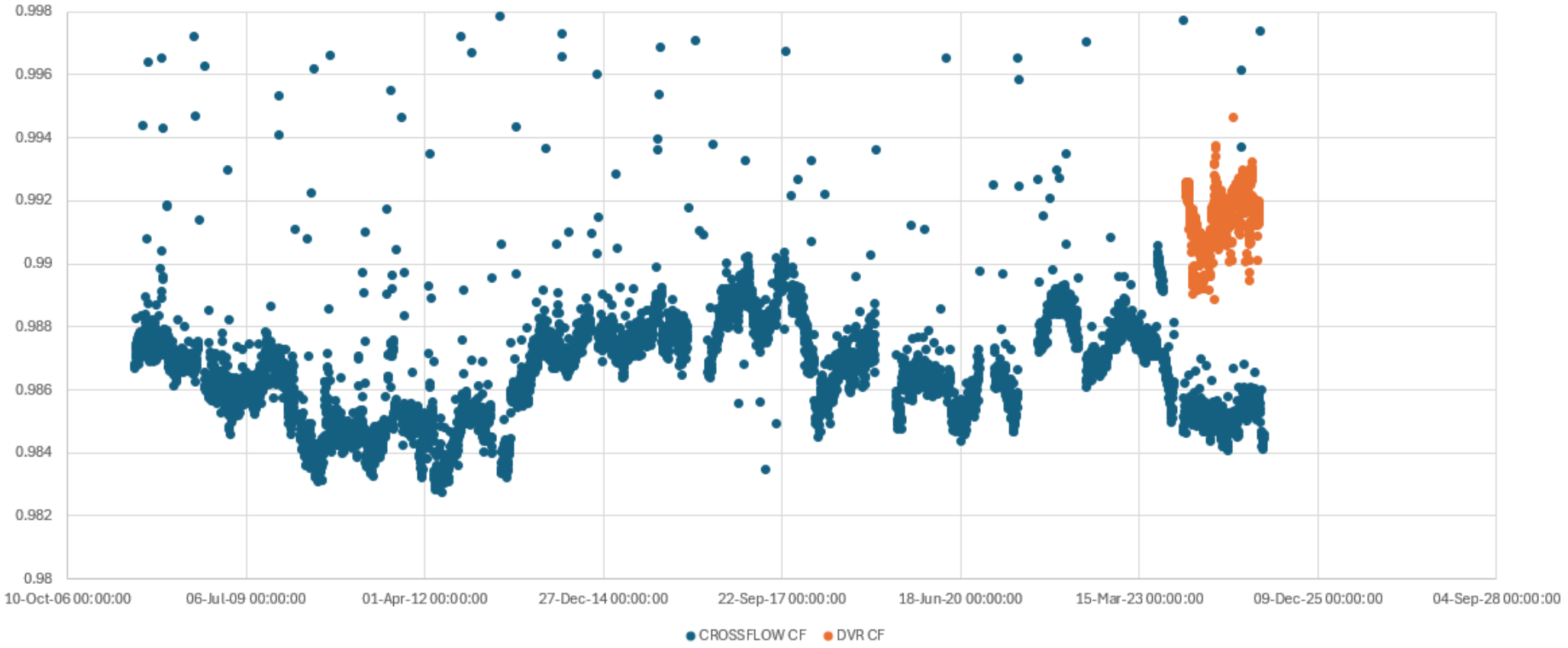
- To maintain current 1.4% MUR power level, it is necessary to demonstrate a total calculated core thermal power uncertainty of ≤ 0.6%.
- Based on current Salem CTP calorimetric uncertainty calculation, total measured FW flow rate uncertainty contributes ~93% of the calculated CTP uncertainty
- To maintain CTP uncertainty ≤ 0.6%, the total FW flow rate uncertainty must be ≤ 0.56%
- Final DVR models at Salem are expected to have nominal reconciled total FW flow rate uncertainties of ≤ 0.54%
  - Unit 2 expected to have lower nominal uncertainty than Unit 1, primarily due to increased measurement uncertainty for the Unit 1 FW flow rate measurements due to more significant fouling bias

Unit 1 Site Acceptance Testing

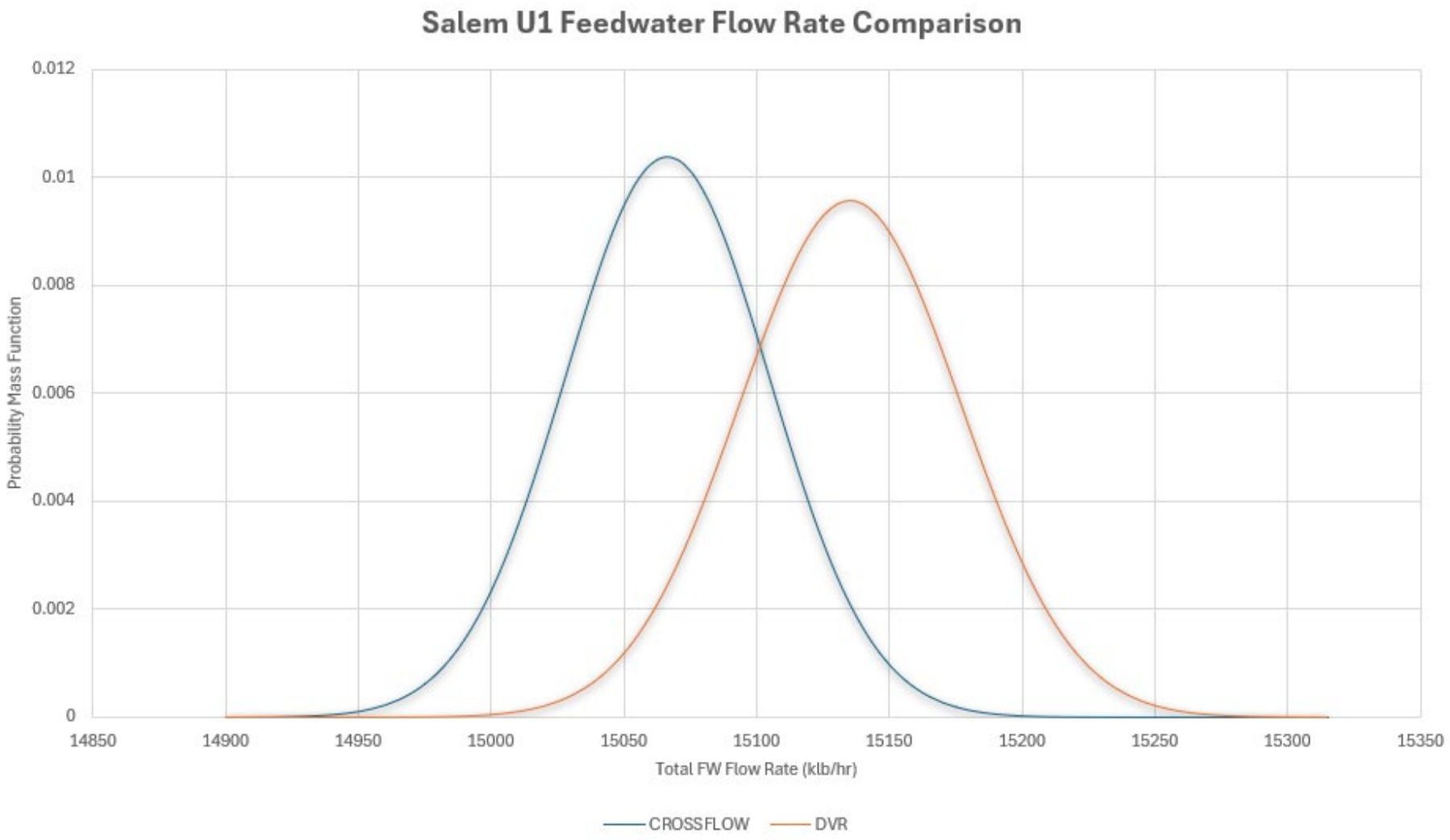


Unit 1 DVR FW Verification (C&L #9)

- Venturi flow element correction factors from Crossflow to DVR:



Unit 1 DVR FW Verification (C&L #9)



DVR Measurement Uncertainties

- **Measurement Uncertainties (C&L #1)**
  - Measurement uncertainty is an important input for DVR; all tags providing input into the model (plant instrument or otherwise) can have measurement uncertainties assigned to them
  - SE Condition and Limitation #1 requires that the DVR input measurement uncertainties be demonstrated to bound the expected error sources (process, instrument, channel, etc.)
  - The contribution of a tag's settings to the reconciled total FW flow rate uncertainty can be quantified and ranked. Therefore, it is expected that higher ranking (or more significantly contributing) tags will require increased justification for their measurement uncertainty settings as compared to lower contributing tags.

DVR Measurement Uncertainties

- **Measurement Uncertainties (C&L #1) – Continued**
  - A dedicated appendix to the Functional Design Specification includes the measurement uncertainty settings for all tags, as well as references/justification for the values (uncertainty calculations, calibration records, bounding estimates, etc.)

Proprietary information withheld in accordance with 10 CFR 2.390

Unit 1 DVR FW Uncertainty Contributions

- Main contributors to FW uncertainty

Proprietary information withheld in accordance with 10 CFR 2.390

Unit 1 DVR FW Uncertainty Contributions

- Main contributors to FW uncertainty

Proprietary information withheld in accordance with 10 CFR 2.390

Unit 1 DVR FW Uncertainty Contributions

- Uncertainty contribution from plant instrumentation:
- Uncertainty contribution from non-plant instrumentation:
- More contributors to uncertainty means the determination of total FW flow rate (and calculated CTP) is less susceptible to errors in any single instrument

Proprietary information withheld in accordance with 10 CFR 2.390

DVR Correction Factor Implementation

- DVR output will be periodically reviewed to determine a valid feedwater flow rate correction factor to be implemented into the plant CTP calorimetric calculation (proposed 3-month periodicity)
  - Review of plant history for feedwater venturi measurement stability shows minimal risk of defouling or other sudden non-conservative bias
  - 3-month periodicity aligns with quarterly surveillance periods for more safety-significant surveillances
  - Current plants using DVR for power recovery (fouling bias correction) have a 3-month periodicity for reviewing/updating the correction factor
  - Minimize operator burden without corresponding reduction in risk
- Independent plant measurements that have a high correlation with actual plant CTP will be used to ensure implemented correction factor is valid and that any sudden non-conservative shift in flow element performance is detected

Allowed Outage Time

- If implemented correction factor is declared non-functional, the allowed outage time before downpower is planned to be 72-hours
  - Aligns with recent MUR submittals using the LEFM technology
  - Minimal risk for non-conservative shift during this time-period
  - Allows sufficient time for investigation and troubleshooting
- Deviation between independent measurements and implemented correction factor will result in overhead annunciator alarm in control room initiating AOT through alarm response procedures
  - Prior to allowed outage time being exceeded, the correction factors will be set to 1.0000 (uncorrected venturi measurements) and unit will downpower to 3411 MWt (pre-MUR power level)
  - Or manually swap over to Crossflow to maintain CLTP

Included Attachments/Enclosures

- Proprietary and non-proprietary versions of the following are anticipated to be provided as LAR attachments:
  - Functional Design Specifications
  - Functional Acceptance Tests
  - Site Acceptance Tests
  - Calorimetric Uncertainty Calculations
  - Evaluations of Limitation and Conditions 7 and 9

Questions / Discussion

Thank You