

10 CFR 50.90

RS-12-043

March 30, 2012

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

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Additional Information Supporting Request for License Amendment Regarding
Measurement Uncertainty Recapture Power Uprate

- References:
1. Letter from Craig Lambert (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture (MUR) Power Uprate," dated June 23, 2011
 2. Letter from B. Mozafari (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2, and Braidwood Station, Units 1 and 2 – Request for Additional Information RE: Measurement Uncertainty Recapture Power Uprate Request (TAC NOS. ME6587, ME6588, ME6589, and ME6590)," dated February 14, 2012 [ML 120270146]
 3. E-mail from B. Mozafari (U. S. NRC) to L. Holden (et. al.) (Exelon Generation Company, LLC), "RE: B/B MUR LAR RAI #1 Response Date," dated March 8, 2012 [ML12068A382]
 4. Letter from B. Mozafari (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 and Braidwood Station, Units 1 and 2 – Request for Additional Information Regarding Measurement Uncertainty Recapture Power Uprate Request (TAC NOS. ME6587, ME6588, 6589, and ME6590)," dated March 9, 2012 [ML 120590460]
 5. Letter from Kevin F. Borton (Exelon Generation Company, LLC) to U. S. NRC, "Additional Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated February 20, 2012
 6. Letter from Kevin F. Borton (Exelon Generation Company, LLC) to U. S. NRC, " Additional Information Supporting Request for License Amendment

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NRR ADD6

Regarding Measurement Uncertainty Recapture Power Uprate," dated November 1, 2011

7. Letter from N. J. DiFrancesco (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Braidwood Station, Units 1 and 2, and Byron Station, Unit Nos. 1 and 2 – Request for Additional Information RE: Measurement Uncertainty Power Uprate Request (TAC NOS. ME6587, ME6588, ME6589, AND ME6590)," dated October 12, 2011 [ML11262A161]

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Facility Operating License Nos. NPF-72, NPF-77, NPF-37 and NPF-66 for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, respectively. Specifically, the proposed changes revise the Operating License and Technical Specifications to implement an increase in rated thermal power of approximately 1.63% based on increased feedwater flow measurement accuracy. In References 2, 3 and 4, the NRC provided requests for additional information (RAIs) to support review of the proposed changes.

In Reference 5, EGC provided responses to the RAIs in Reference 2 with the exception of the response to Mechanical and Civil Engineering Branch [EMCB] request number 13; as indicated in that letter EGC would provide this response under a separate transmittal. Attachment 1 to this letter provides the information in response to EMCB request number 13.

The requested information in Reference 3 is a follow-up to a previous response provided by EGC in Reference 6 to request number 5 from the Fire Protection Branch RAIs provided in Reference 7. In response to this request, EGC is providing the information in Attachment 2.

In response to the RAIs in Reference 4, EGC is providing the information in Attachments 3 and 4.

EGC has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the previously stated bases in Reference 1 for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Leslie E. Holden at (630) 657-3316.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of March 2012.

Respectfully,



Kevin F. Borton
Manager, Licensing - Power Uprate

- Attachment 1 Response to Request for Additional Information, NRC Letter dated February 14, 2012 [ML120270146], Request Number 13, (Non- Proprietary)
- Attachment 2 Response to Request for Additional Information, NRC E-mail dated March 8, 2012 [ML12068A382], (Non- Proprietary)
- Attachment 3 Response to Request for Additional Information, NRC Letter dated March 9, 2012 [ML120590460], (Non-Proprietary)
- Attachment 4 CD, "Byron and Braidwood Stations, Feedwater Flow Trend Data," March 30, 2011 [ML120590460], (Non-Proprietary)

**Braidwood and Byron Stations
Measurement Uncertainty Recapture License Amendment Request (MUR LAR)
March 30, 2012**

ATTACHMENT 1

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
NRC Letter dated February 14, 2012 [ML120270146]
Request Number 13**

(NON-PROPRIETARY)

NRC Civil and Mechanical Engineering Branch

NRC Request 13

Discuss further information to demonstrate that, for the expected post-uprate conditions, the spent fuel pool (SFP) structure, including SFP liner and the spent fuel racks, remain capable of performing their intended design functions and will continue to be in compliance with the Byron and Braidwood design basis code of record(s) and acceptance criteria.

Response

As stated in the MUR power uprate license amendment request (LAR) (Reference A1-1), Attachments 5 and 7, Section VI.1.D.ii, "Spent Fuel Pool Cooling System," the decay heat load in the spent fuel pool (SFP) increases slightly for the MUR power uprate, resulting in an increase of approximately 3.5°F in the expected peak SFP water temperature for each of the three scenarios.

For the first design basis case discussed in Section VI.1.D.ii, having a 1/3 core discharge and with one heat exchanger train operating, the peak SFP temperature increases to 144.6°F. For the second design basis case having a full core offload and with one heat exchanger train operating, the peak SFP temperature will increase to 166.6°F. For the third design basis case discussed, having a normal 1/3 core refueling discharge followed 17 days later by a full core discharge with two heat exchangers operating, the calculated bulk SFP water temperature increases to 141.5°F.

The existing calculations for the SFP structure, including the liner and fuel pool racks, have been reviewed for the increased peak temperatures. The review concluded that these structures will remain capable of performing their intended design functions following the MUR power uprate and will continue to be in compliance with the Byron and Braidwood Stations design basis code of record(s) and associated acceptance criteria.

Reference:

- A1-1 Letter from Craig Lambert (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture (MUR) Power Uprate," dated June 23, 2011

**Braidwood and Byron Stations
Measurement Uncertainty Recapture License Amendment Request (MUR LAR)
March 30, 2012**

ATTACHMENT 2

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
NRC E-Mail dated March 8, 2012 [ML12068A382]**

(NON-PROPRIETARY)

NRC Fire Protection Branch

NRC Follow-Up Request 1

Staff notes that modifications associated with the SGTR and MTO have not yet been completed to address the impact on the fire protection program. The NRC staff requests the licensee discuss how the results of modifications associated with the SGTR and MTO would impact the fire protection program and the plant's compliance with the fire protection program licensing basis, 10 CFR 50.48, or applicable portions of BTP CMEB 9.5-1, at the EPU conditions. Confirm how will the licensee will ensure that, once developed and implemented, the modifications will not change this impact.

Response

The Steam Generator Tube Rupture (SGTR) and Margin to Overfill (MTO) modifications are still being developed. The impact of these modifications on the fire protection program will be evaluated in accordance with EGC's configuration change process. Per the process, these modifications will be evaluated to assure the changes do not adversely impact the approved Fire Protection Program and will not adversely impact the ability to achieve and maintain safe shutdown in accordance with the current Bryon Unit 1 license condition 2.C (6), Byron Unit 2 license condition 2.E, and Braidwood Unit 1 and 2 license condition 2.E.

**Braidwood and Byron Stations
Measurement Uncertainty Recapture License Amendment Request (MUR LAR)
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ATTACHMENT 3

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
NRC Letter dated March 9, 2012 [ML120590460]**

(NON-PROPRIETARY)

NON-PROPRIETARY

NRC Reactor Systems Branch

NRC Request 1

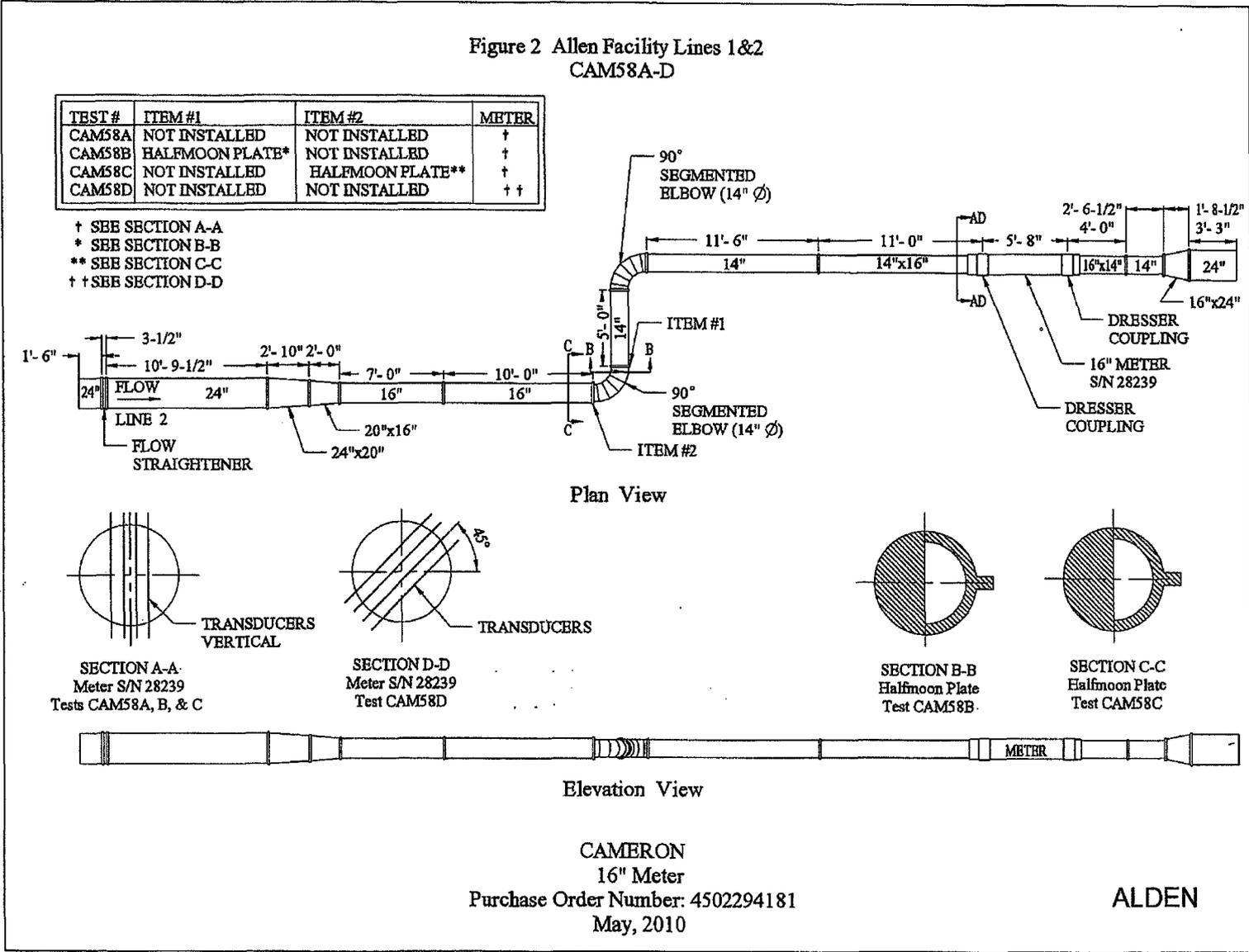
Test fidelity, such as test versus planned plant configuration, test variations to address configuration differences, and potential effects of operation on flow profile and calibration, should be addressed on a plant-specific basis. Applicant requests must provide a comparison of the test and plant piping configurations with an evaluation of the effect of any differences that could affect the UFM calibration. Further, sufficient variations in test configurations must be tested to establish that test-to-plant differences have been bracketed in the determination of UFM calibration and uncertainty. The turbulent flow regimes that exist when the plant is near full power result in limited upstream flow profile perturbation from downstream piping. Consequently, the effects of downstream equipment need not be considered for normal CheckPlus operation provided changes in downstream piping, such as the entrance to an elbow, are located greater than two pipe diameters downstream of the chordal paths. However, if the CheckPlus is operated with one or more transducers out of service, the acceptable separation distance is likely a function of transducer to elbow orientation. In such cases, if separation distance is less than five pipe diameters, it should be addressed. Therefore the staff requests the licensee to provide downstream distances from the ultrasonic flow meter (UFM) to the next non-straight pipe component at the Alden labs test setup to verify their applicability to the in plant setup.

Response

Figures A3.1-1 and A3.1-2 provide diagrams of the Alden Laboratory test piping configuration typical for Byron and Braidwood Stations, respectively. There were no downstream elbows included in the test configuration. Attachment 11 of the Measurement Uncertainty Recapture (MUR) License Amendment Request (LAR) (Reference A3-1) provided the typical in-plant piping configuration; the closest elbow is greater than five pipe diameters (approximately 30-feet) downstream of the LEFM spool piece.

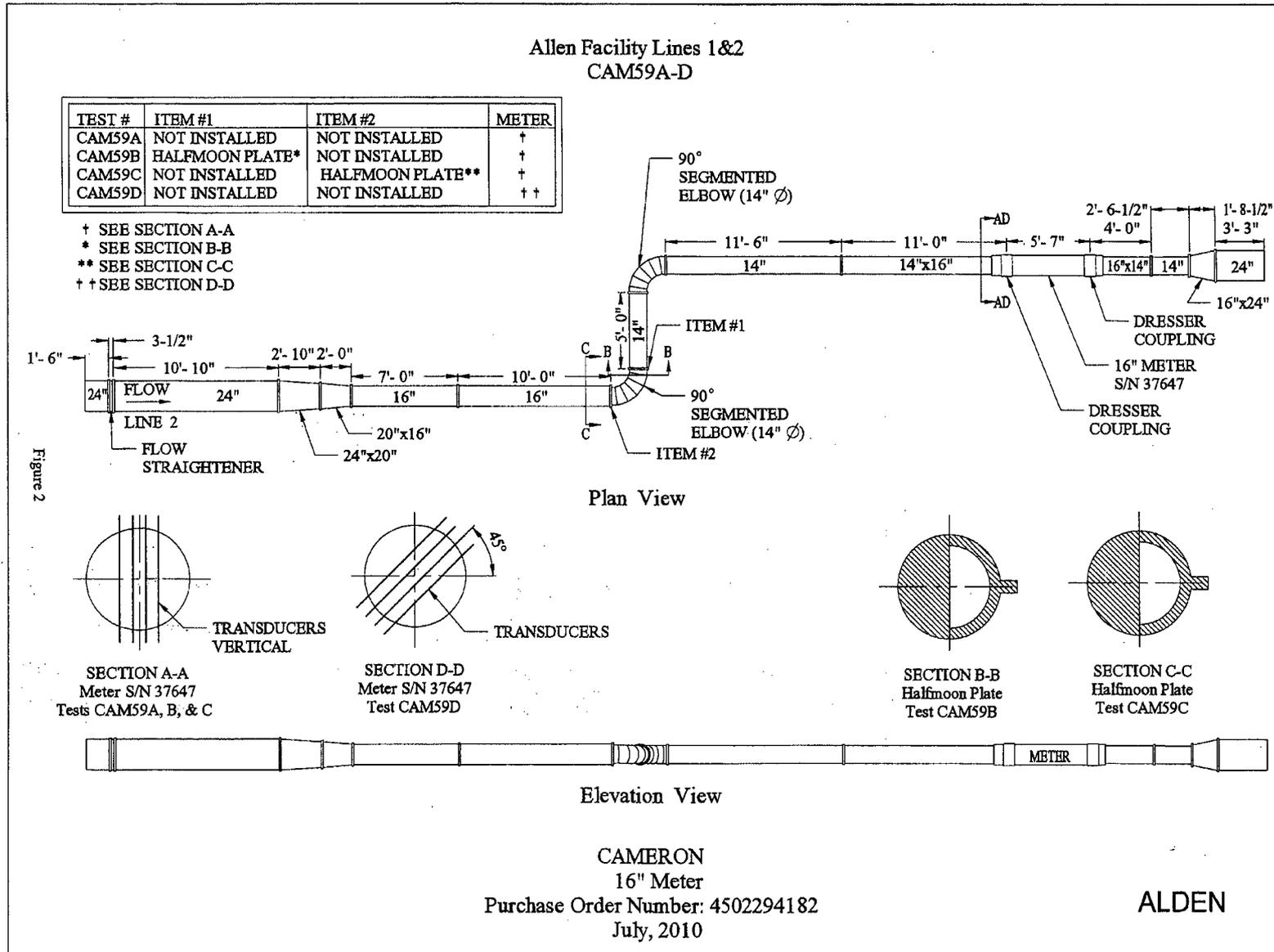
NON-PROPRIETARY

Figure A3.1-1: Byron Station Typical Alden Test Laboratory Pipe Configuration



NON-PROPRIETARY

Figure A3.1-2: Braidwood Station Typical
 Alden Test Laboratory Pipe Configuration



NON-PROPRIETARY**NRC Request 2**

Each applicant for a power uprate must conduct an in-depth evaluation of the UFM following installation at its plant that includes consideration of any differences between the test and inplant results and must prepare a report that describes the results of the evaluation. This should address such items as calibration traceability, potential loss of calibration, cross-checks with other plant parameters during operation to ensure consistency between thermal power calculation based upon the LEFM and other plant parameters, and final commissioning testing. The process should be described in written documentation and a final commissioning test report should be available for NRC inspection. Therefore the NRC staff requests the licensee to provide a summary of the data comparing the LEFM Checkplus operating data to the Venturi data for the past 6 months to verify consistency between thermal power calculation based on LEFM and other plant parameters.

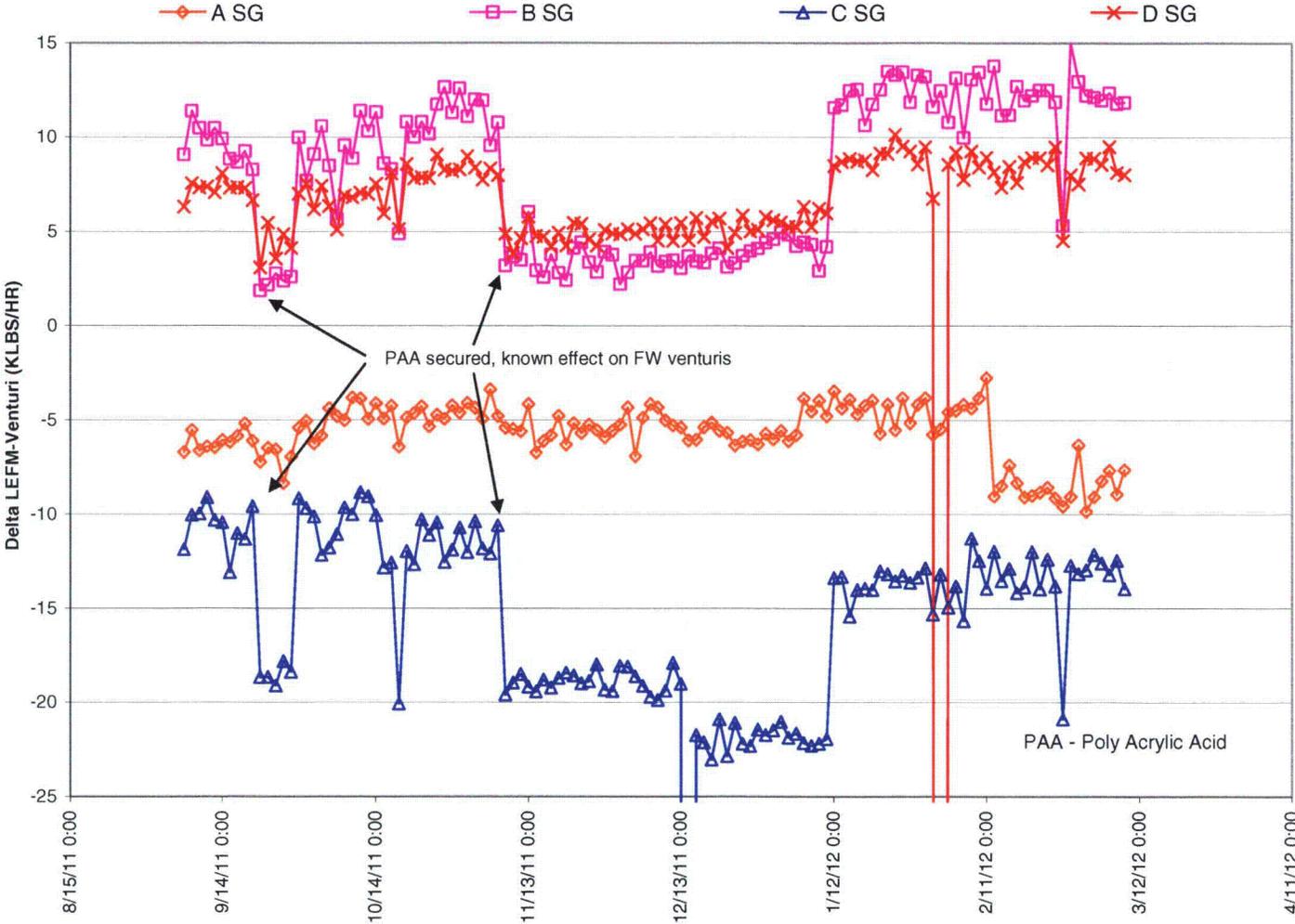
Response

The feedwater flow trend data is provided on a CD accompanying this submittal as Attachment 4. The Byron Unit 1 data is for 6-months from September 6, 2011 to March 8, 2012. The Byron Unit 2 data is from the date of LEFM start-up (October 12, 2011) to March 1, 2012. The Braidwood Unit 2 data is for 6-months from August 22, 2011 to March 1, 2012. The LEFM has not been installed in Braidwood Unit 1, therefore there is no available data.

The data provided is derived by taking flow data and averaging over a two hour period. One two hour average is collected every 36 hours and reported in the files on the accompanying CD and graphed on Figures A3.2-1 through 6. Figures A3.2-1, 3 and 5 show the difference between the venturi and the LEFM flows for each of the feedwater line flows for Byron Units 1 and 2, and Braidwood Unit 2, respectively. Figures A3.2-2, 4 and 6 show a comparison of the total feedwater flow between the venturis and LEFM for Byron Units 1 and 2, and Braidwood Unit 2, respectively.

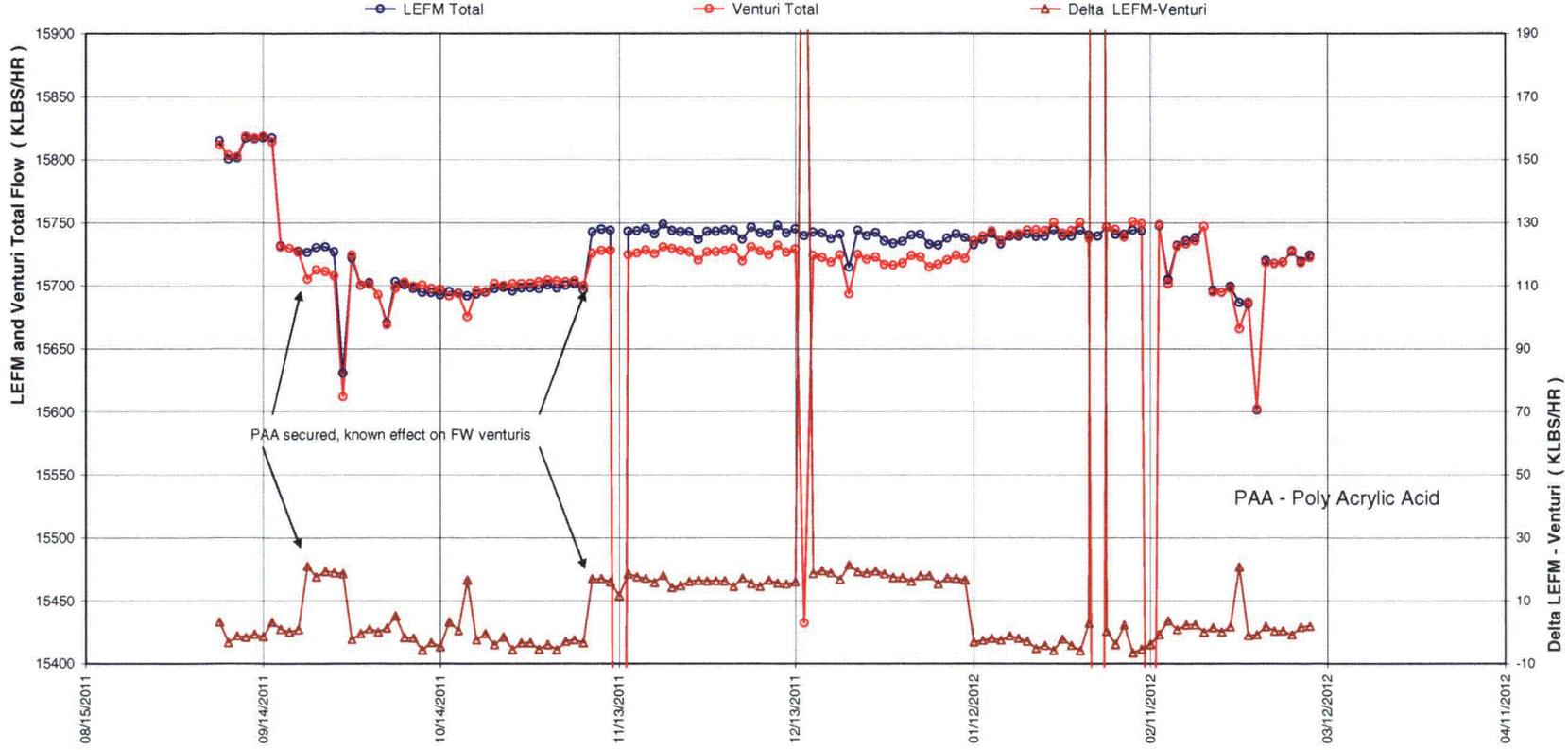
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Figure A3.2-1: Byron Unit 1 Feedwater Flow - Venturi Flow Minus LEFM Flow (per Loop)



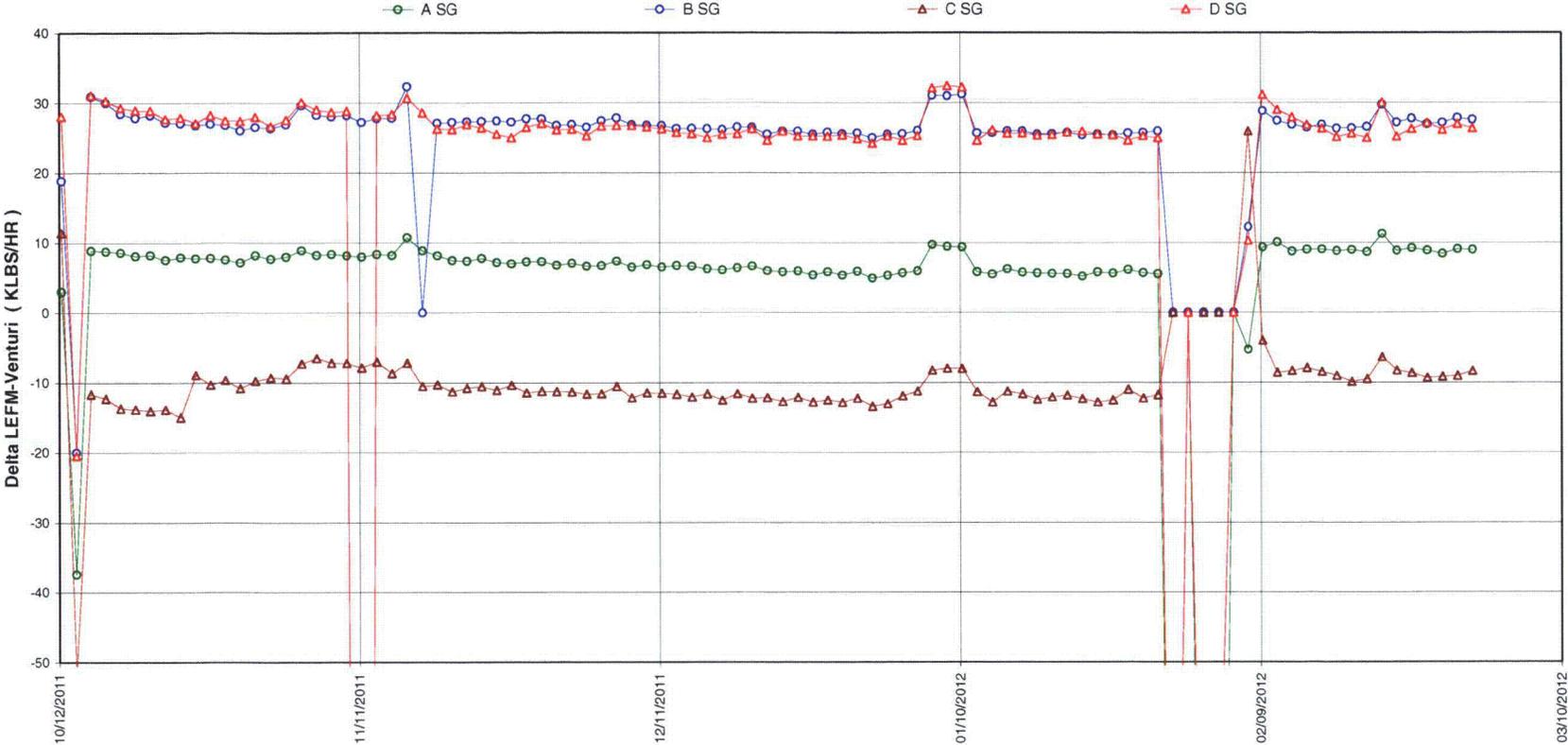
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Figure A3.2-2: Byron Unit 1 Feedwater Flow - Total Venturi and LEFM Flow Comparison



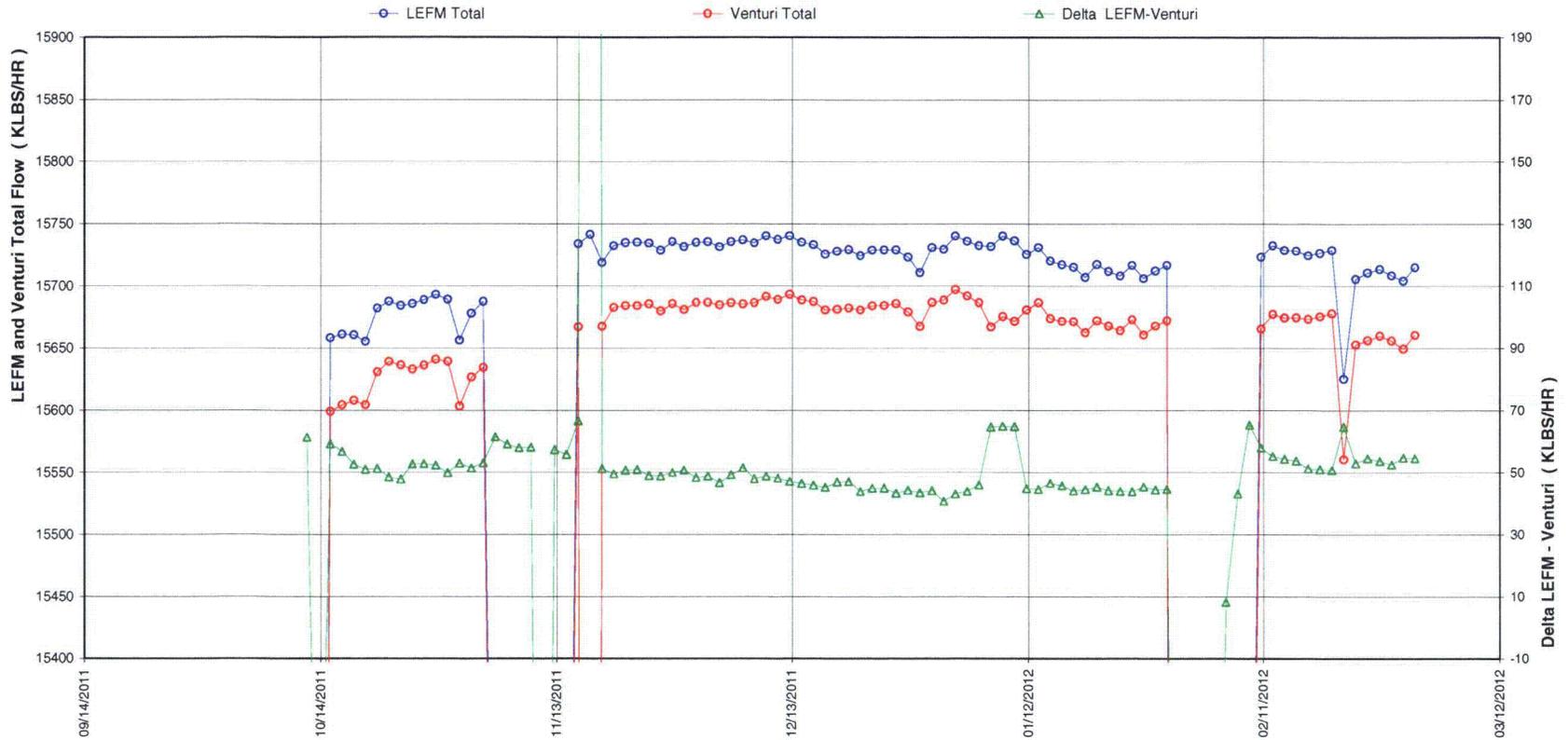
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Figure A3.2-3: Byron Unit 2 Feedwater Flow - Venturi Flow Minus LEFM Flow (per Loop)



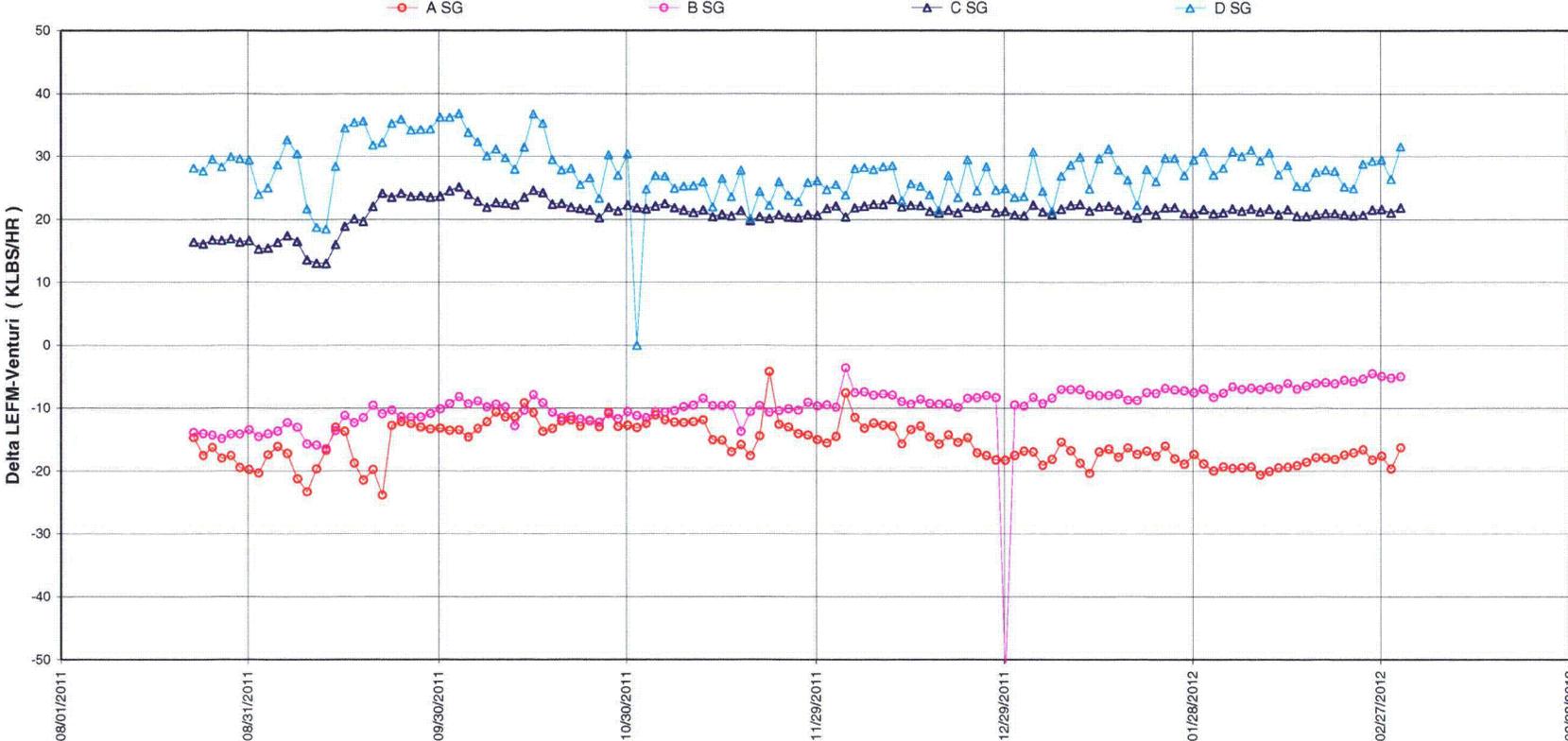
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Figure A3.2-4: Byron Unit 2 Feedwater Flow - Total Venturi and LEFM Flow Comparison



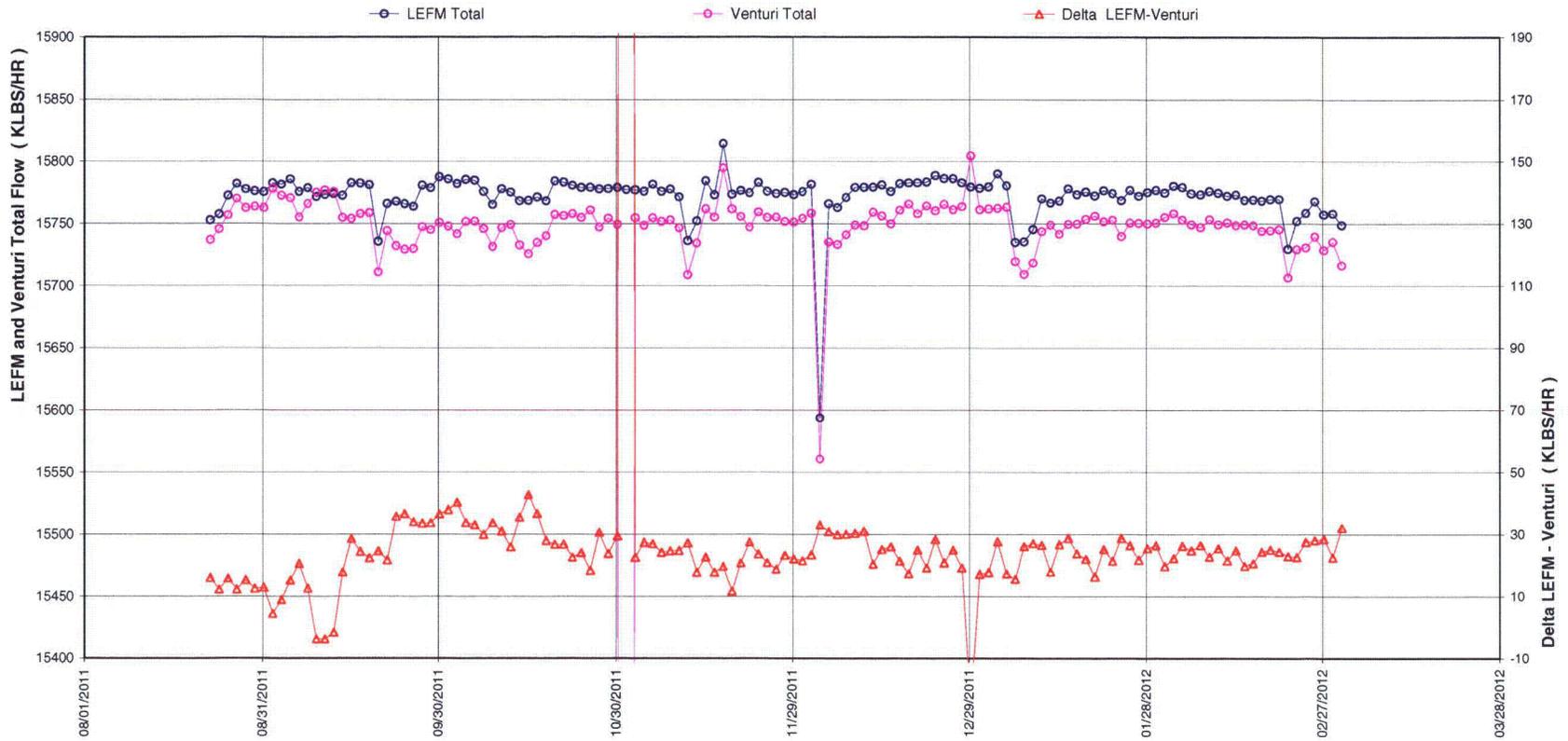
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Figure A3.2-5: Braidwood Unit 2 Feedwater Flow - Venturi Flow Minus LEFM Flow (per Loop)



NON-PROPRIETARY

Figure A3.2-6: Braidwood Unit 2 Feedwater Flow - Total Venturi and LEFM Flow Comparison



NON-PROPRIETARY

Reference:

- A3-1. Letter from Craig Lambert (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture (MUR) Power Uprate," dated June 23, 2011

**Braidwood and Byron Stations
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ATTACHMENT 4

**Braidwood and Byron Stations
Measurement Uncertainty Recapture Technical Evaluation**

**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
NRC Letter dated March 9, 2012 [ML120590460]**

CD "FW Flow Data"

File Name	File Size:
Byron U1 LEFM-Venturi-History Trends	59 KB
Byron U2 LEFM-Venturi-History Trends	56 KB
Braidwood U2 LEFM-Venturi-History Trends	61 KB

Sensitivity Level: Publically Available

Media: CD-R

Special Information: Data file format is .xls which is used by Microsoft Excel. The data file is to be kept in native-format and the CD-R copy can be submitted to the Public Document Room.