

General Information or Other (PAR)

Event # 41794

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Supplier: GE ENERGY	Event Date / Time: 04/26/2005 (EDT)
	Last Modification: 06/24/2005
Region: 1	Docket #:
City: WILMINGTON	Agreement State: Yes
County:	License #:
State: NC	
NRC Notified by: JASON S. POST	Notifications: JAMES DWYER R1
HQ Ops Officer: STEVE SANDIN	CAROLYN EVANS R2
Emergency Class: NON EMERGENCY	BRUCE BURGESS R3
10 CFR Section:	RUSSELL BYWATER R4
21.21 UNSPECIFIED PARAGRAPH	OMID TABATABAI NRR

PART 21 NOTIFICATION - CRITICAL POWER DETERMINATION FOR GE14 AND GE12 FUEL WITH ZIRCALOY SPACERS

The following is a portion of a facsimile received on June 24, 2005 from GE Energy, reference - MFN 05-058 Rev 1:

ATTACHMENT 2 - 60-Day interim Report Notification per §21.21(a)(2), and Transfer of Information per §21.21(b)

(i) Name and address of the individual informing the Commission: J. S. Post, Manager, Engineering Quality & Safety Evaluations, GE Energy - Nuclear, 3901 Castle Hayne Road, Wilmington, NC 28401.

(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States, which may fail to comply or contain a defect: The affected and potentially affected plants are identified in Attachment 1. This concern is limited to plants that have fresh or once-burned GE14 or GE12 fuel with Zircaloy spacers. GE12 fuel with Inconel spacers is not affected.

(iii) identification of the firm constructing the facility or supplying the basic component, which may fail to comply or contain a defect: Global Nuclear Fuel-Americas, LLC, Wilmington, NC.

(iv) Nature of the defect or failure to comply and safety hazard, which could be created by such defect or failure to comply: During review of GE14 ATLAS critical power tests results, it was discovered that springs on the Zircaloy test spacers used in the GE14 and GE12 critical power testing were deformed, possibly during the testing. This resulted in a potentially non-conservative critical power determination for fuel bundle corner pin locations. This non-conservatism potentially impacts the calculated margin to the Operating Limit Minimum Critical Power Ratio (OLMCPR), the Safety Limit MCPR (SLMCPR), the Rod Withdrawal Error (RWE) analysis, and the R-factors used in the on-line 3D core simulator. GE has completed the evaluation of the impact on the critical power determination, and has completed the evaluation of the impact on the R-factors. GE has performed a preliminary evaluation of the impact on the margin to the OLMCPR, the impact on the SLMCPR, and the impact on the RWE event. Potentially affected plants have been informed and have taken appropriate compensatory actions.

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(v) The date on which the information of such a potential defect or failure to comply was obtained: This concern was identified in the GE safety evaluation program on April 26, 2005.

(vi) In the case of a basic component which may contain a defect or failure to comply, the number and locations of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in this part: The basic component that may contain a defect is the critical power determination for fresh and once-burned GE14 and GE12 fuel with Zircaloy spacers. GE12 fuel with Inconel spacers and other GNF fuels are not affected. In the US, only GE14 is affected since all GE12 designs in the US have Inconel spacers.

(vii) The corrective action which has been, is being, or will be taken: the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action (note, these are actions specifically associated with the identified Potential Reportable Condition evaluation): GE has completed the evaluation of the impact on the critical power determination and has completed the evaluation of the impact on the R-factors. GE has performed a preliminary evaluation of the impact on the margin to the OLMCPR, the impact on the SLMCPR, and the impact on the RWE event.

Plants that may have non-conservative process computer calculated OLMCPR margins have taken compensatory action as necessary based on the magnitude of the non-conservatism to prevent inadvertently exceeding the OLMCPR during plant operating maneuvers.

Additional corrective actions planned are as follows:

1. Complete the current-cycle analyses to confirm the non-conservative MFLCPR impact (September 20, 2005).
2. Complete the analysis for previous cycle(s) extending to the previous three years of operation to determine which plants may have a non-conservative MFLCPR (December 15, 2005).
3. Complete the analyses to confirm that no plant has a SLMCPR impact greater than or equal to the reportable threshold of 0.01 (September 20, 2005).
4. Determine and provide the necessary data for plants that perform their own SLMCPR calculations, or that operate with fresh fuel batches of non-GE fuel along with second cycle affected GE14 fuel (September 30, 2005).
5. Complete the evaluation to confirm that the RWE analyses do not impact the OLMCPR (September 20, 2005).
6. Provide bundle R-factor and software updates for the on-line 30 core simulator (beginning in August 2005, and extending through the balance of 2005).

(viii) Any advice related to the potential defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees: Affected plants should continue to work with their GE Customer Account Leader to obtain information as plant-specific calculations are completed.

ATTACHMENT 1 - Affected and Potentially Affected Plants for Current Operating Cycle [ABSTRACTED]

(a) Impact on MFLCPR: Transfer of Information; preliminary analysis indicates MFLCPR impact, GE does not have sufficient information to determine if the OLMCPR could have been exceeded

Clinton, Brunswick 1 & 2, Nine Mile Point 2, Fermi 2, FitzPatrick, Dresden 2, LaSalle 1 & 2, Limerick 1 & 2, Peach Bottom 2 & 3, Quad Cities 2, Perry 1, Cooper, Duane Arnold, Monticello, and Hope Creek.

(b) Impact on SLMCPR: Transfer of Information; GE does not have sufficient information to determine if there is an impact on the SLMCPR greater than or equal to 0.01

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(c) Impact of Road Withdrawal Error (RWE) on OLMCPR: Transfer of Information; GE does not do the analysis for RWE (info provided via telephone during notification to Ops Center)

Browns Ferry 2 & 3



GE Energy

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June 24, 2005
MFN 05-058 Rev 1

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

**Subject: Part 21 60 Day Interim Report Notification: Critical Power
Determination for GE14 and GE12 Fuel With Zircaloy Spacers**

During review of GE14 ATLAS critical power tests results, it was discovered that springs on the Zircaloy test spacers used in the GE14 and GE12 critical power testing were deformed, possibly during the testing. This resulted in a potentially non-conservative critical power determination for fuel bundle corner pin locations on GE14 and GE12 bundles with Zircaloy spacers. GE12 fuel with Inconel spacers is not affected. This non-conservatism potentially impacts the calculated margin to the Operating Limit Minimum Critical Power Ratio (OLMCPR), the Safety Limit MCPR (SLMCPR), the Rod Withdrawal Error (RWE) analysis, and the R-factors used in the on-line 3D core simulator. GE has completed the evaluation of the impact on the critical power determination, and has completed the evaluation of the impact on the R-factors. GE has performed a preliminary evaluation of the impact on the margin to the OLMCPR, the impact on the SLMCPR, and the impact on the RWE event. The results of the preliminary evaluation are described below. Potentially affected plants have been informed and have taken appropriate compensatory actions.

Since GE is unable to complete the evaluation by the end of the 60 day evaluation period provided by 10CFR21 (due June 25, 2005), GE is issuing this information as a 60 Day Interim Report Notification per §21.21(a)(2) to the plants identified in Attachment 1. In addition, GE does not have sufficient information to perform some portions of the analyses for some potentially affected plants. Therefore, this is provided as a Transfer of Information per §21.21(b) to the plants identified in Attachment 1. Information required by §21.21(d)(4) is provided in Attachment 2.

Background

During qualification evaluations of a new critical power test facility, it was discovered that the GE14 and GE12 ATLAS critical power tests had been performed with

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deformed springs on the Zircaloy test spacers. The deformation is likely a result of the large magnetic fields created in the ATLAS test and is not present in operating Zircaloy spacers. Thus, GE14 and GE12 critical power determinations that were used to develop the GEXL14 (for GE14) and GEXL10 (for GE12) critical power correlations for GE14 and GE12 fuel designs were based on test conditions that were slightly different from actual plant configurations. The deformation resulted in a potential non-conservative critical power determination for fuel bundle corner pin locations for GE14 and GE12 fuel designs with Zircaloy spacers. Only GE14 fuel is further described in this letter since all US plants with GE12 fuel have Inconel spacers and are not affected. Accounting for this non-conservatism, if the corner pins determine the core limiting bundle minimum critical power ratio or become the limiting pins, then the calculated minimum margin at a core operating state to the OLMCPR may be non-conservative.

Evaluation

GE has determined that the test spacer deformation can be accounted for in the core evaluation process by revising the GE14 Zircaloy spacer R-factor additive constants for the bundle corner fuel pins. Use of the revised additive constants resulted in an update to bundle R-factors for plants with GE14 fresh fuel designs with Zircaloy spacers and also required a change to the GEXL14 analytical solution to assure solution convergence for resultant higher controlled bundle R-factors. A change to bundle R-factor potentially affects:

- (a) The calculated margin to the operating limit minimum critical power ratio (OLMCPR) implemented in core evaluations as the maximum fraction of limiting critical power ratio (MFLCPR),
- (b) The calculated safety limit MCPR (SLMCPR),
- (c) The OLMCPR if the Rod Withdrawal Error (RWE) is a limiting event for OLMCPR determination, and
- (d) Process computer databank (PCDB) data used in the on-line 3D simulator to calculate bundle MCPR during plant operation.

GE has completed detailed core depletion simulations, using the PANAC 3D core simulator to determine any non-conservatism in the calculated core limiting MCPR during a plant's current cycle of operation. The potential non-conservative critical power determination can exist for as much as the first 9000 MWd/ST of bundle exposure provided the fresh fuel does not experience significant extended periods of control. When that exposure is reached, the corner pin and 2 adjacent pins for GE14 fuel will have decreased enough in relative power, compared to previously limiting pins (non corner pins) so that those previously limiting pins again become limiting in the bundle CPR calculation. In some instances, where fresh bundles have been controlled for an extended period, the corner pins fissile depletion may be depressed enough to become limiting past this exposure point due to this control blade history (CBH) effect. However, for all evaluation cases, once the previously limiting pins become limiting again, the limiting CPR of the bundle returns to the same value as was previously calculated.

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The status of each potential impact is as follows:

- (a) A preliminary current-cycle analysis has determined which plants may have a non-conservative MFLCPR for a portion of the current operating cycle. A non-conservative MFLCPR could lead to inadvertently exceeding the OLMCPR during plant operating maneuvers. Based on communications with the plants that may have a non-conservative MFLCPR, GE believes that no plant has exceeded their OLMCPR nor was a violation projected with planned operating strategies during the current cycle. However, an evaluation of the previous cycle(s) that extends to the previous three years of operation as required by 10CFR50.72 has not been completed. Affected plants have been notified of the preliminary results and have made an administrative adjustment for any impact in the current cycle to their limiting MFLCPR to account for the potential non-conservative calculated core limiting MCPR. Action to determine if the non-conservative MFLCPR has resulted in exceeding the OLMCPR must be performed by the licensee since this is determined by on-line core monitor evaluations. Therefore, upon completion of the analysis the results will be communicated to the affected plants. Plants for which the preliminary current cycle analysis shows that the MFLCPR is not affected are identified in Attachment 1 Column (a) as OK. Plants for which the preliminary current cycle analysis shows that the MFLCPR is non-conservative are identified in Attachment 1, Column (a) as a TI. The current cycle analyses are scheduled to be complete by September 20, 2005. Analysis for previous cycle(s) that extends to the previous three years of operation for all plants identified as OK or TI in Column (a) are scheduled to be completed by December 15, 2005.
- (b) A preliminary analysis to determine the impact on the SLMCPR has been completed. The preliminary analysis concluded that no plant has a SLMCPR impact ≥ 0.01 , which is the reportable threshold for SLMCPR. The plants for which the preliminary analysis has shown that the current SLMCPR is unaffected are indicated in Attachment 1, Column (b) as OK. The analyses are scheduled to be complete by September 20, 2005.
- GE cannot perform SLMCPR evaluations for plants that perform their own SLMCPR calculations, or that operate with fresh fuel batches of non-GE fuel along with second cycle affected GE14 fuel. The potentially affected plants for which GE cannot perform the evaluation are indicated in Attachment 1, Column (b) as a TI. Communications with the TI plants will be required to determine what GE data is needed (e.g., GE14 CPR data and/or bundle R-factor data) for them to complete the evaluation. The necessary data will be provided as soon as possible, but the schedule may extend to September 30, 2005, depending upon what information is required.
- (c) The RWE is not typically a limiting event for determination of the OLMCPR for plants with a Rod Withdrawal Limiter (i.e., BWR/6), plants with a power-dependent Rod Block Monitor (RBM) (i.e., plants with ARTS that installed the ARTS hardware), or plants where the RWE is not analyzed for their

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licensing bases (i.e., ABWR). The RWE analysis could impact the OLMCPR for plants that do not have ARTS, or plants that have ARTS but did not install the power-dependent RBM. This analysis is scheduled to be complete by September 20, 2005. The plants for which a preliminary analysis has shown that the modified R-factors does not result in the RWE analysis impacting the OLMCPR are identified in Attachment 1, Column C as OK.

- (d) The updated R-factors for use in on-line 3D core simulators are being developed. Non-conservative R-factors in the on-line 3D core simulator could lead to inadvertently exceeding the OLMCPR during plant maneuvers. The plants that have a potential non-conservative impact in their on-line MCPR calculations are the same plants as identified as a TI for item (a) above. Implemented compensatory action to adjust the MFLCPR is sufficient to prevent inadvertently exceeding the OLMCPR. Revised bundle R-factors for use in on-line 3D core simulators and updates to the GEXL14 solution 3D simulator software will be provided to the affected plants as they are developed and will be delivered beginning in August and extending through the balance of 2005. Following incorporation of the bundle R-factor and software updates, administrative MFLCPR adjustments can be removed.

Safety Basis

This condition, if uncorrected, has the potential to result in exceeding a Technical Specification Safety Limit (TSSL) if a limiting Anticipated Operational Occurrence (AOO) were to occur and one of the following two conditions were to exist: (1) non-conservative margin to the OLMCPR or a non-conservative on-line 3D core simulator calculation resulted in a plant inadvertently exceeding their OLMCPR, or (2) the plant had a non-conservative SLMCPR. The condition could not lead to a substantial safety hazard due to the large margin to fuel failure associated with the OLMCPR and SLMCPR. The aforementioned compensatory actions provide adequate TSSL protection pending completion of the analyses and actions described above.

Corrective/Preventive Actions

Plants that may have non-conservative margin to the MFLCPR have implemented compensatory adjustments to avoid inadvertently exceeding the OLMCPR during normal plant operation. Additional actions are as follows:

1. Complete the current-cycle analyses to confirm the non-conservative MFLCPR impact (September 20, 2005).
2. Complete the analyses for previous cycle(s) extending to the previous three years of operation to determine which plants may have a non-conservative MFLCPR (December 15, 2005).
3. Complete the analyses to confirm that no plant has a SLMCPR impact greater than or equal to the reportable threshold of 0.01 (September 20, 2005).

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4. Determine and provide the necessary data for plants that perform their own SLMCPR calculations, or that operate with fresh fuel batches of non-GE fuel along with second cycle affected GE14 fuel (September 30, 2005).
5. Complete the evaluation to confirm that the RWE analyses do not impact the OLMCPR (September 20, 2005).
6. Provide bundle R-factor and software updates for the on-line 3D core simulator (beginning in August 2005, and extending through the balance of 2005).

If you have any questions on this information, please call me at (910) 675-6608.

Sincerely,



Jason. S. Post, Manager
Engineering Quality & Safety Evaluations

cc: S. B. Alexander (NRC-NRR/DISP/PSIM) Mail Stop 6 F2
M. B. Fields (NRC-NRR/DLPM/LPD4) Mail Stop 7 E1
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J. F. Harrison (GE)
J. F. Klapproth (GE)
L. M. Quintana (GE)
K. K. Sedney (GE)
G. B. Stramback (GE)
G. A. Watford (GE)
PRC File

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**Attachment 1 - Affected and Potentially Affected Plants
for Current Operating Cycle**

No Imp = Evaluation has confirmed that there is No Impact

Blank = Not using GE fuel

(a) Impact on MFLCPR:

- OK = Preliminary analysis complete and not impacted,
- TI = Transfer of Information; preliminary analysis indicates MFLCPR impact, GE does not have sufficient information to determine if the OLMCPR could have been exceeded

(b) Impact on SLMCPR:

- OK = Preliminary analysis complete and not impacted (i.e., SLMCPR impact < reportable threshold of 0.01),
- TI = Transfer of Information; GE does not have sufficient information to determine if there is an impact on the SLMCPR ≥ 0.01

(c) Impact of Rod Withdrawal Error (RWE) on OLMCPR:

- OK = Preliminary analysis complete and not impacted

<u>(a)</u>	<u>(b)</u>	<u>(c)</u>	<u>Utility</u>	<u>Plant</u>
TI	OK	OK	AmerGen Energy Co.	Clinton
No Imp	No Imp	No Imp	AmerGen Energy Co.	Oyster Creek
TI	OK	OK	Carolina Power & Light Co.	Brunswick 1
TI	OK	OK	Carolina Power & Light Co.	Brunswick 2
No Imp	No Imp	No Imp	Constellation Nuclear	Nine Mile Point 1
TI	OK	OK	Constellation Nuclear.	Nine Mile Point 2
TI	OK	OK	Detroit Edison Co.	Fermi 2
			Dominion Generation	Millstone 1 ¹¹¹
			Energy Northwest	Columbia
TI	OK	OK	Energys Nuclear Northeast	FitzPatrick
OK	OK	OK	Energys Nuclear Northeast	Pilgrim
			Energys Operations, Inc.	Grand Gulf
			Energys Operations, Inc.	River Bend
OK	OK	OK	Energys Nuclear Northeast	Vermont Yankee
TI	OK	OK	Exelon Generation Co.	Dresden 2
OK	OK	OK	Exelon Generation Co.	Dresden 3
TI	OK	OK	Exelon Generation Co.	LaSalle 1
TI	OK	OK	Exelon Generation Co.	LaSalle 2
TI	OK	OK	Exelon Generation Co.	Limerick 1
TI	OK	OK	Exelon Generation Co.	Limerick 2
TI	OK	OK	Exelon Generation Co.	Peach Bottom 2
TI	OK	OK	Exelon Generation Co.	Peach Bottom 3
OK	OK	OK	Exelon Generation Co.	Quad Cities 1
TI	OK	OK	Exelon Generation Co.	Quad Cities 2
TI	OK	OK	FirstEnergy Nuclear Operating Co.	Perry 1
TI	OK	OK	Nebraska Public Power District	Cooper
TI	OK	OK	Nuclear Management Co.	Duane Arnold
TI	OK	OK	Nuclear Management Co.	Monticello
			PPL Susquehanna LLC.	Susquehanna 1
			PPL Susquehanna LLC	Susquehanna 2

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TI	OK	OK	PSEG Nuclear	Hope Creek
OK	OK	OK	Southern Nuclear Operating Co.	Hatch 1
OK	OK	OK	Southern Nuclear Operating Co.	Hatch 2
No Imp	No Imp	No Imp	Tennessee Valley Authority	Browns Ferry 1 ⁽¹⁾
OK	TI	TI	Tennessee Valley Authority	Browns Ferry 2
OK	TI	TI	Tennessee Valley Authority	Browns Ferry 3

Notes:

1. Plant is in extended shutdown.

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**Attachment 2 – 60-Day Interim Report Notification per §21.21(a)(2), and
Transfer of Information per §21.21(b)**

- (i) Name and address of the individual informing the Commission:
J. S. Post, Manager, Engineering Quality & Safety Evaluations, GE Energy - Nuclear, 3901 Castle Hayne Road, Wilmington, NC 28401.
- (ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States, which may fail to comply or contain a defect:
The affected and potentially affected plants are identified in Attachment 1. This concern is limited to plants that have fresh or once-burned GE14 or GE12 fuel with Zircaloy spacers. GE12 fuel with Inconel spacers is not affected.
- (iii) Identification of the firm constructing the facility or supplying the basic component, which may fail to comply or contain a defect:
Global Nuclear Fuel - Americas, LLC, Wilmington, NC.
- (iv) Nature of the defect or failure to comply and safety hazard, which could be created by such defect or failure to comply:
During review of GE14 ATLAS critical power tests results, it was discovered that springs on the Zircaloy test spacers used in the GE14 and GE12 critical power testing were deformed, possibly during the testing. This resulted in a potentially non-conservative critical power determination for fuel bundle corner pin locations. This non-conservatism potentially impacts the calculated margin to the Operating Limit Minimum Critical Power Ratio (OLMCPR), the Safety Limit MCPR (SLMCPR), the Rod Withdrawal Error (RWE) analysis, and the R-factors used in the on-line 3D core simulator. GE has completed the evaluation of the impact on the critical power determination, and has completed the evaluation of the impact on the R-factors. GE has performed a preliminary evaluation of the impact on the margin to the OLMCPR, the impact on the SLMCPR, and the impact on the RWE event. Potentially affected plants have been informed and have taken appropriate compensatory actions.
- (v) The date on which the information of such a potential defect or failure to comply was obtained:
This concern was identified in the GE safety evaluation program on April 26, 2005.
- (vi) In the case of a basic component which may contain a defect or failure to comply, the number and locations of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in this part:
The basic component that may contain a defect is the critical power determination for fresh and once-burned GE14 and GE12 fuel with Zircaloy spacers. GE12 fuel with Inconel spacers and other GNF fuels are not affected. In the US, only GE14 is affected since all GE12 designs in the US have Inconel spacers.
- (vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action (note, these are actions specifically associated with the identified Potential Reportable Condition evaluation):

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GE has completed the evaluation of the impact on the critical power determination and has completed the evaluation of the impact on the R-factors. GE has performed a preliminary evaluation of the impact on the margin to the OLMCPR, the impact on the SLMCPR, and the impact on the RWE event.

Plants that may have non-conservative process computer calculated OLMCPR margins have taken compensatory action as necessary based on the magnitude of the non-conservatism to prevent inadvertently exceeding the OLMCPR during plant operating maneuvers.

Additional corrective actions planned are as follows:

1. Complete the current-cycle analyses to confirm the non-conservative MFLCPR impact (September 20, 2005).
2. Complete the analysis for previous cycle(s) extending to the previous three years of operation to determine which plants may have a non-conservative MFLCPR (December 15, 2005).
3. Complete the analyses to confirm that no plant has a SLMCPR impact greater than or equal to the reportable threshold of 0.01 (September 20, 2005).
4. Determine and provide the necessary data for plants that perform their own SLMCPR calculations, or that operate with fresh fuel batches of non-GE fuel along with second cycle affected GE14 fuel (September 30, 2005).
5. Complete the evaluation to confirm that the RWE analyses do not impact the OLMCPR (September 20, 2005).
6. Provide bundle R-factor and software updates for the on-line 3D core simulator (beginning in August 2005, and extending through the balance of 2005).

(viii) Any advice related to the potential defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees:

Affected plants should continue to work with their GE Customer Account Leader to obtain information as plant-specific calculations are completed.