August 9, 2010

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10 CFR 50.90

U.S. Nuclear Regulatory Commission
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Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266 and 50-301
Renewed License Nos. DPR-24 and DPR-27

License Amendment Request 261
Extended Power Uprate
Response to Request for Additional Information

References: (1) FPL Energy Point Beach, LLC letter to NRC, dated April 7, 2009, License Amendment Request 261, Extended Power Uprate (ML091250564)
(2) NRC electronic mail to NextEra Energy Point Beach, LLC, dated May 19, 2010, Draft – Request for Additional Information Re: AFW (ML101410232)
(3) NextEra Energy Point Beach, LLC letter to NRC dated July 8, 2010, License Amendment Request 261, Supplement 5, Extended Power Uprate (ML101890785)

NextEra Energy Point Beach, LLC (NextEra) submitted License Amendment Request (LAR) 261 (Reference 1) to the NRC pursuant to 10 CFR 50.90. The proposed amendment would increase each unit's licensed thermal power level from 1540 megawatts thermal (MWt) to 1800 MWt, and revise the Technical Specifications to support operation at the increased thermal power level.

Via Reference (2), the NRC staff determined that additional information is required to enable the staff's continued review of the request. Enclosure 1 provides the NextEra responses to the NRC staff's questions from the Electrical Engineering Branch transmitted in Reference (2). Enclosure 2 provides the NextEra responses to the NRC staff's questions from the Balance of Plant Branch transmitted in Reference (2). NextEra responses to the NRC staff's questions from the Technical Specifications Branch were provided by Reference (3).

The information contained in this letter does not alter the no significant hazards consideration contained in Reference (1) and continues to satisfy the criteria of 10 CFR 51.22 for categorical exclusion from the requirements of an environmental assessment.

In accordance with 10 CFR 50.91, a copy of this letter is being provided to the designated Wisconsin Official.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on August 9, 2010.

Very truly yours,

NextEra Energy Point Beach, LLC

FOR
Larry Meyer
Site Vice President

Enclosures

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

## ENCLOSURE 1

## NEXTERA ENERGY POINT BEACH, LLC
## POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

## LICENSE AMENDMENT REQUEST 261
## EXTENDED POWER UPRATE
## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The NRC staff determined that additional information was required (Reference 1) to enable the Electrical Engineering Branch to complete its review of License Amendment Request (LAR) 261, Extended Power Uprate (EPU) (Reference 2). The following information is provided by NextEra Energy Point Beach, LLC (NextEra) in response to the NRC staff's request.

***Electrical Branch RAI 1.a***

*The licensee provided its responses to the staff's RAI dated February 1, 2010, in its letter dated March 3, 2010 and April 15, 2010. The staff has the following additional questions based on the review of licensee's response.*

*In Question 1, the staff raised concerns regarding the EDG "A" voltage and frequency being outside the acceptance limits specified in Regulatory Guide 1.9 during sequencing of loads under certain accident loading conditions. In response to the staff's concerns, the AFW pump motor start was changed from a random load to a fixed load block at 32.5 seconds after EDG breaker closure to improve the EDG voltage response profile and motor-operated valve (MOV) response times. The staff notes that the revised transient analysis shows that for Train "A" EDG, the voltage drops to 51% during the initial loading for a postulated large break loss of coolant accident (LOCA) in one unit and loss of offsite power (LOOP) in the other unit case. Also, for non-large break design basis LOCA & LOOP case postulated in the transient analysis, the voltage drops to 51% during the initial loading and between 32 and 36 seconds, the voltage drops to 59% and then overshoots to 140% and the frequency response is + 2.8 and -4 of the nominal frequency. The staff also notes that the frequency dips and overshoot increased from the previous sequencing mode. The staff is concerned that the licensee's EDG dynamic model validation is not conservative since it is compared to the response from an integrated safeguards testing when some of the larger pumps are operating in recirculation mode resulting in faster acceleration time. The EDG response during a worst case accident loading condition may be slower. Verify that the performance capabilities of safe shutdown equipment, when the EDG is operating with fully loaded motor loads for the limiting design basis accident with sufficient margin. Provide an executive summary of the evaluation.*

**NextEra Response**

The emergency diesel generator (EDG) transient analysis calculation documents a dynamic model of the EDG system and connected loads utilizing ETAP® software, Version 7.1.0N. The methodology used to validate the model relied upon two sets of data, previously collected vendor motor and test data.

The analysis includes a description of the methodology used to model large pump/fan motors for the following equipment:

- Safety injection (SI) pump
- Component cooling water (CCW) pump
- Service water (SW) pump
- Residual heat removal (RHR) pump
- Containment spray (CS) pump
- Containment accident fan
- Auxiliary feedwater (AFW) pump

The motor impedance models were developed based upon the various individual unique motor characteristics provided by motor vendor data sheets. These parameters were used to create a composite motor model for each type of motor in service. The composite motor model bounds all individual motors of that type.

The transient analysis calculation documents the motor demand factors for expected motor loads during surveillance tests and design basis events (loss of offsite power (LOOP) / loss of coolant accident (LOCA) transients). These maximum demand factors are based upon calculated flow conditions during worst-case design basis LOOP/LOCA transients.

The calculation documents the test data obtained during performance of SI actuation with loss of engineered safeguards AC surveillance tests performed during refueling outages. During these tests, the data recorded for generator voltage and frequency is compared to an ETAP case that models the surveillance test load sequences. The data is examined for the first two load sequence blocks at T= 0, and T= 5.5 seconds where T= 0 corresponds to EDG breaker closure. The model is tuned such that the parameters used in the EDG governor and voltage regulator can be adjusted to ensure that the simulated ETAP response bounds the test data. In this use, "bounds" means that the voltage undershoots and overshoots envelope the voltage responses and frequency responses observed in the test data. The demand factors used for the surveillance test tuning runs in the model are specific to the loading conditions for the surveillance tests and differ from the maximum demand factors used for the design basis LOOP/LOCA simulated ETAP runs. The LOOP/LOCA demand factors are calculated based upon maximum expected flow conditions during an accident. The purpose of tuning the model is to establish the dynamic response of the EDG to ensure correct dynamic models are utilized to perform the design basis analysis. Tuning the model to bound the test data ensures that the adjustable parameters in the governor and voltage regulator are accounted for in the model validation. Therefore, this results in a conservative EDG model to be utilized to perform the design basis analysis.

The composite motor models are validated independent of surveillance test data by examining the motor response curves over the expected motor operating ranges against vendor curve data. This combination of using composite motor models as well as governor and voltage regulator tuning to envelope the data is conservative in that it tends to over predict voltage and frequency undershoots and overshoots. Also, the motor acceleration times reported for the LOOP/LOCA simulations are determined for the motors operating against the maximum expected flow conditions for the design basis worst-case LOOP/LOCA transient simulations. This approach ensures that secondary studies in the EDG transient analysis calculation to evaluate motor-operated valve (MOV) stall and motor control center (MCC) dropout conditions are bounded.

The EDG transient loading analysis results submitted in Reference (4) were noticeably different than results previously submitted to the NRC in Reference (5). This is largely due to the effects of changing two parameters in the ETAP model.

The first parameter changed was the maximum available mechanical power setting for the General Motors Electro-Motive Division (EMD) diesel engine. This parameter was changed to incorporate the Engine Systems, Incorporated (ESI)/EMD Owner's group "cold load" analysis into the model. The ESI/EMD Owner's group provides guidance on derating the mechanical power available during the first three minutes of EDG operation due to the turbocharger shaft being driven by the EDG during this time until the exhaust gas stream takes over shaft drive of the turbocharger. The inclusion of this cold load derating lowers the mechanical power setting to 2850 kW (per ESI/EMD Owner's group guidance). This limit impacts the frequency response of the EDG near the end of the transient and when other large pump loads are started together.

The second parameter changed was a better curve fit option for the generator saturation curve (field current vs. terminal voltage) available in ETAP Version 7.1.0N, referred to as "Sbreak." The previous revision of the transient analysis calculation used ETAP Version 5.5.6N and the better curve fit Sbreak option was not available in that version. Sbreak was included in the latest calculation revision because it produces more conservative results.

In conclusion, the model in ETAP utilized to perform the EDG transient analysis results in a conservative analysis because the model is conservatively tuned to provide bounding equipment models for design basis accident loading conditions.

***Electrical Branch RAI 1.b***

*In response to the staff's question 1 regarding the downstream effects on components, the licensee states that "the dynamic EDG loading calculation results show that there is an initial delay in energizing the MCC loads when the EDG output breakers close because the initial voltages are below the pickup requirements of the 480 V MCC contactors. The voltage recovers above the pickup requirements of the contactors to start the required loads. In addition, the MCC contactors on Train 'A' also drop below their holding voltage requirements during the loading sequence when two switchgear motors start simultaneously. This occurs only when containment spray pumps have a delayed motor start. The voltage recovers above the pickup requirements of the contactors to re-start the required loads. The loads are capable of restarting and operating to meet design bases requirements." The evaluation also concludes that control fuses will not operate and the protective devices will not trip. Also, the MOVs will complete their valve stroke in the required time with the minimum stroke time margin of 0.77 seconds. Provide clarification, using a specific example, on the logic used to determine that all loads are capable of restarting and operating for the limiting or bounding case.*

*Typically, MCC circuits have a seal-in contact to maintain circuit continuity during extended operation. Verify that any circuits with seal-in contacts will restart after a low voltage excursion. Some MOVs have design margin of 0.77 seconds. The evaluation indicates that the postulated interrupt time due to contactor drop out was added to name plate stroke time. Provide details on how the combination of varying EDG frequency and voltage affected the stroke time.*

**NextEra Response**

The following is the logic used for MCC loads to determine that all equipment is capable of performing their designated safety function:

Safety-Related Non-MOV Loads (e.g., fans, pumps, heaters, etc.):

(a) A review of equipment performance was performed to determine if the lower voltages would negatively impact the operation of the equipment.

(b) An evaluation was performed of the overcurrent protective devices (breaker and overload heaters) to ensure they would not prematurely trip. All equipment was evaluated to determine if two consecutive starts could be performed without tripping the overcurrent device. Based on the results of the EDG transient analysis, the MCC loads would start on initial energization and potentially one additional time when a MCC contactor may drop out.

(c) An evaluation was performed to ensure the MCC control circuit fuses would not trip on overcurrent as a result of the voltage variations.

MOV Loads:

(a) A review of the equipment performance requirements was performed to establish the minimum MOV voltage requirements, stroke time requirements and protective device information.

(b) An evaluation was performed to determine the total stroke time of the MOV based on the voltage dropping below either the MOV minimum voltage requirements and/or the MCC contractor dropout voltage. The total stroke time consisted of the valves stroke time plus the amount of time the voltage was below the minimum voltage requirements. The total stroke time was then compared to the stroke time required to support meeting the accident analysis. The total stroke time was determined to be acceptable, if it was less than the time required to meet the accident analysis.

(c) An evaluation was performed of the overcurrent protective devices (breakers and overload heaters) to ensure they would not prematurely trip. This was performed in two approaches: (1) An evaluation of the time current curve is performed to determine if the time to trip at locked rotor current for the total stroke time is greater than total stroke time. If the time to trip is less than the total stroke time, Item (2) is performed for a more detailed evaluation. (2) An evaluation is performed to determine if the total energy developed based on the valve operation is less the amount of energy to trip the protective device to ensure the protective device will not trip. The total energy consists of the summation of the energy created from the valve stroking (running at full load amps) and valve stalling (running at locked rotor current).

(d) An evaluation was performed to ensure the MCC control circuit fuses would not trip on overcurrent as a result of the voltage variations.

An example is provided for the SI-860 valves (CS pump discharge valves) based on the logic above. The minimum voltage requirements for these valves to operate is 365 V and the required stroke time is less than or equal to 16.5 seconds. The valves design stroke time is 11.73 seconds. The CS valves actuate on a high-high containment pressure signal, and therefore, are a random load on the system.

The stroke time evaluation for original response is based on the following conservative approach. The voltage dropped below 365 V a total of 5 times during the load sequence for a maximum total of 3.6 seconds, which was conservatively rounded to 4.0 seconds. The valve stroke time of 11.73 seconds was added to stall time of 4.0 seconds to determine a total stroke time of 15.73 seconds. This provides a 0.77 second margin to the required stroke time of 16.5 seconds. This approach is conservative because the SI-860 valves will only operate across three load blocks at which the voltage would drop below 365 V. This was the most limiting valve and all remaining valves have a margin of greater than 7 seconds to the required stroke time to meet the design basis accident analysis.

An evaluation of the protective device for the SI-860 valves was performed. The time to trip at locked rotor condition was at least 21 seconds. This was greater than the required stroke time of 16.50 seconds, and therefore, the protective device would not prematurely trip before the valve performed its function. A detailed evaluation of the protective devices for the SI-860 valves was not required.

An evaluation of the control circuit fuses was performed and determined that the fuses would not trip on overcurrent as a result of the voltage variation on the system for pickup/inrush conditions or holding conditions.

In conclusion, it was determined that the SI-860 valves would be capable of performing their specified safety function because the total stroke time including stall would still meet the required stroke time and no overcurrent protective devices would trip on overcurrent.

The EDG transient loading analysis included the effect that voltage decays and contactor dropouts during automatic load sequencing have on the ability of the MOVs to operate and perform their specified safety function. The worst-case impact on stroke time for the MOVs was determined based upon consideration of contactor dropout and available voltages below MOV rated voltage that cause the MOVs to cease stroking for brief periods. The worst-case stroke time was determined and compared with required stroke times required to support the accident analysis. Evaluation of the impact on MOV stroking caused by the EDG load sequencing determined that the MOVs would still operate within their required stroke times. The effect of varying EDG voltage is identified above. The effect of varying EDG frequency is considered to have a negligible affect on the MOV stroke time, as the area for frequency dips and overshoots are approximately equal.

The EDG transient loading analysis included an evaluation of the impact of contactor dropout on the actuation of safety loads. Although the 480 V motor contactors may drop out during subsequent load steps, the transient analysis demonstrates that the bus voltage quickly recovers to a value that will enable the contactors to pick back up, as long as the engineered safety features actuation system (ESFAS) automatic actuation signal is still present. The elementary diagrams for the 480 V loads actuated by ESFAS were reviewed to confirm that the ESFAS signal, if active, will allow the contactors to pick up after voltage returns to a sufficient voltage. This review confirmed that all of the 480 V ESFAS actuated loads are adequately "sealed-in" by the ESFAS signal.

In addition, the ESFAS signals (e.g., SI, high-high containment pressure, containment isolation, etc.) were reviewed to ensure that those signals continue to be present throughout the load sequencing because these signals are locked until the ESFAS signals are manually re-set. For loads that start during the first load step, the ESFAS signal is applied throughout the load sequencing. However, loads that are started during the subsequent load steps will start after their sequence timer has timed out, switchgear bus voltage is present and the ESFAS signal is present.

***Electrical Branch RAI 1.c***

*The licensee states in response to question 1 that for accidents where the containment spray pump (CSP) start may be delayed, the potential simultaneous start of the CSP and the AFW pump has been evaluated and found to be acceptable. According to the EDG loading table, the Safety Injection pump, rated at 700HP, starts at time 0 seconds, the service water pumps, rated at 300HP start at 15.5, 20.5 and 25.75 seconds and for the component cooling water pump, rated at 250HP, start time is not provided. The ability of the EDG to handle large transient loads is dependent on the magnitude of the sequenced load and the running loads. Provide clarification on the evaluation performed to analyze the worst case frequency and voltage resulting from the CSP or other pumps starting in conjunction with a large load due to permissive signals.*

**NextEra Response**

The maximum loading conditions during a LOOP for EDG transient analysis is based on individual worst-case loading sequence on the EDG when being automatically loaded. The worst-case total loading of the EDG occurs with one EDG supplying both units during a design basis event with a LOOP/LOCA on one unit coincident with a LOOP on the other unit. The following safeguards actuation signals are present on the accident unit: safety injection, containment isolation, and high-high containment pressure.

Design basis LOOP/LOCA event EDG load sequencing includes the following safeguards equipment:

| Equipment | Load | Start Time[1] |
|---|---|---|
| Component cooling water (non-accident unit) | 250 | 0+ |
| High head safety injection | 700 | 0+ |
| Residual heat removal | 200 | 5.5 |
| Containment spray[2] | 200 | 10.25 |
| Service water | 300 | 15.5 |
| Service water | 300 | 20.5 |
| Service water | 300 | 25.75 |
| Auxiliary feedwater | 350 | 32.5 |
| Containment accident fans | 150 | 39.4 |
| Containment accident fans | 150 | 46.75 |

Notes:
1. Time after EDG breaker is closed and power is restored.
2. Containment spray pump start occurs 10.25 seconds after receipt of a high-high containment pressure signal and having bus voltage available.

In addition to the safeguards equipment identified above, the EDG transient loading analysis also included MCC loads that are driven by a process variable which could be present at anytime and therefore may start at any time throughout the load sequence.

The EDG transient analysis is performed for the following four load sequences to assure the most conservative transient load profile is established:

(1) Time T= 0+ where MCC process loads start immediately and CS starts at earliest possible time;

(2) Time T= 25.75 seconds where the MCC process loads and CS pumps start with the third SW pump motor;

(3) Time T= 32.5 seconds where the MCC process loads and CS pumps start with the AFW pump motor; and

(4) Time T= 46.75 seconds where the MCC process loads and CS pumps start with the second containment accident fan motor.

This evaluates the worst-case loading for each load sequence onto the EDGs. The previous response provided the results for large break LOCA and the T= 32.5 seconds load sequence for AFW. However, the analysis was performed to evaluate the potential simultaneous start of MCC process drive loads and CS pump with each load sequence type. The acceptance criteria of the calculation had to be met for each of the above load sequences.

***Electrical Branch RAI 1.d***

*In response to RAI Question 6 regarding the EDG endurance and margin test, the licensee proposed to test the EDGs for 24 hours at ≥ 2850 kW (G01 /G02), ≥ 2848 kW (G03/G04). The proposed 24-hour test does not demonstrate the design margin of the EDG as recommended in RG [Regulatory Guide] 1.9 since the 2-hour portion of the 24-hour test is not loaded to 105-110 percent of the EDGs continuous rating. Therefore, the staff requests the licensee to provide justification why the proposed loading ranges are adequate to demonstrate the design margins of the EDGs to operate for its intended mission time.*

**NextEra Response**

The G-01 and G-02 EDGs have a 2000-hour rating of 2850 kW, a 200-hour rating of 2963 kW, and a 4-hour rating of 3000 kW. The G-03 and G-04 EDGs have a 2000-hour rating of 2848 kW, a 200-hour rating of 2951 kW and a 4-hour rating of 2987 kW. All four EDGs are powered by EMD 20-645E4 engines. The postulated worst-case design basis loads for G-01 and G-02 are 2817 kW and the postulated worst-case design basis loads for G-03 and G-04 are 2831 kW.

In this proposed surveillance requirement (SR), the EDGs will be loaded to greater than the postulated worst-case design basis loads. The test loads were selected to demonstrate the capability of the EDGs to carry the design basis loads above the continuous rating of the EDGs and to prevent routine overloading of the EDG. The postulated worst-case design basis loads for G-01 and G-02 are not more than the 2000-hour load rating and the postulated worst-case design basis loads for G-03 and G-04 are not more than the 2000-hour load rating. Note that the actual loads are expected to be lower than the maximum design basis loads based on the significant conservatisms used to develop the worst-case design basis loading.

The load rating of the EDG is based on an inlet air temperature of 115°F and a maximum ambient air temperature of 95°F. The maximum inlet air temperature in the EDG rooms has been calculated and is less than the 115°F inlet air temperature, which provides margin to the EDG rating above that for which credit is being taken. The proposed EDG Technical Specification (TS) surveillance is run at the 2000-hour load rating. This is the EDG rating that is equivalent to the continuous duty rating of one year of operation at 2600 kW continuous rating and is approximately 9.5% above the EDG continuous duty rating. When operating at the 2000-hour level rather than the continuous rating, the EDG functionality is not affected, but maintenance requirements following operation are increased by the manufacturer. The EDG functionality or operability capability is defined by the 30-minute EDG load rating of 3050 kW; the calculated loading of 2817 kW for G01 and G02 (2831 kW for G03 and G04) provides an 8.2% (7.7% for G03 and G04) margin between a conservative projected worst-case EDG loading and the design capability of the EDG. Conducting the surveillance at the 2850 kW (or 2848 kW for G03 and G04), 2000-hour load rating, demonstrates that the EDG will carry more than the projected load, yet balances surveillance testing requirements against the increased maintenance requirements that would apply, if the EDG is tested at higher loads. The increased maintenance would result in increased out of service time. Therefore, the surveillance test load value is an appropriate balance between demonstrating reliability with some margin allowance and not incurring increased unavailability by having to perform additional maintenance, if the EDG were tested at higher load values.

The following conservative assumptions are included in the EDG load analysis:

1. Several transformer loads are taken at connected load with no diversity.

2. The battery room vent fans (W-85 and W-86) are modeled at their high speed rating (25 HP) rather than the low speed rating (12.5 HP). The fans automatically drop to low speed following a LOOP.

3. Static loads within the model are considered to have a demand of 122% and actual loading would be less under EDG normal allowable voltage (97.3% to 103.3%) conditions.

4. The impact of frequency is conservatively rounded up to a 102% (60.4 Hz). The increase in load would be less, since the maximum allowable frequency is 60.3 Hz, which corresponds to a 101.5% increase in load. Although the EDG load calculation demonstrates that the EDG can accommodate higher frequency values, it is expected that operators would adjust EDG frequency to 60 Hz during a loss of offsite power event and provide additional load margin.

5. The worst-case EDG loading occurs in cases where a single EDG is carrying the load for both units with a LOCA/LOOP in one unit and a LOOP in the other unit. In a normal lineup, all four EDGs are available and the EDG is only supplying the loads on a single safeguards bus.

These calculation conservatisms ensure that the tested EDG load bounds the expected loading with adequate margin.

***Electrical Branch RAI 1.e***

*The starting of the new AFW pump was changed from a random load to a fixed load block at 32.5 seconds after EDG breaker closure. The licensee response indicates that this change was acceptable for LOOP/LOCA event. Verify that other design bases events such as main steam line break or steam generator rupture event are not adversely impacted. Provide a summary of your evaluation.*

**NextEra Response**

The additional design basis events that initiate AFW following a LOOP are steam generator tube rupture (SGTR), and two non-LOCA events (loss of non-emergency AC power to the station auxiliaries (LOAC) and main steam line break core response (MSLB). As shown in the table below, all delay times assumed for AFW initiation following a LOOP are greater than the 32.5 seconds for the EPU analyses. Therefore, there is no impact on these other design basis events. Similarly, for the current analyses of record for these events, the time delays assumed for AFW initiation following the LOOP are greater than 32.5 seconds. Thus, there is no impact to the current analyses of record for these events at the current licensed power level.

| Event | AFW Delay Assumed |
|---|---|
| LOAC | 60 seconds |
| SGTR | 5 minutes |
| SGTR (Supplemental doses)[1] | 5 minutes |
| MSLB (Core response – zero power)[2] | Conservatively initiated at start of transient |

Notes:

1. For SGTR margin to overfill analysis, no time delay for AFW is assumed for conservatism startup.
2. MSLB mass and energy inputs into the containment response calculations assumes that there is no LOOP, since this is conservative for the analysis. Hot full power MSLB core response does not model AFW.

***Electrical Branch RAI 2***

*In response to the staff's RAI question 5 regarding the performance capabilities of the non-EQ AFW motor in potentially harsh environment during the large break LOCA or other limiting accident conditions, the licensee stated that the AFW pumps are connected to safety-related buses through safety-related breakers and it will prevent degraded MDAFW pump motors from adversely affecting the safety related bus during the accident. The staff is concerned regarding the failure modes and its effects on the equipment needed to perform safety functions including potential for presenting misleading information to the operator during and after an accident. Provide an executive summary of the failure modes and effects analysis performed to show there are no adverse effects of not qualifying the AFW pump motors.*

**NextEra Response**

The motor-driven AFW (MDAFW) pump safety-related breakers serve as an isolation device to prevent failures of the MDAFW pump motor from adversely affecting safety-related accident mitigation functions being powered from the bus. Protection of the new MDAFW pumps against motor overload is provided via protective relays installed in their 4160 V switchgear. Each switchgear breaker includes instantaneous and inverse time overcurrent protection, as well as ground fault protection. NextEra evaluated the electrical protection afforded for the new MDAFW pumps. The results of the calculation show that both the motors and their power supply cables are protected against both overload and short circuit and that the MDAFW pump breakers properly coordinate with their upstream breakers.

During a large break LOCA, the AFW pumps are secured early in the accident, since steam generator (SG) levels are rapidly restored and the AFW pumps are not needed for the large break LOCA response. Therefore, there is no significant radiation dose accumulation in the new MDAFW pump rooms, when the pumps are running, that would cause a motor failure. For small break LOCA, SGTR, MSLB, loss of normal feedwater (LONF), and LOAC events, there is no harsh environment in the MDAFW pump rooms. Since the AFW pumps are in a mild environment for these events that require their operation, harsh environment qualification is not needed.

***Electrical Branch RAI 3***

*Provide a summary of the loading changes to the Class 1E DC system as a result of changing/adding power supplies for motor driven auxiliary feedwater (MDAFW) pumps and turbine driven auxiliary feedwater TDAFW and other changes (AST and EPU). Confirm whether the standby steam generator pumps are powered from Class 1E DC sources. Also, confirm whether the battery loading profiles and the TS surveillance requirements remain the same. In addition, confirm whether MDAFW and TDAFW DC power and control circuits maintain redundancy.*

**NextEra Response**

AFW Modifications

The approximate steady-state loads removed and added to the four 125 V DC battery systems due to the AFW modifications are listed below. The below steady state loads shown are approximate, and do not include intermittent loads operating during short periods in design basis accident (DBA) or station blackout (SBO) scenarios.

Battery D05 – Train A
Approximate Net Load Change = Removed 69 W for AFW Modifications

Battery D06 – Train B
Approximate Net Load Change = Removed 74 W for AFW Modifications

Battery D105 – Train A
Approximate Net Load Change = Added 1290 W for AFW Modifications

Battery D106 – Train B
Approximate Net Load Change = Added 1399 W for AFW Modifications

The P-38A and P-38B standby steam generator (SSG) feed pumps are to perform non safety-related functions after the AFW system turnover modifications are completed. Each SSG pump will continue to be supplied safety related electrical power from the same safety-related switchgear from which it currently receivea power. P-38A will receive power from Train A switchgear and P-38B will continue to receive power from Train B switchgear.

The AFW modifications result in a net load reduction for batteries D05 and D06. It is anticipated that the existing TS SRs will remain bounding for these two battery systems as a result of AFW modifications. AFW modifications have added load to batteries D105 and D106. AFW load increases and net load increases from other plant modifications will result in changes to the load profiles used for TS SRs for these two battery systems.

Calculations have been performed to address safety-related battery performance for design basis accident (LOOP/LOCA) and station blackout conditions, as well as to address battery performance for non safety-related batteries during a LOOP event. Safety-related batteries D05, D06, D105, D106, and non safety-related station batteries 1D205 and 2D205 available capacity margin is well above the minimum required margin. Safety-related station battery D305 is a swing battery that is capable of supplying the load of batteries D05, D06, D105, D106, 1D205, or 2D205 temporarily. It also allows for charging or maintenance of the other batteries. The calculations also demonstrate that battery D305 can be substituted for all batteries. The calculations show that in all cases, the minimum voltage requirements at the downstream 125 V DC panels are satisfied for all evaluated scenarios.

The AFW modifications for each unit included placing motor operated valves for the TDAFW pump system on a safety-related 125 V DC power source opposite the train serving that unit's MDAFW pump system. The new MDAFW pumps and existing TDAFW pumps have been configured such that each unit has two dedicated AFW pumping systems, each on different safety related trains. Unit 1 TDAFW pump, 1P-29, has its control power provided from Train A 125 V DC sources. Unit 1 MDAFW pump, 1P-53, is supplied motive power from Train B 4.16 kV safety-related switchgear and is supplied control power from Train B 125 V DC sources. Unit 2 TDAFW pump, 2P-29, has its control power provided from Train B 125 V DC sources. Unit 2 MDAFW pump, 2P-53, is supplied motive power from Train A 4.16 kV safety-related switchgear and is supplied control power from Train A 125 V DC sources. Therefore, each unit is provided with two safety-related AFW pumps, each of which is furnished electrical power from redundant and independent sources of power.

Alternate Source Term (AST) Modifications

The approximate steady-state loads removed and added to the four 125 V DC battery systems are listed below. The below steady-state loads shown are approximate, and do not include intermittent loads operating during short periods in DBA or SBO scenarios.

Battery D05 – Train A
Approximate Net Load Change = Added 10 W for AST Modifications

Battery D06 – Train B
Approximate Net Load Change = Added 10 W for AST Modifications

Battery D105 – Train A
Approximate Net Load Change = Added 10 W for AST Modifications

Battery D106 – Train B
Approximate Net Load Change = Added 10 W for AST Modifications

A summary of the loading changes to the Class 1E DC system as a result of changing/adding power supplies for EPU will be transmitted to the NRC via the NextEra response to EEEB-30 of Reference (6).

**References**


(1) NRC electronic mail to NextEra Energy Point Beach, LLC, dated May 19, 2010, Draft – Request for Additional Information Re: AFW (ML101410232)

(2) FPL Energy Point Beach, LLC letter to NRC, dated April 7, 2009, License Amendment Request 261, Extended Power Uprate (ML091250564)

(3) NextEra Energy Point Beach LLC, letter to NRC, dated March 3, 2010, License Amendment Request 261, Extended Power Uprate, Response to Request for Additional Information (ML100630133)

(4) NextEra Energy Point Beach, LLC letter to NRC, dated April 15, 2010, License Amendment Request 261, Supplement 4, Extended Power Uprate (ML101050357)

(5) NextEra Energy Point Beach, LLC letter to NRC, dated September 25, 2009, License Amendment Request 261, Extended Power Uprate, Response to Request for Additional Information (ML092750395)

(6) NRC letter to NextEra Energy Point Beach, LLC, dated April 23, 2010, Point Beach Nuclear Plant, Units 1 and 2 - Request for Additional Information from Electrical Engineering Branch RE: Extended Power Uprate (TAC Nos. ME1044 and ME1045) (ML101100761)

# ENCLOSURE 2

## NEXTERA ENERGY POINT BEACH, LLC
## POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

## LICENSE AMENDMENT REQUEST 261
## EXTENDED POWER UPRATE
## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The NRC staff determined that additional information was required (Reference 1) to enable the Balance of Plant Branch to complete its review of License Amendment Request (LAR) 261, Extended Power Uprate (EPU) (Reference 2). The following information is provided by NextEra Energy Point Beach, LLC (NextEra) in response to the NRC staff's requests for additional information (RAI).

***BOP - AFW - RAI - 17***

*In order to protect the auxiliary feedwater (AFW) pumps from damage due to lack of sufficient water supply, the licensee uses a combination of a low pressure switch in conjunction with timers. One timer initiates a swap over from the condensate storage tank (CST) to service water (SW) as the supply source. Another timer runs concurrently to trip the pump if the swapover does not occur. The licensee has provided representation of the sequencing, showing the times for the swapover and the pump trip. The licensee's method differs significantly from the industry standard, which uses only the activation of a low pressure switch to trip the pump. Therefore, staff requires additional information in order to understand the logic used to protect the pump, to determine whether the pumps are adequately protected and will still perform its function when called upon. The follow questions refer to the figure in Enclosure 2, provided in letter dated January 7, 2010.*

1. *The figure explains the T= 0 (assumed to be the bottom line in the figure) occurs when a detected suction pressure in sensed. Explain how the low pressure setpoint was determined and how any uncertainty was captured.*

2. *The figure explains the "$T_{pl,\ Max}$ = 25.5 seconds" is the maximum allowable time delay for the pump trip.*

    a. *Explain the basis for pump trip prior to T= 25.5 seconds.*
    b. *Describe the worst case scenario, and any assumptions, that were used to establish the basis for the time allowance.*
    c. *Show the point in the suction piping where the water will theoretically stop once the pump stops if the swapover does not initially occur? Determine at this point if the suction piping is protected from air intrusion in the suction line if the operator later swaps over to the safety-related source of water.*

3. *What does "$T_{set\ switchover}$ = 14 seconds" correspond to? Timer delay or the time the service water valve operator gets a signal to open?*

4. *The figure states "SW full flow = 3 seconds." Does the 3 seconds represent the valve full stroke time? Does it include uncertainty? Does the system require the valve to open fully to restore significant suction pressure to stop the timer?*

5. *Also what stops the timer after the swapover to ensure AFW pump does not trip?*

6. *The figure state "$T_{Switchover\ Complete}$ = 18.4 seconds" and "$T_{Trip,\ min}$ = 18.9 seconds" leaving only 0.5 seconds. Is there any delay time need from 3 seconds needed to develop full flow to the time the pressure switch sense the restored pressure and send a signal to the time to stop the pump trip signal?*

*Is there any safety significance for "$T_{pl}$, min" = 12.5 seconds? If so, explain the basis used to determine the time.*

**NextEra Response**

1. The bottom line in the figure indicates the T= 0 seconds point for the transient. This would include transients which cause suction line pressure at the auxiliary feedwater (AFW) pumps to drop below the setpoint, including uncertainty. The evaluation assumes a break of the suction piping at the start of the protected volume of suction piping. Point Beach Nuclear Plant (PBNP) Calculation 97-0231, Auxiliary Feedwater Pumps Low Suction Pressure SW Switchover and Pump Trip Instrument Loop Uncertainty/Setpoint Calculation, determined the AFW pump low suction pressure setpoint and associated uncertainties. Calculation 97-0231 has been recently revised to remove use of the single-sided uncertainty approach and has been provided as Enclosure 1, Attachment 5, of Reference (4).

2.a. Time T= 25.5 seconds is the calculated value for the operating pumps to trip prior to consuming the available volume of water in the AFW pump suction piping. The consumed volume does not include the volume in the piping from the common suction header to the individual AFW pumps.

2.b. The bounding case postulates that the common AFW pump suction line breaks after the pumps are already running at full flow.

Prior to T= 0 seconds,

- Earthquake or tornado occurs, causing a loss of normal feedwater and reactor trip on both units;
- Independent of the event, a random single failure occurs which causes loss of power to one of the AFW pump trip circuits; or
- Both AFW pumps start and achieve full flow.

At T= 0 seconds,

- Failure of the unprotected AFW pump suction and recirculation piping;
- Low suction pressure occurs due to failed piping;
- Individual AFW pump time delays begin their timeout for the suction transfer and pump trip.

A bounding low steam generator (SG) pressure of 890 psig was selected to assess the AFW pump flows, based on historical plant trip data. Since the turbine-driven AFW (TDAFW) pumps have fixed resistances at their discharge, whereas the motor-driven AFW (MDAFW) pumps have flow control loops, the transient flows for the TDAFW pumps are higher and they become the bounding pumping system for this transient.

The water consumption calculation uses TDAFW pump trip throttle valve closure time based on vendor data and an assumed pump coast down time based on historical records. The calculation credits the discharge check valve closure on pump trip so water consumed in the coast down is based on operation on the recirculation loop if the service water (SW) suction transfer is not successful.

2.c. Attachments 1 and 2 show the arrangement of the TDAFW and MDAFW pump suction piping, respectively. These figures also show the point in the suction piping where the water will theoretically stop once the pump stops, if the suction transfer does not initially occur. By design, suction transfer will occur prior to AFW pump trip. As noted in Item 2.a, above, the consumed volume does not include the volume in the piping from the common suction header to the individual AFW pumps. Thus, the trip setpoint and suction piping design ensure that the individual AFW pump suction lines and SW connections remain submerged to ensure appropriate suction conditions for the AFW pumps.

3. Time T= 14 seconds is the process limit for the suction transfer time delay relay. Contacts in this relay provide input to the SW isolation valve that will initiate the suction transfer. The acceptance criteria for the time delay is time to close the contacts thus, T= 14 seconds represents the time that the SW isolation valve receives its signal to open. This value is selected to ensure that the suction transfer will not be initiated due to low suction pressure occurring during normal pump start-up transients. The time required for the suction pressure to stabilize during normal pump start-up transient ($T_{PL, min}$) has been conservatively selected based on existing plant test data. Additional suction pressure transient data will be collected during MDAFW pump start-up testing to allow margin management between suction transfer and pump trip time delay relay setpoints.

4. The 3-second duration represents the period for the SW isolation valve to open sufficiently to allow the SW system to meet the AFW pump flow requirement. Since the isolation valve is a gate valve, it does not need to open full stroke to provide the required AFW pump flow. The value is derived based on the maximum allowable full stroke time for the valve, a conservative value for the pressure in the SW system and flow characteristics for a typical gate valve. Since this value is based on the maximum allowable full stroke time for the valve, no uncertainty has been applied to this value.

5. As the SW isolation valve begins to open, SW flow starts to mix with flow from the condensate storage tank (CST). This will decrease the rate at which the water in the CST suction piping is depleted. As soon as the SW supply is capable of supporting the pump flow, the check valve in the CST suction piping will seat and pressure at the pump suction will recover. When the pressure in the suction pipe increases above the low suction pressure setpoint, the input to the pump trip time delay relay will be removed and the relay will reset.

6. The 3-second duration discussed above is based on the time required for the SW valve to pass the required AFW flow with the pressure at the tap on the suction pipe equal to the low suction pressure setpoint. The low suction pressure time delay relays are AGASTAT Series ETR, which have a stated maximum relay release time of 75 milliseconds. Therefore, the 0.5 second margin between the completion of the switchover and minimum trip time is considered to be adequate.

The value of $T_{pl}min$ is a conservatively selected minimum time delay to prevent spurious suction transfer due to normal pump startup transients.

***BOP - AFW - RAI - 18***

*In a letter dated April 22, 2010, the licensee states, "The EQ evaluation provided in LR Section 2.3.1 for high energy line breaks (HELBs) outside containment is based upon the extended power uprate (EPU) operating conditions and mass and energy releases at EPU power levels, which bound the conditions at the current licensed power level." As part of the EPU the licensee proposes to make several changes to the plant, e.g. FWIVs, methodology change in evaluating HELBs. These changes will not be part of the plant, nor approved by the U.S. Nuclear Regulatory Commission, when the AFW modifications are incorporated under the current licensing basis. Therefore, the proposed evaluation at EPU may not be appropriate to bound the current plant condition prior to the additional modifications and approval of the revised methodology.*

*The staff requests the licensee to evaluate secondary system line breaks for the current license conditions.*

**NextEra Response**

The PBNP Design Guideline for Environmental Qualification Service Conditions has been revised to incorporate both the current pre-EPU service conditions, as well as the EPU service conditions calculated for HELB and other harsh environment design basis accidents, subject to NRC approval of the LAR 261 (Reference 2). The environmental qualification (EQ) documentation for the existing AFW electrical components has been revised to encompass both the pre-EPU and EPU harsh environment service conditions. For example, the EQ checklists for the MS-2019 and MS-2020, TDAFW pump steam supply motor-operated valves, have been revised to address both the pre-EPU and EPU service conditions. The new electrical equipment for the new AFW system include the new MDAFW pump motors, controls, and associated power, control, and instrumentation cables. The electrical motors and local control components are located in a mild environment for HELB conditions for both pre-EPU and EPU conditions and no specific environmental qualification documentation is required. The new electrical power, control and instrumentation cable, which may traverse harsh environment areas for HELB outside containment, have been environmentally qualified for the harsh environmental service conditions calculated for both pre-EPU and EPU conditions. Therefore, the AFW modifications have addressed EQ of electrical equipment for HELBs outside containment based on both current licensed power level and the proposed EPU conditions.

## ***BOP - AFW - RAI - 19***

*The proposed modification will retain the current suction header from the CSTs to the AFW pumps for the steam-turbine driven auxiliary feedwater (TDAFW) pumps and standby steam generator (SSG) pumps, and will add a separate header from the CSTs to both new motor-driven auxiliary feedwater (MDAFW) pumps. The new suction line must be safety-related up to a specific point to support the safety-related pumps. The licensee establishes the same low pressure setpoint for both the TDAFW pumps and the new MDAFW pumps, even though the pumps are supplied by different headers and the pumps have different flow rates.*

*The staff requests the licensee to:*

- *a) identify the location of the safety to nonsafety-related transition in the new suction piping,*
- *b) evaluate any differences between the two headers,*
- *c) determine if the new header provides the same safety assurance as the existing header,*
- *d) provide a comparison of the pumps and the suction headers to show that calculations used to derive the low pressure setpoint are applicable for both headers and pumps.*

## NextEra Response

a. The safety to non-safety-related transition in the new MDAFW pump suction piping is at the check valve upstream of the tie-in point for the SW suction supply. This is consistent with the safety to non safety-related transition in the existing TDAFW pump suction piping.

b. The common portion of the TDAFW pump suction piping is 10 inch and 8 inch diameter Schedule 10S stainless steel piping and the TDAFW pump dedicated suction piping is 6 inch diameter Schedule 10S. The protected volume of the TDAFW pump suction piping that is credited for pump protection starts just below the top of a steel structure that was installed to provide seismic and tornado protection for the piping. The protected portion of the TDAFW pump suction piping is seismically designed and supported. The TDAFW suction piping is classified as Augmented Quality between the inlet of the check valve and the CSTs.

The common portion of the MDAFW pump suction piping is 8 inch and 6 inch diameter Schedule 40S stainless steel piping and the MDAFW pump dedicated suction piping is 6 inch and 4 inch diameter Schedule 40S stainless steel piping. The protected volume of the MDAFW pump suction piping that is credited for pump protection starts at the concrete wall between the turbine building and the control building. The protected portion of the MDAFW pump suction piping is seismically designed and supported. The MDAFW suction piping is classified as Augmented Quality between the inlet of the check valve and the CSTs.

c. Based on the comparisons described in Item b above and the design provisions discussed in the NextEra response to BOP-AFW-RAI-17, the MDAFW suction header provides the same safety assurance as the TDAFW pump suction header.

d. As discussed in the NextEra response to BOP-AFW-RAI-17 above, the key difference between the transient response of the MDAFW and TDAFW pumping systems is that the TDAFW pumps have fixed resistances at their discharge, whereas the MDAFW pumps have flow control loops. Threfore, the transient flows for the TDAFW pumps are higher and it becomes the bounding pumping system for this transient and for establishing the low pressure setpoint.

***BOP - AFW - RAI - 20***

*The proposed new low suction pressure trip setpoint and timing circuitry to automatically swap-over the AFW suction is based upon the AFW pumps being initially supplied by the CST and automatically swapping over to the SW supply.*

*The staff requests the licensee to verify that the AFW pumps will be adequately protected in the event the AFW pumps are being supplied by SW and the SW supply is interrupted.*

**NextEra Response**

The SW supply is the credited safety-related suction source for the AFW pumps. Final safety analysis report (FSAR) Section 9.6 states, "Supply of service water for essential services is redundant and can be maintained in case of failure of one loop section header."

**References**


(1) NRC electronic mail to NextEra Energy Point Beach, LLC, dated May 19, 2010, Draft - Request for Additional Information Re: AFW (ML101410232)

(2) FPL Energy Point Beach, LLC letter to NRC, dated April 7, 2009, License Amendment Request 261, Extended Power Uprate (ML091250564)

(3) NextEra Energy Point Beach, LLC letter to NRC, dated January 7, 2010, License Amendment Request 261, Extended Power Uprate, Clarification of Response to Request for Additional Information (ML100080013)

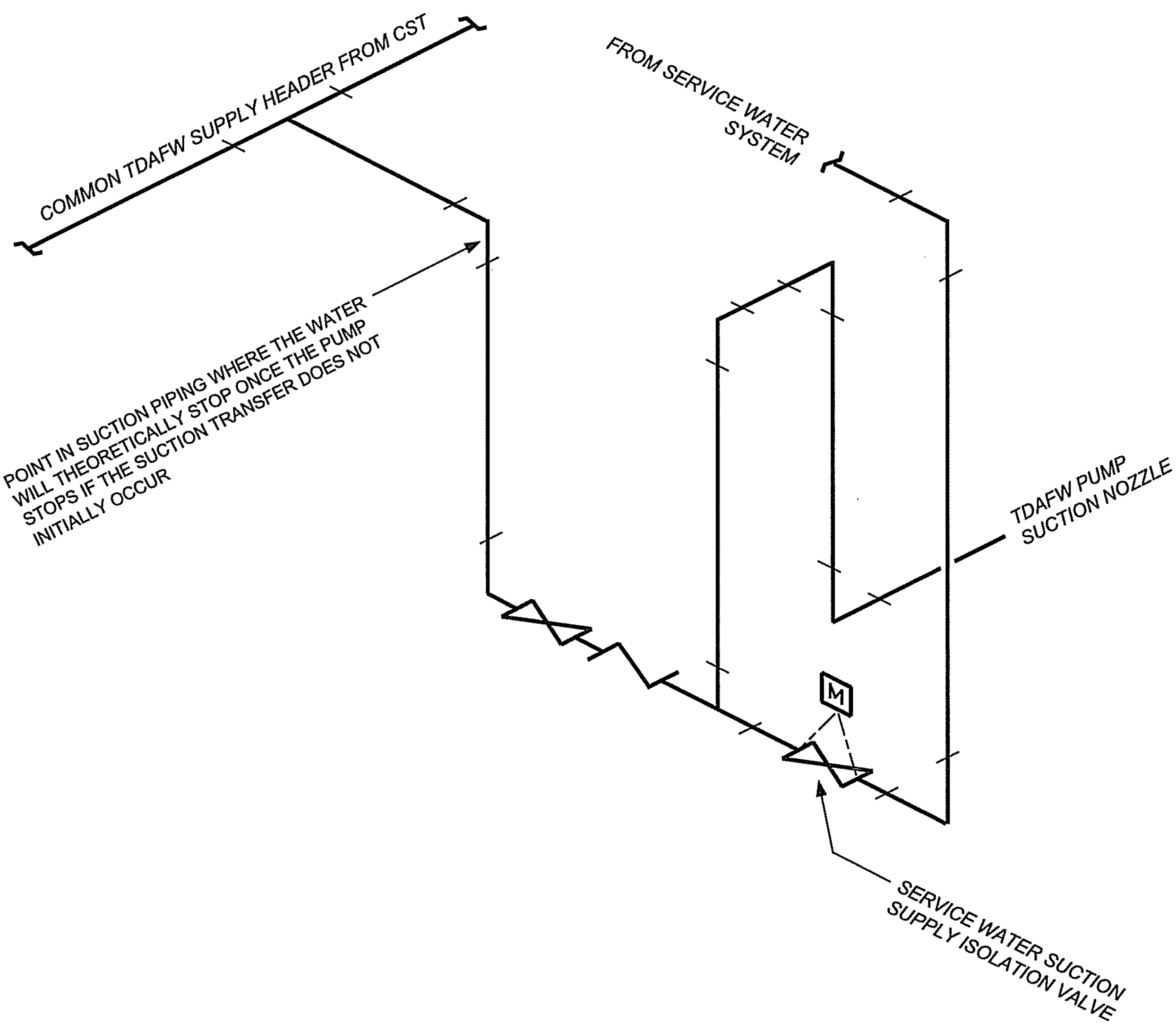
(4) NextEra Energy Point Beach, LLC, letter to NRC dated July 21, 2010, License Amendment Request 261, Extended Power Uprate, Transmittal of Sample Reactor Protection System (RPS) / Engineered Safety Features Actuation System (ESFAS) Instrumentation Setpoint Calculations (ML102040138)

ENCLOSURE 2
ATTACHMENT 1

NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

LICENSE AMENDMENT REQUEST 261
EXTENDED POWER UPRATE
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

TDAFW PUMP SUCTION PIPING CONFIGURATION



**ENCLOSURE 2**
**ATTACHMENT 2**

**NEXTERA ENERGY POINT BEACH, LLC**
**POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2**

**LICENSE AMENDMENT REQUEST 261**
**EXTENDED POWER UPRATE**
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**MDAFW PUMP SUCTION PIPING CONFIGURATION**