Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

May 19, 2011

L-2011-181
10 CFR 50.90

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

Re: St. Lucie Plant Unit 1
Docket No. 50-335
Renewed Facility Operating License No. DPR-67

Response to NRC Health Physics and Human Performance Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate, November 22, 2010, Accession No. ML103560419.
(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie Unit 1 EPU – request for additional information (Human Factors)," April 22, 2011, Accession No. ML111120257.

By letter L-2010-259 dated November 22, 2010 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. DPR-67 and revise the St. Lucie Unit 1 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an Extended Power Uprate (EPU).

By email from the NRC Project Manager dated April 22, 2011 [Reference 2], additional information related to human factors was requested by the NRC staff in the Health Physics and Human Performance Branch (IHPB) to support their review of the EPU LAR. The request for additional information (RAI) identified four questions. The response to these RAIs is provided in Attachment 1 to this letter.

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NRR

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the designated State of Florida official.

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2010-259 [Reference 1].

This submittal contains no new commitments and no revisions to existing commitments.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 19-May-2011

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachment

cc: Mr. William Passetti, Florida Department of Health

Response to Request for Additional Information

The following information is provided by Florida Power & Light in response to the U. S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Nuclear Plant Unit 1 that was submitted to the NRC by FPL via letter (L-2010-259) dated November 22, 2010, Accession Number ML103560419.

In an email dated April 22, 2011 from NRC (Tracy Orf) to FPL (Chris Wasik), Accession Number ML111120257, Subject: St. Lucie Unit 1 EPU – request for additional information (Human Factors.), the NRC requested additional information regarding FPL's request to implement the EPU. The RAI consisted of four (4) questions from the NRC's Health Physics and Human Performance Branch (IHPB). These four RAI questions and the FPL responses are documented below.

IHPB-1

The St. Lucie site includes two plants, Unit 1 and Unit 2, but this LAR addresses only Unit 1. Are operators trained and licensed to operate either unit? If so, how has this been considered in the EPU implementation plan, e.g. how will potential human errors be prevented or minimized during the time period when the units are significantly different? Also, it is not clear that all changes to the control room, simulator, procedures, training, and SPDS will be coordinated and completed prior to EPU implementation – provide a statement to that effect, along with a timeline showing completion milestones for the various human performance initiatives for both units and the associated EPU implementation dates.

Response

St. Lucie operators are trained and licensed to operate either unit.

The EPU project implementation plan includes a comprehensive training component. As part of St. Lucie's training program, the Systematic Approach to Training (SAT) process is used to determine training needs, design and develop training, followed by implementation and evaluation to ensure continuous improvement. This systematic approach will be applied to accommodate design changes as a result of the implementation of EPU.

Implementation of EPU modifications for St. Lucie Unit 2 are planned to take place over the course of two refueling outages. The first outage is SL2-19, which was completed in May, 2011; the second outage, SL2-20, is planned for the Fall of 2012. Implementation of EPU modifications for St. Lucie Unit 1 is planned for the Spring 2012 refueling outage (SL1-24).

The St. Lucie simulator is Unit 2 specific. Use of the simulator to support Unit 1 related training is performed when there are no configuration differences between the simulator and Unit 1. Classroom training is provided relative to the implementation of modifications to both St. Lucie Units. Human errors are prevented through rigorous training in the classroom, plant, simulator, and laboratory settings prior to completion of modifications at each unit. The training includes evaluation tools such as written exams, simulator evaluations, and task performance tools as deemed appropriate.

As mentioned above, Unit 2 modifications are planned to be implemented over the course of two refueling outages. Training has been presented for the modifications performed on Unit 2 during the recently completed SL2-19 outage. The training specific to Unit 2 EPU modifications included classroom instruction with detailed explanations of the plant component changes, impact(s) on associated systems, setpoint changes, procedure changes/differences, changes to operator response requirements, and the differences between the modified components of Unit 2 and the current components of Unit 1. Training for Unit 1 EPU modifications will follow this same structure. Newly licensed operators have received "gap" training since their training was specific to the plant design prior to EPU modifications. A component of the gap training included "delta" training on the differences between Unit 1 and Unit 2.

Changes to the control room, procedures, training and safety parameter display system (SPDS) will be made prior to EPU completion. A timeline showing completion milestones for the various human performance initiatives for both units and associated EPU implementation dates is provided below. Changes to the simulator are implemented as soon as possible and within 2 years following modification implementation.

SL2-19 Outage Modifications

Operations Training		
Group	**Training**	**Date**
Licensed Operator Continuing Training and Non-Licensed Operator Continuing Training	Classroom Instruction SL2-19 EPU Modifications Overview	9/13/10 through 10/22/10 (Complete)
Licensed Operator Continuing Training	Classroom Instruction	11/1/10 through 11/11/10 2/5/11 through 2/17/11 (Complete)
Non-Licensed Operator Continuing Training	Classroom Instruction	11/1/10 through 12/6/10 (Complete)
Non-Licensed Operator Continuing Training	Classroom Instruction. Re-visit SL2-19 Modifications	5/16/11 through 6/17/11
Licensed Operator Initial Training	Classroom Instruction	3/1/11 and 4/6/11 (Complete)
Technical Training		
Engineering Continuing Training	Classroom Instruction	10/5/10 and 10/12/10 10/7/10 and 10/14/10 (Complete)
Maintenance Training		
Electrical, Mechanical, and I&C	Classroom Instruction	12/6/10 (Complete)

SL1-24 Outage Modifications

Operations Training		
Group	**Training**	**Date**
Licensed Operator Continuing Training	Classroom Instruction	5/16/11 through 6/17/11
Licensed Operator Continuing Training	Classroom Instruction	7/11/11 through 8/19/11
Licensed Operator Continuing Training	Classroom Instruction	8/29/11 through 9/30/11
Licensed Operator Continuing Training	Classroom Instruction	10/10/11 through 11/11/11
Licensed Operator Continuing Training Simulator Training	Simulator Practice	7/11/11 through 8/19/11 8/29/11 through 9/30/11 10/10/11 through 11/11/11
Non-Licensed Operator Continuing Training	Classroom Instruction	5/16/11 through 6/17/11
Non-Licensed Operator Continuing Training	Classroom Instruction	7/11/11 through 8/19/11
Non-Licensed Operator Continuing Training	Classroom Instruction	8/29/11 through 9/30/11
Non-Licensed Operator Continuing Training	Classroom Instruction	10/10/11 through 11/11/11
Licensed Operator Initial Training	Classroom Instruction, students will receive information relative to the changes as the class progresses through systems training.	Systems sessions start July 5, 2011
Technical Training		
Engineering Continuing Training	Classroom Instruction	Oct / Nov - 2011
Chemistry Continuing Training	Classroom Instruction	Oct / Nov - 2011
Health Physics Continuing Training	Classroom Instruction	Oct / Nov - 2011
Maintenance Training		
Electrical, Mechanical, and I&C	Classroom Instruction	Oct / Nov - 2011
Outside Vendor Provided Training		
DEH Ovation -Westinghouse Engineering and System Engineers Operations Maintenance I&C Simulator Engineers	Classroom with hands on workstation simulation	9/25/2011 thru 11/4/2011
Heater Drain/MSR/FW Heater Digital Level Controls-Key Controls System Engineer, Engineering, Maint. I&C	Fisher Valve Link/Flowscanner classroom training, with hands on instruction using mock-ups	9/13/2011 thru 9/23/2011
Leading Edge Flow Meter (LEFM) System Engineer, Engineering, Maint., I&C	Classroom with hands on instruction using mock-ups	Nov - 2011

SL2-20 Outage Modifications

Operations Training		
Group	**Training**	**Date**
Licensed Operator Continuing Training	Classroom Instruction	Cycle 12.3 April 2012 and Cycle 12.4 June 2012
Licensed Operator Continuing Training	Simulator Practice on SL2-20 Modifications	Cycle 12.3 April 2012 and Cycle 12.4 June 2012
Non-Licensed Operator Continuing Training	Classroom Instruction	Cycle 12.3 April 2012 and Cycle 12.4 June 2012
Licensed Operator Initial Training	Classroom Instruction	During GAP training, immediately following license exams (Prior to being released for operations duty
Technical Training		
Engineering Continuing Training	Classroom Instruction	April 2012
Chemistry Continuing Training	Classroom Instruction	April 2012
Health Physics Continuing Training	Classroom Instruction	April 2012
Maintenance Training		
Electrical Continuing Training	Classroom Instruction	May 2012
Mechanical Maintenance Continuing Training	Classroom Instruction	May 2012
I&C Continuing Training	Classroom Instruction	May 2012

IHPB-2

In Topic 2.0 of Section 2.11.1.2.2, "Changes to Operator Actions Sensitive to Power Uprate", the licensee did not answer the question completely. The licensee stated that there will be no changes to operator workarounds – this does not address the concern of operator workarounds increasing operator workloads beyond what is already required for the EPU. Therefore, identify and describe any operator workarounds that will exist after the EPU is implemented. Explain why these operator workarounds will not affect the response time of any required Emergency Operating Procedure (EOP) or Off-normal Procedure (ONP) actions.

Response

There are currently two operator workarounds associated with St. Lucie Unit 1, identified below.

1. V21208, 1B intake cooling water (ICW) discharge check valve stuck open upon pump shutdown. Compensatory Action: If the 1C ICW is running on the 1B ICW header and the 1B ICW pump rotates backwards, then SB21209 will have to be closed before starting the 1C ICW pump. Caution tags have been placed describing the required actions.

2. V2500, volume control tank (VCT) divert valve is slow to close causing an unnecessary reduction in VCT level and pressure following diverting activity. Compensatory Action: Change position earlier than normal in order to accommodate for slow stroke.

There is no impact on these workarounds as a result of the EPU. The item 1 workaround is associated with swapping the aligned 1B ICW pump on the "B" train to the spare 1C ICW pump. This operation is not time critical. The item 2 workaround is associated with VCT operations, which are not sensitive to EPU since EPU does not impact the operating parameters associated with VCT operations; the slow stroke associated with the divert valve closing remains unchanged following EPU implementation. It is expected that the issues prompting the need for these workarounds will be addressed prior to implementation of EPU.

In the event a new workaround is necessary; FPL will ensure that the workaround will not result in exceeding response time limits of affected Emergency Operating Procedure (EOP) or Off-normal Procedure (ONP) actions. FPL employs procedures and processes to ensure that changes in operator action requirements will be verified and validated using plant procedures specifically prepared to perform EOP verification and validation.

Verification of procedures are performed to confirm the written correctness of the procedure and to ensure that applicable generic and plant specific technical information has been incorporated properly. The verification evaluation process also checks that the human factors aspects presented in the writer's guide for EOPs have been applied.

Verification activities are table top activities. These activities involve comparing the emergency operating procedures with requirements identified in reference documentation.

Verification of technical accuracy is performed by comparing each emergency operating procedure with the applicable generic and plant specific technical guidelines and with other source data such as technical specifications and Updated Final Safety Analysis Reports. A checklist is used to ensure that key points of comparison are covered consistently.

Verification of written correctness is performed by reviewing each part of each EOP against a checklist of criteria drawn from the EOP writer's guide.

The verification program is based on the industry document Emergency Operating Procedures Verification Guideline (INPO 83-004), developed by the EOPIA Review Group and published by INPO.

Validation of procedures is performed to determine that the actions specified in the procedure can be performed by the operator to manage the emergency conditions effectively.

At St. Lucie, EOPs are validated using one or more of the following methods:

> Table-Top Reviews - Method of validation whereby personnel explain and/or discuss procedure action steps for an observer/reviewer in response to a scenario or as part of an actual industry operating experience review.

Control Room or Local Walk-Through - Method of validation whereby control room operators conduct a step-by-step enactment of their actions during a scenario for an observer / review team without carrying out the actual control functions.

Simulator Exercises - Method of validation whereby control room operators perform actual control functions on simulated equipment during a scenario for an observer/review team.

All exercises are performed to comply with minimum shift complement as specified in technical specifications. Furthermore the validation effort ensures that operator actions can be performed within acceptable times as described in procedures.

On-site Review Group (ORG) review and approval is required for all changes (except editorial) to EOPs.

IHPB-3

In Section 2.11.1 of the LAR, "Human Factors", much credit is taken for "approved plant procedures and processes such as the modification process". To augment the NRC staff's understanding of this topic, provide the licensee-approved procedures that are used for human factors engineering review and the procedures that address verification and validation of Emergency Operating Procedure (EOP) or Off-normal Procedure (ONP) actions and their associated interfaces.

Response

If a modification has the potential to impact human system interfaces, plant operations personnel are typically involved in the design process so that human factor engineering (HFE) requirements can be addressed and incorporated early within the context of the design modification process. Design modifications are performed in accordance with the St. Lucie "Design Change Package" procedure, which includes procedural requirements to perform an initial screening for HFE considerations aligned to the guidelines provided in NUREG-0700, "Human-System Interface Design Review Guidelines." The screening checklist used for this purpose determines if the modification:

- Will change the layout of the control room, control board, operator console, or remote shutdown panel;
- Will install new equipment in the control room, control board, operator console, or remote shutdown panel;
- Adds new equipment that requires operator local control for off-normal or emergency operating procedures;
- Affects the access of existing equipment required for operator action;
- Affects alarms, equipment failures or off-normal conditions that could affect operator response;

- Affects the method in which an operator interfaces with a control or data system;
- Affects the environment of the control room, control board, operator console, remote shutdown panel, or any location where operator action is required for off-normal conditions;
- Involves changes to existing operator computer displays; and/or
- Involves color coding, labeling, scaling, or displays that are different than the existing standard conventions.

If the answer to any of these screening questions is 'Yes,' then an HFE evaluation is performed. The HFE evaluation must address the applicable NUREG-0700 sections or HFE practices used in the design, and explicitly address deviations from NUREG-0700 guidelines and accepted HFE practices. Key stakeholders, usually including the Operations Department, review and approve the HFE evaluation. The HFE Evaluation is included in the engineering change document.

Changes in operator action requirements as discussed in Section 2.11.1.2.2 of LAR Attachment 5 will be verified and validated in the manner described in response to IHPB-2.

Procedures utilized by FPL to perform the HFE review and the verification and validation of operator actions and interfaces review include the following:

QI-5-PR/PSL-3	Verification Guide for Emergency Operating Procedures
QI-5-PR/PSL-4	Validation Guide for Emergency Operating Procedures
QI-5-PR/PSL-6	Requirements for Development and Revision of Emergency Operating Procedures (Procedures Generation Package (PGP))
ADM-09.02	EOP Plant Specific Technical Guidelines
ADM-11.09	Emergency and Off-Normal Operating Procedure Writers Guide
EN-AA-205-1100	Design Change Packages and EC FORM-250 Human Factors Engineering Checklist

The integration of the HFE screening and evaluation into the modification process, the formalized verification and validation of EOPs and ONPs (as discussed in response to IHPB-2), and the SAT-based training process applied to modifications, operator actions and interfaces, including time-critical operator actions, will ensure that the effects of the proposed EPU on operator performance and the available time for operator actions are addressed and not adversely affected by the proposed EPU.

IHPB-4

Will the EPU require any operator interface changes from analog to digital? If so, list those digital changes that change, add, or delete displays used by operators, discuss any differences between the analog display and the digital display, and justify equivalency or describe the advantages of digital display to the operator(s).

Response

The human factors engineering of the control room environment is controlled by FPL's human factors program. Operator interface changes from analog to digital are formally identified through the Human Factors Engineering Checklist. The identification of such changes triggers an HFE Evaluation. Operations department personnel are involved early in this process. They participate in the evaluation and provide formal review and approval. The HFE Evaluation ensures that any deviations from applicable NUREG-0700 and HFE practices are justified. This includes providing assurance that any such changes are beneficial to the operators. These changes are verified and validated and incorporated into the applicable procedures. The operators receive classroom and simulator-based training on them before implementation. Listed below are the planned EPU operator interface changes.

The first four sub-sections below summarize planned control room operator display conversions from analog to digital and describe the equivalency or advantages of the change. The remaining three sub-sections illustrate the consistent application of human factors engineering principles throughout the various modifications of the EPU project. Constant involvement of Operations Department personnel has significantly enhanced our ability to give the operators what they need to effectively monitor and operate the associated equipment. The modification process employed at St. Lucie ensures that applicable NUREG-0700 and HFE practices are implemented as a part of FPL's human factors program.

1. DEH Turbine Control System

The instrumentation package for the existing turbine control system consists of individual indicators via transmitter loops for key operational parameters, several multipoint digital recorders, dedicated annunciator panel windows and inputs to the sequence of events recorder. The instrumentation package for the replacement turbine control system will feature redundant touch screen display panels, but will also retain large portions of the existing instrumentation package including: individual indicators via transmitter loops for applicable remaining key operational parameters, dedicated annunciator panel windows and inputs to the sequence of events recorder. The touch screen panels use mimic displays and function specific popup windows that were derived from turbine control displays developed by Westinghouse for other nuclear projects. These displays were customized for St. Lucie based on a series of meetings with multiple St. Lucie senior reactor operators. In comparison with the existing digital recorders, the touch screen panels provide a superior human factors interface based on the use of integrated mimics with imbedded multi-variable live data points while still retaining trend capability. With the replacement turbine control system, far more information is available to the operators regarding turbine trip parameters since existing electro-hydraulic functions are now performed via triple-redundant instrument channels.

2. Distributed Control System (DCS) Display Screen Changes for LEFM Installation

The DCS calorimetric sub-system processes input signals and calculates reactor power via a secondary side heat balance. DCS calorimetric display screens will be modified to incorporate feedwater flow and temperature input data from the new Leading Edge Flow Meter (LEFM) system and in a way that facilitates data validation via channel checks. Specifically, the affected calorimetric displays will be modified to provide side-by-side comparison of computed mass flow from the venturi DP transmitters and from LEFM. The revised displays will also provide side-by-side comparison of feedwater temperature from the existing RTDs and from LEFM. All changes will comply with existing DCS HFE design criteria which includes consistent application of system wide human factors considerations pertaining to point data quality status monitoring, color conventions, point ID naming conventions and fonts. This is additional information, not replacement information, in digital format.

3. Containment Mini-Purge System

The existing containment hydrogen purge system is being modified in support of the EPU proposed Technical Specification amendment that will reduce the containment Internal Pressure Technical Specification Limiting Condition for Operation (LCO) from 2.4 psig to 0.5 psig. It is anticipated that this LCO change will necessitate more frequent operation of the containment purge system. The existing purge system is designed for local operation. To reduce any operator burden due to compliance with the more-restrictive LCO, the purge system controls are being relocated to the control room, and remote monitoring instrumentation is also being provided. The modification will install control switches with indicating lights for the purge fans and associated flow control valves. In addition, the panel will include a new digital flow recorder.

4. Steam Bypass Control System (SBCS) Digital Controls

The steam bypass control system (SBCS) bypasses steam to the main condenser on a reactor tip or large load rejection, in addition to providing heat removal for cool-down and maintenance of a hot standby condition. The SBCS uses measurement of main steam header pressure, steam flow, and reactor coolant average temperature to produce individual valve modulation output signals, or individual quick opening signals to the steam bypass valves, if plant conditions warrant.

The existing control system reflects the original design and consists of various Proportional – Integral - Derivative (PID) controllers, Manual/Auto (M/A) stations and other discreet electronic modules. Various scaling and tuning changes are needed for SBCS to optimize system performance at EPU conditions. Rather than modifying the existing controls, the SBCS will be incorporated as a new sub-system in DCS based on the existing Unit 2 design. Implementing the necessary EPU changes in this way will improve the operator interface and to eliminate a Unit 1 vs. Unit 2 difference.

5. Feedwater Pump Instrumentation

The main feedwater pumps, and associated cooling, seal water and lubrication sub-systems, are being replaced to support EPU flow requirements. The existing pump instrumentation package primarily consists of locally mounted indicators and switches for pressure, temperature and flow for the lube oil and seal water systems. The local pump instrumentation package is being upgraded to provide: integrated displays via redundant multi-point digital recorders, replacement of switches

with analog channels to reduce the potential for latent malfunctions and elimination of single point vulnerabilities in the pump trip circuits through use of redundant contact logic. In addition, the recorders provide Ethernet output capability thus enabling all data to be made available via the plant LAN to operations, maintenance and system engineering for trending and predictive maintenance.

6. Iso-Phase Bus Duct Cooling

The iso-phase bus duct cooling equipment is being replaced to meet the larger EPU heat load requirements. The existing cooling system instrumentation package primarily consists of locally mounted indicators and switches for differential pressure, temperature and presence of hydrogen. The local cooling system instrumentation package is being upgraded to provide integrated displays via a multi-point digital recorder and replacement of switches with analog channels to provide more complete diagnostic information. In addition, the recorders provide Ethernet output capability thus enabling all data to be made available via the plant LAN to Operations, Maintenance and System Engineering for trending and predictive maintenance.

7. Unit 1 Heater Drain/MSR/FWH Digital Level Controls Upgrade

The outdated pneumatic level control equipment for the Unit 1 moisture separator reheaters, high pressure feedwater heaters and drain collectors are being replaced by more accurate digital electronic equipment rated for EPU conditions for improved control and reliability. The digital equipment will also facilitate data collection for historization and analysis. The operators will have continuously recorded data available via the site data historian. The availability of this data will offer the opportunity to trend and analyze operating conditions that were previously unavailable.