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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Response to Request for Additional Information from the NRC Human Performance Branch Regarding the Power Uprate License Application

Gentlemen:

Entergy Operations, Inc. submitted a license application on December 19, 2000 (2CAN120001), to increase the authorized power level from 2815 megawatts thermal to 3026 megawatts thermal. NRC personnel from the Operator Licensing, Human Performance and Plant Support Branch asked five questions regarding the December 19, 2000, application. Verbal responses to these questions were discussed during a telephone conference call between members of the NRC and Arkansas Nuclear One (ANO) staffs on April 25, 2001. The NRC staff requested written responses to the five questions. Attachment 1 contains the written responses. Attachment 2 lists the regulatory commitments contained in this submittal.

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

Very truly yours,

Jimmy D. Vandergrift
Director, Nuclear Safety Assurance

JDV/dwb
Attachment

A001

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ATTACHMENT 1

NRC Human Performance Branch Questions and ANO Responses

Background Information

During the April 25, 2001, telephone conference call involving members of the NRC and ANO staffs, the draft responses to the five NRC questions were discussed. At the conclusion of the telephone call, the staff requested finalized listings of setpoint and procedure changes. Such finalized lists are not yet available because the design verification portion of the ANO design change control process has not yet been completed. Consistent with this process, for each outage the design verification portion for planned equipment and setpoint modifications is scheduled to be complete approximately six months before the outage. Past experience has shown that a six-month lead time is optimal for managing engineering resources while allowing adequate time for activities such as procedure changes, training and planning for modification installations. The next refueling outage, 2R15, is scheduled to begin April 12, 2001. The six-month lead date is October 12, 2001. In the case of evaluations for which no changes to structures, systems or components are expected, the design verification process may be finalized even later as long as the schedule allows adequate time for procedure changes and training.

While substantial engineering reviews were completed in preparation for our power uprate license amendment request dated December 19, 2000 (2CAN120001), the formal engineering reviews, which include design verification, are still in progress. Effects of the power uprate on operations procedures and on the control room (as well as other instrumentation and control systems) are being documented in accordance with the design change control process at ANO. The documentation required for changes to controls, displays, setpoints, etc., as well as for systems that require no changes, is rigorous and must satisfy the design verification requirements contained in ANSI N45.2.11-1974. Additionally, the documentation requires an engineering screening for impact on operational requirements, including emergency operations, and on human factors areas such as control room layout, display or labeling of equipment, instrumentation, controls, annunciators, operator aids or the control room environment. Because this type of review is imbedded in the design control process, no unique requirement to conduct such reviews is necessary to determine the impact of power uprate on operations.

It should also be noted that comprehensive reviews of affected structures, systems and components were completed as part of the replacement steam generator effort that concluded last fall. In many cases, the replacement steam generator reviews considered the effects of the 7.5% uprate. In the other cases, substantial reviews have been completed as well. Consistent with our engineering processes, procedure changes will occur after the equipment/setpoint changes have been design verified. Until the design verification process completes, it would be premature to provide listings of setpoint and procedure changes. Notwithstanding the above, the ANO responses to the staff's questions are provided below:

NRC Question 1: Changes in Emergency and Abnormal Operating Procedures

Describe how the proposed power uprate will change the emergency and abnormal operating procedures.

Response

The effect of power uprate on operating procedures is summarized in Section 9.9.5 of Enclosure 5, Power Uprate Licensing Report, of the license amendment request dated December 19, 2000.

Power uprate has no effect on the type and scope of the ANO-2 emergency and abnormal operating procedures (EOPs and AOPs). No new operator actions are needed for power uprate and the type and nature of operator actions needed for accident mitigation will not change. Analyses and evaluations for ANO-2 power uprate have been completed. There were no new types of accidents, changes to accident scenarios, or changes to operator actions identified. Existing procedures will adequately cover emergency scenarios or abnormal occurrences. New procedures will not be required.

ANO-2 Emergency Operating Procedures follow the generic guidelines provided in the CEN-152 Emergency Procedure Guidelines. Combustion Engineering, now Westinghouse, has reviewed the guidelines in the above document and verified their use following steam generator replacement and power uprate.

Power uprate will affect the EOPs and AOPs by changing certain setpoints at which actions are performed. ANO-2 maintains a setpoint document for the emergency operating procedures, which will be revised to be consistent with the power uprate analyses. A preliminary review of the setpoint document was conducted by a multi-discipline committee to identify potential changes from power uprate. This committee consisted of representatives from operations, safety analysis, electrical/instrumentation and controls design engineering, system engineering and mechanical/civil/structural design engineering. Out of approximately 215 setpoints, less than 10% have been identified as affected. In some cases, the setpoint itself will remain the same, but the justification for the setpoint requires revision to be consistent with power uprate and the new analyses. For such cases, neither the procedures nor the operator actions are affected. For example, the setpoint for verification of reactor coolant system natural circulation (ΔT) should not change, but the discussion will be updated for power uprate conditions.

There are both indirect and direct changes to EOP and AOP setpoints due to power uprate. Changes to setpoints are indirectly required due to increases in plant parameters used in analyses such as thermal power, hot leg temperature, decay heat, and negative moderator temperature coefficient value. For example, the condensate inventory requirements will be revised to be consistent with the increase in decay heat. The emergency procedures will be revised to incorporate these new setpoint values prior to implementation for power uprate. Procedures will

also be updated as necessary due to the direct changes in pressurizer low pressure setpoint and boric acid mix tank inventory value.

There are several normal and abnormal operating procedures that contain trigger points for specific operator activities (e.g., power level at which the second feedwater pump is started, pressurizer level control program, etc). These will be revised, as necessary. Additional changes identified during the verification and validation phase of the procedures will also be incorporated. These setpoint revisions will not impact the scope of the procedures or the nature of operator actions required.

The abnormal operating procedure for a dropped control element assembly (CEA) will be changed, but the change will allow more time for an operator action. The December 19, 2000 (2CAN120001), application for license amendment included a technical specification change that increases the time allowed for operator action for a dropped CEA from one hour to two hours. This is consistent with the COLR figure limit and supported by the power uprate safety analysis and NUREG-1432, Revision 1, "Standard Technical Specifications Combustion Engineering Plants." This accident is discussed in Section 7.3.3 of the Power Uprate Licensing Report.

NRC Question 2: Changes to Risk Important Operator Actions Sensitive to Power Uprate

Describe any new risk important operator actions required as a result of the proposed power uprate. Describe changes to any current risk important operator actions that will occur as a result of the power uprate. Explain any changes in plant risk that result from changes in risk important operator actions, e.g., identify operator actions that will require additional response time or will have reduced time available, identify operator actions that are being automated as a result of the power uprate, and provide justification for the acceptability of these changes.

Response

Although this question asks about "risk important operator actions," probabilistic safety assessment (PSA)-related information will be provided in a separate letter. Operator actions that were assumed in the power uprate analyses are consistent with current analyses. There were no changes made to operator action assumptions in accident or transient analyses that resulted in reduced operator response times. There are no new operator actions due to power uprate. No operator actions are being automated. Operators will be able to complete manual actions in the time required. This will be demonstrated during the verification and validation phase of the changed procedures.

Any required setpoint changes due to the power uprate values for design parameters such as thermal power, decay heat, and temperatures will be incorporated into the procedures prior to power uprate. For example, the higher operating temperatures may change feedwater pump trip setpoints, heater drain pump differential pressure alarm setpoints, and heater drain tank pressure. Time lines for operator actions during shutdown operations will depend on decay heat. Power reductions required to respond to failure of components like main feedwater pump or circulating water pump may also change. These will be reevaluated and procedures updated as required.

These changes will not result in any type of new operator actions or change the nature of current operator actions.

NRC Question 3: Changes to Control Room Controls, Displays and Alarms

Describe any changes the proposed power uprate will have on the operator interfaces for control room controls, displays and alarms. For example what zone markings (e.g., normal, marginal and out-of-tolerance ranges) on meters will change? What setpoints will change? How will operators know of the change? Describe all controls, displays and alarms that will be updated from analog to digital instruments as a result of the proposed power uprate and how operators were tested to determine they could use the instruments reliably.

Response

Changes to operator interfaces for control room controls, displays and alarms necessitated by power uprate will be minimal. In anticipation of the power uprate, some changes were completed during the last refueling outage when the steam generators were replaced. As the design changes for power uprate are finalized, additional changes to the control room may be identified; however, based on preliminary reviews, these changes are not expected to be significant.

Most of the power uprate impacts to operator interfaces with control stations and controllers are transparent to the operator. Power uprate does not require any new control stations or any physical modifications to existing control stations. No instruments are being upgraded from analog to digital instruments as a result of power uprate.

Zone Markings

ANO-2 does not typically use zone markings on indicator scales to denote normal, marginal, and out-of-tolerance ranges for the process parameter displayed. Abnormal conditions for critical plant parameters are identified through alarms, operator training, and operator log procedures normal range and cross channel check allowable differences.

Control Room Instrument Ranges

As mentioned above, some changes required for power uprate have already been installed. Analog control board indicators for turbine-generator load (MW) meters were replaced with similar analog models with expanded scale ranges during the 2R14 outage as part of the main turbine upgrade. They were replaced in anticipation that generator load could be close to the upper end of the existing indicator scales after turbine modifications were completed during 2R14 and in preparation for the future power uprate. The new scales read up to 1200 MW (to allow adequate margin), replacing 980 MW indicators. Also, the plant computer software will be revised so the range is consistent with the higher power rating and percent plant power indications are calculated using the new base generator output.

The rise in steam pressures at the turbine after 2R14 required an increase to the calibrated range of the turbine first stage pressure inputs to the plant computer and the control board indicator to 0 - 800 psia. The intermediate range (cold reheat) pressure transmitter range was also recalibrated for a higher range of pressure and the analog control board indicator was replaced with a similar analog indicator with a scale of 0 – 280 psig. Both of these modifications will accommodate power uprate range requirements.

Due to the anticipated increase in main steam and main feedwater flow for power uprate, the calibrated range of the steam and feedwater flow transmitters was increased from 0 - 7.2E+06 lbm/hr to 0 - 7.6E+06 lbm/hr during 2R14. The control board recorder chart paper was rescaled along with the associated plant computer point ranges and Feedwater Control System (FWCS) ranges. Although the flow range described above is not expected to change for power uprate, minor adjustments to the measured variable calibration constants may be required due to refinement of best estimate operating point steam and water densities.

Calibration adjustments for Cycle 15 operating point and new level tap distances associated with the replacement steam generators were implemented during 2R14. Because the wide range level transmitters read in inches, the scale range on the control board and computer indicators were increased due to the wider span distance between taps on the replacement steam generators when compared to the original steam generators. The new scale on the wide range indicators and recorders ranges from approximately 17 to 500 inches above the lower tube sheet. Scale changes were not necessary for the narrow range level transmitters since these read in percent (0-100%). Power uprate will not require any additional changes to steam generator level instrumentation scales.

Computer software associated with the Core Operating Limit Supervisory System (COLSS) is updated as part of the normal reload data update process each cycle. For example, various constants associated with the calorimetric power calculations are revised to provide accurate predictions of power for the new core.

Setpoint Changes

Power uprate will necessitate various setpoint changes. For example, as discussed in Section 4.2 of the Power Uprate Licensing Report control systems such as the feedwater control and steam dump and bypass control systems will require adjustments to setpoints. However, such changes do not directly affect the operator's interface with the existing control stations. Nuclear steam supply system control systems are discussed in Section 4.2 of the Power Uprate Licensing Report.

The plant protection system (PPS) low pressurizer pressure setpoint will be changed from 1675 to 1650 psia as discussed in the technical specification change request submitted December 19, 2000 (2CAN120001). Other PPS actuation and pre-trip alarm setpoint changes made during 2R14 for as part of the replacement steam generator effort (see 2CAN119901) included consideration of power uprate as well.

Training

Operators are made aware of all instrumentation and control changes including setpoint changes during routine training on modifications to plant systems. See the response to Question 5 for more information.

NRC Question 4: Changes to the Safety Parameter Display System (SPDS)

Describe any changes the proposed power uprate will have on the SPDS. How will operators know of the changes?

Response

Changes to SPDS will be implemented in accordance with standard engineering and software control procedures. Based upon preliminary reviews, changes to SPDS will be minimal. For example, the low pressurizer pressure trip setpoint limit shown on the RCS Pressure / Temperature (PT) display will be lowered from 1675 to 1650 psia as discussed above in the response to Question 3. Also, the expanded range of feedwater flow discussed in Question 3 above was applied to the Primary to Secondary Heat Transfer Display (PSHT) on SPDS. Operators will be made aware of the changes during routine training (see the response to Question 5 below).

The format for SPDS displays will not change as a result of power uprate.

NRC Question 5: Changes to Operator Training Programs and Control Room Simulator

Describe any changes the proposed power uprate will have on the operator training program and the plant reference control room simulator, and provide the implementation schedule for making the changes.

Response

The effect of power uprate on operator training and the control room simulator is discussed in Section 9.9 of the Power Uprate Licensing Report.

Simulator Modifications

ANO-2 simulator modifications for power uprate will be incorporated according to the standard process for maintaining the simulator. Each plant modification has a Needs Analysis conducted to determine its impact on the simulator model (system and panel changes), as well as on training materials (Simulator Exercise Guides, Simulator Exam Scenarios, System Training Manuals, etc.). Plant modifications that affect the primary systems, secondary systems, and panel hardware or control systems are incorporated into the simulator upon approval of the package.

The following power uprate changes affect specific simulator process models:

- re-spanning of four safety channel excore power detectors

- re-spanning of two startup channel excore detectors
- plant protection system trip setpoint changes
- steam dump and bypass control system setpoint changes
- addition of control element assembly withdrawal prohibit for bank P
- main turbine/generator setpoint changes
- condensate recirculation valve upgrade
- pressurizer level control system adjustments
- feedwater control system adjustments
- generator stator water modifications
- heater drain pump impellers and motors modifications
- reactor core reload

After the process model modifications are complete, simulator initial conditions will be established at various power levels and times-in-life. Simulator operability as described in ANSI/ANS 3.5 will be conducted for changes required by the power uprate (as a minimum).

The simulator software will be capable of being transferred readily from Cycle 15 to Cycle 16 parameters. The Cycle 15 modeling will continue to be used for normal licensed operator requalification training until the end of 2001 and for the completion of the current licensing class.

Operations Training

The ANO-2 Training staff will provide classroom training and simulator training on the power uprate changes for the ANO-2 operations crews and staff prior to refueling outage 2R15. The training will be conducted over two, five-week training cycles. The classroom and simulator training will include plant changes (including SPDS changes), system response changes, new or revised technical specifications, startup testing, revised procedures (normal, abnormal, and emergency) and revised safety analyses as well as pre-outage training. The power uprate training is scheduled to begin in January 2002 and end in March 2002. A three-week period prior to the outage will be used to conduct plant shutdown and cooldown training for the crews in preparation for the outage. The Cycle 15 core and systems will remain available for Just In Time (JIT) training prior to the shutdown or as other needs arise. The ability to change from the present cycle to Cycle 16 in minutes will provide flexibility for any training need.

Verification and validation required for procedure changes is scheduled to begin in the fall and complete prior to the power uprate training in January 2002.

Startup training will be conducted prior to the conclusion of the outage for the operations crews with emphasis on core reload, positive moderator temperature coefficient, reactor engineering interface and teamwork skills.

Attachment 2

Licensee Identified Commitments for 2CAN060105

COMMITMENT	TYPE	
	One-Time Action	Continuing Compliance
The emergency procedures will be revised to incorporate these new setpoint values prior to implementation for power uprate. Procedures will also be updated as necessary due to the direct changes in pressurizer low pressure setpoint and boric acid mix tank inventory value.	✓	
There are several normal and abnormal operating procedures that contain trigger points for specific operator activities (e.g., power level at which the second feedwater pump is started, pressurizer level control program, etc). These will be revised, as necessary. Additional changes identified during the verification and validation phase of the procedures will also be incorporated.	✓	
The abnormal operating procedure for a dropped control element assembly (CEA) will be changed, but the change will allow more time for an operator action.	✓	
Any required setpoint changes due to the power uprate values for design parameters such as thermal power, decay heat, and temperatures will be incorporated into the procedures prior to power uprate.	✓	

The ANO-2 Training staff will provide classroom training and simulator training on the power uprate changes for the ANO-2 operations crews and staff prior to refueling outage 2R15. The training will be conducted over two, five-week training cycles. The classroom and simulator training will include plant changes (including SPDS changes), system response changes, new or revised technical specifications, startup testing, revised procedures (normal, abnormal, and emergency) and revised safety analyses as well as pre-outage training. The power uprate training is scheduled to begin in January 2002 and end in March 2002. A three-week period prior to the outage will be used to conduct plant shutdown and cooldown training for the crews in preparation for the outage.	✓	
Verification and validation required for procedure changes is scheduled to begin in the fall and complete prior to the power uprate training in January 2002.	✓	
Startup training will be conducted prior to the conclusion of the outage for the operations crews with emphasis on core reload, positive moderator temperature coefficient, reactor engineering interface and teamwork skills.	✓	