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NUCLEAR ENERGY

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October 30, 2009

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

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI No. 110, Offsite Power System

References:
1) John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No. 110 EEB 1469.doc" email dated April 28, 200

2) UniStar Nuclear Energy Letter UN#09-402, from Greg Gibson to Document Control Desk, U.S. NRC, Response to RAI No. 110, Offsite Power System, dated September 25, 2009

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated April 28, 2009 (Reference 1). This RAI addresses the Offsite Power System, as discussed in Section 8.2 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 6.

Reference 2 provided a schedule for the expected response date for Question 08.02-3. The enclosure provides our response to RAI No.110, Question 08.02-3, and includes revised COLA content. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

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NRO

Our response to RAI No 110, Question 08.02-3 does not include any new regulatory commitments and does not contain any sensitive or proprietary information.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Michael J. Yox at (410) 495-2436.

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

Executed on October 30, 2009

Greg Gibson

Enclosure: Response to NRC Request for Additional Information, RAI No. 110, Question 08.02-3, Offsite Power System, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/JMR/mdf

Enclosure

Response to NRC Request for Additional Information, RAI No. 110, Question 08.02-3, Offsite Power System, Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 110

Question 08.02-3

Section 8.2.2.4 of FSAR: Compliance to GDC 17 and site-specific grid stability analysis.

a. Page 8-16, system impact study - Applicant to provide a summary of the grid stability steady-state and transient analysis results and the system voltage study results to demonstrate compliance with the final paragraph of GDC 17, with the assumptions made, and the acceptable criteria used for the case(s) analyzed. The analysis to consider the cases of generator trip, loss of largest unit supplying the grid, loss of the largest transmission circuit or inter-tie, and loss of largest load on grid.

b. Page 8-16, last paragraph: The Applicant mentioned that "During certain maintenance outages the output of the unit will need to be limited due to instability. The most restrictive output limitation is during an outage on the 500 kV Waugh Chapel to Brighton line which limits the plant to approximately 85% output." It does not appear to meet the single contingency criteria identified in 8.2.2.4 of EPR-FSAR on the "loss of the largest transmission circuit or inter-tie." How will UniStar meet the GDC-17 requirement in this regard?

c. Page 8-17, Applicant to address that the real and reactive power support to the grid from the nuclear unit is adequate as not to result in grid instability and subsequent loss of off-site power. Describe any limits on the main generator MVAR output such that loss of the main generator will not result in an unacceptable voltage in the switchyard. Describe any auxiliary transmission system equipment, such as capacitor banks, static VAR compensators that may be necessary to offset loss of MVAR support on loss of the main generator.

Response

a. A grid stability analysis was performed as part of the PJM Interconnection (Pennsylvania-New Jersey-Maryland) process for Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3. The Stability Analysis was performed at 2011 summer light load conditions. PJM stability is most challenged during summer light load conditions. The maximum generation output (CCNPP Unit 3) was considered as being the most stability challenging condition. As part of the PJM Impact Study, the range of contingencies evaluated was limited to that necessary for compliance with Mid Atlantic Area Council criteria.

   UniStar Nuclear Energy also performed additional stability simulations to specifically address the cases required by GDC 17, including: CCNPP Unit 3 generator trip, loss of the largest unit supplying the grid, loss of the largest transmission circuit or inter-tie, and loss of the largest load on the grid. The additional stability analysis was performed using the same modeling software (Powertech DSA Tools Software) as was used in the original PJM stability analysis. PJM provided the DSA Tools database for these additional simulations. Powertech DSA Tools software was utilized for the stability analysis, Siemens - PTI PSS MUST software was used for the load flow analysis, and Aspen OneLiner software was used for the short circuit analysis. The CCNPP Unit 3 FSAR will be updated to indicate these software applications.

Within the additional stability simulations the following contingencies were simulated:

- Loss of Calvert Cliffs Nuclear Power Plant Unit 3 generator (loss of power generated by the nuclear power unit).
- Loss of Calvert Cliffs Unit 3 generator following a 4.5 cycle three-phase fault at the Calvert Cliffs 500 kV bus.
- Loss of the Calvert Cliffs to Chalk Point 500 kV line.
- Loss of the Calvert Cliffs to Chalk Point 500 kV line following a 4.5 cycle, three-phase fault at the Calvert Cliffs 500 kV bus.
- Loss of the Calvert Cliffs to Waugh Chapel 500 kV line (loss of the largest transmission circuit or inter-tie).
- Loss of the Calvert Cliffs to Waugh Chapel 500 kV line following a 4.5 cycle, three-phase fault at the Calvert Cliffs 500 kV bus.
- Loss of Peach Bottom Unit 3 generator (loss of largest unit supplying the grid).
- Loss of Peach Bottom Unit 3 generator following a 4.5 cycle three-phase fault at the Peach Bottom 500 kV bus.
- No fault loss of the Brighton 367 MW load (loss of largest load on grid).

No transient instability characteristics or voltage violations were discovered on the CCNPP Unit 3, 500 kV bus for any of the analyzed contigencies. Additionally, the CCNPP Unit 3, 500 kV switchyard voltage is maintained, such that the preferred power supply remains stable and is not degraded below the acceptance criteria stated below, and listed in the U.S. EPR FSAR Subsection 8.2.2.4, "Compliance with GDC 17," and CCNPP Unit 3 FSAR Subsection 8.2.2.4, "Compliance with GDC 17."

These acceptance criteria are provided as COL Item 8.2-4, which requires performance of a site-specific grid stability analysis demonstrating that:

- The preferred power supply (PPS), which is the offsite power from the transmission system to the Class 1E emergency power supply system (EPSS) that is preferred to provide power under accident and post-accident conditions, is not degraded below a level that will activate EPSS degraded grid protection actions after any of the following single contingencies:
  - U.S. EPR turbine-generator trip.
  - Loss of the largest unit supplying the grid.
  - Loss of the largest transmission circuit or inter-tie.
  - Loss of the largest load on the grid.
- Additionally, the transmission system will not subject the reactor coolant pumps to a sustained frequency decay of greater than 3.5 Hz/sec as bounded by the decrease in reactor coolant system flow rate transient and accident analysis described in Section 15.3.2.

b. With the 500 kV Waugh Chapel to Brighton line out of service, CCNPP Unit 3 will reduce power as directed by the TSO (Transmission System Operator). In this configuration, the

CCNPP Unit 3, 500 kV switchyard voltage is maintained, such that the PPS remains stable and is not degraded below the acceptance criteria stated below and listed in the U.S. EPR FSAR Subsection 8.2.2.4 and the CCNPP Unit 3 FSAR Subsection 8.2.2.4. This analysis was run for the nine contingencies listed above in the response to Part a).

These acceptance criteria are provided as COL Item 8.2-4, which requires performance of a site-specific grid stability analysis demonstrating that:

- The PPS is not degraded below a level that will activate EPSS degraded grid protection actions after any of the following single contingencies:
  - U.S. EPR turbine-generator trip.
  - Loss of the largest unit supplying the grid.
  - Loss of the largest transmission circuit or inter-tie.
  - Loss of the largest load on the grid.
- Additionally, the transmission system will not subject the reactor coolant pumps to a sustained frequency decay of greater than 3.5 Hz/sec as bounded by the decrease in reactor coolant system flow rate transient and accident analysis described in Section 15.3.2.

c. The 2007 PJM System Impact Study and the 2008 PJM Voltage Study did not identify any MVAR restrictions on the CCNPP Unit 3 generator or the need for any auxiliary transmission equipment such as capacitor banks or static VAR compensators. The 2008 PJM Voltage Study demonstrated that with no MVAR support from the CCNPP Unit 3 generator, the 500 kV switchyard voltage was maintained as not to result in grid instability and subsequent loss of off-site power.

COLA Impact

FSAR Section 8.2.2.4 will be updated as follows in a future COLA revision:

{A system impact study (PJM, 2007) was performed that analyzed load flow, transient stability and fault analysis for the addition of CCNPP Unit 3 as part of the PJM Interconnection Generator and Transmission Interconnection Planning Process. The study was prepared using PJM's reliability planning process against the 2011 summer loading and identified the system upgrades necessary to maintain the reliability of the transmission system. The criteria are based upon PJM planning procedures, NERC Planning Standards, and Reliability First Regional Reliability Council planning criteria. All previous active queues are modeled in the study. ~~For~~ Aspen OneLiner software was used to perform the short circuit analysis, all units are modeled as operating. For the load flow analysis, peak loading is utilized with the largest generating unit tripped. For the stability analysis, light loading (50% of peak loading) is utilized with maximum generation. These cases are re-run every time a new queue is placed in the system.

The computer analysis for stability was performed using the ~~Siemens Power Technology International Software PSS/E~~ Powertech DSA Tools software. The analysis examined conditions involving loss of the largest generating unit, loss of the most critical transmission line, and multiple facility contingencies. The study also examined the import/export power flows between utilities, using Siemens-PTI PSS MUST software. The model used in the analysis was based on the Eastern Interconnect power grid, with PJM system contingencies.

The results of the study conclude that with the additional generating capacity of CCNPP Unit 3, the transmission system remains stable under the analyzed conditions, preserving the grid connection, and supporting the normal and shutdown requirements of CCNPP Unit 3. During certain maintenance outages the output of the unit will need to be limited due to instability. The most restrictive output limitation is during an outage on the 500 kV Waugh Chapel to Brighton line ~~which limits the plant to approximately 85% output.~~ at which time CCNPP Unit 3 will reduce power to a level to assure stability as directed by the Transmission System Operator (TSO).