FPL Energy
Seabrook Station

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SBK-L-07181
Docket No. 50-443

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

Seabrook Station

Supplemental Information for License Amendment Request 07-01, Setpoint Change for Reactor Trip System Interlock P-9

Reference:

FPL Energy Seabrook, LLC letter SBK-L-07042, License Amendment Request 07-01, Setpoint Change for Reactor Trip System Interlock P-9, March 29, 2007.

In the referenced letter, FPL Energy Seabrook submitted license amendment request (LAR) 07-01, Setpoint Change for Reactor Trip System Interlock P-9. The LAR proposed a change to the Seabrook Station Technical Specifications (TS) to increase the power level required for a reactor trip following a turbine trip (P-9 setpoint). The current TS requires a reactor trip when a turbine trip signal occurs and reactor power is greater than 20 percent rated thermal power (RTP); the LAR proposed to change the P-9 setpoint to 45 percent RTP. The purpose of this letter is to provide additional information regarding the proposed amendment.

Following submittal of the LAR, FPL Energy Seabrook recognized that the proposed change impacts the Anticipated Transient Without Scram (ATWS) mitigation system (AMS). The AMS is normally enabled to automatically actuate during operation above 20 percent power based on an arming signal from main turbine impulse pressure. With the proposed change to the P-9 setpoint, however, the turbine could be off-line when power is between 20 percent and 45 percent, and the AMS would not be enabled. The supplemental information provided in the Enclosure to this letter provides an evaluation of the effect of the P-9 setpoint change on the functioning of the AMS.

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This additional information regarding LAR 07-01 does not alter the conclusion in the referenced submittal that the proposed change does not involve a significant hazard consideration pursuant to 10 CFR 50.92.

Should you have any questions regarding this letter, please contact Mr. James M. Peschel, Regulatory Programs Manager, at (603) 773-7194.

Very truly yours,

FPL Energy Seabrook, LLC.

Gene St. Pierre
Site Vice President

Enclosures:

cc: S. J. Collins, NRC Region I Administrator
G. E. Miller, NRC Project Manager, Project Directorate I-2
W. J. Raymond, NRC Senior Resident Inspector

Mr. Christopher M. Pope, Director Homeland Security and Emergency Management
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FPL Energy
Seabrook Station

AFFIDAVIT

SEABROOK STATION UNIT 1

Facility Operating License NPF-86
Docket No. 50-443

Supplemental Information for License Amendment Request 07-01, Setpoint Change for Reactor Trip System Interlock P-9

I, Gene F. St. Pierre, Site Vice President of FPL Energy Seabrook, LLC hereby affirm that the information and statements contained within this supplement to License Amendment Request 07-01 are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed
before me this
9th day of JANUARY, 2008

Shirley Sweeney
Notary Public

SHIRLEY SWEENEY
MY COMMISSION EXPIRES OCT. 6, 2009
NOTARY PUBLIC NEW HAMPSHIRE

Gene St Pierre
Gene St. Pierre
Site Vice President

ENCLOSURE to SBK-L-07181

Impact of the P-9 Setpoint Change on the
Anticipated Transient Without Scram (ATWS) Mitigation System

ATWS Mitigation System Description

The ATWS mitigation system (AMS) provides an alternative means to the protection system for automatically tripping the turbine and actuating emergency feedwater (EFW) in the event of an ATWS. The AMS actuation signal is initiated on low steam generator level in three of four steam generators. The setpoint is lower than the low steam generator level reactor trip/EFW actuation setpoint, and a time delay is added to the actuation signal to permit the protection system to actuate prior to AMS actuation. Permissive C-20 enables AMS actuation when both turbine impulse pressure transmitters reach the C-20 setpoint of 20 percent power. The C-20 permissive is maintained following a turbine trip from above 20 percent power long enough to allow the AMS to perform its function.

In the event of an ATWS, the AMS performs two functions: (1) trips the turbine, and (2) initiates EFW flow. AMS is normally armed for actuation at 20 percent turbine power as sensed by turbine impulse pressure. However, changing the P-9 setpoint to 45 percent reactor power will allow the turbine to be shut down at power levels less than 45 percent. With the turbine off-line, turbine impulse pressure approaches zero, and the AMS will not be armed for automatic actuation. As a result, the proposed revision to the P-9 setpoint creates a condition in which the AMS will not automatically initiate EFW flow in the event of an ATWS that occurs between 20 percent and 45 percent reactor power with the turbine off-line.

Evaluation of the Impact of the P-9 Setpoint Change on the AMS

Seabrook Station implemented an AMS design based on Westinghouse Topical Report WCAP-10858-P-A, "AMSAC Generic Design Package." The WCAP documents that short-term protection against high RCS pressure is not required until 70 percent of nominal power. However, to minimize the amount of voiding in the RCS during an ATWS, the AMS should operate at and above 40 percent nominal power. As a result, the WCAP established a setpoint of 40 percent power for the C-20 permissive.

In 1997, the industry recognized that the basis for the C-20 interlock setpoint was determined using reactor power while the permissive function described in WCAP-10858 was a function of turbine impulse pressure and was prescribed to be set based on turbine power of 40 percent. Westinghouse issued Technical Bulletin ESBU-TB-97-08 to address this discrepancy, and Seabrook revised the C-20 setpoint to 20 percent turbine power to ensure the AMS would be armed prior to reaching 40 percent reactor power. The technical bulletin discusses additional analyses performed at reduced power conditions during the development of the AMS based on the generic Westinghouse ATWS models that supported the ATWS rule. The ATWS analyses from reduced power levels found that the peak RCS pressure at 70 percent of nominal thermal power without

AMS was less than the peak RCS pressure at 100 percent of thermal power with AMS. The bulletin also notes that, although the C-20 permissive of 40 percent power was selected to limit the amount of RCS voiding, at 40 percent reactor power and below no boiling is expected to occur within the first 10 minutes, which is the duration considered in the analysis to investigate the short-term consequences of an ATWS. For power levels between 40 and 70 percent, voiding at the core outlet is not expected to occur until well after the peak RCS pressure is reached.

Differences may exist between reactor power and turbine power at reduced power conditions with turbine power indicating 5 percent to 10 percent less than reactor power. To address these differences, Westinghouse investigated the consequences of limiting ATWS transients with a loss of feed without AMS actuation from an initial condition of 50 percent reactor power. The investigation concluded that the amount of RCS voiding is less than that previously predicted at 100 percent power with AMS, and the RCS inventory remaining 10 minutes into the transient is well above that needed to keep the core covered. Therefore, no core damage due to RCS boiling is anticipated to occur without AMS at or below 50 percent reactor power.

The effect on the AMS with the P-9 setpoint increased to 45 percent reactor power is that EFW will not be initiated by AMS following an ATWS during operation between 20 and 45 percent power with the turbine tripped. For an ATWS initiated at 50 percent power without a subsequent AMS actuation, the Westinghouse analysis found that the amount of RCS voiding is less than that following an ATWS from 100 percent power with AMS actuation. The reference plant assumed in the analysis had a full power output of 3423 MWt. Consequently, for the reference plant, the voiding following an ATWS from 1712 MWt without AMS actuation was less than the voiding following an ATWS from 3423 MWt with AMS actuation.

The only major differences between the reference plant and Seabrook Station are the amount and timing of EFW flow. In the partial power studies, no EFW flow is assumed so the comparison of results between the reference plant and Seabrook Station is directly applicable. Therefore, the amount of RCS voiding for an ATWS at Seabrook Station occurring from 1712 MWt (50% power level for the reference plant) without a subsequent AMS actuation would be similar to that determined for the reference plant under the same conditions. The maximum analyzed power for Seabrook is 3678 MWt, so 1712 MWt corresponds to 46.5 percent power for Seabrook. Based on the analysis for the reference plant, for Seabrook Station, the amount of voiding following an ATWS from 1712 MWt without AMS actuation would be less than that following an ATWS from 3678 MWt with AMS actuation. To summarize the case for Seabrook Station, both the peak RCS pressure and the amount of RCS voiding following an ATWS initiated from 45 percent power without a subsequent AMS actuation will be less than that for an ATWS occurring at 100 percent power with actuation of the AMS.

Seabrook Station data from the plant shutdown at the end of cycle 11 showed that reactor power on the power range nuclear instruments (NI power) indicated as much as 9 percent less than reactor power as determined by the calorimetric (calorimetric power) when

operating in the range of 40 to 50 percent power. Based on this deviation in power indications, when the P-9 permissive resets at 43 percent NI power, calorimetric power could be as high as 52 percent. Resetting the P-9 permissive allows shutdown of the turbine without a reactor trip, and turbine shutdown removes the arming signal for automatic actuation of the AMS. The deviation in the power indications could cause a condition that would permit reactor operation with the turbine off-line, with calorimetric power greater than 50 percent, and the AMS unavailable for automatic actuation. The generic ATWS evaluation performed by Westinghouse in 1997 justified an ATWS arming setpoint of 50 percent power for the reference plant, which is equivalent to 46.5 percent power for Seabrook Station.

If the turbine is tripped while operating just below the P-9 reset level (43 percent NI power, 52 percent calorimetric power), a rapid power reduction will result as the automatic rod control system responds by inserting control rods. The AMS remains armed for six minutes following a turbine trip. Within that six minute period, automatic rod control will reduce NI power to less than 36 percent and calorimetric power to less than 46.5 percent power. Without automatic rod control, operation above 46.5 percent calorimetric power with the turbine off-line and the AMS unavailable for automatic operation could occur immediately following the turbine trip. If calorimetric power remained above 46.5 percent, the duration would be only a few minutes and the risk of experiencing an ATWS during this brief period is insignificant.

The Westinghouse Technical Bulletin also discusses that the purpose of the final ATWS rule is to reduce the risk of core damage associated with the postulated occurrence of ATWS events. The analyses that demonstrate the consequences of ATWS events with AMS are generic in nature, and were all performed assuming full power initial conditions. However, any part-power ATWS risk is expected to be small relative to the full power ATWS risk because: 1) the analyses performed in support of the WCAP-10858-P-A demonstrate that peak RCS pressure does not challenge the ASME service level C stress limit criterion for power levels below 70 percent without AMS armed, and, therefore, there is no additional risk due to over-pressurization; and 2) the amount of time that most plants spend at part-power conditions is generally small relative to the time at full power.

Regulatory Requirements

10 CFR 50.62 includes a requirement that each pressurized water reactor must have equipment from sensor output to final actuation device, that is diverse from the reactor trip system, to automatically initiate the auxiliary (or emergency) feedwater system and initiate a turbine trip under conditions indicative of an ATWS. In July 1986, the NRC issued a safety evaluation that concluded that the generic designs in WCAP-10858 adequately meet the requirements of 10 CFR 50.62. Since Seabrook Station implemented an AMS that meets the intent of WCAP-10858, the AMS continues to meet the requirements of 10 CFR 50.62.

Conclusion

The change to the P-9 setpoint proposed in LAR 07-01 does not significantly affect the ability of the AMS to mitigate the consequences of an ATWS. The AMS will continue to be armed for automatic initiation under conditions that require the AMS to protect the RCS pressure from exceeding 3200 psig. The effect of the P-9 setpoint change on the AMS arming function does not alter the conclusion in the LAR that the change does not present a significant hazards consideration.