



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

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U. S. Nuclear Regulatory Commission  
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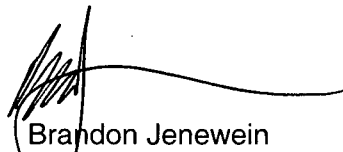
South Texas Project  
Units 1 & 2  
Docket Nos. STN 50-498 & 50-499  
Reactor Vessel Material Surveillance Capsule – Schedule Change

Pursuant to 10 CFR 50 Appendix H.III, STP Nuclear Operating Company (STPNOC) requests Nuclear Regulatory Commission approval to revise the schedule for withdrawal of material specimens exposed in reactor pressure vessel surveillance capsules. The next set of withdrawals is currently scheduled to occur at 16 EFPY for Unit 1 and Unit 2. This coincides with refueling outages 1RE15 and 2RE14, respectively. Under the proposed schedule, one capsule per unit will be withdrawn during refueling outages 1RE16 and 2RE15. The remaining capsules will remain in place pending further determination. Justification for the change is provided in the attachment.

There are no commitments in this letter.

To support scheduling activities for upcoming refueling outage activities, STPNOC requests that the NRC provide approval of this proposed change by July 1, 2009.

If there are any questions, please contact either Mr. Philip Walker at (361) 972-8392 or me at (361) 972-7431.

  
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PLW

Attachment: Proposed Revision to Reactor Vessel Material Surveillance Capsule Withdrawal Schedule

STI: 32333601

A008  
NRK

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**SOUTH TEXAS PROJECT  
UNITS 1 AND 2**

**PROPOSED REVISION TO REACTOR VESSEL MATERIAL  
SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE**

**I. SUMMARY**

The current schedule for withdrawal of neutron fluence surveillance capsules from the Unit 1 and Unit 2 reactor pressure vessels coincides with the schedule for replacement of the reactor pressure vessel heads. The proposed schedule extends the monitoring interval an additional fuel cycle so that these activities do not occur during the same refueling outage.

**II. BACKGROUND**

Appendix H.III.A of 10 CFR 50 requires a material surveillance program for reactor pressure vessels where the peak neutron fluence at the end of the design life of the vessel will exceed  $1.0 \text{ E}17 \text{ n/cm}^2$  ( $E > 1 \text{ MeV}$ ). Neutron fluence at the South Texas Project exceeds this level. Consequently, STP Nuclear Operating Company (STPNOC) has implemented a material surveillance program consistent with Appendix H for South Texas Project Units 1 and 2 in which material specimens are exposed to neutron fluence in reactor vessel surveillance capsules and then withdrawn from the reactor vessel for fracture toughness testing. A description of the surveillance program is provided in WCAP-9492 and WCAP-9967, "Reactor Vessel Radiation Surveillance Program," for Units 1 and 2, respectively. The surveillance program is based on ASTM E185-73, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels." The surveillance program was initially established to cover the 40-year design life of the reactor pressure vessel.

A withdrawal schedule has been established consistent with the requirements of ASTM E185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels." The current schedule as posted in South Texas Project UFSAR Table 16.1-2, "Reactor Vessel Material Surveillance Program – Withdrawal Schedule," along with the proposed schedule, is shown in the attached Table 1 and Table 2. As noted in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Section X1.M31, "Reactor Vessel Surveillance," changes to the capsule withdrawal schedule are to be approved by the NRC prior to implementation.

**III. PROPOSED REVISION TO THE WITHDRAWAL SCHEDULE**

Under the current withdrawal schedule, extraction of the remaining material surveillance capsules is to occur at approximately 16 effective full power years (EFPY). This corresponds to refueling outages 1RE15 (Unit 1) and 2RE14 (Unit 2). Under the proposed schedule, one capsule per unit will be withdrawn during 1RE16 and 2RE15. The surveillance specimens will have been exposed to neutron fluence for an estimated 18 EFPY by that time. The remaining capsules will be left in place pending further determination.

**IV. REASON FOR THE PROPOSED REVISION TO THE WITHDRAWAL SCHEDULE**

STPNOC has scheduled replacement of the reactor pressure vessel (RPV) heads during 1RE15 (Unit 1) and 2RE14 (Unit 2). The replacement schedule was implemented as a consequence of NRC Order EA-03-009 regarding reported cracks around reactor head

penetration nozzles. STPNOC has calculated the susceptibility of the Unit 1 and Unit 2 RPV heads to pressurized water stress corrosion cracking, as represented by effective degradation years (EDY) at the end of each operating cycle. Unit 1 EDY is projected to be 7.37 by Spring 2008 (refueling outage 1RE14) and 7.87 in Fall 2009 (1RE15). Unit 2 EDY is projected to be 8.16 in Fall 2008 (2RE13) and 8.66 in Spring 2010 (2RE14). Enhanced examination practices consistent with the "Moderate" category will become applicable to Unit 2 when EDY is 8 or higher until the head is replaced. Delaying head replacement will require additional enhanced examinations in the interim.

Although currently classified in the "low" susceptibility category, replacement of the heads as scheduled will minimize implementation of more frequent inspections mandated by EA-03-009 for "moderate" category plants. Revising the capsule replacement schedule as requested will reduce potential for impact on reactor vessel head replacement activities.

## **V. JUSTIFICATION**

### **40-Year License**

Three material surveillance capsules have been withdrawn from each unit: U, Y, and V from Unit 1, and V, Y, and U from Unit 2. Most recently, capsule V was removed from Unit 1 after 11.13 EFPY of exposure, and capsule U was removed from Unit 2 after 10.31 EFPY of exposure. The schedule for capsule withdrawal was established consistent with the guidelines of ASTM E185-82 based on the predicted End-of-Life (EOL)  $\Delta RT_{ndt}$  for the reactor vessel beltline materials.

Charpy V-notch testing has been performed on surveillance capsules U, Y, and V from Unit 1, and capsules V, Y, and U from Unit 2. The results are documented in WCAP-16149 Revision 2 (reference 1) and WCAP-16093 Revision 2 (reference 2). The 30 ft-lb EOL transition temperature increases for the surveillance capsule materials following irradiation do not exceed 100°F. The specific transition temperature changes for each capsule are listed in Tables 3 and 4. For these limited changes in  $\Delta RT_{ndt}$ , ASTM E185-82 Table 1 recommends that a minimum of three surveillance capsules be withdrawn per unit to support an operating life of 40 years. Therefore, Unit 1 and Unit 2 have satisfied this criterion for monitoring neutron embrittlement, and no further samples are needed to support operation to the end of the licensed 40-year life of the units.

Based on the above, the proposed change to the current withdrawal schedule will have no adverse impact on assurance of reactor vessel integrity over the remainder of the 40-year license(s).

### **60-Year License**

STPNOC has stated its intention to submit a request to the NRC to extend the operating licenses of Unit 1 and Unit 2 an additional 20 years. Part of the justification supporting the application will be provided by data derived from an additional capsule removed from each unit.

There are three remaining capsules in each reactor pressure vessel (X, W, and Z). Capsule X (both units) is intended to be the source for data to qualify operation for 60 years to support license renewal for the extended plant life. Capsule X was chosen because it has the highest lead factor of the three remaining capsules in both units (Table 2). Capsules W

and Z are considered to be spares, and will be kept in place until another determination for disposition is made.

Per ASTM E185-82, the EOL capsule is withdrawn when neutron fluence exposure at end-of-life is not less than once or greater than twice the peak EOL vessel fluence. Assuming the same guidance applies to an End-of-Life-Extension (EOLE) capsule, the allowed Unit 1 neutron fluence range is  $3.86 \text{ E19}$  to  $7.72 \text{ E19 n/cm}^2$ , and  $3.73 \text{ E19}$  to  $7.46 \text{ E19 n/cm}^2$  for Unit 2 (based on Table 6-3 of WCAP-16149, Rev. 2 and WCAP-16093, Rev. 2, assuming 54 EFPY at EOLE). At the time of extraction in 1RE16 and 2RE15, Units 1 and 2 will be at approximately 18 EFPY. The approximate neutron fluence exposure of capsule X at 18 EFPY, as determined from Table 6-1 by interpolation, is:

Unit 1 Capsule X:  $\sim 4.37 \text{ E19 n/cm}^2$

Unit 2 Capsule X:  $\sim 4.18 \text{ E19 n/cm}^2$

These values are within the allowed range for cumulative neutron fluence at EOLE consistent with the criteria of ASTM E185-82. Therefore, deferring withdrawal of Units 1 and 2 surveillance capsules X to refueling outages 1RE16 and 2RE15 is acceptable in terms of neutron fluence exposure.

## VI. REFERENCES

1. WCAP-16149 Revision 2, "Analysis of Capsule V from the South Texas Project Nuclear Operating Company, South Texas Unit 1 Reactor Vessel Radiation Surveillance Program"
2. WCAP-16093 Revision 2, "Analysis of Capsule U from the South Texas Project Nuclear Operating Company, South Texas Unit 2 Reactor Vessel Radiation Surveillance Program"
3. NUREG-1801, "Generic Aging Lessons Learned (GALL) Report"

**TABLE 1**  
**IRRADIATED SPECIMEN NEUTRON FLUENCE EXPOSURE**

UNIT 1	CAPSULE	CYCLE		CUMULATIVE IRRADIATION TIME (EFPY)		NEUTRON FLUENCE (n/cm <sup>2</sup> )
	U	1		0.78 (Actual)		0.26 E19
	Y	6		4.90 (Actual)		1.29 E19
	V	11		11.13 (Actual)		2.62 E19
	X	15 (Scheduled)	16 (Proposed)	16 (Estimate)	18 (Estimate)	4.37 E19 (Estimate)
	W	15 (Scheduled)	NA	16 (Estimate)	NA	NA
	Z	15 (Scheduled)	NA	16 (Estimate)	NA	NA

UNIT 2	CAPSULE	CYCLE		CUMULATIVE IRRADIATION TIME (EFPY)		NEUTRON FLUENCE (n/cm <sup>2</sup> )
	V	1		0.87 (Actual)		0.34 E19
	Y	5		5.13 (Actual)		1.21 E19
	U	9		10.31 (Actual)		2.40 E19
	X	14 (Scheduled)	15 (Proposed)	16 (Estimate)	18 (Estimate)	4.18 E19 (Estimate)
	W	14 (Scheduled)	NA	16 (Estimate)	NA	NA
	Z	14 (Scheduled)	NA	16 (Estimate)	NA	NA

**TABLE 2**  
**IRRADIATED SPECIMENT EFFECTIVE EXPOSURE**

UNIT 1	CAPSULE	CYCLE		CUMULATIVE IRRADIATION TIME (EFPY)		LEAD FACTOR	EFFECTIVE EXPOSURE (YR)	
	U	1		0.78 (Actual)		3.59	2.80	
	Y	6		4.90 (Actual)		3.28	16.07	
	V	11		11.13 (Actual)		3.04	33.84	
	X	15 (Scheduled)	16 (Proposed)	16 (Est)	18 (Est)	3.28	52.48 (Est)	59.04 (Est)
	W	15 (Scheduled)	NA	16 (Est)	NA	3.24	51.84 (Est)	NA
	Z	15 (Scheduled)	NA	16 (Est)	NA	3.24	51.84 (Est)	NA

UNIT 2	CAPSULE	CYCLE		CUMULATIVE IRRADIATION TIME (EFPY)		LEAD FACTOR	EFFECTIVE EXPOSURE (YR)	
	U	1		0.87 (Actual)		3.09	2.69	
	Y	5		5.13 (Actual)		3.11	15.95	
	V	9		10.31 (Actual)		3.20	30.93	
	X	14 (Scheduled)	15 (Proposed)	15 (Est)	16 (Est)	3.22	48.30 (Est)	59.04 (Est)
	W	14 (Scheduled)	NA	15 (Est)	NA	3.19	47.85 (Est)	NA
	Z	14 (Scheduled)	NA	15 (Est)	NA	3.19	47.85 (Est)	NA

**TABLE 3**  
**UNIT 1 SURVEILLANCE MATERIAL COMPARISON FOR**  
**CHARPY 30 FT-LB TRANSITION TEMPERATURE SHIFT**

<b>MATERIAL</b>	<b>CAPSULE</b>	<b>NEUTRON FLUENCE (n/cm<sup>2</sup>)</b>	<b>30 FT-LB TRANSITION TEMPERATURE SHIFT (°F)</b>
<b>Intermediate Shell Plate R1606-2 (longitudinal)</b>	U (1RE01)	0.26 E19	18.09
	Y (1RE06)	1.29 E19	43.98
	V (1RE11)	2.62 E19	40.15
<b>Intermediate Shell Plate R1606-2 (transverse)</b>	U (1RE01)	0.26 E19	23.44
	Y (1RE06)	1.29 E19	11.94
	V (1RE11)	2.62 E19	23.84
<b>Weld Metal</b>	U (1RE01)	0.26 E19	33.58
	Y (1RE06)	1.29 E19	37.89
	V (1RE11)	2.62 E19	26.61
<b>Heat Affected Zone</b>	U (1RE01)	0.26 E19	0.00
	Y (1RE06)	1.29 E19	19.20
	V (1RE11)	2.62 E19	58.82



**TABLE 4**  
**UNIT 2 SURVEILLANCE MATERIAL COMPARISON FOR**  
**CHARPY 30 FT-LB TRANSITION TEMPERATURE SHIFT**

<b>MATERIAL</b>	<b>CAPSULE</b>	<b>NEUTRON FLUENCE (n/cm<sup>2</sup>)</b>	<b>30 FT-LB TRANSITION TEMPERATURE SHIFT (°F)</b>
<b>Intermediate Shell Plate R2507-2 (longitudinal)</b>	V (2RE01)	0.23 E19	16.39
	Y (2RE05)	1.21 E19	33.96
	U (2RE09)	2.40 E19	27.48
<b>Intermediate Shell Plate R2507-2 (transverse)</b>	V (2RE01)	0.23 E19	11.86
	Y (2RE05)	1.21 E19	35.26
	U (2RE09)	2.40 E19	40.18
<b>Weld Metal</b>	V (2RE01)	0.23 E19	0.00
	Y (2RE05)	1.21 E19	4.08
	U (2RE09)	2.40 E19	20.64
<b>Heat Affected Zone</b>	V (2RE01)	0.23 E19	0.00
	Y (2RE05)	1.21 E19	54.20
	U (2RE09)	2.40 E19	21.84