FENOC Response to NRC's Questions
Regarding 2R16 Steam Generator Inspections

1. **Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.**

   FENOC Response:

   No primary-to-secondary leakage was experienced during Cycle 16.

2. **Discuss whether any secondary side pressure tests were performed during the outage and the associated results.**

   FENOC Response:

   No secondary side pressure tests were performed during 2R16.

3. **Discuss any exceptions taken to the industry guidelines**.

   FENOC Response:

   No exceptions have been taken to the industry guidelines

4. **For each SG, provide a description of the inspections performed including the areas examined and the probes used (e.g. dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g. 100 percent of dings/dents greater than 5 volts and a 20% sample between 2 and 5 volts) and the expansion criteria.**

   FENOC Response:

   The following applies to all SGs unless specifically noted.

Location Examined	Probe	Initial Scope	Expansion Scope
Full Length	Bobbin	100%	None
Hot Leg Tubesheet (TSH +6, -3")	Plus Point	100%	20% cold leg if structural or leakage significant indication detected
SGC Cold Leg Tubesheet (TSH +6, -3") *	Plus Point	20%	100% SGC, 20% other SGs if SCC detected
Dents ≥5V	Plus Point	100%	None
Dents ≥2V, <5V at 01H, 02H, 03H, 04H TSPs	Plus Point	100%	100% hot leg dents ≥2V for PWSCC detection
Dents within +/- 1 inch of AVBs	Plus Point	100%	None
Dings >1V	Plus Point	100%	None
Row 1 and 2 U-bends	Plus Point	100%	100% Row 3 if Row 2 indication detected
Row 3 thru 8 U-bends	Plus Point	25%	100% Row 3 thru 10
Special Interest			
TSPs with Bobbin DSI, DNI	Plus Point	100%	None
TSPs with SPR >2V	Plus Point	100%	None

TSPs with SPR ≥1.5V, <2V	Plus Point	25%	100% SPR ≥1.5V
Freespan bobbin NQI, FSI, etc.	Plus Point	100%	None
Hot Leg tubesheet BLG/OXP below F* down to neutral axis	Plus Point	100%	None
New PLP and historic locations plugged due to PLP interaction	Plus Point	100% including 2-tube box	Continue boxing until PLPs are no longer observed
Plugs	Visual	100%	None
FOSAR	Visual	Tube lane, annulus	
SGA steam drum, feedring repair	Visual	N/A	SGB, SGC locations of significant degradation detection in SGA

*: SGC cold leg TTS sampling was performed as SGC cold leg has never been sampled. SGA cold leg has been sampled twice since 2R12 and SGB cold leg sampled once; no cold leg SCC has been reported to date.

Eddy current testing in SGA is approximately 95% complete in SGA, 100% complete in SGB, and 65% complete in SGC.

Remote visual examination of the lower SG bowl region of all SGs (HL and CL) per Westinghouse NSAL 2012-01 recommendations.

5. **For each area examined (e.g., tube supports, dents/dings, sleeves, etc.), provide a summary of the number of indications identified to date for each degradation mode (e.g., number of circumferential primary water stress-corrosion cracking (PWSCC) indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth and length of the indication). In particular, address whether tube integrity (structural and accident-induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential PWSCC at the expansion transition for the first time at this unit).**

FENOC Response:

A. Hot Leg TTS Expansion Transition and Sludge Pile:

SGA: 47 tubes affected, 41 with circumferential ODSCC, 4 with axial ODSCC, 1 with both circumferential ODSCC at transition and axial ODSCC in sludge pile (not interacting), 1 with circumferential PWSCC

SGB: 24 tubes affected, 21 with circumferential ODSCC, 3 with axial ODSCC

SGC: 29 tubes affected, 27 with circumferential ODSCC, 2 with axial ODSCC

FENOC Response to NRC's Questions
Regarding 2R16 Steam Generator Inspections

Circumferential ODSCC:

Maximum 300 kHz +Pt voltage of 0.31V, maximum arc length of 280 degrees, realistic estimate of maximum depth of about 60%TW.

Axial ODSCC:

Maximum 300 kHz +Pt voltage of 0.25V, maximum length of 0.22 inch, maximum depth estimated using EPRI ETSS I28432 voltage based regression of 55%TW.

Circumferential PWSCC:

Maximum 300 kHz +Pt voltage of 0.86V, arc length of 29 degrees, maximum depth of 53%TW

B. Hot Leg TSP:

SGA: 1271 total DSI, DNI, and SPR reports from bobbin coil analysis; 7 tubes confirmed to contain axial ODSCC.

SGB: 568 total DSI, DNI, and SPR reports from bobbin coil analysis; 16 tubes confirmed to contain axial ODSCC.

SGC: 348 total DSI, DNI, and SPR reports reported to date. Plus Point special interest testing has not commenced.

Axial ODSCC:

Maximum 300 kHz +Pt voltage of 0.18V, maximum length of 0.47 inch, maximum depth estimated using EPRI ETSS I28432 voltage based regression of 50%TW.

C. AVB Wear:

37 indications in SGA, 94 in SGB, 0 in SGC. Three historic AVB wear indications are present in SGC; these tubes have not yet been inspected with bobbin coil.

Maximum depth report is 39%TW in SGB.

D. Loose Part Wear:

No “new” loose part wear was reported. Two extremely small volumetric indications were reported at the cold leg TTS. These locations are adjacent to tubes plugged many outages ago due to loose part wear. Prior inspection data indicates these indications were present prior to 2R16. No presence of loose parts was observed on these tubes. All volumetric indications were bounding inspected using a two-tube deep pattern.

E. Ding ODSCC:

One tube in SGA was reported to contain an axial ODSCC indication in a 1.08 volt ding. The indication is short, 0.24 inch, and extremely shallow (estimated to be <40%TW based on the +Pt signature). No flaw-like bobbin report was present at this location (Channel 5 reporting criterion was not achieved). The indication was observed from the 100% +Pt, >1V ding program.

FENOC Response to NRC's Questions
Regarding 2R16 Steam Generator Inspections

6. Describe repair/plugging plans.

FENOC Response:

All crack-like indications at the top-of-tubesheet will be sleeved if within the sleeving boundary. Those not within the sleeving boundary will be plugged.

All axial crack-like indications located within the TSPs will be plugged or repaired using the alternate repair criterion per GL 95-05; all free span crack-like indications will be plugged.

Any AVB wear >40%TW by bobbin will be plugged.

Historic volumetric indications associated with loose parts will be sized according to ETSS 21998.1 and left in service if depth <40%TW and no presence of a loose part is observed. Preliminary estimates of depth for these is <20%TW using ETSS 21998.1.

7. Describe in-situ pressure test and tube pull plans and results (if applicable and available).

FENOC Response:

To date, no tubes require in situ pressure testing.

8. Discuss the following regarding loose parts:

- what inspections are performed to detect loose parts;
- a description of any loose parts detected and their location within the SG (including the source or nature of the loose part, if known);
- if the loose parts were removed from the SG; and
- indications of tube damage associated with the loose parts, as applicable.

FENOC Response:

Both eddy current and FOSAR is used to detect foreign objects.

The only foreign objects detected were an approximate 2 inch long piece of gasket backing in SGA annulus region, which was removed from the SG, and a small diameter wire in SGC tube lane region.

To date, no new degradation associated with PLPs has been reported. The only degradation associated with PLPs was observed in SGC; the indications are associated with historic PLP/wear locations. No PLP was observed by eddy current.

9. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g. in-bundle visual inspections, feed-ring inspections, sludge lancing, assessing deposit loading, etc.)

FENOC Response:

Sludge lancing was performed in all SGs; removal totals were 35.5 lb in SGA, 49.5 lb in SGB, 61.5 lb in SGC.

FOSAR of the tube lane and peripheral annulus was performed in all SGs. Only two metallic objects were noted; a 2 inch long piece of gasket backing, which was removed, and a thin wire

(~0.02 inch diameter) with approximately 1 inch length which is embedded in hardened deposits in the tube lane near R1 C45. This location is a low flow region.

Visual inspection of the SGA steam drum and 2R13 feedring repair patch is planned. UT inspection of the repair patch is planned to ensure that erosion/corrosion of the underside of the patch is not occurring. A replacement plan is in place should UT show significant wall loss of the patch.

10. Discuss any unexpected or unusual results.

FENOC Response:

The SGA and SGC TTS ODSCC results are slightly larger than anticipated, but due to the unpredictable nature of ODSCC initiation, the results are not alarming.

While not considered unusual, a pre-outage tube-to-tube proximity review was performed. While tube-to-tube proximity in Westinghouse SGs has no relation to tube-to-tube wear mechanisms, this review was performed based on the tube material, Alloy 600 mill annealed. Tube-to-tube proximity conditions in mill annealed tubing could lead to localized tube temperatures and an increased ODSCC initiation potential. The pre-outage review concluded that no detectable tube-to-tube proximity is present.

11. Provide the schedule for SG-related activities during the remainder of the current outage.

FENOC Response:

Complete ECT exams in SG A and SG C.

Complete sleeving and plugging in all SGs.

Complete secondary side upper internals visual examination of SG A.

Complete FOSAR of SG C secondary side.

Anticipated completion of all SG activities is the week of October 21, 2012