




# **Draft Revision 6 PWR SG Examination Guidelines**

Industry / NRC Meeting  
August 29, 2001





**Revision 6 is a draft document undergoing utility review according to the SGMP process. It may change before publication.**



# Presentation Outline

- Status of Exam Guidelines
- Current Issue
- SG Exam Guidelines Background
- Section 3 – Prescriptive Inspection Requirements
- Section 4 – Performance Based Inspection Requirements
- Section 5 – Degradation Assessments



# SG Exam Guidelines Rev 6 Status

- Initial resolution of industry comments is close to completion
  - Document will be reviewed by the industry again
- Will brief the NRC again when closer to publication if significant changes are made



# Current Issue

- NRC has expressed concern over the proposed long inspection intervals
- Industry Guidelines allow extended inspection intervals based on performance history, new designs, and improved materials
  - Checks and balances are included



# Chronology of SG Exam Guidelines Revisions

- Original Issue, 1981, NDE Center Draft Topical
- Revision 1 1984, Formal EPRI Report
- Revision 2 1988, Added NSSS Input
- Revision 3 1992, Perf. Demo. Requirements
- Revision 4 1996, Prescriptive Sampling
- Revision 5 1997, Strong Language, “*Shalls*”
- Revision 6 In progress

Current requirement to assess need for revision at least once every two years



# Background

- SG Examination Guidelines is a utility developed document that has benefited from vendors' input and comments
- Work on draft Revision 6 started in March 2000 and is expected to finish in late 2001
- Approval is expected in early 2002



# Background

- Rev. 6 draft was completed in April and received industry review during May 1-June 25
- 724 comments have been received from utilities and vendors
- All comments will be reviewed, resolved, and results will be made available to all
  - Document approval per SGMP Admin Procedures
- This presentation highlights proposed SG inspection interval changes in Rev. 6





# Revision 6 Organization

- Section 1 - Introduction and Background
- Section 2 - Compliance Responsibility
- Section 3 - Sampling Requirements for Prescriptive Based Examinations
- Section 4 - Sampling Requirements for Performance Based examinations
- Section 5 - Steam Generator Assessments
- Section 6 - System Performance
- Section 7 - Summary Requirements
- Appendices



# Prescriptive Based Exam Requirements - Section 3

Separate sampling requirements for 600 MA, 600 TT, and 690 TT materials

## 600 MA:

- Inspect 100% of tubes in each SG every 60 EFPM
- SG's shall be inspected each refueling outage



# Prescriptive Based Exam Requirements - Section 3

## 600 TT:

- Given SGs are free from active degradation,
- Inspect 100% of tubes in each SG in 120, 90, 60, 60, 60,..., EFPMs and with the following conditions:
  - All inspection periods require supporting DA and OA
  - Examine at least 50% of tubes in each SG by the refueling outage nearest the mid-point of the period and the remaining 50% by the refueling outage nearest the end of the period.
  - No SG can operate for more than two refueling cycles without being inspected.



# Prescriptive Based Exam Requirements - Section 3

## 600 TT (continued):

- If an active damage mechanism is present, the tubing shall be subject to the same rules as Section 3.3.5 for Alloy 600 MA tubing. If subsequent examinations verify active damage mechanisms are not present, the Alloy 600 MA rules still apply.



# Prescriptive Based Exam Requirements - Section 3

## 690 TT:

- Given SGs are free from active degradation,
- Inspect 100% of tubes in each SG in 144, 108, 72, 60, 60, 60, ..., EFPMs with the following conditions:
  - All inspection periods require supporting DA and OA
  - Examine at least 50% of tubes in each SG by the refueling outage nearest the mid-point of the period and the remaining 50% by the refueling outage nearest the end of the period.
  - No SG can operate for more than three refueling cycles without being inspected.



# Prescriptive Based Exam Requirements - Section 3

## 690 TT Continued):

- If an active damage mechanism is present, the tubing shall be subject to the same rules as Section 3.3.5 for Alloy 600 MA tubing. If subsequent examinations verify active damage mechanisms are not present, the alloy 600 MA rules still apply.



# 600 TT and 690 TT Cycle Length Basis

## ■ Collective experience

- Plants have accumulated many years of operating experience using 600 TT and 690 TT tubing
  - ◆ 600 TT plants have operated 15 EFPY with no confirmed corrosion
  - ◆ 690 TT plants have operated 8 EFPY with no confirmed corrosion
- With increasing number of new and replacement steam generators, the aggregate of the 600 TT and 690 TT steam generators are sampled and inspected with increasing frequency
- If any degradation is detected in any 600 TT or 690 TT steam generator, it must be considered in the degradation assessments of all other plants of the same tubing material and modify inspection plans accordingly



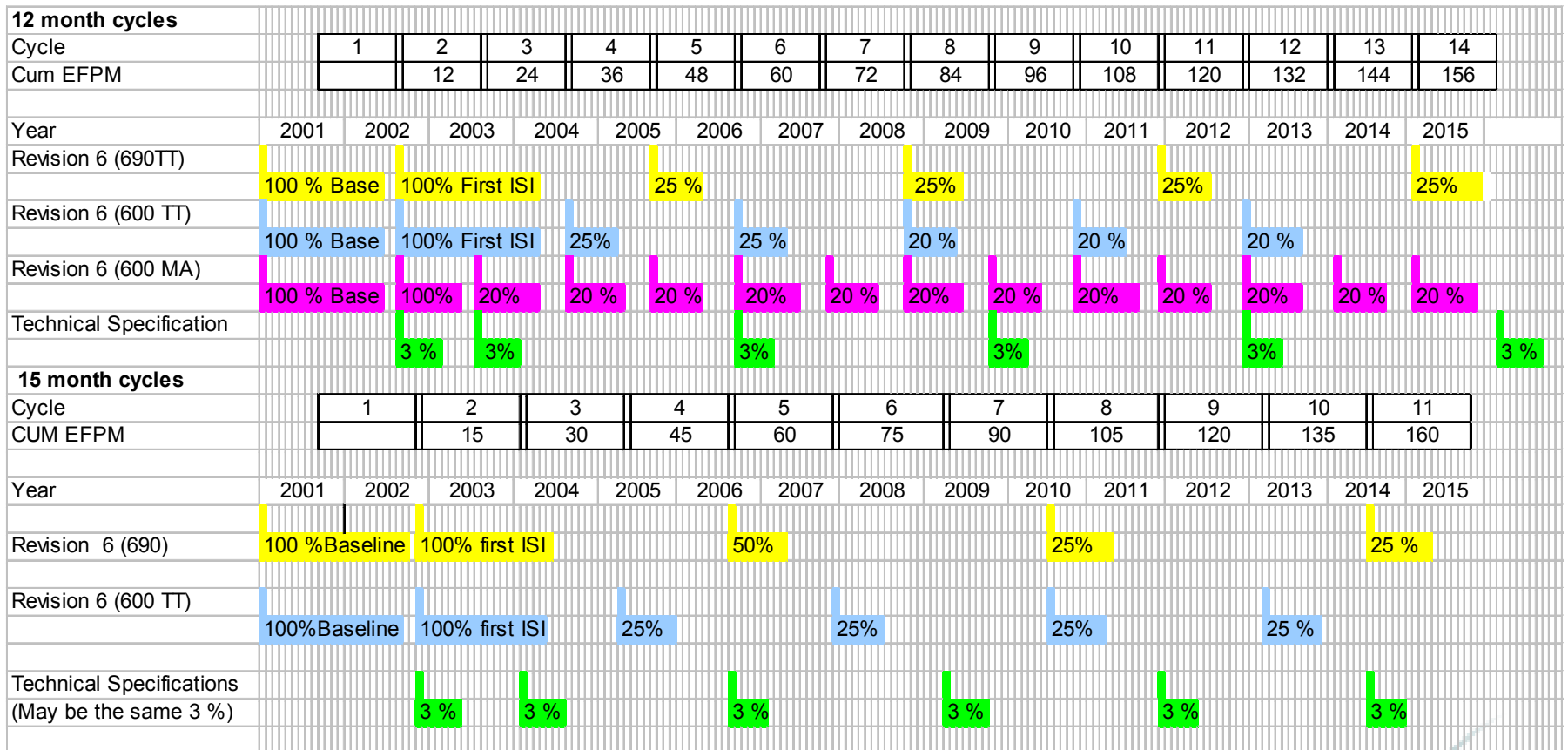
# 600TT and 690TT Cycle Length Basis

- Compensatory measures
  - If active degradation is determined at a plant, its cycle length reverts to 600 MA requirements
  - Secondary side requirements address foreign objects
- Program enhancement over existing regulation
  - Proposed sampling/frequency much more conservative than the current Tech Spec requirement of 3% every 40 months





# Comparison of Rev. 6 Insp. Freq. to Tech. Spec. Reqmt's



# Comparison of Rev. 6 Insp. Freq. to Tech. Spec. Reqmt's

<b>18 Month Cycles</b>																				
Cycle	1		2		3		4		5		6		7		8		9		10	
Cum EFPM	18		36		54		72		90		108		126		144		162			
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017			
Revision 6 (690TT)	100 % Base		100% First ISI				50%				50%				50%					
Revision 6 (600 TT)	100 % Base		100% First ISI		50%				20%		30%		20%							
Revision 6 (600 MA)	100 % Base		100% ISI		33.3%		33.3%		33.3%		33.3%		33.3%		33.3%		33.3%			
Technical Specification			3 %		3%		3%		3%		3%		3%		3%		3%			
<b>22 Month Cycles</b>																				
Cycle	1		2		3		4		5		6		7		8					
CUM EFPM	22		44		66		88		110		132		154							
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016				
Revision 6 (690)	100 %Base		100% first ISI				50%				50%									
Revision 6 (600 TT)	100%Base		100% first ISI		50%				50%		50%									
Technical Specifications (May be the same 3 %)			3 %		3%		3%		3%		3%		3%		3%					



# Performance Based Exam Requirements – Section 4

- Revision 6 changes
  - Performance based methodology only applies to advanced materials
  - Concept of performance based inspection was in revision 5
  - Revision 6 adds guidance on methodology
- Requirements
  - Pre-service inspections and the first in-service inspection are the same as in section 3.



# Performance Based Exam Requirements – Section 4

- Requirements (continued)
  - Establishes process to determine subsequent inspection periods
    - ◆ Basis: EPRI report on deterministic performance based inspection criteria for steam generators
  - No preset inspection frequency
  - Minimum inspection sample is 20% for susceptible regions, 100% for regions with detected mechanisms



# Steam Generator Assessments

## - Section 5

### Section 5.2 Degradation Assessments

- Degradation assessment is the foundation of SG inspection program
- Requirements
  - The design information, operating history, and chemistry history for the steam generator shall be documented in the assessment.
  - As a minimum, the assessment shall include and document thinning, pitting, wear, outside diameter IGA/SCC, primary-side SCC and impingement at all susceptible regions within the steam generator to determine if an inspection is necessary and the basis for that conclusion



# Steam Generator Assessments - Section 5

- Requirements (continued)
  - The degradation assessment shall be performed prior to the PSI of new and replacement steam generators and prior to each scheduled ISI of steam generators.
  - Additionally, a review of the degradation and operational assessments shall be performed prior to each refueling outage when steam generator primary side inspections are not scheduled, to validate the surveillance interval.



# Active Damage Mechanism

- A combination of ten or more, new indications of degradation ( $\geq 20\%$  TW) and previous indications of degradation which display an average growth rate equal to or greater than 25% of the repair limit per cycle in any one SG, or
- One or more new or previously identified indications of degradation, including cracks, which display a growth greater than or equal to the repair limit in one cycle of operation.

