TXU

Comanche Peak Steam Electric Station – Unit 1 Steam Generator Replacement Project

Anticipated Licensing Actions

October 19, 2004

Purpose of Discussions

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- Introduce key personnel
- Present SG Replacement Plans for CPSES-1
- Provide scopes and schedules of anticipated licensing actions

Personnel Introductions

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- SG Replacement Project Manager
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- Safety Analysis Manager
  - Whee Choe — wchoe1@txu.com
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- Engineering and Safety Analysis Point of Contact
  - James Boatwright — jboatwright@txu.com
    - Consulting Nuclear Project Manager
    - 214-812-8232
- Regulatory Affairs Point of Contact
  - Bob Kidwell — rkidwell@txu.com
    - 254-897-5310

Agenda

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- Overview of Replacement SG Design Features
- Expected Effects on Analytical Methodologies
- Expected Changes to Technical Specifications
- Other Licensing Actions
- Tentative Schedules
- General Discussions

Comanche Peak
Steam Electric Station – Unit 1

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- 4-loop Westinghouse Plant with large dry containment
- Part of two-unit site with shared control buildings
- Originally rated at 3411 MWth, now at 3458 MWth with MUR uprate
- Current SG: Westinghouse D-4 with integral preheater
  - Approximately 3% tube plugging level

Replacement SG Design Features

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- Westinghouse ?76 feed ring design
- Similar to ?75 design in use at Shearon Harris and V.C. Summer

RSG Design Features

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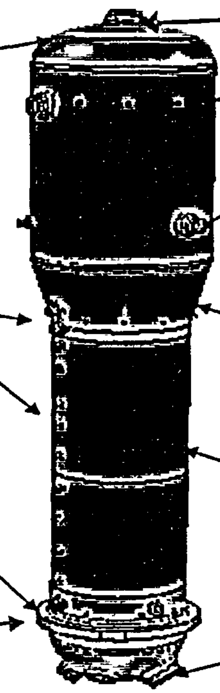
RSG Design: Overview of Design Features

- Forged elliptical head with integral nozzle (eliminates nozzle weld)
- Auxiliary feedwater nozzle
- Inspection ports above each TSP (maintenance enhancement)
- Four 6 – inch handholes Above tubesheet (maintenance enhancement)
- Support ring to match existing supports



- Major nozzles with extra stock (aids installation)
- Relocated main feedwater nozzle on upper shell
  (Feedring RSG with simplified operation vs. OSG with preheater)
- Forged transition cone with cylindrical upstands (eliminates ISI welds)
- Forged shell barrels (minimizes ISI welds)
- Primary nozzle with safe end extension (aids installation)

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Westinghouse

RSG Design Overview

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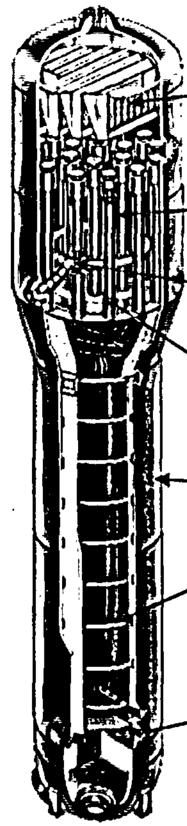
RSG Design: Overview of Design Features



- Peerless single tier secondary separators (enhancement for reduced moisture carryover)
- High capacity primary separators (enhancement for reduced moisture carryover)
- Elevated feedring with Alloy 690 spray nozzles (mitigates stratification and water hammer; traps loose parts)
- Enhanced materials throughout (high strength pressure boundary, Alloy 690 used, erosion resistant material in high velocity regions)
- Tubesheet secondary side tubelane free of obstructions (maintenance enhancement)

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RSG Design Overview

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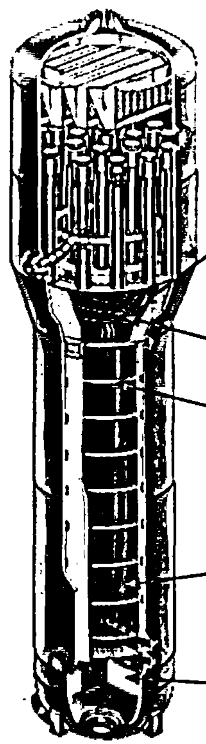
RSG Design: Overview of Design Features



- Enhanced tube bundle with thermally treated Alloy 690 tubing
  - 5532 tubes with 0.75" OD and on ? pitch
  - Increased heat transfer area (76000 sq ft)
  - Provides for reduced T-hot operation
  - Provides margin for potential power uprate
- Field proven minimum gap AVB system
- Stainless steel broached tube support plates
- Increased secondary side circulation ratio (mitigates sludge deposition on tubes, tube dryout, tube degradation mechanisms)
- Enhanced tube to tubesheet joint

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RSG: Design Overview

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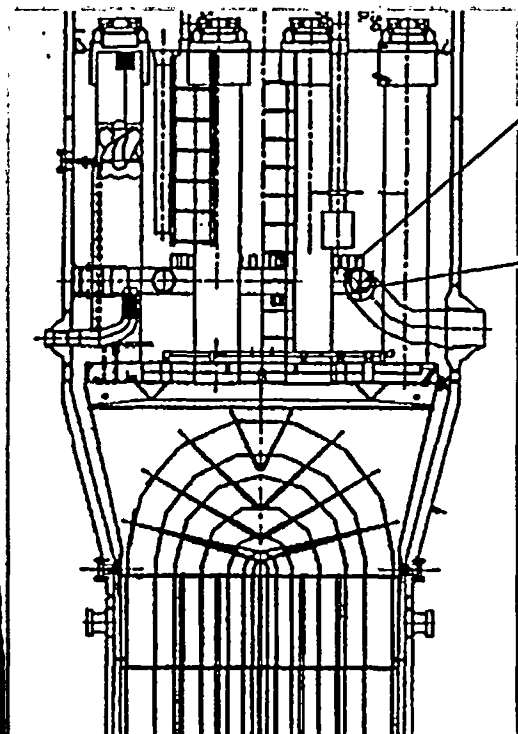
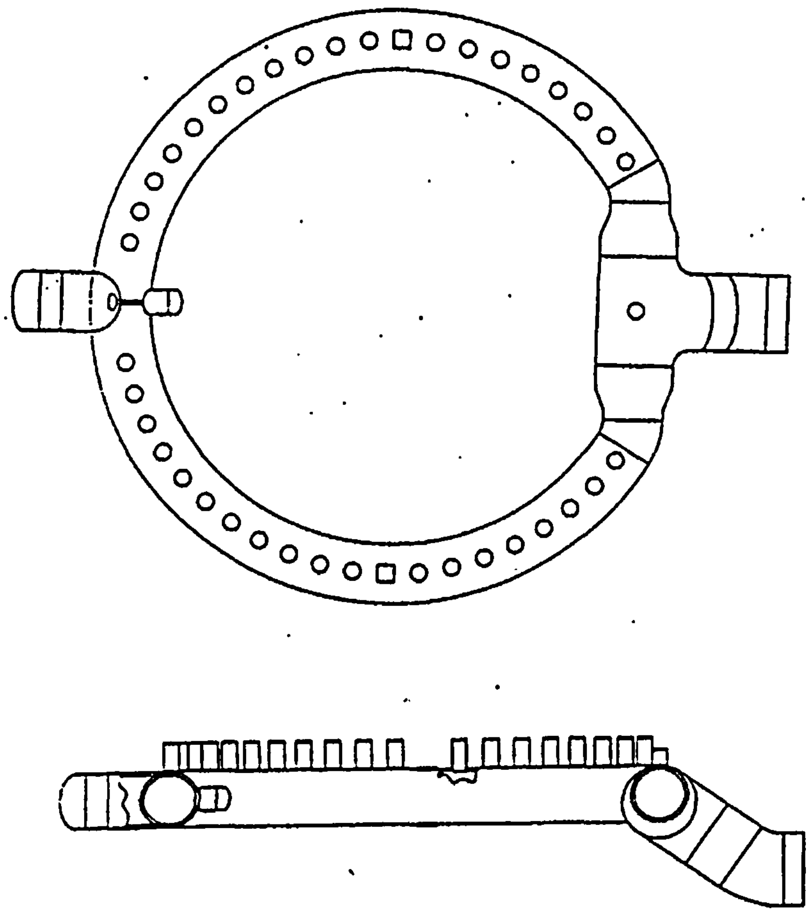
- Elevated feedring with top discharge nozzles
- Nozzle holes sized to trap loose parts
  - Hole diameter less than tube to tube clearance



Feedwater Distribution System



SG Comparisons

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- Relative to D-4 SG, the ?76 has:
  - 76,000 ft^2 heat transfer area (vs. 48,000 ft^2)
  - Essentially the same exterior envelope
  - Separate MFW and AFW piping
  - 5532 U-tubes (vs. 4578)
  - ¾" tube OD (same)
  - 1.03" triangular pitch (vs. 1.0625" square pitch)
  - Top of tube bundle 8 ft higher

SG Comparisons (cont.)

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- Relative to D-4 SG, the ?76 has:
  - 5330 ft^3 Shell-side volume (vs. 5954 ft^3)
  - Increased Tube Side Volume
    - Approximately 1300 ft^3 additional RCS volume
    - ~ 13% increase
  - Circulation Ratio of ~ 4 (vs. ~2.4)
  - Slightly larger secondary fluid mass
  - 251" narrow range water level span (vs. 233")

Changes to Operating Strategies

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- Generically, design for a Tavg range of 589.2°F – 574.2°F, but:
- Limit Steam Pressure to 1000 psia
  - Initially, set full power Tavg ~ 585°F @ 3458 MWth
  - Raise Tavg toward 589.2°F as SG heat transfer capability decreases (due to fouling or tube plugging)
- Design to a much tighter Tavg range (e.g., ±1°F) on cycle-specific basis
  - Lower values of Tavg are intended for future use in Tavg coastdown

Effects on FSAR Chapter 15 Analytical Methods

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- **Chapter 15 Analytical Methods:**
  - Developed by CPSES
  - Approved by NRC
  - Listed in TS 5.6.5
    - (Core Operating Limits Report)
- **Primary Affected Transients and Accidents:**
  - FLB, LOAC, LOFW, MSLB
  - LOCAs (SB and LB)
  - SGTR

Methods for Non-LOCA Transients and Accidents

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- SG Model Changes:
  - Approved CPSES SG model is coarse; includes explicit preheater representation; recirculation is not modeled
  - Chose to adopt feed ring SG model developed by Westinghouse
    - Uses RETRAN-02
    - Benchmarked against plant data
    - Methodology reviewed and approved by NRC
      - WCAP-14882-P-A

Affected non-LOCA Transients and Accidents

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- Feedline Break
  - Due to elevated feed ring, initial transient similar to steamline break
  - Ensuing heat-up similar to original SG transient
  - Detailed model with circulation requires use of dP model to simulate steam generator water level trip functions
    - vs. mass, as described in the CPSES topical
- No fundamental methodology differences
  - Conservative initial conditions and system performance characteristics, backed up by sensitivity studies

Affected Transients and Accidents (cont.)

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- Loss of non-emergency power to the station auxiliaries (Loss of AC power)
  - Different SG model – no methodology changes
- Loss of Normal Feedwater
  - Different SG model – no methodology changes
- Main Steamline Break
  - Update existing simplified SG model with new dimensions; use existing methodology
- SG tube rupture
  - Update existing simplified SG model with new dimensions; use existing methodology

LOCA Methodologies

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- LBLOCA Methodology
  - No methodology effects
  - New SG model
- SBLOCA Methodology
  - New SG noding consistent with non-LOCA model
  - Small modification to reactor vessel upper plenum model

Topical Report Supplements

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- RXE-91-001-A, "Transient Analysis Methods for Comanche Peak Steam Electric Station Licensing Applications", October 1993.

  - To be supplemented to address more detailed SG model, SG Water Level indication, and Feedwater Line Break response

  - Will continue to be used to support Unit 2

Topical Report Supplements (cont.)

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- ERX-2000-002-P, "Revised Large Break Loss of Coolant Accident Analysis Methodology", March 2000.
- RXE-95-001-P-A, "Small Break Loss of Coolant Accident Analysis Methodology," September 1996.
- ERX-2001-005-P, "ZIRLO™ Cladding and Boron Coating Models for TXU Electrics Loss of Coolant Accident Analysis Methodologies", October 2001.

- All to be supplemented (with a single supplement) to describe model changes per 10CFR50.46
- All will continue to be used to support Unit 2

Expected Technical Specification Changes

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- **Reactor Trip System and ESFAS:**
  - **TS Table 3.3.1-1 and TS Table 3.3.2-1 and associated Bases Tables:**
    - **SG Water Level – low-low and high-high**
    - **Main Steamline Pressure – low**
      - **Allowable Values in the TS Tables**
      - **Nominal Trip Setpoints in the TS Bases Tables**
      - **AVs and NTSs calculated per methodology described in TS Bases**

Expected Technical Specification Changes (cont.)

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- SG Tube Surveillance Program
  - TS 5.5.9
    - Remove those allowances established for the Unit 1 SGs that are not applicable to the Unit 2 SGs
    - No new requirements anticipated specifically for the ?76 SGs
    - May adopt TSTF-449, Rev. 1, for both CPSES units via separate licensing action

Expected Technical Specification Changes (cont.)

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- Core Operating Limits Report (COLR)
  - TS 5.6.5
    - Update lists of methodologies used to determine the core operating limits with new CPSES Topical Supplements
- Pressure and Temperature Limits Report (PTLR)
  - TS 5.6.6
    - Resolve previous commitment to update methodology with WCAP-14040-P-A, Revision 4.

Other Potential Licensing Actions

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- General update of radiological dose consequences methodologies to be consistent with RG 1.195
  - Pending results of Engineering Analysis and ensuing10CFR50.59 Evaluation
- General reviews of methodologies used throughout the RSG project
  - Methods identified to date have been previously approved by the NRC for the intended application, pending results of 10CFR50.59 Evaluation

Tentative Schedule

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- **Spring 2007** — Install replacement SGs
- **February 2007** — NRC approval of RSG-related licensing actions
- **Spring 2006** — Submit any License Amendments identified through 10CFR50.59 Evaluations
- **Winter 2006** — NRC Approval of Topical Report Supplements
- **Fall 2005** — Submit Proposed TS changes
- **December 2004** — Submit Topical Report Supplements (Presentation to NRC reviewers ~ 30 days later)

General Discussions

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- **Questions?**