Quad Cities Station Update

End-of-Cycle Meeting
June 14, 2006

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Site Vice President

Topics:

- **Extended Power Uprate**
  - *The problem*
  - *The fix*
- **Radiation Reduction**

Extended Power Uprate Completed

Objective – Increase total generation output on both reactors

- 17% Power Uprate
  - Produce 912 megawatts electric
- NRC approval in December 2001
- Initial EPU operation:
  - Unit 2 in March 2002
  - Unit 1 in December 2002

The Problem

Increased steam flow

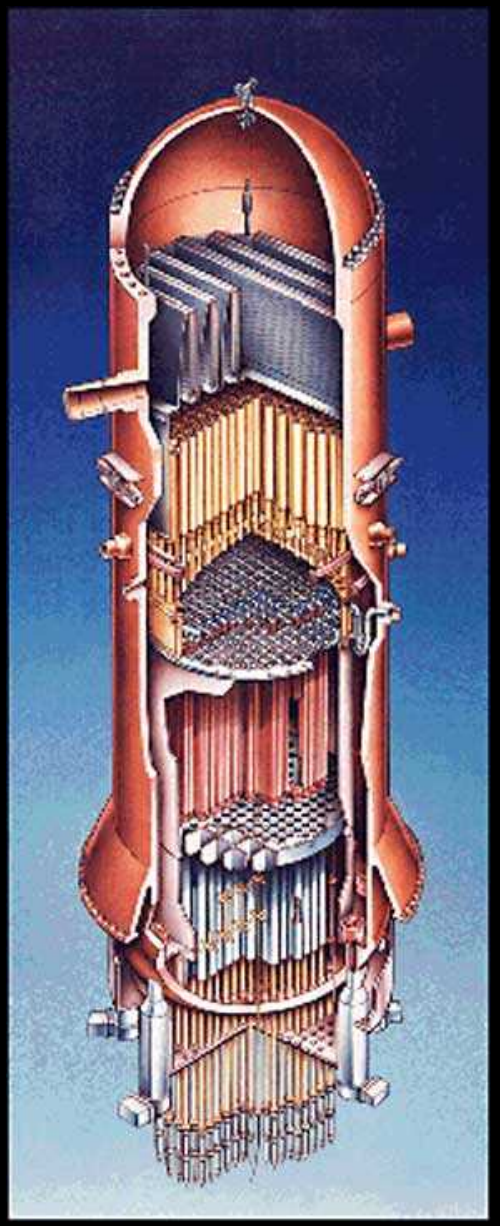
Increased acoustic loads

Increased Steam Dryer loads

Increased steam line piping vibrations

Steam Dryer cracks

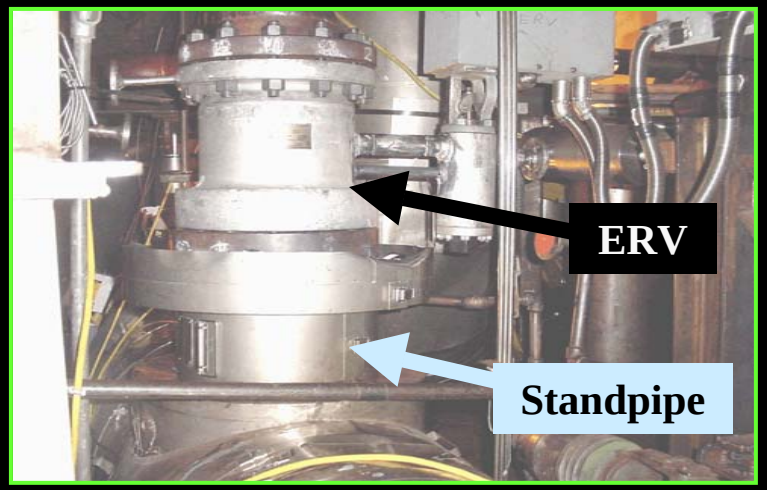
ERV actuator damage



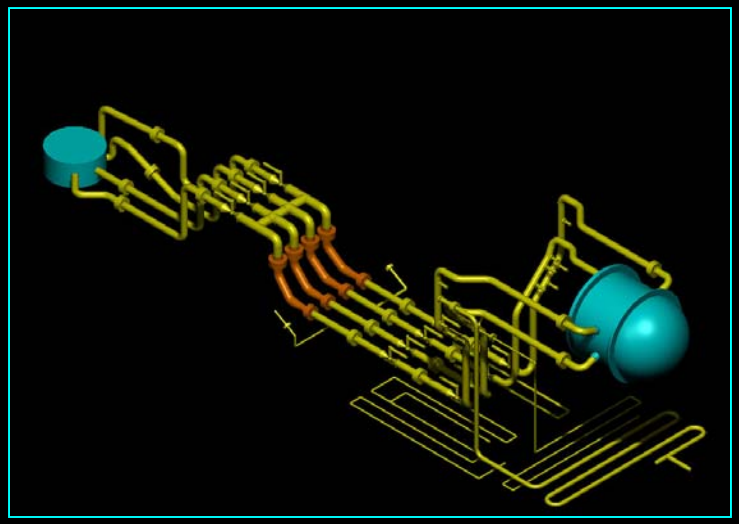
Finding the Source

- Unprecedented testing and analysis determined the source of the vibration to the ‘standpipes’ on the steam lines where the valve attach to the piping.

– The length of the standpipe was increased to reduce the acoustics inside the pipe. --- *Similar to tuning a pipe organ, or blowing over the top of a soda bottle.*



State-of-the-Art Testing and Analysis Conducted to Validate Vibration Source



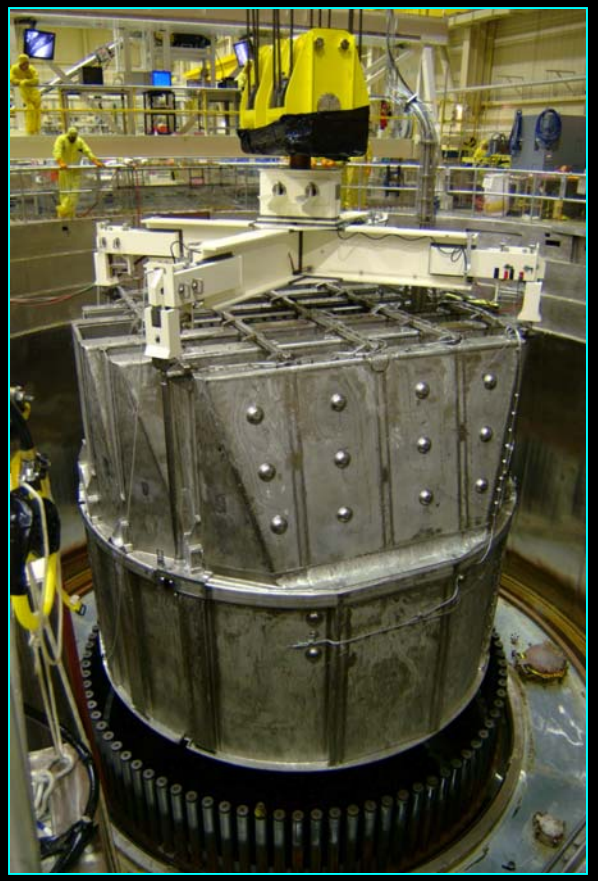
- Testing conducted in six states
- Scale models of actual Quad Cities reactor and piping utilized
- Shaker table testing conducted to duplicate actual vibration levels

Actions Taken to Correct Vibration Problem

- Installed New Steam Dryers
  - More robust
- Installed Acoustic Side Branch Modification
  - Retune the steam system
- Installed Upgraded Valve Actuators
  - ‘Hardened’ the actuator

New Steam Dryers

- **Both Quad Cities steam dryers were replaced in early 2005 with a more robust design:**
  - Increased stress margins on steam dryers
  - Instrumentation provided validation of design load
  - Strain gauges provided stress data for analytical purposes



2006 Electromatic Relief Valve Upgrade

- Late 2005 issues were discovered with the actuators on the Electromatic Relief Valves (ERVs) due to vibration.
- The ERV actuators have now been replaced with more robust design:
  - Several ERV actuator replacement options evaluated. New General Electric design proved to be most rigorous as validated with shaker table tests.

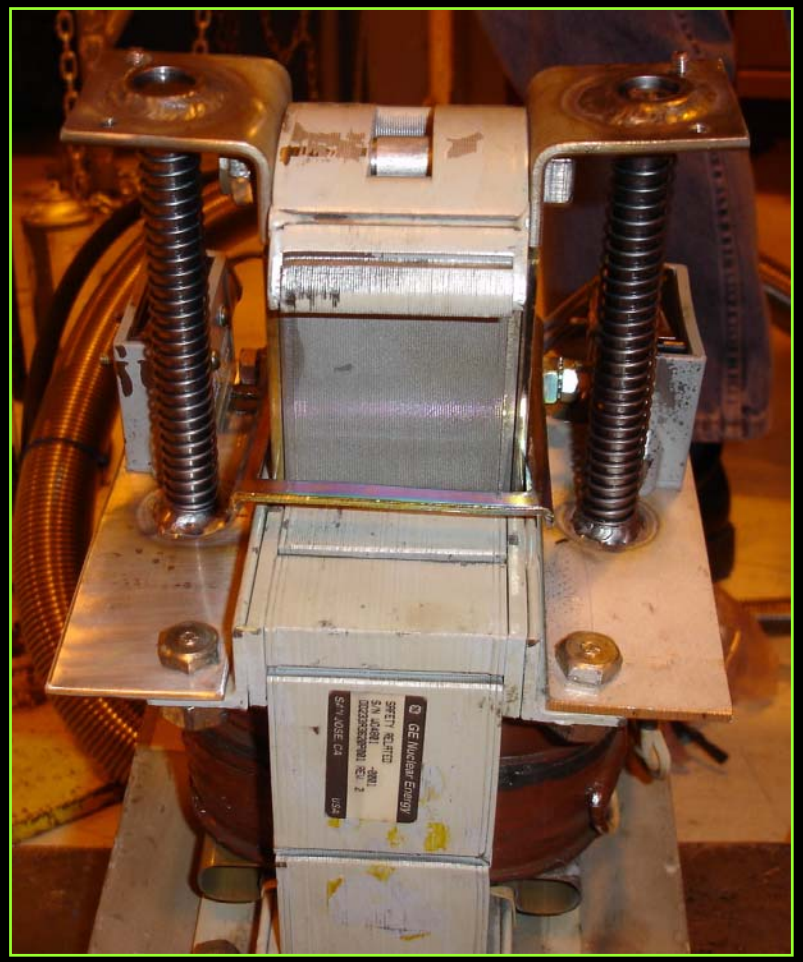
Shaker Table Testing

ERV Actuator Testing

ERV Testing

New ERV Actuator -vs- Previous

New GE Design



Previously Installed Design

2006 Acoustic Side Branch Modification

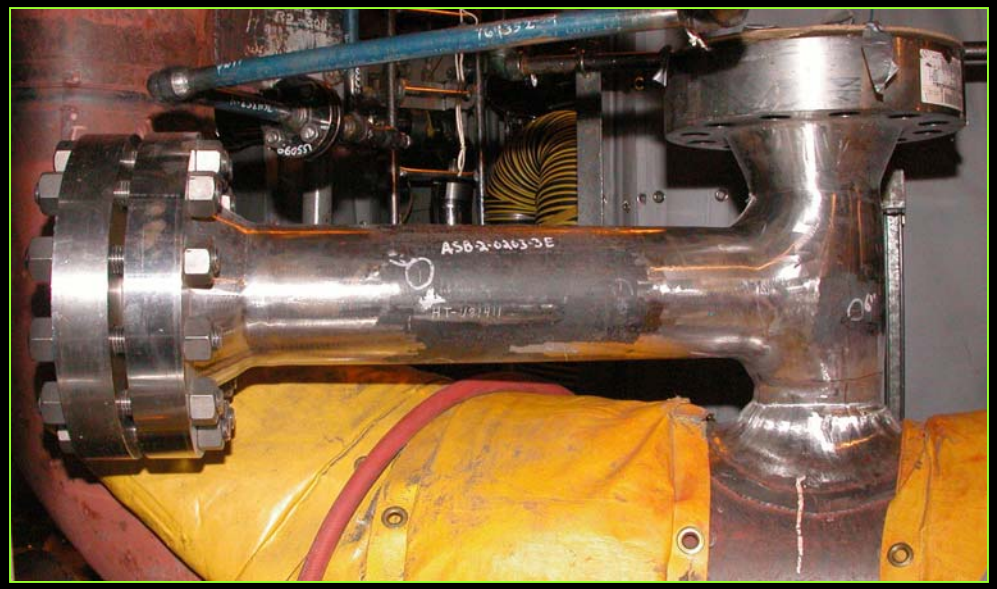
Removing the Source of the Vibrations

2006 Acoustic Side Branch Modification

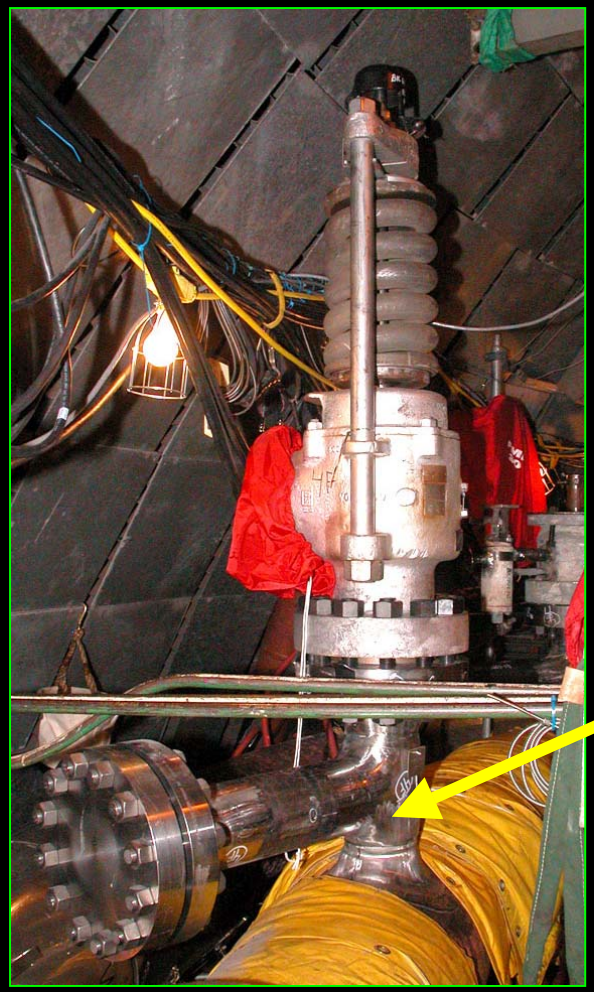
- Objectives:
  - Reduce dryer loading to increase stress margin for long-term operation of dryer
  - Reduce overall MSL vibrations impacting ERV actuators and other attached main steam components
  - Retuned the steam system

How Does the ASB Work?

The addition of the ASB increases the effective length of the ERV/SV standpipe, thereby decreasing the frequency of the acoustic standing wave. It is similar to a muffler, the ASB 'tunes' the steam flow to reduce vibrations in the piping.

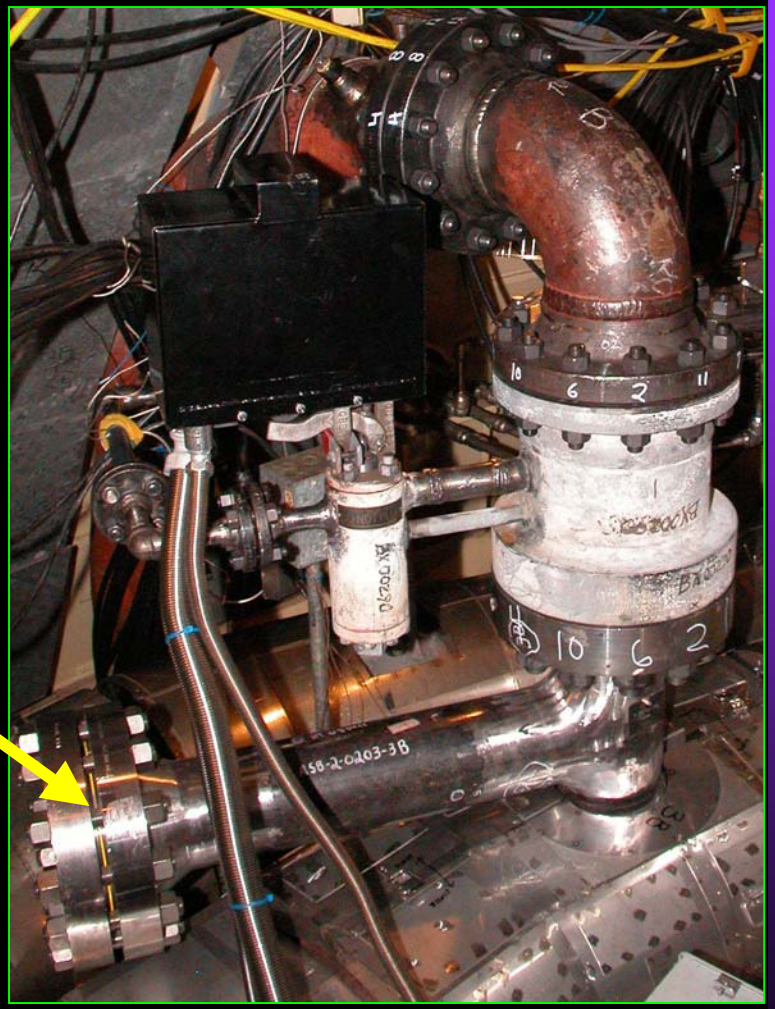


Acoustic Side Branch Mod



Main Steam Safety Valve

ASBs



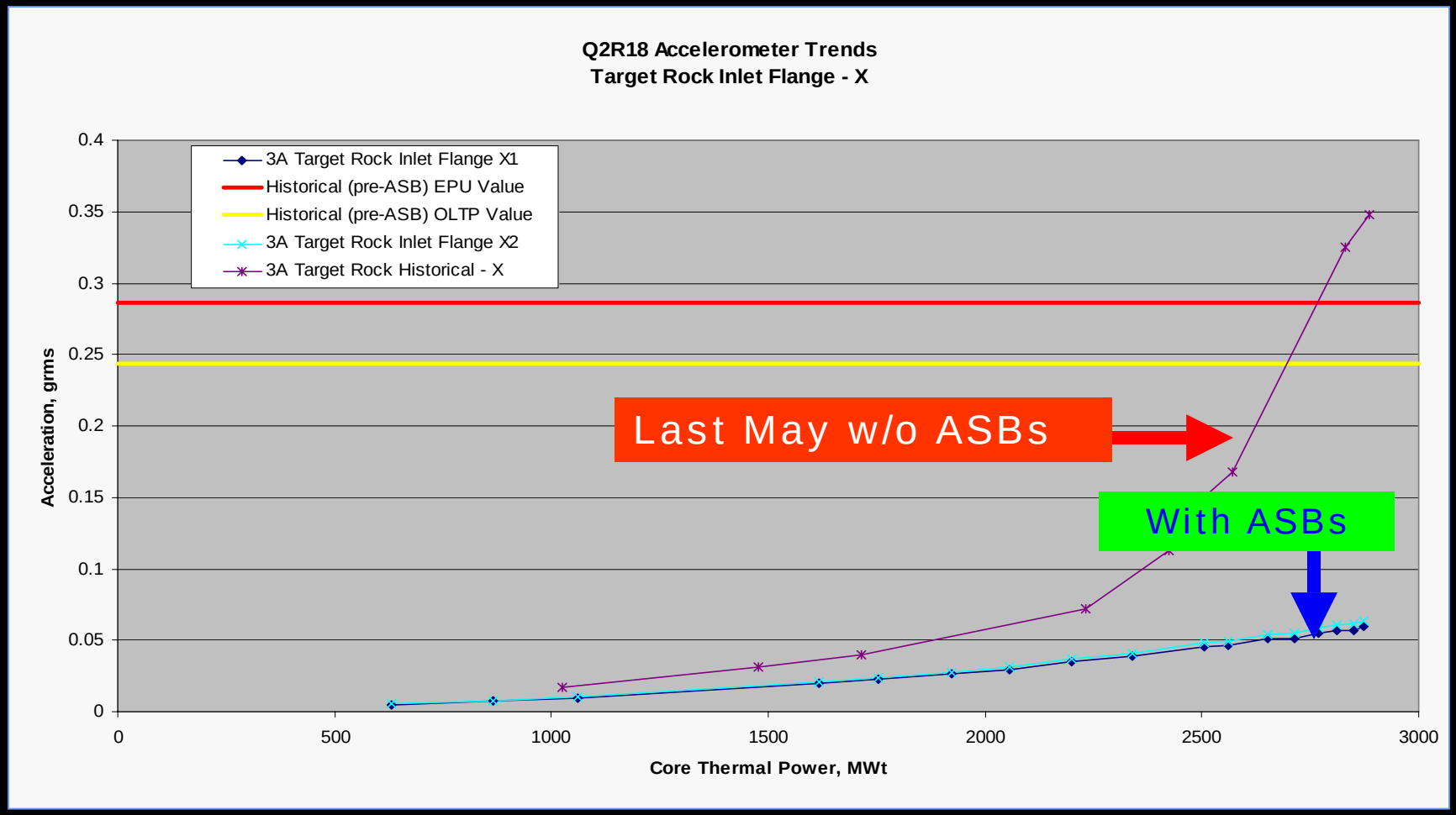
Electromatic Relief Valve

Unit 2 Startup Testing

RESULTS:

- EPU Flow Induced Vibration (FIV) Reduced to ~ 50% Original Licensed Thermal Power Levels.
  - Meaning: today steam piping vibration levels at full-EPU power is approximately 50% than when the plant was first put in to commercial operation in 1972.

Typical Accelerometer Data Results

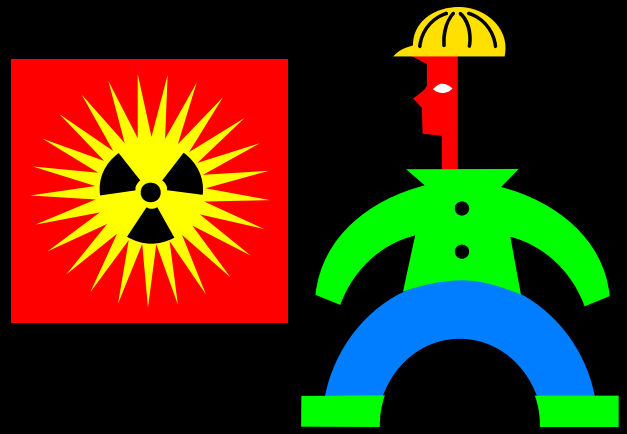


Conclusions

ASBs Work!

- Main Steam Line (MSL) vibrations are reduced
- The ASB modification effectiveness has been confirmed. This adds significant safety margin and substantially increased vibration tolerance to the steam dryer structural integrity and other main steam line components.
- Both units can operate safely and reliably at EPU power levels.

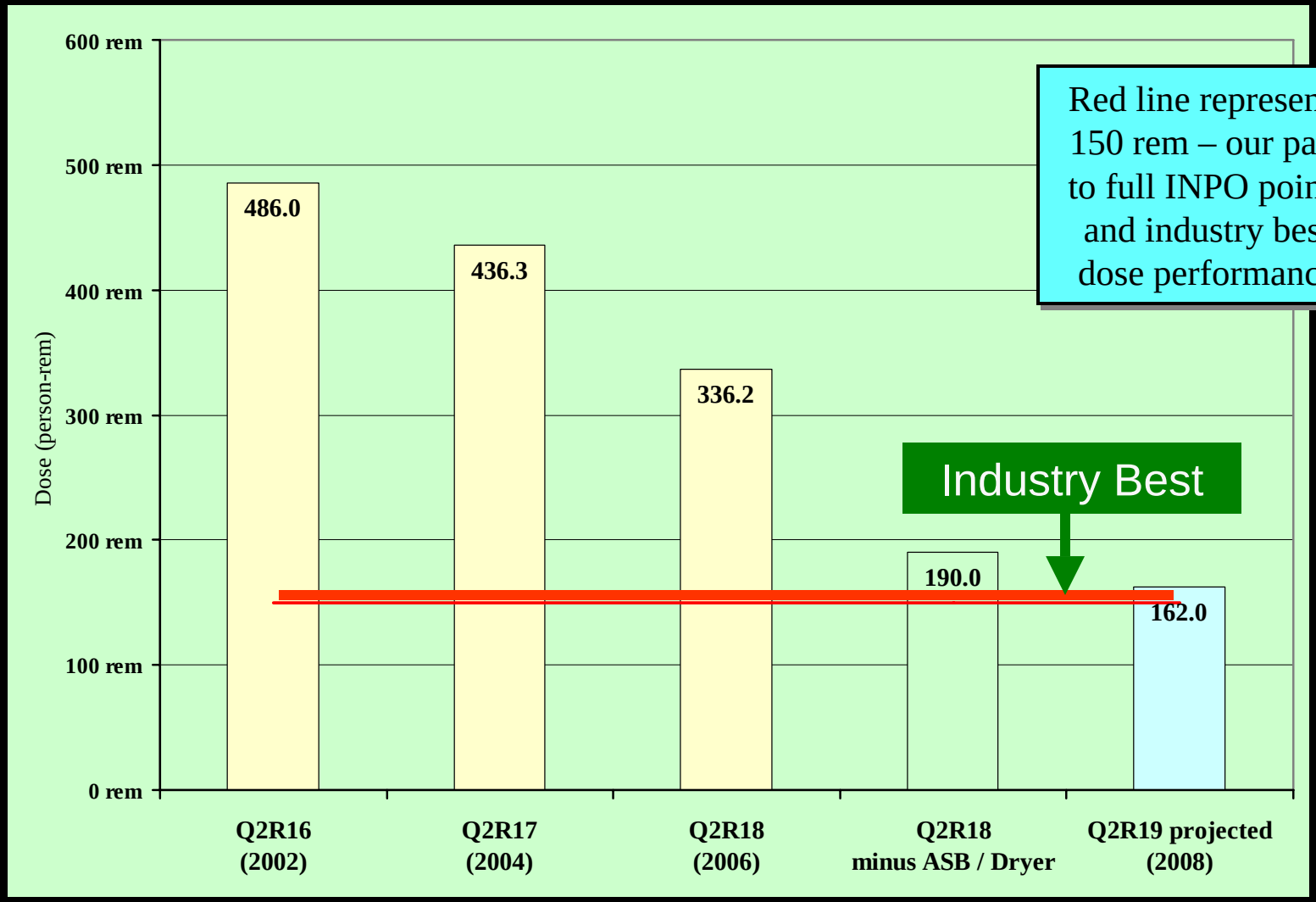
Radiation Exposure Efforts



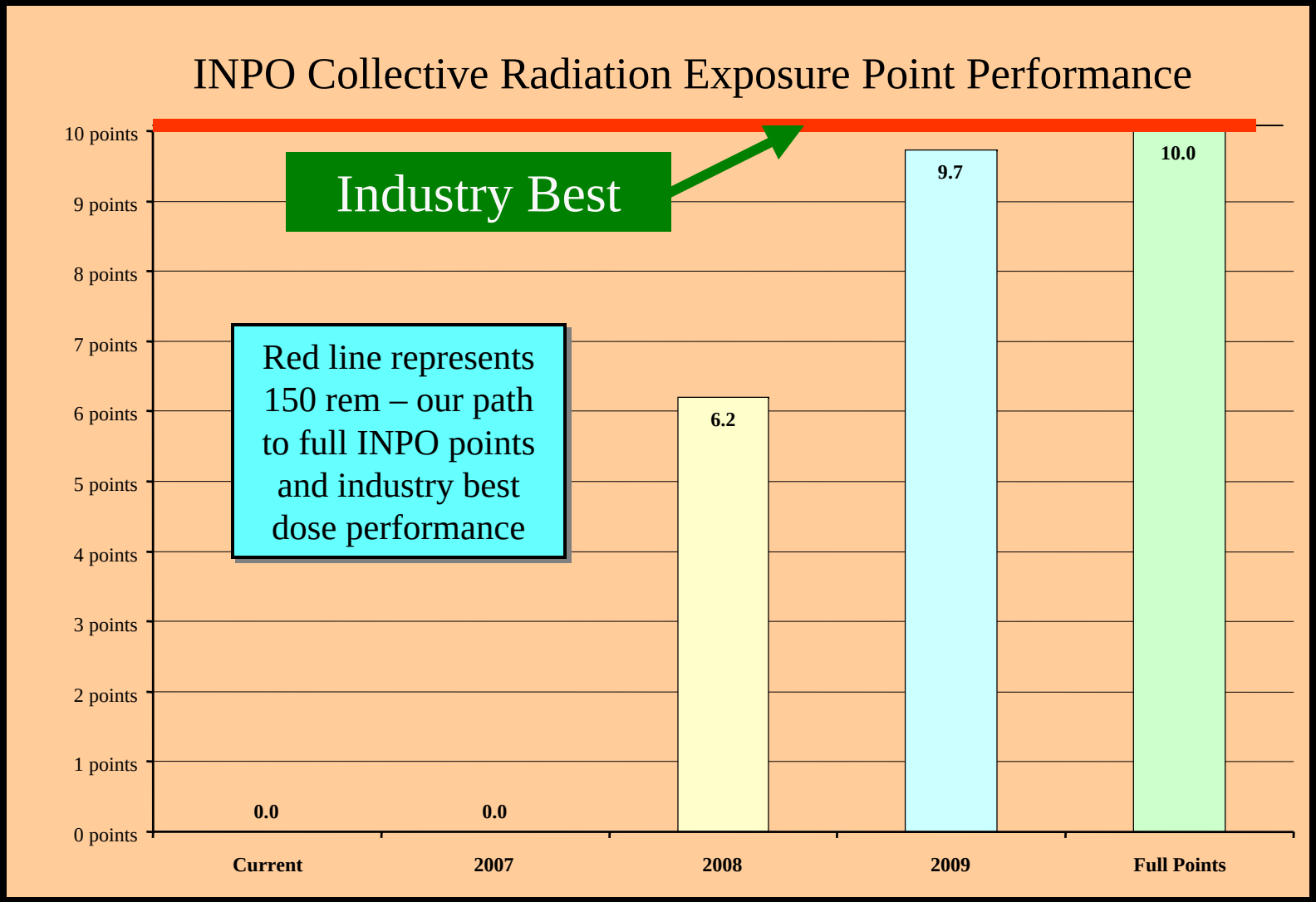
Station Has Taken Aggressive Actions to Reduce Radiation Exposure

- Chemical decontamination of reactor piping on both units
- Replacement of turbine blades which contained high sources of Cobalt 60
- Installed permanent lead shielding in several high radiation areas of the plant
- Improved worker training / increased awareness through individual dose goals

U2 Outage Dose Reduction Trend



Where Are We Going



Questions?