

Commission Briefing on GSI-191

Industry Perspectives on GSI-191

October 25, 2006



Industry Panel

- **Tony Pietrangelo**
VP Regulatory Affairs, NEI
- **Joe Donahue**
VP Nuclear Engineering and Services, Progress Energy
Chairman, PWR Owners Group Executive Committee
- **Amir Shahkarami**
Sr. VP Engineering and Technical Services, Exelon

Overview

- A highly conservative, deterministic approach was developed to address GSI-191
- Conservative test methods are also being applied
- Licensees are moving forward with significant design and operational enhancements
- Industry wants to achieve closure expeditiously



Evaluation Methodology (NEI-04-07)

- Developed as a conservative screening tool to identify areas for licensee action
- Necessary to bound spectrum of plant configurations and materials
- Did not include guidance on chemical effects and downstream effects
 - Resolution activities initiated in parallel with joint industry/NRC chemical effects testing

Examples of Bounding Assumptions

- Instantaneous double-ended break of largest pipe at worst location ($< 1 \text{ E-7/yr}$)
 - Maximize head loss
 - No credit for Leak Before Break
- Spherical zone of influence (up to 28.6 D)
- All non-qualified coatings inside containment assumed to fail
- 100% transport to screens

Chemical Effects

- Joint industry/NRC tests demonstrated need to consider chemical precipitants
- PWROG developed guidance for plant-specific chemical effects treatment
 - Conservative estimation of precipitant formation
 - Neglects inhibition effects
- Combination of high fiber load, high precipitant formation leads to prediction of high head loss
- Industry pursuing range of actions to resolve
 - Combination of refinements to methodology, test protocols and design changes

Industry Resolution Activities

- Analysis and mock-up testing being performed in support of strainer replacements
- Plant activities extend well beyond installation of larger strainers
- Plant-specific designs are a driver in the resolution path taken
- Installation of new screens has begun and will continue to 1st Quarter 2008



Licensee Actions Taken or Considered

- Install very large screens
- Utilize alternate buffers
- Install trash racks/debris interceptors
- Remove fibrous insulation
- Numerous compensatory actions
- Water management initiative

PWROG Activities

- Industry guidance documents have been developed to address
 - Debris generation and transport
 - Downstream effects evaluation
 - Chemical effects
 - Alternate buffers
- Conservative treatment of individual phenomena and operational parameters
 - Overall result is highly conservative

Progress Energy Activities

■ Crystal River

- Original sump screen:
 - ◆ Design: Wire mesh with 1/4" square openings
 - ◆ Size: 86 ft²
- Replacement sump screen:
 - ◆ Design: Concentric rolled and perforated plates (tophat design) with 1/8" diameter holes
 - ◆ Size: 1140 ft² (thirteen times larger than original)
 - ◆ 50% screen head loss margin reserved for chemical effects
- Separate flow diverter and debris interceptor upstream of screen
- Status: Installed in fall 2005



Progress Energy Activities

Crystal River Tophat Strainers

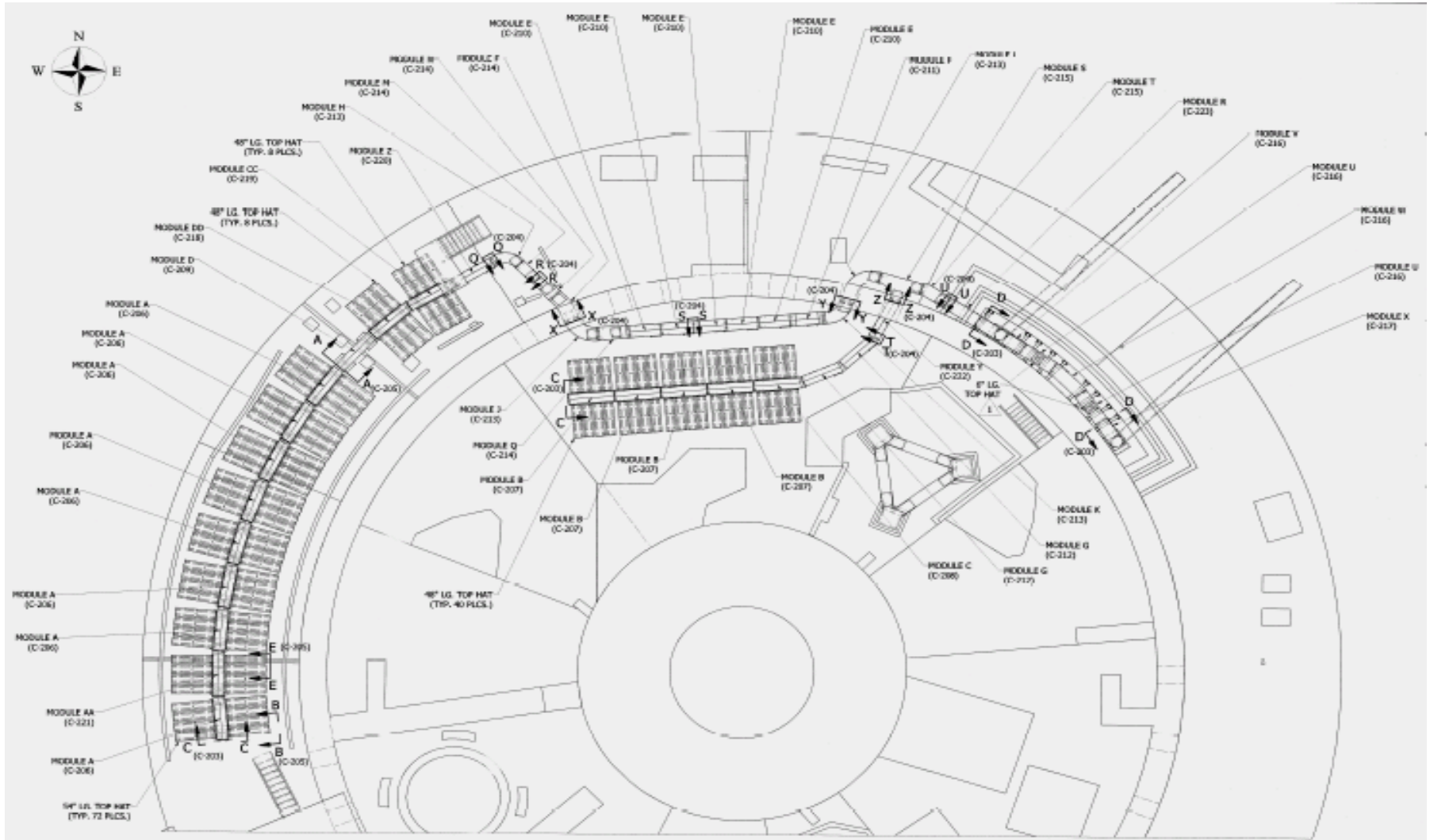


Progress Energy Activities

- H. B. Robinson
 - Original sump screen:
 - ◆ Design: Wire mesh with 7/32" square openings
 - ◆ Size: 116 ft²
 - Replacement sump screen:
 - ◆ Design: Tophat with 3/32" diameter holes and integral woven mesh to minimize debris penetration
 - ◆ Size: 4200 ft² (thirty-six times larger than original)
 - ◆ >50% screen head loss margin reserved for chemical effects
 - Status: Will be installed in spring 2007



H. B. Robinson Strainer Layout



PLAN VIEW

Progress Energy Activities

- Material head loss testing
- Screen penetration testing
- Coating destruction pressure (ZOI) testing
- Chemical effects
 - Working closely with NEI and PWROG to resolve chemical effects issue
 - Additional testing may be required to quantify head loss impact
 - Using industry predictive spreadsheet to identify actions most effective in reducing chemical precipitates



EXELON PWRs

- Byron Station Units 1 and 2
- Braidwood Station Units 1 and 2
- Three Mile Island Unit 1

- Salem Units 1 and 2



EXELON Activities

- Byron & Braidwood Stations
 - Original sump screen:
 - ◆ Design: Wire mesh with 3/16" square openings
 - ◆ Size: 150 ft² total both sumps
 - Replacement sump screen
 - ◆ Design: "Pocket" design with 1/12" holes
 - ◆ Size: 3000 ft²/sump, 6000 ft² total
 - ◆ Design complete including head loss and chemical effects testing
 - Status:
 - ◆ Byron – Unit 1 : installed Sept. 2006
 - ◆ Braidwood – Unit 2 : will be installed Oct. 2006
 - ◆ Byron – Unit 2 : will be installed April 2007
 - ◆ Braidwood – Unit 1 : will be installed Oct. 2007



EXELON Activities

- Byron & Braidwood Stations
 - Additional Hardware Modifications
 - ◆ Remove/replace fiberglass insulation within ZOI with Reflective Metal Insulation
 - ◆ Install trash racks for large debris interception
 - ◆ Replace ECCS throttle valve trim
 - Operational Modifications
 - ◆ Improved loose debris surveillances
 - ◆ EOP changes for increased cool down rates for Small Break LOCA (Bulletin 2003-01)



EXELON Activities

Byron/Braidwood Replacement Sump Screen



EXELON Activities

- Salem Units 1 and 2
 - Original sump screen:
 - ◆ Design: Wire mesh with 1/8"x1/8" square openings
 - ◆ Size: 85 ft²
 - Replacement sump screen
 - ◆ Design: "Pocket" design with 1/12" holes
 - ◆ Size: 5000 ft² total
 - ◆ Screen design complete
 - ◆ Chemical effects testing scheduled for Nov. 2006
 - Status:
 - ◆ Unit 2 will be installed October 2006
 - ◆ Unit 1 will be installed February 2007

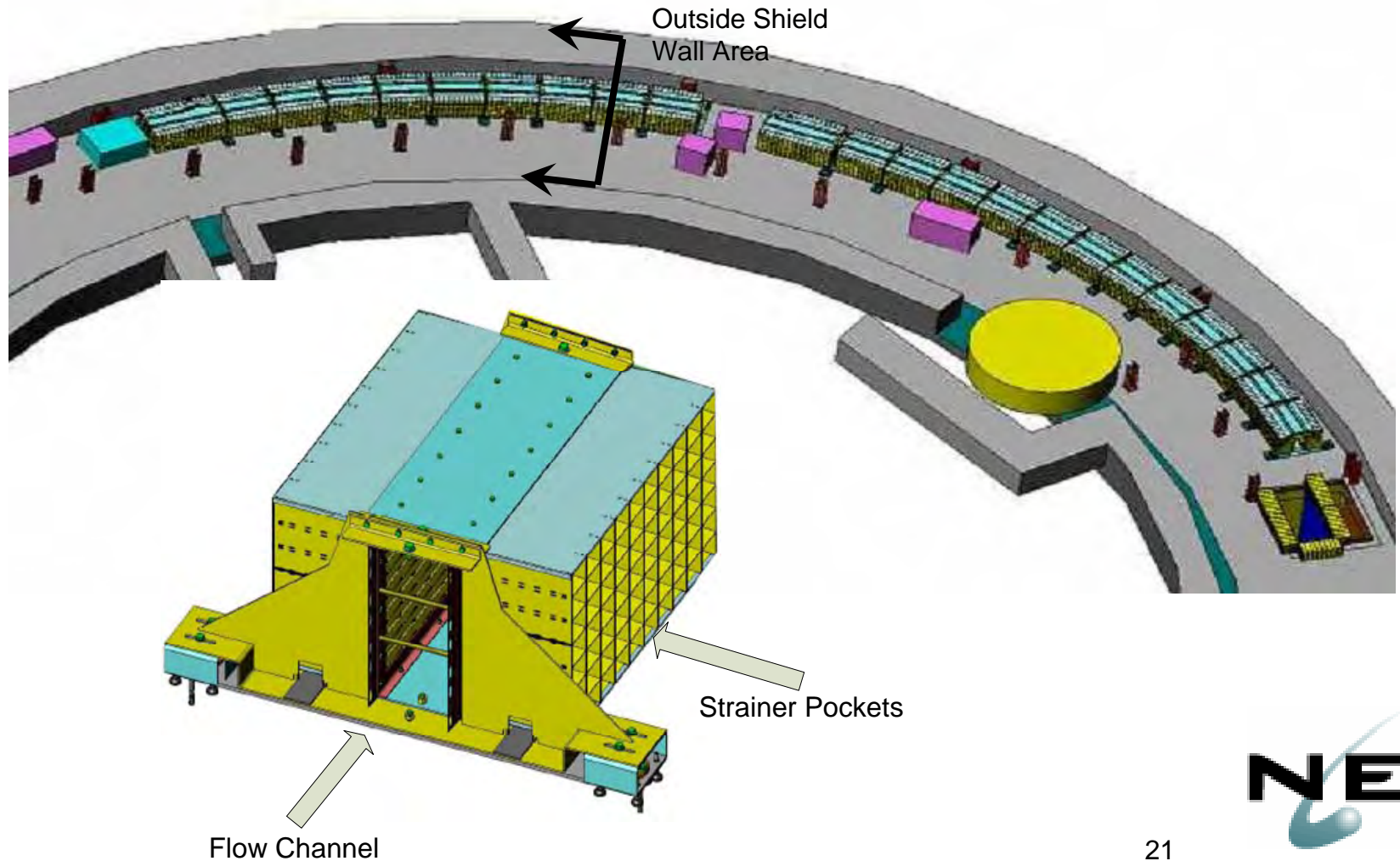


EXELON Activities

- Salem Units 1 and 2
 - Additional Hardware Modifications:
 - ◆ Remove/replace Calcium Silicate and Min K insulation within ZOI with Reflective Metal Insulation
 - ◆ Install trash racks for large debris interception
 - No equipment modifications anticipated to address Downstream Effects



Salem Replacement Strainers



Closure = Reasonable Assurance of Long Term Cooling

- GSI-191 in context
 - Low risk significant event
 - Significant safety enhancements
- Chemical effects is the challenge
 - No silver bullet
 - Screens sized with margin
 - Working with staff on more realistic treatment
- Closure is recognition that the above actions achieve reasonable assurance

