2010 AEC-NRC Bilateral Technical Meeting

CONTAINMENT SUMP STRAINER REPLACEMENT PROJECT AT MAANSHAN NUCLEAR POWER PLANT (GSI-191 Issues)

2010 AEC/NRC Bilateral Technical Meeting
Taipei, Taiwan
May 4, 2010

Outlines

1. Maanshan NPP GSI-191 Project
2. Walkdown Activities
3. Observations & Results
4. Recommendations
5. Strainer Replacement Phase II Project
6. Q & A

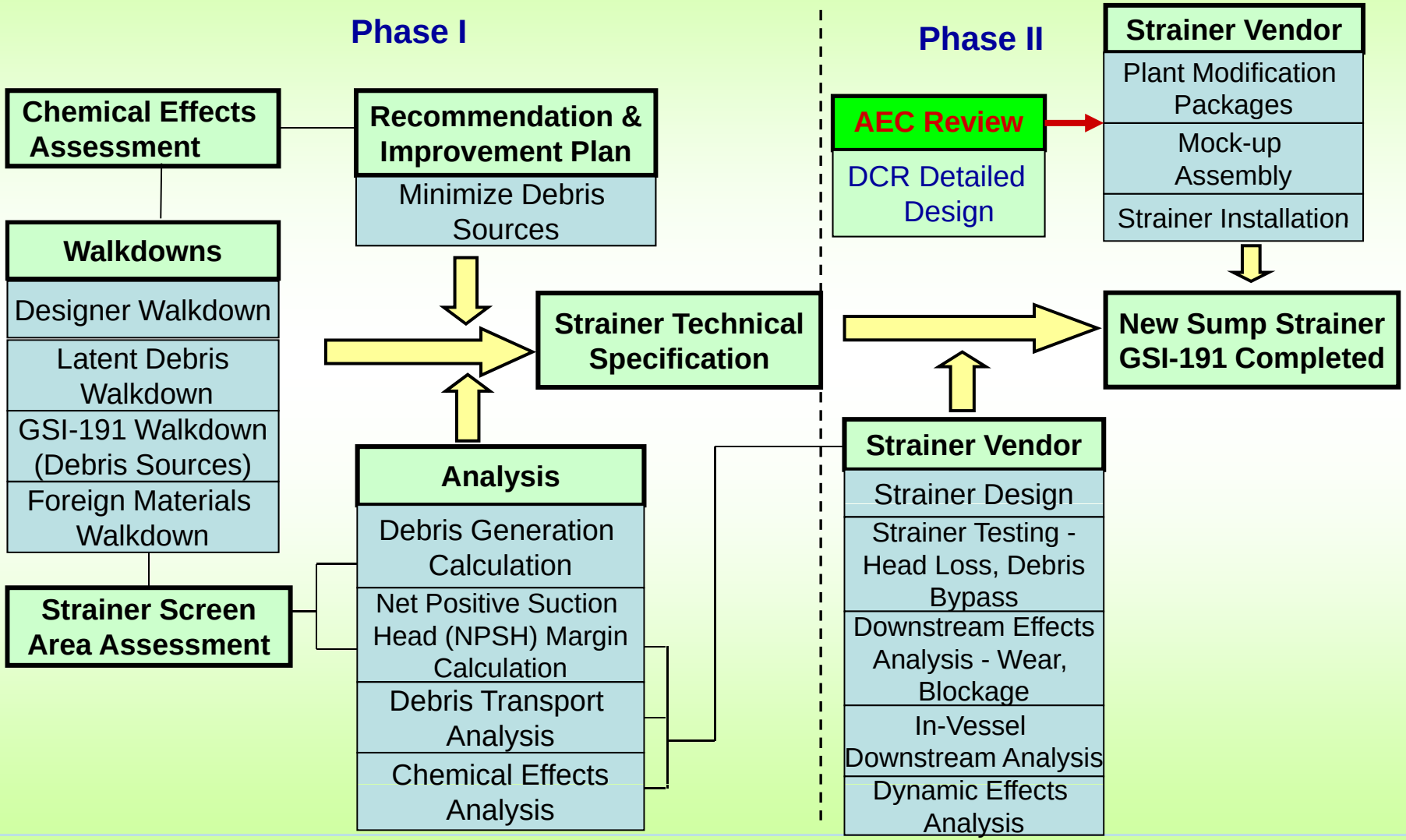
1. Maanshan GSI-191 - Overview

- Maanshan nuclear power plant (MNPP) is the only PWR plant in Taiwan w/ Two Units
- MNPP has started evaluating GSI-191 related issues since 2004 in response to GL 2004-02 and the request of Atomic Energy Council (AEC)
- MNPP will implement a containment cleaning improvement program and perform plant modifications towards GSI-191 compliance

1. Maanshan GSI-191 - Overview

- **MNPP proposed a sump strainer improvement plan with two-phase scope of work**
  - Phase I: Perform walkdown activities and provide strainer technical specification for Phase II project
    - **Completed in November 2009**
  - Phase II: Select vendor/manufacturer for strainer design, testing, manufacturing, and installation
    - **Starting in August 2010**

1. Maanshan GSI-191 – Overview (cont.)
Work Flow



Work Flow (cont.)

Phase I

- Min water level
- Max flow rate
- Max head loss at given low rates
- Debris types, quantities
- Pres, Temp, Humidity, Radiation profiles
- Spray pH range
- Seismic accelerations

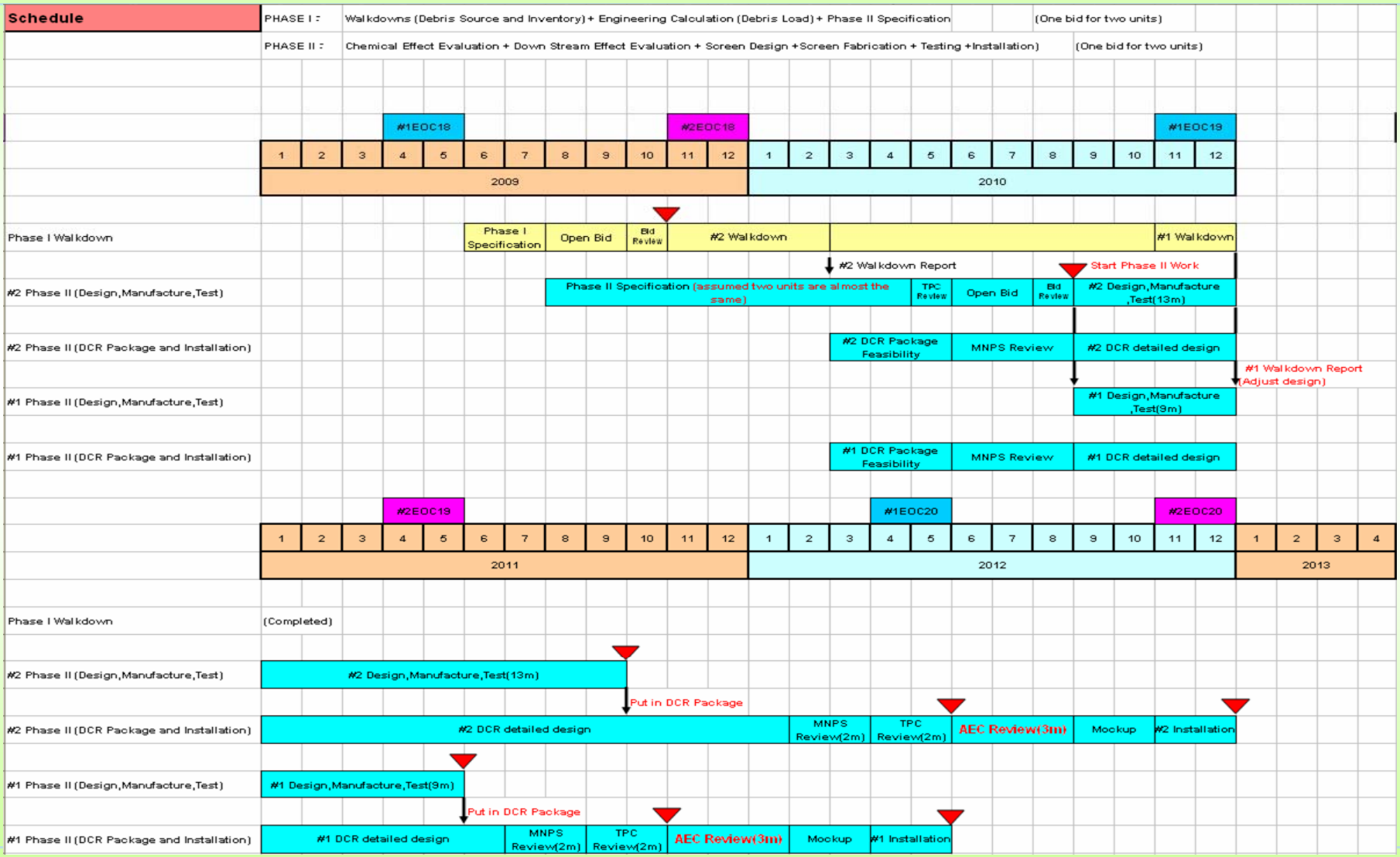
Strainer Technical Specification

- Max filtration area / sump volume
- Guaranteed head loss / fixed footprint

Phase II

DCR Package feasibility Study

1. Maanshan GSI-191 – Overview (cont.)
Time Schedule



2. Walkdown Activities

- **Phase I project - Performed Unit #2 Walkdowns in November 2009**
- **Four walkdowns planned & completed**
  - Designer Walkdown
  - Latent Debris Walkdown
  - Foreign Material Walkdown
  - GSI-191 (Debris Sources) Walkdown
- **Unit #1 Walkdowns scheduled in November 2010**

2. Walkdown Activities

- **Schedule for Unit #2 Walkdowns (2009)**

Activity	Thurs 19-Nov AM	PM	Fri 20-Nov AM	PM	Sat 21-Nov AM	PM	Sun 22-Nov AM	PM	Mon 23-Nov AM	PM	Tues 24-Nov AM	PM	Wed 25-Nov AM	PM	Thurs 26-Nov AM	PM	Fri 27-Nov AM	PM	Sat 28-Nov AM	PM	Sun 29-Nov AM	PM	Mon 30-Nov AM	PM	Tues 1-Dec AM	PM	Wed 2-Dec AM	PM	Thurs 3-Dec AM	PM	Fri 4-Dec AM	PM	Sat 5-Dec AM	PM	Sun 6-Dec AM	PM
INER meetings with Maanshan																																				
Coating engineer																																				
Insulation engineer																																				
GSI-191 cognizant engineer																																				
RP technicians																																				
Plant escorts																																				
Access training/Pre-workdown																																				
Walkdowns																																				
Designer walkdown																																				
Latent walkdown																																				
GSI-191 walkdown																																				
Foreign material walkdown																																				
Hand-over meetings with Maanshan/AEC																																				

2. Walkdown Activities

- **Designer Walkdown**
  - Confirm sump dimensions
  - Survey area near sump
  - Determine best strainer installation path
- **Latent Debris Walkdown**
  - Take 50 samples of dust & lint from 12 surface types (5 samples concrete(h) and equipment(v) ; 4 samples others)
  - Samples taken at the three elevations and outside and inside the bio-shield

2. Walkdown Activities

- **Foreign Material Walkdown**
  - Survey of entire containment to identify non-outage related foreign materials (tags, labels, placards, signs, paper, tape and others)
  - Conservatively estimate the surface area of each type of foreign materials
- **GSI-191 (Debris Sources) Walkdown**
  - Evaluate condition of insulation and coatings
  - Photograph damaged insulation and coatings for future reference
  - Document any additional debris sources
  - Identify choke points and water holdup volumes

3. Observations & Results

- **Designer Walkdown Observation**
  - Sump dimensions are as indicated on design drawings
  - Curb surrounding sump is beneficial
  - Congested areas surrounding sump may hold-up some debris
  - Concrete slab above the sump minimizes HELB/missile concerns
  - Unobstructed floor space exists between sump & containment liner to add more modules at El. 100’ if necessary
  - Best transport path for strainer components appears to be via Polar Crane drop through stairwell above sump

Sump Pictures

3. Observations & Results

- **Latent Debris Walkdown Observation**
  - Containment cleanliness is typical, nothing is out of ordinary
  - Recommend vacuuming latent debris from as many accessible horizontal surfaces as possible
  - Special attention to be placed on grated surfaces and penetrations
- **Latent Debris Calculation**
  - Amount estimates 165.4lb_m

3. Observations & Results

- **Latent Debris Summary**

Surface Type	Area [ft^2]	Mass/Area [g/ft^2]	Conversion [g -> lb_m]	Mass [lb_m]
Containment Liner	84,340	0.016	0.002205	2.98
Grating	3,679	12.032	0.002205	97.60
Horizontal Concrete	22,335	0.345	0.002205	16.99
Vertical Concrete	67,733	0.029	0.002205	4.32
Horizontal Equipment	3,110	0.607	0.002205	4.16
Vertical Equipment	27,942	0.032	0.002205	1.99
Horizontal HVAC	4,031	1.495	0.002205	13.29
Vertical HVAC	2,219	0.208	0.002205	1.02
Horizontal Pipe	15065	0.348	0.002205	11.54
Vertical Pipe	11991	0.057	0.002205	1.50
Horizontal Cable Tray	5,175	0.870	0.002205	9.93
Vertical Cable Tray	776	0.073	0.002205	0.13
			Total Mass	165.4

Latent Debris Walkdown

3. Observations & Results

- **Foreign Materials Observation**
  - Miscellaneous debris of concern includes gloves (cotton and latex), tape & paper (particularly on electrical penetrations)
  - Debris from top of accumulators should be removed
  - Paper and tape are major contributors in the northern half of elevation 126’
  - Plastic speakers are the largest contributor at the perimeter of the operating area
  - It’s about 1200 labels & tags for valves/components
- **Foreign Materials Calculation**
  - Amount estimates 270ft^2 + 30ft^2 margins

Photos from Foreign Material Walkdown

3. Observations & Results

- **GSI-191 (Debris Sources) Observation**
  - Most insulation is RMI, as confirmed by the insulation engineer
  - Fiberglass insulation mostly in good condition
  - No other types of insulation was found
  - Coatings appear to be in generally good condition
  - Flow path choke points observed at 100ft
  - Two water holdup areas found at the operating floor

3. Observations & Results

- **Summary of Debris Sources**

Debris Sources	Insulation		Coating		Flow Path Choke Point			Water Holdup Area	
	RMI	Nukon	Qualified	Un-qualified	100ft	126ft	148ft	Refueling computer track apparatus	Reactor head laydown area
Observation	Good	15 Small Damages (0.5ft^3 each) 12 Large Damages (1ft^3 each)	Good	Not Available	Yes Inside the missile barrier area	None	None	Yes 2 Tracks at 148ft	Yes at 148ft
Amount		~20ft^3 (19.5ft^3)						19.5ft^3	139ft^3
Total Amount								158.5ft^3	

Photos from GSI-191 Walkdown

4. Recommendations

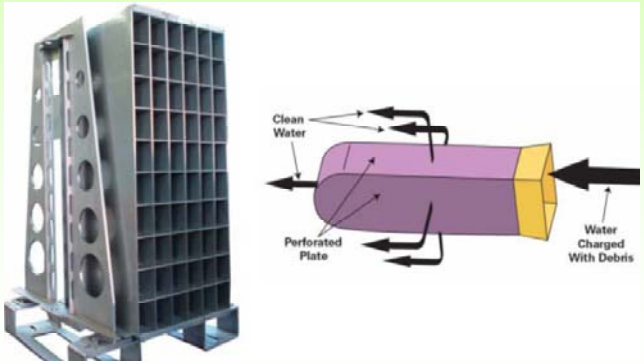
- Repair damaged fiberglass insulation and jacketing throughout containment
- Remove as much paper and tape from containment as possible and aluminum
- Replace aluminum labels with stainless steel tags
- More rigorous adherence to containment cleaning procedure
- Procedural change to modification process (e.g. GSI-191 Checklist) to maintain or reduce debris amounts
- Transport strainer modules through north stairway for installation

5. Strainer Replacement Phase II

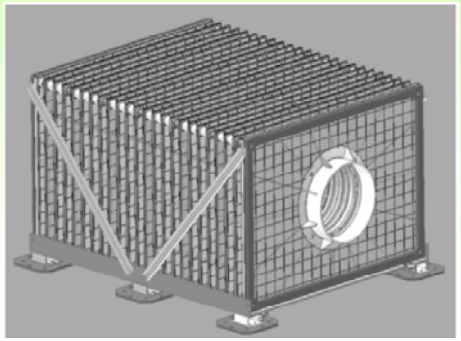
- **Strainer Technical Specification - Primary strainer design input from plant data, Unit #2 walkdown, and debris generation/NPSH analyses**
- **Strainer Vendor Selection - Open bid in August 2010**
- **1st strainer installation in April 2012 for Unit #1**
- **2nd strainer installation in November 2012 for Unit #2**
- **Complete plant modifications in compliance with GSI-191**

5. Strainer Replacement Phase II Project - Available Strainer Types (ref)

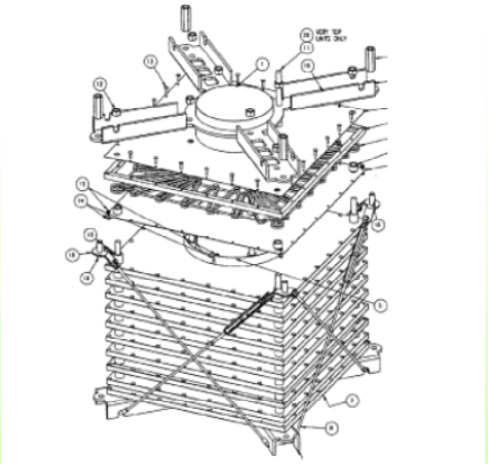
Finned



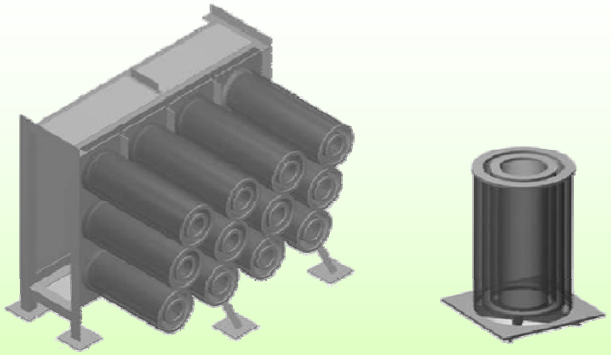
Pocket



Disk



Sure Flow



Top Hat

6. Q & A

- What kind of strainer type is recommended?
- Has any strainer been approved or certified by NRC?
- Suggestion for safety factors or margins of the installed strainer size?
- New BWR blockage issues?

Thank you very much

敬請指教

Strainer Installed in USA

- **PWR Strainer Vendors in USA:**
  - Finned type strainer: 7 units
  - Pocket type strainer: 20 units
  - Top Hat type: 14 units
  - Disk type: 11 units
  - Sure Flow type: 17 units
- **Total: 69 PWR units in USA**