

ENCLOSURE 4

Westinghouse Small Modular Reactor (SMR) Seismic Introductory Meeting
presentation held on October 2, 2013

(Non-Proprietary)

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Westinghouse Small Modular Reactor
Seismic Introductory Meeting
Rockville, MD – Wednesday, Oct/02/2013



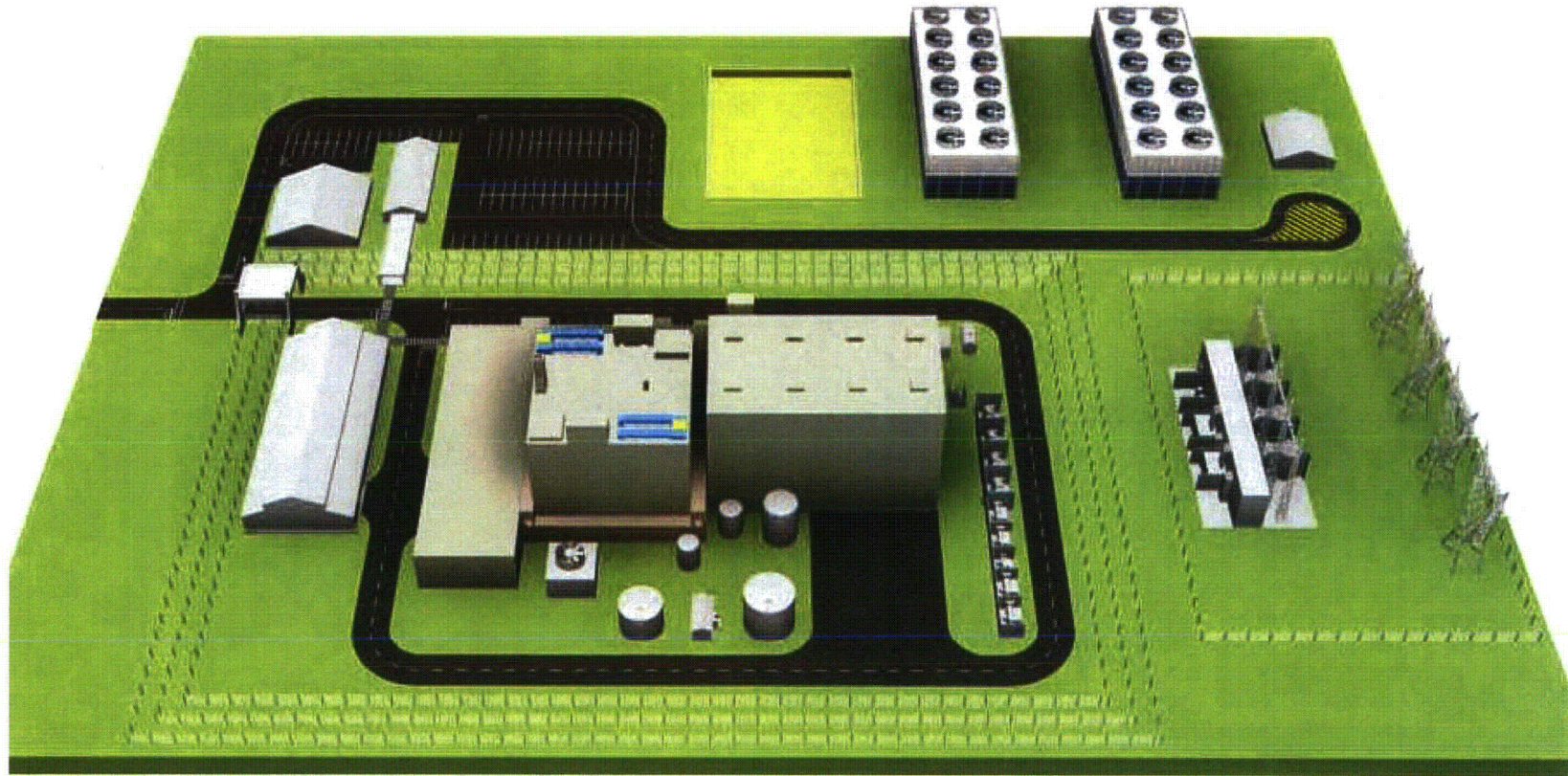
Agenda

1. Description of SMR Power Block and Nuclear Island
2. Seismic Design Parameters (SRP 3.7.1)
3. Seismic Analysis
 - 3 Soil Structure Interaction (SRP 3.7.2)
 - 3A Seismic Analysis of Category II and Category III Systems and Subsystems
 - 3B Seismic Interaction – Systems & Sub-Systems (SRP sections 3.7.2.8 and 3.7.3.8)
4. Fluid Structure Interaction

1. Description of SMR Power Block



Aerial View of the Plant

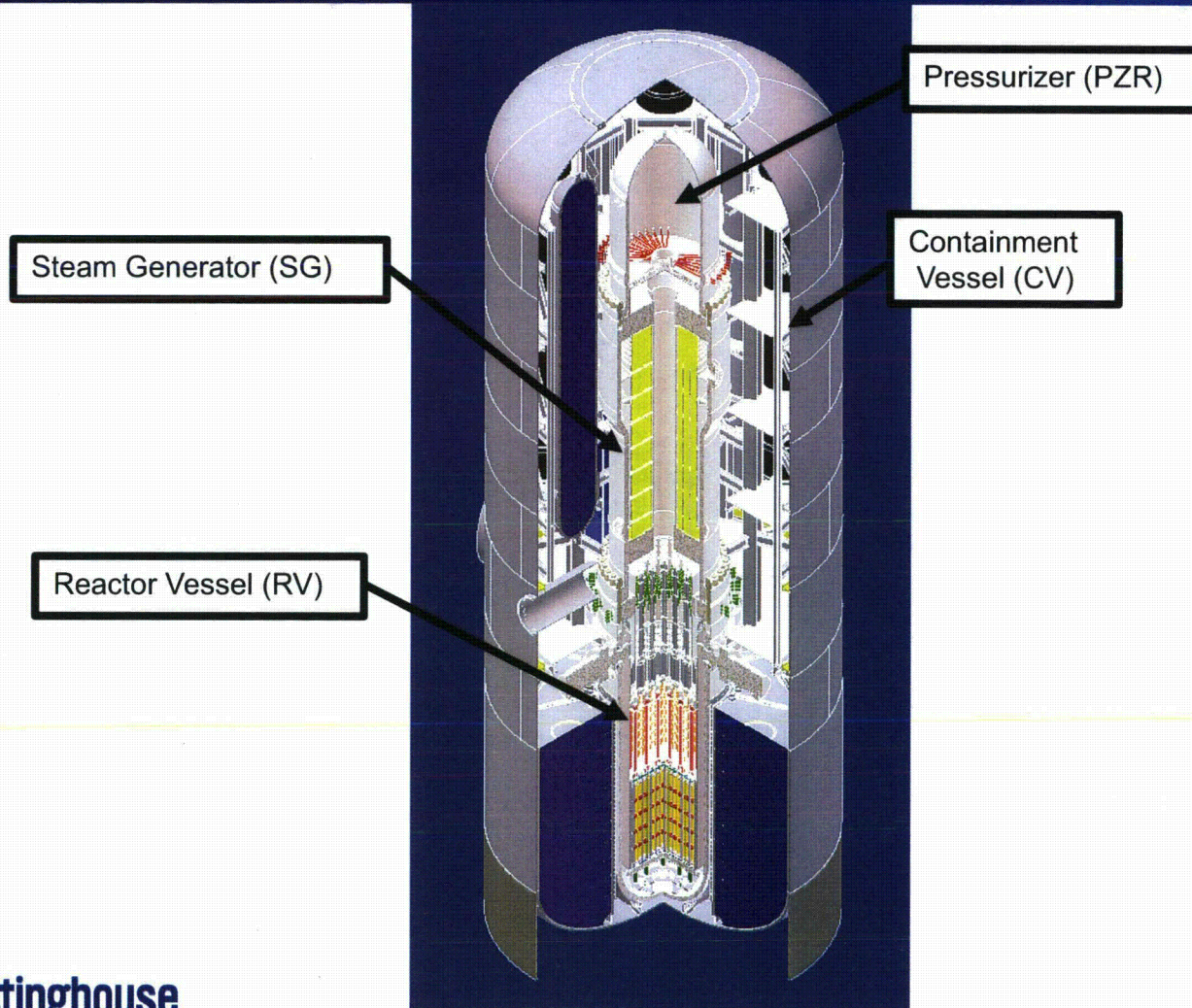


View of Nuclear Island and Turbine Building (Security-Related Information - Withhold Under 10CFR2.390)

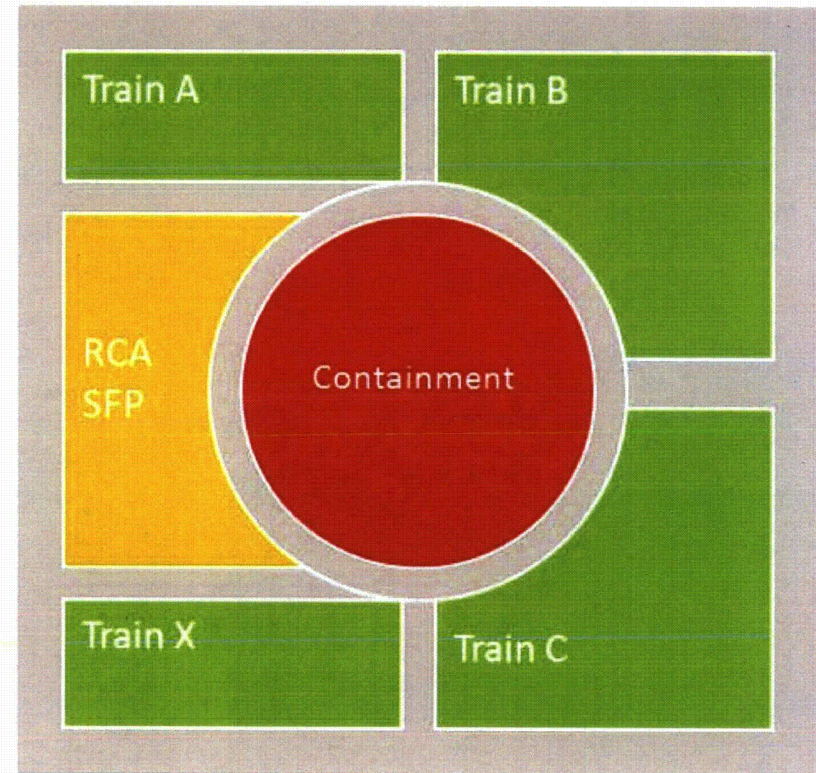
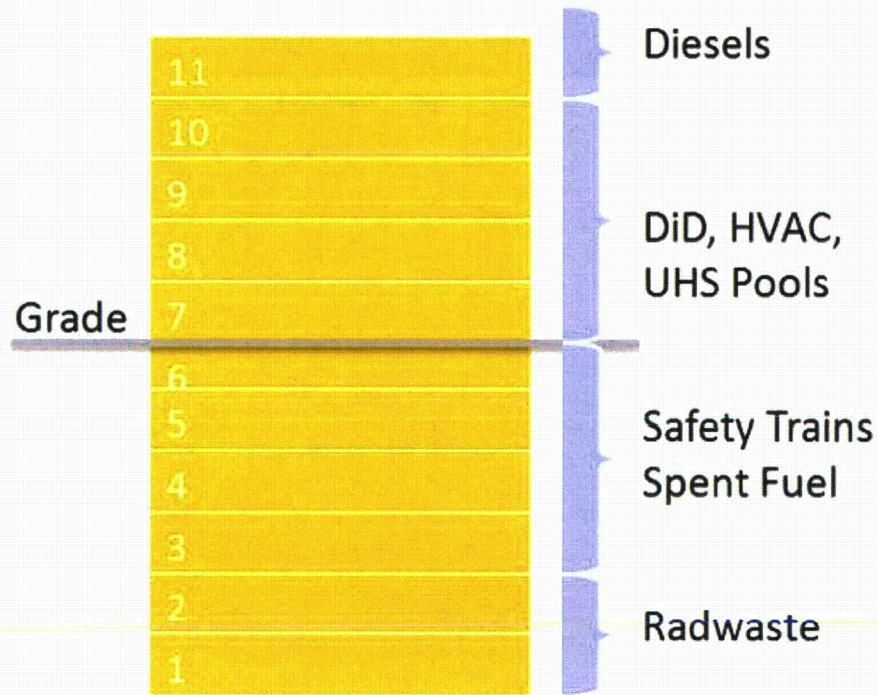
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View of Containment Vessel and Internals



Safety Zones



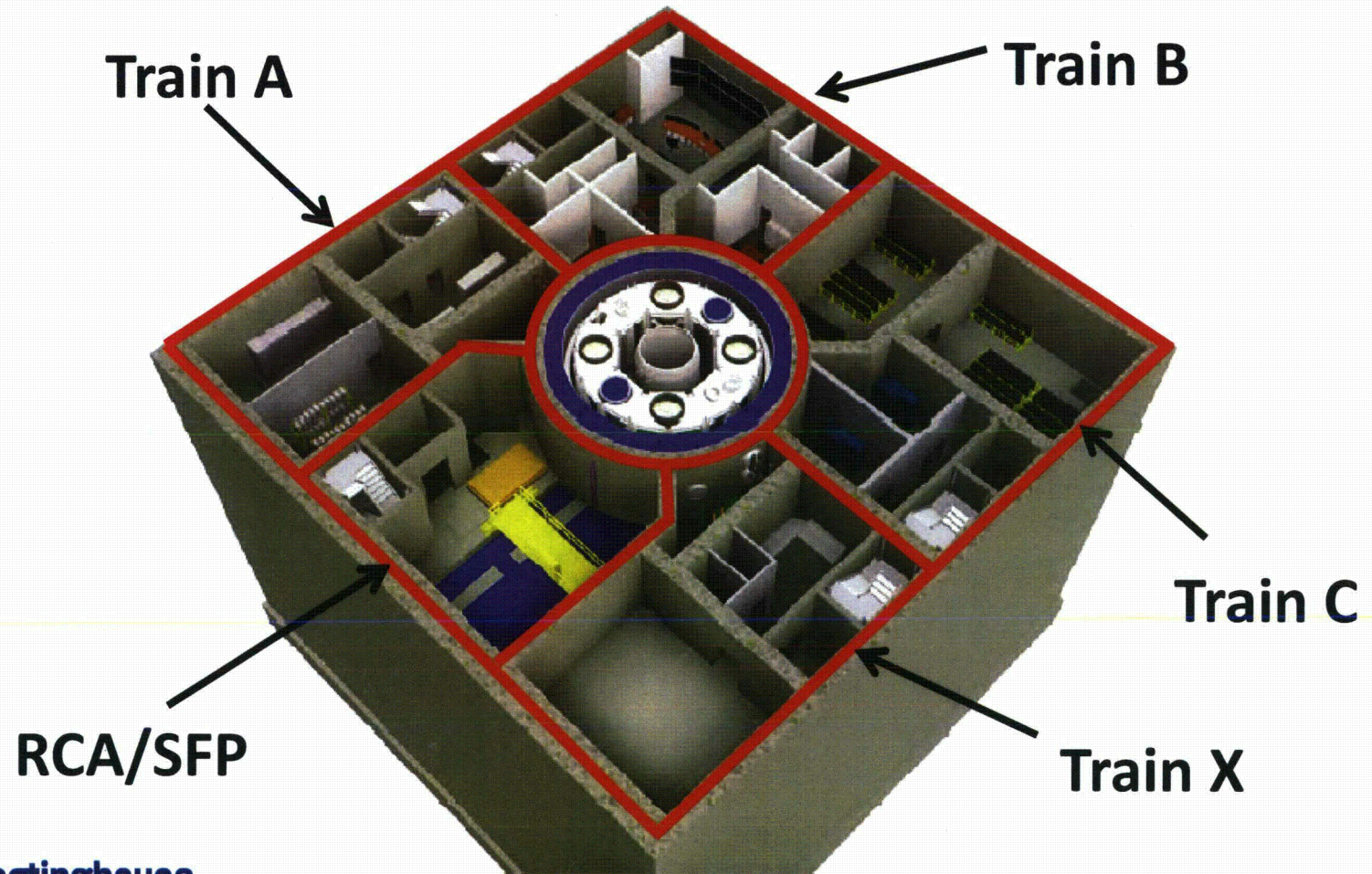
Nuclear Island Building Configuration

(Security-Related Information - Withhold Under 10CFR2.390)

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Safety Zones



Level 1: Radiological Controlled Area

(Security-Related Information - Withhold Under 10CFR2.390)

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Level 3: Safety Train IDS and Spent Fuel

(Security-Related Information - Withhold Under 10CFR2.390)



Level 5: Safety Trains and Refuel Area

(Security-Related Information - Withhold Under 10CFR2.390)



Level 7: Grade – HVAC, CCS, FWS, BDS

(Security-Related Information - Withhold Under 10CFR2.390)



Level 10: Nuclear Island – VAS AHU

(Security-Related Information - Withhold Under 10CFR2.390)



Level 11: Nuclear Island – Diesels

(Security-Related Information - Withhold Under 10CFR2.390)

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Level 12: Roof

(Security-Related Information - Withhold Under 10CFR2.390)

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Access Corridor

(Security-Related Information - Withhold Under 10CFR2.390)

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2. Seismic Design Parameters (SRP 3.7.1)

Acronyms

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ASCE	American Society of Civil Engineers
CEUS	Central and Eastern United States
CIS	Containment Internal Structures
CMT	Core Make-up Tank
CSDRS	Certified Seismic Design Response Spectra
FEA	Finite Element Analysis
FIRS	Foundation Input Response Spectra
GMRS	Ground Motion Response Spectrum
HRHF	Hard Rock High Frequency
IBC	International Building Code
iRV	integral Reactor Vessel

Acronyms

ISRS	In-Structure Response Spectra
LRFD	Load and Resistance Factor Design
NPP	Nuclear Power Plant
NRC	U.S. Nuclear Regulatory Commission
RCP	Reactor Coolant Pump
SC	Steel-Plate Reinforced Concrete
SFP	Spent Fuel Pool
SMiRT	Structural Mechanics in Reactor Technology Conference
SSC	Structures, Systems and Components
SSE	Safe Shutdown Earthquake
SSI	Soil Structure Interaction
UHS	Ultimate Heat Sink Tanks
WUS	Western United States

Seismic Analysis Flowchart (1/3)



Seismic Analysis Flowchart (2/3)



Seismic Analysis Flowchart (3/3)



Seismic Design Basis

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Seismic Design Basis (cont.)



Seismic Design Basis (cont.)

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Seismic Design Basis (cont.)



Seismic Design Basis (cont.)

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Seismic Design Basis (cont.)

a,c



Seismic Design Basis (cont.)



Seismic Design Basis (cont.)



Seismic Design Basis (cont.)

Example of Strain Compatible Soil Properties (V_s , V_p), ft/s



Seismic Design Basis (cont.)

Example of Strain Compatible Soil Properties (Damping)



Seismic Design Basis (cont.)

Example of Soil Column Frequencies



Seismic Design Basis (cont.)

Example of Soil Column Frequencies



Seismic Design Basis (cont.)



Seismic Design Basis (cont.)

a,c



Seismic Design Basis (cont.)

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3. Soil Structure Interaction (SRP 3.7.2)

Nuclear Island Building Configuration

(Security-Related Information - Withhold Under 10CFR2.390)



Nuclear Island Building Configuration



SSI Analysis (cont.)

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SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)

Tabulation of SSI Models Run in ACS SASSI

[Empty table area]



SSI Analysis (cont.)

NI07 FEA Mesh M1 – Callaway Specific



SSI Analysis (cont.)

NI07 FEA Mesh M2 – Generic (SP1 to SP5)



SSI Analysis (cont.)

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SSI Analysis (cont.)



SSI Analysis (cont.)



SSI Analysis (cont.)

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SSI Analysis (cont.)

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SSI Analysis (cont.)

a,c



SSI Analysis (cont.)

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3A Seismic Analysis of Category II and Category III Systems and Subsystems

Structural Analyses – Seismic Category II SSCs

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Layout of Adjacent Buildings

a,c



Seismic Analysis – Buildings and SSCs (Cat III/NS)

a,c



Seismic Parameters – Adjacent Buildings (Cat III/NS) ^{a,c}



3B Seismic Interaction – Systems & Sub-Systems (SRP sections 3.7.2.8 and 3.7.3.8)

Seismic Interaction - Systems (SRP 3.7.2.8)

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Seismic Interaction - Subsystems (SRP 3.7.3.8)



Types of Seismic Interaction

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4. Fluid Structure Interaction (FSI)

Nuclear Island Building Configuration

(Security-Related Information - Withhold Under 10CFR2.390)



FSI Problem Description



FSI Problem Description



FSI Problem Description

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Analysis Approach Selected

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Analysis Approach Selected

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FSI Analysis (cont.)

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Validation of Analysis Approach



Validation of Analysis Approach (cont.)



Validation of Analysis Approach (cont.)



Validation of Analysis Approach (cont.)



Validation of Analysis Approach (cont.)

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Preliminary FSI Analysis

a,c



Preliminary FSI Analysis (cont.)



Preliminary FSI Analysis Results



Preliminary FSI Analysis Results (cont.)



Preliminary FSI Analysis Results (cont.)



Preliminary FSI Analysis Results (cont.)



Preliminary FSI Analysis Results (cont.)



Preliminary FSI Analysis Results (cont.)



Preliminary FSI Analysis – General Conclusions



Seismic Analysis Flowchart (3/3)



Last Slide

THANK YOU

