

**Nuclear
Safety Workshop**

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Working Together to Enhance Nuclear Safety



Results from Beyond Design Basis Event Pilots

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Recommendations in DOE Report of August 2011 (Beyond Design Basis Events)

- ▶ Update DOE safety analysis and emergency management requirements/guidance and perform pilot applications
- ▶ Perform system walkdowns and evaluations at several Cat 1 and 2 DOE nuclear facilities to assess potential susceptibilities to natural phenomena hazards and external BDBEs
- ▶ Conduct emergency drills and exercises at DOE sites with nuclear facilities, focusing on BDBEs

Pilot Evaluation Studies - Purpose

- ▶ HSS and NA-41 initiated a project involving a series of pilot studies in response to short-term actions identified in the DOE August 2011 report
- ▶ The purpose of the pilots was to examine:
 - How Beyond Design Basis Events (BDBEs) were evaluated and documented in DSAs
 - Results of actions taken as a result of Safety Bulletin 2011-01
 - Actions planned or available in response to BDBEs
 - Whether application of draft safety analysis and emergency management guidance could improve BDBE analysis and preparations for mitigating actions

Pilot Evaluation Studies – Overview

- ▶ HSS prepared safety analysis guidance to aid in the BDBE evaluation process and confirm DSA conclusions
- ▶ NA-41 draft guidance for severe accidents also developed
- ▶ Site visits conducted at 4 Hazard Category 1 and 2 facilities
 - High Flux Research Reactor at ORNL (HC 1)
 - Waste Encapsulation Storage Facility at Hanford (HC 2)
 - H-Area Tank Farms at Savannah River (HC 2)
 - Tritium Facilities at Savannah River (HC 2)

Pilot Evaluation Studies – Overview

- ▶ Assembled multidiscipline team of independent experts and facility personnel in fields of safety analysis, seismic, operations, and emergency response
- ▶ Teams reviewed Documented Safety Analyses and Site Responses to Safety Bulletin 2011-01, toured facilities and applied enhanced draft safety analysis guidance to BDBE scenarios
- ▶ Performed targeted walkdowns of a select few systems, structures, and components (SSCs)
- ▶ Pilot results used to refine BDBE evaluation process

Safety Analysis Activities

- ▶ Identified critical safety functions (and associated SSCs) relied on to prevent or mitigate consequences of radiological material releases that could exceed 25 rem off-site
- ▶ Qualitative evaluation of BDBE impacts on each identified safety function (generally assumed failure of SSCs) using existing DBA analysis and simplified assumptions
- ▶ Considered range of NPH types, where applicable based on local geology and meteorology
- ▶ Where warranted, performed detailed evaluation and walkdown of SSCs using approach such as guidance in EPRI NP-6041-SL (margin assessment)

Safety Analysis Results

- ▶ Confirmed that bounding BDBE accident at each facility was a seismic event
- ▶ Rad consequences were below the EG, except at H-Area Tank Farm (based on failure of planned mitigative actions)
- ▶ Structured evaluation process yielded valuable insights on NPH threats and mitigative actions that weren't always captured in DSAs
 - Spectrum of NPH scenarios with lesser impact than seismic event still present unique challenges (e.g., flood vs. seismic)
 - Site conditions can affect post-accident mitigative actions and assumptions (e.g., accessibility to facility, monitoring capabilities)
 - Additional detail in DSA could improve quality of emergency operations procedures

Walkdown Activities

- ▶ Initial facility walkdowns conducted to familiarize team with facility systems and site characteristics described in DSA (e.g., facility layout SSC locations)
- ▶ Initial walkdowns helped subject matter experts consider BDBE vulnerabilities and rule out certain events (e.g., elevation of SSCs relative to BDBE flood)
- ▶ System specific walkdowns conducted using similar techniques and checklists as those in DOE-EG-0545, *Seismic Evaluation Procedure for Equipment in U.S. Department of Energy Facilities*

Walkdown Results

- ▶ System specific walkdowns supporting margins assessments hampered by physical access of SSCs and availability of facility records at legacy facilities
- ▶ Some opportunities identified that would improve success of planned BDBE mitigating actions (e.g., removal of abandoned piping and equipment that could interfere with access to important facility safety features)
- ▶ In some cases such as H-Area Tank Farm's storage of portable ventilation units, the walkdowns confirmed robustness of safety class SSCs to withstand BDBE stresses

Insights and Conclusions

- ▶ Based on hazard potential, many DOE nuclear facilities could be excluded from performing BDBE analysis, consistent with 10 CFR 830 requirement to consider the need for such analysis
- ▶ Structured BDBE evaluation process recommended for a few select existing DOE facilities with potential to exceed the Evaluation Guideline
- ▶ Some enhancements to existing DOE directives are warranted related to new facilities, safety analysis, emergency management, USQ process

What's Next?

- ▶ **Policy/Guidance Follow-On Actions**
 - Classification and DSA treatment of SSCs identified as important in mitigating BDBE effects
 - Appropriate mechanism for communicating BDBE derived mitigation responses into emergency preparedness plans and responses
 - Cost benefit process for evaluating potential upgrades resulting from BDBE analysis
- ▶ **Update Safety Analysis and Emergency Management Guidance Documents**