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Meeting Minutes for the WMA C PA Exposure Scenarios Working Session

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Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-08RV14800

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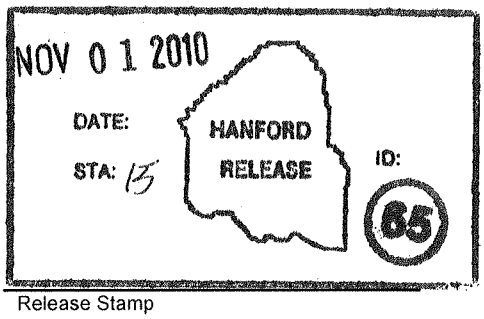
Abstract: Summary of meeting between DOE-ORP, Washington Department of Ecology, Environmental Protection Agency, Nuclear Regulator Commission, Native American Tribes, and stakeholders regarding Exposure Scenarios Working Session for the Waste Management Area C performance assessment. The meeting minutes consist of roster of attendees, summary notes taken at the meeting and content of flip charts used during the meeting.



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Meeting Minutes

Waste Management Area C Performance Assessment
Exposure Scenarios Working Session

held at
Washington State Department of Ecology Offices
3100 Port of Benton Boulevard
Richland, WA 99352

on
September 28 through September 30, 2010

LIST OF TERMS

Abbreviations and Acronyms

CA	Composite Analysis
CEES	Columbia Energy and Environmental Services, Inc.
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (Public Law 111-88, 123 Stat. 2924, 42 USC 9607 et seq.)
CHPRC	CH2M HILL Plateau Remediation Company
CRESP	Consortium for Risk Evaluation with Stakeholder Participation
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy-Office of Environmental Management
DOE-HQ	U.S. Department of Energy-Headquarters
DOE-ORP	U.S. Department of Energy-Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOSE	CTUIR Department of Science and Engineering
Ecology	State of Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
HAB	Hanford Advisory Board
ICRP	International Commission on Radiological Protection
MSC-PFM	Mission Support Contract – Portfolio Management
MTCA	Model Toxics Control Act (WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended)
NPT-ERWM	Nez Perce Tribe – Environmental Restoration and Waste Management (program)
NRC	U.S. Nuclear Regulatory Commission
PA	performance assessment
PNNL	Pacific Northwest National Laboratory
ROD	record of decision
SGE	Surface Geophysical Exploration
TC&WM EIS	Tank Closure and Waste Management Environmental Impact Statement
UCL	upper control limit
WAC	*Washington Administrative Code*
WMA	waste management area
WRPS	Washington River Protection Solutions, LLC

Attendees: Representatives from Department of Energy-Office of River Protection (DOE-ORP), DOE Richland Operations Office (DOE-RL), DOE-Headquarters (DOE-HQ), the Washington State Department of Ecology (Ecology), the U.S. Nuclear Regulatory Commission (NRC), State of Oregon, Environmental Protection Agency (EPA), and representatives of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Nez Perce Tribe, and Yakama Nation met at the Ecology offices in Richland, Washington on 28 through 30 September 2010.

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Agenda for Waste Management Area C Performance Assessment – Exposure Scenarios Working Session September 28–30, 2010	
Sep 28 AM	**Introductions, Goals and Objectives – Exposure Scenarios, Review of Past Working Session Decisions, Overview of Requirements/Guidance for Exposure Scenarios.**
8:00 AM	**Refreshments**
8:15 AM	**Introductions** (C. Kemp/S. Eberlein)
8:30 AM	**Goals and Objectives of Exposure Scenarios Working Session** (S. Eberlein)
8:45 AM	Kirk Cantrell → Update on Testing of Tank Residuals from Advanced Photon Source Facility at Argonne National Laboratory
9:00 AM	**Updates on Past Working Session Decisions, Engineering Systems #2 + Open items** (M. Bergeron)
10:00 AM	Break
10:15 AM	Performance Assessment Appendix I, Baseline Risk Assessment, DOE Performance Assessment (M. Connelly)
10:45 AM	Ecology: Overview of their Needs/Requirements for Exposure Assessments (Beth Rochette, Damon Delistraty)
11:00 AM	EPA: Overview of their Needs/Requirements for Exposure Assessments
11:15 AM	CTUIR: Overview of their Needs/Requirements for Exposure Assessment (Barbara Harper)
Sept 28 PM	**Exposure Scenarios Cont'd**
1:00 PM	Yakama: Overview of their Needs/Requirements for Exposure Assessment
1:15 PM	DOE: Overview of their Needs/Requirements for Exposure Assessment (Marty Letourneau)
1:30 PM	NRC: Perspective of Exposure Assessment
1:45 PM	WAC 173-340 Exposure Assessment (Priscilla Tomlinson)
2:30 PM	Break
2:45 PM	WAC 173-340 Exposure Assessment cont'd
4:00 PM	Adjournment

Agenda for Waste Management Area C Performance Assessment – Exposure Scenarios Working Session September 28–30, 2010	
Sep 29 AM	**Exposure Scenarios Cont'd**
8:00 AM	Refreshments
8:15 AM	CERCLA Exposure Scenarios for the Central Plateau (Eileen Mahoney)
9:45 AM	**Break**
10:00 AM	CTUIR Exposure Scenarios (Barbara Harper)
10:30 AM	Yakama Exposure Scenarios
11:00 AM	**Open Discussion**
11:30 AM	Lunch
Sept 29 PM	**Exposure Scenarios Cont'd**
12:45 PM	Central Plateau Risk Management Scenario → Subsistence Farmer (J. Lowe)
1:15 PM	Radiation Dose/Risk (Jim Lape)
1:45 PM	DOE 435.1 Exposure Scenarios (M. Connelly)
2:45 PM	Break
	DOE 435.1 Exposure Scenarios cont'd
3:00 PM	Scoping Analysis on Generic Exposure Scenarios (Matt Kozak)
4:00 pm	Adjournment
Sept 30 PM	**Exposure Scenarios Cont'd**
8:00 AM	Refreshments
8:15 AM	Scoping Analysis on Generic Exposure Scenarios (cont'd)
9:00 AM	Open Discussion
9:30 AM	Break
9:45 AM	**Review of Consensuses and Notes** (T. Martin)
10:15 AM	**Working Session Feedback** (T. Martin)
10:30 AM	**Look Ahead**

Discussion: DOE is pursuing closure of Waste Management Area (WMA) C located at the Hanford Site. At some point in the future, DOE and NRC will consult on waste determinations for these tank closures; additionally these tanks will be closed in coordination with EPA and Ecology in accordance with the *Hanford Federal Facility Agreement and Consent Order – Tri-Party Agreement* (2 vols., as amended, State of Washington Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington) and State-approved closure plans. The DOE, NRC, EPA, and Ecology met for the ninth of a series of technical exchanges on the proposed inputs for a WMA C Performance Assessment (PA). The technical exchanges are intended to capitalize on early interactions between the agencies with a goal of developing DOE's WMA C PA. Technical discussions during the meeting are intended to allow for the clarification of general modeling approaches and for the identification of other specific questions.

Topics: The following specific topical areas were discussed during the meeting:

1. Update on Testing of Tank Residuals from Advanced Photon Source Facility at Argonne National Laboratory
2. Updates on Past Working Session Decisions, Engineering Systems #2 + Open items
3. Goals and Objectives of Exposure Scenarios Working Session
4. Performance Assessment Appendix I, Baseline Risk Assessment, DOE Performance Assessment
5. EPA: Overview of their Needs/Requirements for Exposure Assessments
6. Ecology: Overview of their Needs/Requirements for Exposure Assessments
7. CTUIR: Overview of their Needs/Requirements for Exposure Assessment
8. Yakama: Overview of their Needs/Requirements for Exposure Assessment
9. DOE: Overview of their Needs/Requirements for Exposure Assessment
10. NRC: Perspective of Exposure Assessment
11. WAC 173-340 Exposure Assessment
12. CERCLA Exposure Scenarios for the Central Plateau
13. CTUIR Exposure Scenarios
14. Yakama Exposure Scenarios
15. Radiation Dose/Risk
16. DOE 435.1 Exposure Scenarios
17. Exposure Scenarios, Discussion and Q/A
18. Scoping Analyses for Exposure Scenarios
19. Exposure Scenarios Session Review, Closeout

Summary: The following summarizes the discussion during the meeting, by topical area.

Update on Testing of Tank Residuals from Advanced Photon Source Facility at Argonne National Laboratory

- Pacific Northwest National Laboratory (PNNL) Staff provided an overview and update on work that has been ongoing to test tank residuals to better understand the post-cleaning chemical state of the residuals. Information on this subject was presented to the meeting participants in earlier working sessions and this update was intended to show what work has been done since then.
- PNNL Staff used the Advanced Photon Source Facility at Argonne National Laboratory to explore the oxidation state of residual constituents at the molecular level.
- PNNL Staff described how results indicate that many of the post-cleaning residuals that remain in the tanks have been inhibited and formed into less mobile chemical states.
- PNNL Staff also described how it appears that the current empirical release concentrations for uranium may be too conservative. Studies are ongoing to develop more realistic release models for uranium from some of the C-200 tanks.

Updates on Past Working Session Decisions, Engineering Systems #2 + Open Items

- DOE-ORP Staff provided an overview of past working session decisions concerning proposed inputs and parameters to be used in the performance assessment modeling.
- Meeting participants discussed how the parameter assumptions comported with expectations and assumptions about the processes that would affect release from the tank farms.
- State of Oregon Staff raised concerns as to whether the existing assumptions capture the case for release and transport that includes lateral flow and the latest information about uranium release chemistry. DOE-ORP Staff agreed to address this concern.

Goals and Objectives of Exposure Scenarios Working Session

- DOE-ORP Staff provided an overview of the exposure scenarios working session and how it fits into the larger process; in particular, how the initial exposure scenarios will be addressed and the alternatives that will also be addressed, including Native American exposure scenarios and other alternative scenarios.
- DOE-ORP Staff noted that subsequent sessions will address numeric codes, ecological risk, results from initial model results, and results from the final model results.
- DOE-ORP Staff provided an overview of other work that is going on that also provides context for this PA, including corrective measures studies, a closure demonstration study being performed at WMA C, and other ongoing permitting actions.

Performance Assessment Appendix I, Baseline Risk Assessment, DOE Performance Assessment

- DOE-ORP Staff provided an overview and refresher on what the *Hanford Federal Facility Agreement and Consent Order* requires in terms of performance assessment and baseline risk assessment. The requirements of other sources, including EPA and DOE, were also reviewed for context. A depiction of the overall WMA C PA Process was presented which tried to reflect the pertinent regulatory drivers.

- DOE-ORP Staff described what media sampling and analysis is available for characterizing the area surrounding WMA C and the underlying logic that is used to interpret those results.

- DOE-ORP Staff provided an overview of the considerations that will go into developing exposure scenarios, including the projected land use, other existing sources of contamination, exposure pathways, intruder scenarios, uptake of contaminants, and points of assessment.

EPA: Overview of their Needs/Requirements for Exposure

- EPA Staff provided an overview of their needs and requirements for exposure scenario analyses. Requirements are based on the assumptions that are derived from the National Contingency Plan, and include considerations of current land use and expected future land uses.

- EPA Staff explained what scenarios they would be looking at, primarily starting with an industrial scenario because of the surrounding land use, and other alternative scenarios and considerations that would drive the exposure scenarios. For example, presence of radionuclides or chemicals that could be particularly impacting to a construction worker might drive consideration of analyses that would account for those impacts.

Ecology: Overview of their Needs/Requirements for Exposure Assessments

- Ecology Staff provided an overview of their needs and requirements for exposure scenario analyses, including what would be required to address ecological risk assessment. The goal is to protect biota at a population level, with the exception of threatened and endangered species, which are addressed at an individual level.

- Ecology Staff explained that the Washington State Model Toxics Control Act (MTCA) prescribes a two-tiered approach, a simplified approach and a site-specific evaluation. Because of the complexities, the site-specific approach is appropriate for the Hanford Site. MTCA identifies specific levels to be met for chemicals and radionuclides. Compliance with the MTCA values must be achieved in the top 15 feet below ground surface. Ecology prefers a 95 percent confidence interval approach rather than a maximum value in making these determinations.

- Ecology Staff also identified the alternative methods that MTCA allows in addition to the look up tables, including literature surveys, soil bioassays, biomarkers, site-specific field studies, and weight of evidence approach.

- Ecology Staff discussed how water resource impacts need to be measured; in particular, not taking account for any mixing or dilution in surface water. Where the interface between groundwater and surface water actually is may need further discussion.

- Ecology Staff also discussed how to address sediments, soil vapors, and particles.

- Ecology Staff presented contextual considerations for exposure scenarios to be addressed in the PA, including how corrective action and closure requirements must be met. One of the considerations is the definition of unrestricted land-use, which assumes the possibility of excavation down to a depth of 15 feet.

- Ecology Staff identified that consideration of surface water also includes consideration of cross-media contamination, e.g., soils and groundwater cannot contaminate surface waters. The interface with surface water may occur prior to a visible discharge point, e.g., where surface water mixes with groundwater.

- Ecology Staff identified that cleanup levels that are developed need to comply with Washington Administrative Code requirements. Typically, the default parameters are acceptable, but there are some exceptions, e.g., chromium.

- Ecology Staff identified that requirements for fate and transport modeling are also dictated in the Washington Administrative Code, particularly with regard to site-specific data and mechanisms that should be discussed, e.g., sorption, vapor-phase partitioning, natural degradation, dispersion, decay, dilution, and infiltration. Evaluation criteria include burden of proof, scientific basis, and criteria for quality of information. Verification and validation are also important expectations for all fate and transport models.

- Ecology Staff considers it important to evaluate various intrusion modes. Some particular considerations for acute exposure due to intrusion include basement excavation, utility trenches, irrigations systems, mining, road construction, and industrial development. Some considerations for chronic intruder exposure include ingestion of groundwater, direct contact with soil, and consuming produce from a garden in contaminated areas.

CTUIR: Overview of their Needs/Requirements for Exposure

- Representative of the CTUIR provided an overview of their needs and requirements for exposure scenario analyses, including consideration of scenarios that reflect the standard CERCLA Reasonable Maximum Exposure multi-pathway scenario. The basic question tribes want to answer is whether tribal lifestyles (as defined by the scenario) could be safe to resume in this location.

- Representative of the CTUIR indicated the need for cumulative Hazard Index and cancer data and an emphasis on protection of human health and the environment and meeting Applicable or Relevant and Appropriate Requirements.

- Representative of the CTUIR identified other considerations, including unrestricted use and unlimited exposure, resolution of cap designs, how to calculate exposure point concentrations, average living habits, point of compliance, performance objectives (15 mrem vs. 25 mrem), and the particular assumptions that are made in an exposure scenario.

Yakama: Overview of their Needs/Requirements for Exposure

- Representative of the Yakama Nation provided an overview of their needs and requirements for exposure scenario analyses, including looking at where we are going with this performance assessment and what considerations should be incorporated. Scenario is based on the subsistence lifestyle and is based on the whole of the Hanford Site.

DOE: Overview of their Needs/Requirements for Exposure Assessment

- DOE Staff provided an overview of how DOE Order 435.1 (DOE O 435.1, 1999, *Radioactive Waste Management*, U.S. Department of Energy, Washington, D.C.) addresses exposure scenarios for the closure of a tank farm. Both intruder scenarios and all pathways dose to a future member of the public are addressed. The roles of the performance assessment and the composite analysis were discussed.

NRC: Perspective of Exposure

- NRC Staff provided perspectives on exposure assessment.

WAC 173-340 Exposure Assessment

- DOE-ORP Staff provided an overview of the MTCA regulations and how conceptual site models should be constructed for MTCA exposure scenarios.

- DOE-ORP Staff identified the specific MTCA sections that are referenced in the State of Washington's Dangerous Waste Regulations (WAC 173-303, "Dangerous Waste Regulations", *Washington Administrative Code*, as amended.) for corrective action. Three separate points of assessment need to be addressed: (1) the WMA C boundary; (2) the Core Zone boundary; and (3) the river.

- DOE-ORP Staff identified the pathways that would be assessed once contamination is assumed to be in the groundwater, from direct contact, and from air.

- DOE-ORP Staff noted that the summation of hazards and risks includes summing cancer risks and noncancer hazards separately. Hazards can be summed for chemicals within the same pathway and/or pathways that apply to the same receptor. Noncancer hazards can also be summed separately to produce target, organ-specific hazard indices.

- DOE-ORP Staff provided an overview of how to calculate cleanup levels for soils, with the idea that risks will be calculated from cleanup levels. Soil direct contact parameters were defined and explained in order to help meeting participants understand the MTCA calculations. Other conditional considerations include soil vapors and dermal contact.

- DOE-ORP Staff provided an overview of how to calculate cleanup levels for groundwater, with the idea that risks can be calculated from cleanup levels. Groundwater exposure parameters used in MTCA were defined and explained in order to help meeting participants understand the MTCA calculations.

- DOE-ORP Staff provided an overview of how to calculate cleanup levels for surface water, with the idea that risks can be calculated from cleanup levels. Surface water exposure parameters used in MTCA were defined and explained in order to help meeting participants understand the MTCA calculations.

- DOE-ORP staff presented an overview of how to calculate cleanup levels for the air, with the idea that risks can be calculated from cleanup levels. Air exposure parameters used in MTCA were defined and explained in order to help meeting participants understand the MTCA calculations

CERCLA Exposure Scenarios for the Central Plateau

- DOE-RL Staff provided an overview of the CERCLA baseline risk assessment methodology being developed and applied to the Central Plateau Inner Area. Presentation included an overview of the relevant CERCLA guidance documents for human health risk assessments that are the basis for this methodology.

- DOE-RL Staff summarized the human health risk assessment process being applied in the Central Plateau Inner Area. The four steps of this process are: (1) hazard identification, including data analysis and selection of contaminants of primary concern; (2) exposure assessment, including receptor exposure assumptions and calculation of exposures; (3) toxicity assessment, including selection of reference doses and cancer slope factors (from the Integrated Risk Information System database); and (4) risk characterization, including calculation of cancer risk and hazard indices.

- DOE-RL Staff discussed the selection of exposure parameters and assumptions being used in the CERCLA human health risk assessment process. Specific receptors will include resident child, resident adult, industrial worker, and trespasser.

CTUIR Exposure Scenarios

- Representative of the CTUIR presented their exposure scenario assumptions for a tribal traditional resident/subsistent homesteader. This scenario is very similar to EPA's subsistent farmer, but with more reasonable exposure factors and access to wild foods. This scenario recognizes that the tribal traditional resident does not visit the study area, but lives there and is self-sufficient.

- Representative of the CTUIR identified questions that need to be answered about assumptions concerning soil, groundwater, air, external, surface water, food, and exposure point parameters and identified assumptions that they would like to see modeled.

Yakama Exposure Scenarios

- Representative of the Yakama Nation presented their assumptions for an exposure scenario which describes a traditional subsistence lifestyle. The conceptual site model assumed is unrestricted subsistence use, with all resources used every day for a lifetime.
- Representative of the Yakama Nation presented their assumptions concerning exposure pathways, exposure routes, receptor activities, consumption and ingestion rates, and other exposure factors.
- Representative of the Yakama Nation indicated that they would like to see a cumulative site-wide risk assessment.

Radiation Dose/Risk

- DOE-ORP Staff provided an overview of the basics of dose versus risk, including basic concepts of dose/risk, dose calculations, converting dose to risk, differences between CERCLA and DOE, and updates to dose and risk factors. Other topics addressed included approaches for characterizing adverse health effects, types of doses, and dose conversion factors.

DOE 435.1 Exposure Scenarios

- DOE-ORP Staff provided a presentation of differences between a DOE performance assessment and a risk assessment under CERCLA or the Washington Administrative Code in terms of assumptions, exposure scenarios, and other parameters.

Exposure Scenarios, Discussion and Q/A

- Meeting participants discussed other scenario considerations that either have not been addressed or still need to be addressed.
- Meeting participants discussed the need to understand requirements that would drive design of a cap.

Scoping Analyses for Exposure Scenarios

- DOE-ORP Staff provided an overview of scoping calculations and approaches to help meeting participants understand the relative differences between alternative scenarios and assumptions.
- DOE-ORP staff outlined differences between performance assessment and risk assessment. One of the significant evolutions in performance assessment is the development of stylized conditions and agreed scenarios such as using current conditions at a site, avoiding excessive speculation, basing assumptions on current practices. Other issues that the performance assessment community has dealt with include waste classification, siting criteria, institutional controls, and intruder considerations.

Exposure Scenarios Session Review, Closeout

- Meeting participants discussed dates for follow up discussions on exposure scenario specifics.

Flip Charts from Waste Management Area C working session, Exposure Scenarios, September 28-30, 2010

Updates on Past Working Session Decisions, Engineering Systems #2 + Open items (Marcel)

- There is a new water study that should be the basis for PA modeling. It has a very different conceptual model (Dirk).
- Dirk to propose a sensitivity case focused on water running down the side of the grout and pooling at the bottom of the tank, thereby saturating the waste for a period of time. Subsequently, this water will stairstep northeast to the aquifer and then run back to the southwest once it enters the aquifer.
- More information on the 'random field' approach will be developed and available later (Marcel).
- The data package should be updated to include assumptions about the location of the residuals, mixing and the grout/waste interface. For example, does waste mix/seep into the grout? (Hans).
- Current leak inventory on sheet is considered a minimum by the Nez Perce and David will provide a more reasonable estimate to Mike as a sensitivity case (David).

Goals and Objectives of Exposure Scenarios Working Session (Susan)

- Slide 2: Change "risk management" scenarios to "alternative" scenarios (Brenda).
- Information on waste that has already leaked to the soil needs to be collected and understood before tank closure decisions are made (Dirk). The TC&WM-EIS has performed some of this work (Jeff).
- Slide 8: CERCLA ROD box on soil at bottom right of slide does not currently exist as a decision so should be removed (Dirk and Jeff). A box could remain since this work needs to happen but it isn't necessarily a "CERLCA ROD" (Keith).

Performance Assessment Appendix I, Baseline Risk Assessment, DOE Performance Assessment (Mike)

- PA management plan will have to account for updates in dose factor knowledge (Dirk).
- Slide 17: Delete "Recognizes that the Central Plateau" (Brenda).

Ecology Overview of Exposure Assessments Needs/Requirements (Damon)

- The May session should include a presentation on ICRP 108 (Chris). The May session should also include a presentation on the Chernobyl field studies (Dirk).

CERCLA Exposure Scenarios for the Central Plateau (Eileen)

- Pro UCL policy of defaulting to maximum if 95% UCL is greater is questionable, particularly if the curves fit (Dirk, Damon).

CTUIR Exposure Scenarios (Barbara)

- The ability to calculate risk relies on the CA so a decision on any individual PA cannot be made without the CA.

Yakama Exposure Scenarios (Kristin)

- It would be helpful if Matt could perform some sensitivity analyses around the impact of sweat times (e.g., difference in risk between 1 hr/day, 7hrs/day or even 20 hrs/day) (Hans).

DOE 435.1 Exposure Scenarios (Mike)

- Slide 4: Why would "Typical Group" not include Native Americans? (Barbara). It would (Mike and Marty).
- Scenario that looks at current local habits does not appear to be in any of the current scenarios (Barbara).

Scenario Brainstorming

- Badger scenario (Stan).
- Industrial Intruder (Beth).
- Alien Invasion (Susan).
- Local Habits (Barbara).
- Scenario that meets multiple regulatory requirements (Barbara).
- Heavy irrigation on closure cap (David).
- Wind farms (Brenda).
- Underground dwellings (Barbara).
- Climate change (I think this was George).
- Important to understand what the cap contributes to protectiveness.
- Alternate scenarios should include an explanation of what is to be learned from the scenario (Jeff).

Looking forward

- Two mini-sessions to prioritize sensitivity cases will be held for anyone who wishes to attend on October 12 and November 10. Mike will send out email containing more details as they become available.
- A presentation on the SGE characterization results would be helpful (Hans).
- An Excel spreadsheet that includes all the current parameters from the various regulatory scenarios is needed (Dirk). Mike will prepare one (Mike).
- A listing of cap requirements in one place would be useful (Hans).