

Meeting Minutes of the Subcommittee on Disaster Reduction

01 May 2014, 10:00 a.m. to 12:00 p.m., White House Conference Center Lincoln Room

Italics indicate absent members. "T" indicate members participating via teleconference.

Co-chairs

David Applegate (USGS)
Margaret Davidson (NOAA)
Dennis Wenger (NSF)

OSTP Liaison

Tamara Dickinson (OSTP)

Designated Representatives

BLM *Edwin Roberson*
CDC *Mark Keim*
DHS *Mary Ellen Hynes*
DHS/FEMA *Roy Wright*
DHS/USCG *Robert Thomas*
DOD *Al Johnson*
DOE *Patricia Hoffman*
DOT *Sheila Duwadi*
EOP/OMB *Michael Clark*
EOP/OSTP *Tamara Dickinson*
EPA *Peter Jutro*
Stephen Clark

FERC *Marsha Palazzi*
HUD *Dana Bres*
NASA *Craig Dobson*
NGA *Patricia Allen Aquinas*
NGB *TBD*
NIH *Aubrey Miller (T)*
NIST *Steve Cauffman*
NOAA *Margaret Davidson*
Christopher Strager
NPS *Marcy Rockman*
NSF *Dennis Wenger*
OPHS *Estella Jones*

State *Fernando Echavarría*
USACE *Steven Cary*
Dimitra Syriopoulou
USAID *Sezin Tokar*
USDA *TBD*
USFS *Richard Guldin*
Elizabeth Reinhardt
Carlos Rodriguez-Franco
USGS *David Applegate*
USNRC *Steven West*

Other Attendees

DHS *Mitch Erickson (T)*
Meredith Lee
DHS/FEMA *Kim Hayward (T)*
DOI *Jenna Sloan (T)*
DOT *Phil Yen*
EOP/NSS *Eric Letvin*
EOP/OSTP *Phil Duffy*
EPA *Brendan Doyle*
Keely Maxwell

NOAA *Katya Wowk (T)*
NSF *Gregory Anderson*
USNRC *Patrick Madden*
Thomas Nicholson (T)
Brett Rini (T)
David Skeen
Robert Taylor

USGS *Kiza Gates*
Kris Ludwig
Matthew Rollins
STPI *Chris Clavin*
Kristen Kulinowski
SDR Secretariat *Bret Schothorst*
Barbara Haines-Parmele

Agenda

10:00 Welcome and Introductions
10:05 Report from the Co-chairs and Approval of Minutes
10:15 Briefing: USNRC Site Visit to Fukushima
11:00 Briefing: USNRC Post-Fukushima Seismic Hazard Re-Evaluations for Licensees
11:30 Presentation: Climate Change and Extreme Weather: The Latest Science from the IPCC
11:55 Close and Next Actions

Handouts

- May Meeting Agenda
- Draft April Meeting Minutes

I. Welcome and Introductions

National Science and Technology Council (NSTC) Subcommittee on Disaster Reduction (SDR) Co-chair David Applegate (USGS) called the May meeting to order at 10:03 a.m. in the Lincoln Room of the White House Conference Center (WHCC), and participants introduced themselves.

II. Report from the Co-chairs and Approval of Minutes

The April monthly meeting minutes were approved with one change – Marc Levitan (NIST) was added as a meeting participant via teleconference.

In the report from the Co-chairs, Applegate highlighted that the SDR Wildland Fire Science and Technology Task Force held its interagency organizational kickoff meeting on April 10, 2014 to review its objectives and map out a plan forward. The group is next planning to hold a three-day working workshop June 17-19, 2014 at the Department of the Interior to inventory current agency roles and responsibilities and establish a resource baseline related to wildfire activities. Applegate added that a save the date email with more information will go out in the coming days to the group's designated agency representatives that will include a template to gather this information for the meeting. If you have not done so, please let the SDR Secretariat (bret.schothorst@mantech.com) know if your agency is interested in participating on the Task Force.

Applegate encouraged agencies to join NSF in providing support to the University of Colorado Boulder's Natural Hazards Center to assist the institute with their mission to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery and to foster information sharing and integration of activities among researchers, practitioners, and policymakers. Other regular Federal contributors in the past have included: NOAA, DOT, DHS, FEMA, USGS, NASA, U.S. Army Corps of Engineers, and U.S. Forest Service. Please contact SDR co-chair Dennis Wenger ([dwenger@nsf.gov](mailto:d Wenger@nsf.gov)) for more information if you are interested in contributing to this important shared effort.

Applegate also noted that FEMA's *America's PrepareAthon!* initiative held its first National Day of Action on April 30, 2014, to increase emergency preparedness and resilience through hazard-specific drills, group discussions, and preparedness exercises. The initial spring event revolved around taking actions to prepare for tornadoes, wildfires, floods, and hurricanes, while a subsequent event in the fall will center on preparedness for earthquakes, hazardous materials, pandemic flu, and winter weather. To participate in future activities of the *America's PrepareAthon!* initiative, please visit its new website at: <http://www.ready.gov/prepare>.

Aubrey Miller (NIH) promoted that an Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events workshop will be convened for stakeholders with an interest in advancing the state of disaster research. The workshop is being jointly planned by the National Institute of Environmental Health Sciences (NIEHS), the Office of the Assistant Secretary for Preparedness and Response (ASPR), the National Library of Medicine (NLM) and the Centers for Disease Control and Prevention (CDC). It will be held June 12-13, 2014, on the campus of NIH in Bethesda, Maryland, and will include Federal, state, and local researchers, responders, and planners exploring a broad range of issues related to mechanisms and barriers to rapid response. Please visit <http://iom.edu/Activities/PublicHealth/MedPrep/2014-JUN-13.aspx> for more information and to register to attend.

Chris Strager (NOAA) of the National Weather Service (NWS) kindly provided a preliminary report on the tornadoes and very heavy rains that struck the Central and Eastern U.S. last week. The bulk of the fatalities were in Arkansas and Mississippi, where tornadoes reached EF4 intensity. Initial NWS notification was given to emergency managers six days out showing areas of moderate to high risk.

Steve Cauffman (NIST) reported that his agency recently began holding a series of stakeholder workshops on the development of a set of resilience standards and a framework for community disaster resilience as called for in the President's Climate Action Plan. The first workshop, titled "Developing a Community-Centered Approach to Disaster Resilience," took place on April 7, 2014 and was well attended. The next workshop will take place in July 30, 2014 at the Stevens Institute of Technology in Hoboken, New Jersey, and will focus on coastal hazards like hurricanes and flooding. More information can be found by visiting: http://www.nist.gov/el/building_materials/resilience/disreswksp.cfm. Please contact Cauffman (stephen.cauffman@nist.gov) to find out more information.

III. Briefing: USNRC Site Visit to Fukushima

Applegate introduced Steve West (USNRC), who is Deputy Director of the Office of Nuclear Regulatory Research at the U.S. Nuclear Regulatory Commission (USNRC). He briefed the SDR on his agency's recent visit to the Fukushima Daiichi nuclear disaster site. West's presentation highlighted the significant damage and system failures at the plant that occurred as a result of the earthquake and tsunami.

West began his presentation by providing background information on the magnitude 9.0 Great Tohoku Earthquake that struck March 11, 2011, off the Pacific coast of Japan, which was the 5th strongest earthquake ever recorded and the most powerful to hit Japan. The epicenter of the earthquake was 112 miles from the Fukushima Daiichi nuclear power plant site, and according to West, shaking from the earthquake lasted over three minutes, moved Honshu (the main island of Japan) eight feet to the east, and shifted the Earth 4-10 inches on its axis. The earthquake triggered powerful tsunami waves that reached heights of over 130 feet in Tohoku's Iwate Prefecture, and in the Sendai area, the waves traveled up to six miles inland.

West outlined that the initial plant response to the earthquake at Fukushima Daiichi included shutting down three of the six nuclear reactors on site – Units 4, 5, and 6 were already shut down – and relying on emergency diesel generators to supply power to the plant, as expected per standard protocol. The plant conditions were initially considered stable and controlled at that time. As West noted, the site was designed to withstand tsunami waves of up to 19 feet; however, the actual height of the tsunami that resulted from the earthquake was estimated between 46-49 feet. This caused widespread flooding, loss of power, and damage to the plant, which impacted equipment, lighting, indications, and communications throughout the facility.

Regarding the general accident progression in the immediate aftermath of the event, West highlighted the conditions that were observed at the Fukushima Daiichi site. Due to the unknown status of the plant in the initial stages of the disaster, the USNRC, DOE, and National Nuclear Security Administration (NNSA) recommended a 50-mile evacuation zone for U.S. citizens in Japan living near the site due to the following complications:

- Unknown or questionable plant status;
- Heat removal capability lost;
- Reactor temperature and pressure rise;
- Core uncover;
- Fuel cladding (temperature > 2,200 Fahrenheit → hydrogen gas);
- Hydrogen migration, accumulation, and explosions; and
- Elevated radiation levels.

Of the three units in operation at the time of the disaster, West stated that Unit 1 sustained the most significant damage and experienced the most severe conditions, including: intermittent injection and venting; reactor pressure vessel breach and stuck open safety relief valve; fuel melt and core damage (about 4.5 hours after the earthquake); hydrogen generation and explosion; and elevated radiation levels and offsite release. In Unit 2, core injection (of water to cool the core) lasted for about 70 hours, which

allowed for more time to prepare line-ups before doses increased. The Unit 1 explosion prevented core injection after that time in Unit 2, and the Unit 3 explosion damaged the vent alignment and seawater injection staging in Unit 2 as well. Complications in depressurizing the reactor pressure vessel and venting containment eventually led to core damage in Unit 2, in addition to elevated radiation levels. West noted that Unit 2 was the last core to melt, and plant operators came close to saving it.

Initial conditions in Unit 3 were not as severe as Unit 1, as power was available for about 30 hours after the event. West added that core injection in Unit 3 lasted for about 35 hours until complications – the fire engine pump could not inject until the reactor pressure vessel pressure was reduced, and safety relief valves could not be opened without power and air – prevented further cooling. After about six hours without injection, Unit 3 experienced a core melt (about 40 hours after the earthquake) as well as a hydrogen explosion and elevated radiation levels. In Unit 4, West underscored that the dry cask storage was flooded but fuel remained cool, and its spent fuel pools maintained their structural integrity. The diesel generator in Unit 6 provided heat removal to the inactive Unit 5 and 6 pools and their fuel cores, but the Unit 4 spent fuel pool experienced concerning elevated temperature levels and a hydrogen explosion due to the backflow of hydrogen from the Unit 3 gas treatment system.

After sharing photos of the damage and clean-up efforts that were taken during the commission's February 2014 site visit to Fukushima Daiichi, West highlighted that as part of the trip the USNRC team was able to participate in a control room simulation at the Fukushima Daini plant (about seven miles away from Fukushima Daiichi) that recreated the events of March 11. With regards to the status of the plant today, West stated that all six reactors at the Fukushima Daiichi site are stable and fuel pool cooling is reliable. He added that a massive effort is underway by a team of roughly 4,000 workers per day to decommission all six units of Fukushima Daiichi and decontaminate plant water in over 1,000 storage tanks, which is estimated to be a 40-year project. In response to a question from Chris Clavin (STPI), West noted that plants in the process of being decommissioned generally pose a low threat risk. West noted that Japanese officials have made ground water control a top priority of the restoration project, and local scientists have concluded that the radiation releases from the disaster do not pose a public health or safety concern. That said, former residents of Fukushima are still not permitted to return to the area to live and will not be for the foreseeable future.

In closing, West underlined that while the nuclear tragedy in Japan is unprecedented, the Japanese are dedicated to sharing their experiences worldwide to help improve nuclear safety. West ensured that there is no imminent risk from continued nuclear plant operation in the U.S., but the USNRC is moving forward with identified safety enhancements for U.S. nuclear power plants that will help prepare their plant licensees for the unexpected. Please visit <http://www.nrc.gov/reactors/operating/ops-experience/japan-dashboard.html> for additional information or contact West (Steven.West@nrc.gov) with any questions about his briefing.

IV. Briefing: USNRC Post-Fukushima Seismic Hazard Re-Evaluations for Licensees

After West's presentation, Applegate introduced David Skeen (USNRC) and Robert Taylor (USNRC) for a short follow-on briefing on the USNRC's post-Fukushima seismic hazard re-evaluations for U.S. nuclear plant licensees. Skeen is the Deputy Director of the Division of Engineering within the Office of Nuclear Reactor Regulation at the USNRC and was Director of the commission's Japan Lessons-Learned Project Directorate. Taylor was the Deputy Director for the Japan Lessons-Learned Project.

As West mentioned in the previous briefing and due to the lessons learned from Fukushima, the USNRC is moving forward with identified safety enhancements for U.S. nuclear plants, which will help prepare plant licensees for the unexpected. The disaster at Fukushima initiated thought-provoking discussions between government and industry about how a single event can create significant problems at multiple sites. It also sparked conversations from industry representatives at high-levels about what actions can be

taken to improve the safety of the technology at their own sites. Skeen noted that there is still a lot to be learned about what, how, and why systems failed during the Fukushima event, but the U.S. is doing its best to take those lessons learned from Japan and apply them here.

Skeen and Taylor stated that a USNRC Japan Lessons Learned Near-Term Task Force Report concluded that there was no imminent risk to continued nuclear operations in the U.S.; however, to ensure adequate protection, it would be appropriate for licensees to re-evaluate their resilience to seismic hazards using present-day requirements and guidance – given that the state of knowledge has evolved since original licensing. In a two-phased process that will screen and prioritize plants for risk evaluation, Taylor highlighted that after a three-year plant self-analysis period the commission will expeditiously recommend safety enhancements and conduct backfit analyses to ensure compliance with current regulations. Taylor added that because there is no immediate safety concern at U.S. nuclear plants, the updates are not under a time constraint, allowing them to be designed and installed correctly.

In response to a question from Kristen Kulinowski (STPI) regarding what entity will be responsible for bearing the cost of making the recommended enhancements, Taylor stated that the licensees will have to bear the full cost of performing the initial risk analysis and self-assessment. He added that if the USNRC chooses to impose additional safety enhancements on plants, the associated cost to a licensee can be waived in some cases if the improvement is cost-beneficial and for the adequate protection of public health and safety. Mary Ellen Hynes (DHS S&T) encouraged the USNRC not to be myopic in its risk analysis of nearby critical infrastructure – such as dams – that may pose a threat to U.S. nuclear plants in an event like Fukushima. Skeen responded by stating that the commission is doing its best to prepare for the unexpected when considering its seismic hazard re-evaluations. Please contact Skeen (David.Skeen@nrc.gov) or Taylor (Robert.Taylor@nrc.gov) to learn more about USNRC's efforts to make its U.S. nuclear power plants more resilient to extreme events.

V. Presentation: Climate Change and Extreme Weather: The Latest Science from the IPCC

Applegate introduced Phil Duffy, who is Senior Advisor for the U.S. Global Change Research Program (USGCRP) at the White House Office of Science and Technology Policy (OSTP). He presented the latest scientific report findings on climate change and extreme weather from the Intergovernmental Panel on Climate Change (IPCC) and the National Climate Assessment (NCA).

Duffy began his briefing by outlining the concept of attribution as it relates to the determination of causes of observed climate trends. In climate discussions, Duffy noted that this typically means quantifying the level of human contribution to the changing climate. He added that the inability to attribute does not mean that no connection exists – only that one cannot be proven to exist at this time. Duffy then outlined the already observed climate changes and laid out anticipated warming trends for the future in terms of their impact on the frequency and intensity of various natural hazards, such as extreme heat and precipitation, floods, drought, severe hurricanes, wildfire, and tornados. According to Duffy, data from observations, models, and basic theory all point to more intense storms, floods, fires, and drought in a warmer world:

- Extreme heat – increases virtually certain;
- Extreme precipitation – more in many areas, including some that will be drier overall;
- River flooding – tendency for increases in some regions;
- Coastal flooding – very likely to increase and sea level rise worsens inundation;
- Drought – increased frequency and severity probable in many regions;
- Severe hurricanes – likely increase in the number of storms, maximum wind speed, and precipitation rates in most basins; and
- Tornados – unknown, trends not detectable because of inhomogeneities in the data record.

Duffy focused a significant portion of his presentation on discussing drought, which has severely impacted several Western U.S. states in recent months – most notably California. According to their Department of Water Resources, in California climate change is having a profound impact on water resources, as evidenced by dramatic changes in snowpack, sea level, and river flows. Duffy noted that drought consists of more than just low precipitation and is defined relative to local and seasonal normal conditions. He underscored that trends in precipitation are difficult to detect amidst its natural variability. According to Duffy, there are three primary types of drought: 1) meteorological drought, which is defined as below-average precipitation; 2) agricultural drought, which consists of below-average soil moisture; and 3) hydrological drought, which has below-average river flow as its primary characteristic. Duffy added that water scarcity can result from any of these types and is worsened by a warming climate, as well as agricultural and hydrological drought absent of changes in precipitation. Regarding recent analysis conducted on drought trends, Duffy stated that the NCA cites the presence of regional trends in drought in the U.S. and that human influence has been seen on drought severity but not drought frequency due to higher temperatures. He added that the IPCC has low confidence in the attribution of changes in drought intensity or duration globally to human influence.

With respect to wildland fire, an impact of climate change that's happening now in the Western U.S., Duffy stated that variations in wildfire activity are strongly controlled by climate. He added that specific relationships between wildfire activity and climate depend on the ecosystem type, and that warming results in drier fuel and a longer fire season, increasing the likelihood of large fires. Both the IPCC and NCA attribute observed increases in extreme heat to human greenhouse gas emissions, and the NCA indicates that most of the increases of heat wave severity over the U.S. are likely due to human activity. Duffy noted that the effects of changes in forest management practices are over-hyped with respect to controlling the frequency and severity of wildland fire, and the NCA attributes more fire weather, but not more fire, to climate change. Going forward, Duffy expressed a certainty to expect more fire.

Duffy closed by noting that recent warming is unique over at least the last 1,000 years, and current climate models cannot replicate the observed warming trends unless human greenhouse gas emissions are included. He added that natural forces alone (such as solar and volcanic activity) cannot explain the observed warming. Duffy highlighted that the NCA will be an important resource to understand these trends and provide input to Federal science priorities to create more sustainable and environmentally sound plans for the Nation's future in the face of a changing climate. Please contact Duffy (pduffy@usgcrp.gov) with any questions about his presentation.

VI. Adjournment

Applegate adjourned the SDR May meeting at 12:14 p.m.

VII. Future Meetings

Upcoming SDR meetings in 2013 will be held from 10:00 a.m. to 12:00 p.m. on the dates listed below in the Lincoln Room of the White House Conference Center:

2014

- ✓ Thursday, June 5
- ✓ Thursday, July 10
- ✓ Thursday, August 7
- ✓ Thursday, September 4
- ✓ Thursday, October 2
- ✓ Thursday, November 6
- ✓ Thursday, December 4

VIII. Agenda Items and Other Communications with the Subcommittee

Please send proposed agenda items and any other items intended for distribution to the full Subcommittee to the SDR Secretariat Bret Schothorst (bret.schothorst@mantech.com).

IX. Contact Information

SDR Leadership

David Applegate	Co-chair	703-648-6600	applegate@usgs.gov
Margaret Davidson	Co-chair	843-740-1220	margaret.davidson@noaa.gov
Dennis Wenger	Co-chair	703-292-8606	dwenger@nsf.gov
Tamara Dickinson	OSTP Liaison	202-456-6105	tdickinson@ostp.eop.gov

Secretariat

Bret Schothorst	703-388-0312	bret.schothorst@mantech.com
Barbara Haines-Parmele	703-388-0309	barbara.haines-parmele@mantech.com

X. Summary of May Actions

Action	Lead	By When
Contact the SDR Secretariat (bret.schothorst@mantech.com), copying SDR Co-chair David Applegate (applegate@usgs.gov) and OSTP Liaison Tammy Dickinson (Tamara_L_Dickinson@ostp.eop.gov), to participate in the SDR Wildland Fire S&T Task Force.	SDR Members	ASAP
Contact SDR Co-chair Dennis Wenger (dwenger@nsf.gov) if your agency is able to provide funding support to the University of Colorado Boulder's Natural Hazards Center.	SDR Members and Federal Colleagues	ASAP
Reach out to Aubrey Miller (miller.aubrey@nih.gov) for more information regarding an Institute of Medicine Forum on Medical and Public Health Preparedness for Catastrophic Events workshop that will be held June 12-13, 2014, on the campus of the National Institutes of Health in Bethesda, Maryland.	SDR Members and Federal Colleagues	ASAP
Please consider supporting the work of the SDR and its Secretariat through a contribution from your agency. Let SDR Co-chair David Applegate (applegate@usgs.gov) know if you need an Agency- or Department-specific request letter.	SDR Members	Standing
Email the SDR Secretariat (bret.schothorst@mantech.com) and OSTP Liaison Tammy Dickinson (Tamara_L_Dickinson@ostp.eop.gov) if willing to pilot an assessment of the progress of the short-, mid-, and long-term goals outlined in the SDR <i>Grand Challenges for Disaster Reduction</i> hazard-specific implementation plans.	SDR Members	Standing

<p>Contact OSTP Liaison Tammy Dickinson (tdickinson@ostp.eop.gov) if it would be helpful for OSTP to issue a letter to your agency or department requesting new (or re-affirmed) designation of official representatives. Ideas for other entities that should be represented on the SDR are also welcome.</p>	SDR Members	Standing
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