19th Meeting of the DMCC

Seattle, WA
May 14, 2012

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Executive Summary

The U.S. Department of Energy (DOE) Meteorological Coordinating Council (DMCC) convened a meeting at the Marriott Renaissance Hotel, Seattle, WA on May 14, 2012. This meeting was held in conjunction with the 26th Emergency Management Issues Special Interest Group (EMI SIG) Annual Meeting. DMCC is a program that was created in 1994 and has been under the oversight of the EMI SIG since 2004.

This year was the 19th DMCC meeting since its inception on December 2, 1994. About 22 people participated in one or more of the DMCC meeting sessions, with 16 people participating the early morning session. Participants from the public and private sectors attended and actively participated in the meeting.

The purposes of this meeting were to provide a forum for DMCC members and DMCC associates to review accomplishments, products and projects; discuss the mission and implementation of its organizational goals; and resolve outstanding objectives during the meeting. The following was accomplished:

1. NNSA/DOE site meteorological program managers were provided an opportunity to discuss their programs to obtain feedback from the DMCC membership on various issues they were facing.

2. NNSA/DOE site meteorological program managers made technical presentations on relevant operational and research topics to the DMCC membership to enhance their knowledge of the atmospheric sciences and assist them in their program execution.

3. The results of recent DMCC Assist Visits (AVs) were presented.

4. New DMCC products were discussed.

5. Discussions on the FY12 accomplishments and FY13 planning of the DMCC took place.

Additionally, early planning for the 20th DMCC Meeting was briefly discussed. The next DMCC Meeting will be held in conjunction with the next EMI SIG Annual Meeting on May 6, 2013.

Lastly, a special joint session involving the DMCC, Subcommittee on Consequence Assessment and Protective Actions (SCAPA), and Hazard Assessment Subcommittee (HASC) members was held after the adjournment of the DMCC Meeting and is included in this report. The joint session covered topics of technical interest to DOE meteorological programs.

1.0 Overview

The DMCC convened at the Marriott Renaissance Hotel, Seattle, WA on May 14, 2012. This was the 19th meeting that DMCC has sponsored since its inception on December 2, 1994. The meeting was called to order by Carl Mazzola, substituting for DMCC Chairman, Walt Schalk, Director, National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory Special Operations & Research Division (ARL SORD). Mr. Schalk was unable to attend due to other work responsibilities, but participated via Live Meeting and telephone. The meeting, facilitated by John Merrick, presented new DMCC initiatives to its membership and associates, shared the many DMCC accomplishments over the past 17-1/2 years, and provided discussions on recent advancements in atmospheric sciences to the DMCC membership.

The following activities were accomplished at the meeting:

1. NNSA/DOE site meteorological program managers or associates were provided an opportunity to discuss their programs and obtained constructive feedback from the DMCC membership on various issues they were facing.

2. Several technical presentations on relevant operational and research topics were provided to the DMCC membership to enhance their knowledge of the atmospheric sciences and assist them in their program execution.

3. The DMCC Assist Visit Program was reviewed.

Fifteen members were in attendance at the meeting, and three others attended remotely via Microsoft Live Meeting. The 18 attending members and their respective affiliations are listed below.

DMCC Meeting Attendees

Tom Bellinger, BWXT Y-12 (Live Meeting)
John Bolling, DOE/HS-45
John Ciolek, AlphaTRAC, Inc.
Kirk Clawson, NOAA ARLFRD
Jim Fairobent, DOE/NA-41
Dave Freshwater, DOE/NA-41
Cliff Glantz, PNNL
Tony Hupp, ORISE
Laura Hammons, ORISE
Erik Kabela, ORNL (Live Meeting)
Melanie Lepard, SRNS
Carl Mazzola, SEI
John Merrick, Consultant DOE SROO Retired
Frank Moussa, CFO
Tom Rogers, DOE/HS-45
Walt Schalk, NOAA ARLSORD (Live Meeting)
Diana Siegel, LANL
Richard Thomas, Intercet

2.0 DMCC Business, Products, Projects and Activities

2.1 Overview of DMCC Activities

Carl Mazzola for Walt Schalk, DMCC Chairman, presented an overview of the DMCC activities since its last meeting in May 2011. Carl indicated that the May 2011 meeting, which was held in Charleston, SC, had 18 attendees. The activities highlighted included the site Assist Visit (AV) Program, support to others, and support to the private sector. The AV Program was introduced, but the detail was left for a more detailed presentation by Carl Mazzola. Support to others included several articles posted to the DMCC website, the development of a draft Consequence Assessment (CA) Self-Assessment Guide, and the development of the Software Quality Assurance (SQA) process. Support to the private sector involved the continued positive relationship with the Nuclear Utility Meteorological data User Group (NUMUG), and supporting eight American National Standards Institute/American Nuclear Society (ANSI/ANS) meteorological monitoring and dispersion modeling standards.

Walt closed his discussion stating that the goals of the DMCC are to continue these activities and look for ways to provide value-added assistance to the efforts of the Department of Energy/National Nuclear Security Administration (DOE/NNSA) site meteorological programs.

2.2 Assist Visit Program Update

Carl Mazzola provided an update of the successful DMCC AV program that has been conducting AVs since 1996. He reviewed the objectives of an AV, which are to evaluate all aspects of a DOE/NNSA site meteorological monitoring program and the meteorological aspects of the site CA program. The AV team looks at the adequacy of the program relative to fulfilling its present mission requirements as well as expected future mission requirements, and evaluates the effectiveness of the program with respect to meeting its services to its site customers.

Carl gave an overview of the many program improvements resulting from meeting the recommendations from AVs. These included enhanced management awareness of meteorological program vitality to operations, Integrated Safety Management System (ISMS) and other programs, better deployment of human resources, better integration and deployment of technical resources through additional Full Time Equivalents (FTEs) or summer intern assistance. One site received a $240,000 capital improvement to purchase sonic anemometers and Sound Detection and Ranging (SODAR) equipment, while another site purchased a higher-resolution lightning detection system, and yet another received funding to develop a state-of-the-art CA model. The AVs also resulted in improvements to existing CA models. In all cases, there was better integration of the CA-meteorological monitoring interfaces. Some sites stated that there was improvement in severe weather monitoring and reporting, improved siting of its meteorological tower arrays, and improved data acquisition and certification procedures and improved calibration procedures. Lastly, some sites improved their existing interfaces with its State agencies.

Carl indicated that 24 performance criteria in ANSI/ANS-3.11(2010) and new DOE O 458.1, which are captured in DOE/EH-0173 Chapter 4 and the DMCC Meteorological Monitoring Assessment Guide, are used for the meteorological monitoring portion of the AV and nine performance criteria in DOE G 151.1-1 Series: Consequence Assessment are used for the CA portion of the AV. For each of these 33 performance criteria, it is determined whether its objective is met, partially met, or not met. These objectives address a full spectrum of program elements, and the observations and recommendations tie-back to one or more specific objectives.

Carl mentioned that customer satisfaction interviews are also conducted and recorded in the body of the AV report. These customers and the programs supported are as follows:

1. Environmental Compliance (NESHAP, NPDES)
2. Emergency Management (EPHA, CA)
3. Integrated Safety Management (DSA, LCO, BIO)
4. Environment Safety & Health (OSHA PSM, RMP)
5. Environmental Monitoring (ASER, DOE O 458);
6. NEPA (EA, EIS, PEIS)
7. Operations
8. NNSA/DOE oversight and State agency interfaces (UDAC)

After the information is gathered, the AV team rolls it up into several noteworthy practices, and various observations and recommendations and determines the quantity of meteorological monitoring objectives and CA objectives were met, partially met or not met with a cross-reference to the specific observation/recommendation that applies to that performance objective.

Carl stressed that these AVs are governed by a no-fault posture, and addressing any program improvements is at the total discretion of site management and its budget constraints and program priorities. DMCC makes itself available for advice, upon request, after each AV and recommends a follow-up AV every 3-4 years, also upon request. Very importantly, there is full confidentiality of the results. The AV usually is comprised of a program specialist, a team leader for the meteorological monitoring portion, and a team leader for the CA portion.

Carl closed the presentation by identifying where the most likely future AVs will be conducted and why these sites were selected.

3.0 Topics of General Interest and Emergency Management and Response

3.1 Meteorological Tower "Base-ics"

By phone, Walt Schalk discussed the basics that he followed associated with an upgrade to the meteorological towers at the Nevada Nuclear Security Site (NNSS). The mesonet at NNSS has been active for many years and has reached a point of obsolescence. Accordingly, a project was commissioned to upgrade these towers.

Walt described what considerations he had to take to ensure that the NNSS mesonet upgrade would result in a reliable and accurate monitoring system. Walt indicated that the last upgrade was back in 2003. Not only are the sensors obsolete, but they are no longer supported by the manufacturer. Some of the equipment is approximately 40 years old, which is beyond its life expectancy, and requires a great deal of maintenance.

Walt shared that before he pursued the mesonet upgrade, he needed to start with the "base–ics," which included a solid foundation, a series of new state-of-the-art meteorological towers that considered the following options: (1) Crank-up or tilt-down; (2) Fixed, mobile, or a combination of both; and a decision on whether the tower would need guy wires.

Walt decided to pursue the simple solution of a fixed tower with the following criteria and goals: (1) no climbing required, since this required special training; (2) no ladders, which would eliminate a fall hazard; (3) pricing to fit a slim budget; (4) being aware of various excavation restrictions; (5) environmental considerations including permits; (6) remoteness of the locations; and (7) accessibility.

In order to build on sound experience and knowledge, Walt reached out through the DMCC to sister Air Resource Laboratories (ARL) offices, which included the Field Research Division (FRD) at Idaho National Laboratory (INL) and the Atmospheric Turbulence and Diffusion Division (ATDD) at Oak Ridge Reservation (ORR). He also contacted a former sister ARL office on its Earth System Research Laboratory (ESRL) and Surface Radiation Network (SURFRAD). These contacts generated many ideas which Walt captured on several photographs.

Walt then shared the final design which had the following features: (1) the tower base does not slip; (2) there will be minimal surface disturbance to two primary designs (i.e., semi-fixed, mobile). Walt described the semi-fixed and mobile designs in detail and requested comments on these preferences:

- Sonic anemometers; both 2-Dimensional and 3-Dimensional
- Temperature/Relative humidity sensors
- Data loggers
- Pressure sensors
- Solar radiation sensors

3.2 Model Optimization Using GPUs and Other Tricks

John Ciolek presented his continuing work on model optimization using Graphical Processing Units (GPUs) and other techniques. He began his talk with a historical overview of early CAPARS systems. In 1996, the architecture was SGI Workstations (i.e., 195 MHz 64-bit) RISC, and in 2000 a dual 600 MHz Pentium III (32-bit) with 512 MB Random Access Memory (RAM). This machine was able to address 1 wind field (670 x 670 cells – 120m), it implemented finite plume immersion, and all sub-systems were on the same computer GRASS-based graphics were used.

John mentioned that, in 2002, CAPARS was optimized to model extended releases for up to 12 hours and up to 30 isotopes. This machine had a dual 2.4 GHz Pentium V Xeon (32-bit) and 1 gigabyte (GB) RAM. The optimization tasks included upgraded hardware, internal caching of meteorological data, indexing of receptors to release location, limiting the number of receptors for long plume duration, and varying the frequency of puff impact evaluation. These 2002 feature additions made run times longer, provided better map feature labeling, added a dedicated map server and an ArcGIS map server. These improvements increased the capability to treat hot fires more robustly and better access to output products. John then shared a performance graph. In 2006, the CAPARS system was further upgraded by adding an "X5" CAPARS machine, a 4-core 3.4 GHz 32-bit Intel Xeon chip, and 4 GB RAM. In additional more spatial locations of meteorological data were added by accessing the Meteorological Acquisition and Data Ingest System (MADIS), additional surface stations and towers, and MAPS profiles.

John stated that, in 2008, there was a hardware upgrade that added "X6" and "X7" computers, a 4-core 3 GHz 32-bit Intel Xeon chip, and 8 GB RAM. This system was faster than the "X5" computer. In 2010 CAPARS sported multiple nested domains, extended releases and run times up to 24 hours, enhanced resolution near the source, incorporation of late-arriving met data, and the mapping servers were moved back to main machine.

John indicated that the CAPARS v5.11 technology as of 2012 now includes two 6-core Xeon X5680 3.33 GHz 64-bit that are hyper-threaded with the power of 24 CPU cores, 36 GB RAM. It has a high-end graphics card for GPU modeling. John noted that it was important to observe that CPU speeds are leveling off, and the number of cores is increasing.

John stated that optimization tests were conducted to determine which functions took the longest to execute, and it was determined that long multiple isotope runs still take too long (i.e., about 35 minutes for 6-hour simulation/release), while single substance releases are still relatively fast. Additional modifications were made to optimize run time. The first modification was to initialize arrays in the in-growth and decay module, which increased execution speed by a factor of 32. Future modifications will include compiler optimization settings, vectorization of all codes, using compiler parallelization switches, examining GPUs and the cost of re-coding a deposition module for use on GPUs.

3.3 Potential MACCS2 Resolution Issue

Cliff Glantz discussed his evaluation of a possible issue with MACCS2 and how it types turbulence. He referred to an Engineer's Report to the Safety Software Experts Working Group (SSEWG) that compared X/Q values using wind speed data with 0.5 m/sec and 0.1 m/sec resolution, and

mentioned "small discontinuities" when using wind speed data with 0.5 m/sec resolution. This report initially raised concerns about a potential software quality assurance (SQA) problem in MACCS2, but after looking at the report Cliff indicated that this conclusion seemed unlikely. Cliff stated that he has struggled with wind speed data resolution issues in the distant past.

Cliff showed a close-up of the top of the X/Q (%) curve and asked whether smooth curves should be expected. Examination of these curves did not appear to reveal anything of an unusual nature. Cliff explained that there are small differences between the curves due to resolution of the wind data which is a stochastic anomaly. He noted that:

- With 0.5 m/sec resolution, there are only about 50 – 70 potentially valid wind speed and stability categories; while,
- With 0.1 m/sec resolution there are about 5 times more potentially valid wind speed and stability categories.

Cliff went on to address another issue that was raised, namely, is meteorological data averaged over 15-minutes more conservative than meteorological data averaged over 1-minute? Cliff opined that perhaps it is but by extension wouldn't data averaged over 1-hour be even more conservative. Longer periods would introduce other anomalies. The way to avoid this is to vector-average, which acts to reduce wind speeds.

Cliff concluded that the MACCS2 code is operating properly, but that DMCC should provide guidance on the appropriate use of meteorological data.

4.0 Round Robin: Best Practices and Lessons Learned from DOE/NNSA Sites

4.1 Idaho National Laboratory

Kirk Clawson discussed National Oceanic and Atmospheric Administration (NOAA)/INL meteorological research and its major activities and accomplishments over the past year.

Kirk mentioned that ARL FRD is transitioning from the 30-year-old MDIFF to using HYSPLIT to support consequence assessment in the INL EOC. They are leveraging the small INL group with the NOAA-ARL expertise. Presently, they have enabled a forecast mode in INL HYSPLIT with WRF at 4-km grid spacing. They have recently been working with ARL HQ and made some HYSPLIT runs to support the consequence assessment of the Fukushima nuclear plants, which compared well with aircraft observations of the Aerial Monitoring System (AMS).

Kirk also complemented DMCC for its 2010 follow-up AV and is preparing a letter of response.

Rick stated that since this area of southeastern Idaho has one of the highest wind energy potentials, it has become a wind energy test bed. ARLFRD is involved in a localized wind energy characterization project. ARL FRD is working with Energy Efficiency and Renewable Energy (EERE) on a project that is predicting the reliable production of wind energy.

Rick also mentioned that ARL FRD does its SQA in house since NOAA does not have a formal SQA process. ARL FRD has developed its own SQA documentation.

4.2 Nevada Nuclear Security Site

Walt Schalk reported on the operational support that ARL/SORD provides the Nevada Nuclear Security Site (NNSS). Due to NNSA/Nevada Site Office funding reductions and a lack of local support, ARL/SORD ceased routine upper-air operations at KDRA on October 1, 2010. As a result, ARL/SORD has purchased a SODAR to obtain needed upper air data. However, ARL/SORD will retain their mobile balloon launched radiosonde capability to support forecasting and experimental support needs for the NNSS.

Walt mentioned that obsolete Vaisala data loggers will be upgraded with new Campbell data loggers in the next year.

Walt indicated that his staff has been reduced with the retirement of Don Bullard and it will be more focused on emergency preparedness and emergency response support. Two of the meteorological technicians are being trained for the 3rd and an extra 4th ERO position.

Walt elaborated on the NNSS lightning detection and warning system which supports its explosives work. The system had 5 sensors which needed upgrading and 4 new sensors replaced the old sensors.

ARL/SORD has entered into two partnerships with other ARL organizations. It is partnering with ARL FRD to overhaul its QA program and on various modeling research assignments.

Walt mentioned that ARL/SORD is also doing more field and experimental work with some of the NNSS organizations and special projects.

4.3 Oak Ridge National Laboratory

Erik Kabela discussed some of the issues associated with his support to the ORNL meteorological program.

4.4 Y-12

Tom Bellinger discussed some of the issues associated with his support to the Y-12 meteorological program.

4.5 Hanford

Cliff Glantz discussed on behalf of the Hanford program the progress of the meteorological program in addressing the September 2008 observations and recommendations. The AV report was used by Hanford's Mission Support Alliance (MSA) to provide information on the status of the meteorological program and its equipment prior to the May 8, 2011 transition of the program from PNNL to MSA. All of the meteorological staff will follow the program from PNNL to MSA. However, the long-term instrument technician will remain with PNNL and his expertise will be lost

to the meteorological program. Paul Fransioli has been advising MSA on meteorological program transition issues.

4.6 Other Sites

An opportunity for other sites to report was provided, but none of the meteorological program managers for sites active in the DMCC program (i.e., SNL, BNL, LANL, LLNL, Pantex, WIPP) were available for discussion.

5.0 Wrap-up

5.1 New Business and Future DMCC Direction

Carl Mazzola facilitated a roundtable discussion on future initiatives. He indicated that DOE O 458.1 was recently issued putting all meteorological programs under the responsibility of DOE/HS-22.

Carl and Walt presented the assist visit program to HS-20 in August 2011.

6.0 Joint Session of SMCC/SCAPA/HASC

The three presentations during this joint session are documented in the SCAPA Report.

7.0 Acronyms

A

AMS	American Meteorological Society
ANS	American Nuclear Society
ANSI	American National Standards Institute
ARL	Air Resources Laboratory
ASER	Annual Site Environmental Report
ATDD	Atmospheric Transport and Diffusion Division
AV	Assist Visit

B

BIO	Basis for Interim Operations
BNL	Brookhaven National Laboratory
BWXT	Y-12 M & O Contractor

C

CA	Consequence Assessment
CFO	Carlsbad Field Office
CPU	Central Processing Unit

D

D	Dimension
DMCC	DOE Meteorological Coordinating Council
DOE	Department of Energy
DSA	Documented Safety Analysis

E

EA	Environmental Assessment
EIS	Environmental Impact Statement

EMI SIG	Emergency Management Issues Special Interest Group
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPHA	Emergency Preparedness Hazard Assessment
ESRL	Earth System Research Laboratory

F

FRD	Field Research Division
FTE	Full-Time Equivalent

G

G	Guide
GB	Gigabyte
GIS	Geographic Information System
GPU	Graphics Processing Unit

H

HASC	Hazards Assessment Subcommittee
HS	Health, Safety & Security
HYSPLIT	An atmospheric transport and dispersion model

I

INL	Idaho National Laboratory

J - K

km	kilometer

L

LANL	Los Alamos National Laboratory
LCO	Limiting Condition for Operation
LLNL	Lawrence Livermore National Laboratory

M

MACCS2	Radiological Dose Assessment Code
MADIS	Meteorological Acquisition and Data Ingest System
MDIFF	Atmospheric dispersion code
MFFF	MOX Fuel Fabrication Facility
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSA	Mission Support Alliance

N

NA-41	Office of Nuclear Non-Proliferation
NARAC	National Atmospheric Release Advisory Center
NEPA	National Environmental Policy Act
NESHAPS	National Environmental Standards for Hazardous Air Pollutants
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NUMUG	Nuclear Utility Meteorological data User Group
NWS	National Weather Service

O

O	Order
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Association

P

PEIS	Programmatic Environmental Impact Statement

PNNL	Pacific Northwest National Laboratory
PSM	Process Safety Management

Q

QA	Quality Assurance

R

RAM	Random Access Memory
RMP	Risk Management Plan

S

SCAPA	Subcommittee on Consequence Assessment and Protective Actions
SEI	Shaw Environmental & Infrastructure
SNL	Sandia National Laboratory
SODAR	Sonic Detection and Ranging
SORD	Special Operations & Research Division
SQA	Software Quality Assurance
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions
SROO	Savannah River Operations Office
SRS	Savannah River Site
SSEWG	Safety Software Experts Working Group
SURFRAD	Surface Radiation Network

T

TN	Tennessee

U

UDAC	Unified Dose Assessment Center
UHS	Ultimate Heat Sink

V

V & V	Verification & Validation

W

WIPP	Waste Isolation Pilot Plant

X – Y - Z