NUMUG 2003

Presentation Abstracts

Session I – Meteorological Monitoring Programs

1.1 ANSI/ANS-3.11 Update

Stan Marsh, SCE

ANSI/ANS-3.11 (2000), American National Standard for Determining Meteorological Information at Nuclear Facilities, dated February 16, 2000, will expire in 2005. This standard represents state of the art in terms of meteorological monitoring guidance for the entire nuclear industry. In order to ensure that this standard remains current and viable, the ANSI/ANS-3.11 Working Group has been reconstituted with the goal to reaffirm and revise the standard prior to its scheduled sunset in 2005. As before, the Working Group will be chaired by Stan Marsh, CCM and Carl Mazzola, CCM. The Working Group is comprised of members of both the private and public nuclear industry. Both the Nuclear Utility Meteorological Data Users Group (NUMUG) and Department of Energy Meteorological Coordinating Council (DMCC) are well represented on the Working Group. The membership of NUMUG and DMCC will have the opportunity to review and comment on the drafts of ANSI/ANS-3.11 Rev. 1 during their preparation. Revisions to the standard will include consideration of in situ and remote monitoring system technologies, data management and display, and should/shall considerations.

The current schedule is for the release of the final ANSI/ANS-3.11 Rev. 1 by February 16, 2005.

1.2 Supporting Maintenance Activities

Bob Yewdall, PSEG

Maintenance of meteorological instrument and data acquisition/ display systems generally receive adequate attentions. This portion of the monitoring systems is implemented by approved/ controlled processes and procedures. In addition, inspections and audits performed by regulatory oversight organizations and internal audits (QA and self-assessment) assure satisfactory instrument performance. However, supporting maintenance activities with respect to structures (towers, instrument building and site areas) may not receive the same level of attention as the meteorological instruments.

Lack of adequate maintenance may lead not only to degraded meteorological system performance but also to unsafe conditions. Increasingly, may meteorological towers have become dual function structures supporting radios, microwave, cellular telephone equipment. This leads to additional burden on maintenance support organizations.

Maintaining items such as: HVAC, cathodic protection, lightning protection, UPS systems, security fencing, guy wire and anchors inspections, power and instrument wiring and conduit inspections, vegetation control, FAA warning lights and structural reviews of the tower are extremely important. In many cases there are no owners of these activities or they have become orphaned due to organizational changes or program cutbacks. Necessary resources attention and budgeting may be lacking in organizations and directly contribute to inadequate maintenance.

In May of this year a Maintenance Survey was sent to NUMUG members. This paper provides a summary of the results of the survey.

1.3 Gaining from Self-Assessment

Gregory Hood, Entergy Operations, Inc

Self-Assessments have become very popular tool in the nuclear industry to improve performance and to confirm regulatory compliance. It has been determined that the most effective organizations are the ones that are driven to improve from within rather than only looking to change when external forces require them to do so. Since most of the US nuclear plants have now been in operations for more than 10 years a self-assessment will determine if the meteorological program has continued to evolve with new regulatory guidance and state-of-the art equipment.

As an example of a completely independent self-assessment with good cooperation from all parties involved at the utility, a self-assessment of all aspects of the Waterford 3 meteorological program was performed. The assessment team was made up of a good mix of plant, utility, corporate utility and independent meteorologists. Since the utility does not have a meteorologiston staff, it was necessary to bring in expertise from outside the utility. Bringing in people from outside the utility provides site management with an objective view of current performance. This paper will describe the process of a meteorological self-assessment and the good results attained through cooperation at Waterford 3.

1.4 Wind Speed Interference from MET Tower Beacon

Kip Barbour, Callaway Plant (Ameren)

In early April 2002 while validating Callaway Plant's meteorological data for the Annual Effluent Release Report, Tim Waldron of Met Associates, Inc. performed differential analysis of the Primary Tower 10M WS data compared to the Secondary 10M WS data. This analysis identified an approximate 3 m/s bias on the Primary Tower data, *but only at night*.

This presentation provides some examples of the differential analysis used by Met Associates to identify the intermittent bias found in the Callaway Plant wind speed data.

1.5 Annual MET Tower Inspections for Obstructions to Wind Flow

Mark Carroll, Murray & Trettell

A program for maintaining meteorological monitoring towers at nuclear facilities will be discussed. Annual tower inspections are performed and are in compliance with the guidelines set forth in the ANSI/TIA/EIA-222-G-1996 document "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures." Annual inspections include a fourteen item checklist. The purpose of the inspection is to identify any needed tower maintenance. The results of the inspection are documented and reported along with any recommendations for corrective action. The annual program also includes routine and as needed tower lighting maintenance.

A second program has been established for performing annual site surveys for the terrain surrounding meteorological monitoring towers at nuclear facilities. Annual surveys are based upon guidance from ANSI/ANS 3.11-2000, "Determining Meteorological Information at Nuclear Power Plants" and NRC Regulatory Guide 1.23, "Meteorological Programs in Support of Nuclear Plants." The purpose of the site surveys is to locate any trees or other natural vegetation that are becoming an obstruction to "natural" wind flow. Procedures and methods used to perform and document the site surveys will be presented. The methodology used to determine existing and potential obstructions to air flow will be detailed along with the use of photographs to document the existing site conditions.

1.6 Consideration of Micrometeorological Trends Associated with WIPP Meteorological Data

Carl Mazzola , Shaw E&I

Outline:
- WIPP Facility and Mission
- Description of meteorological monitoring program
- Meteorological Data Validation Process
- Effect of Micrometeorological Trends on Data Validation and Use
- Conclusions

Session II – Meteorological Applications

2.1 Evaluating Meteorological Monitoring Sites Using Sigma-Theta

Ken Wastrack, TVA

During the 2002 NUMUG meeting, one presentation discussed using Sigma-Theta measurements to determine if trees and tower structures were impacting wind data. The Tennessee Valley Authority (TVA) used this approach to examine its meteorological monitoring sites.

This presentation addresses the results of TVA's evaluation for each of its nuclear plants sites and validates the use of the Sigma-Theta methodology. In general, the evaluation confirmed conditions already known. However, it identified a previously unidentified anomalous condition at Browns Ferry Nuclear Plant—for a narrow range of wind directions, the Sigma-Theta values were not as expected. This presentation examines the anomaly and identifies a probable cause.

2.2 A Real Time Meteorological Analysis & Dispersion Prediction System for Emergency Preparedness

Al Klausmann, EarthTech

Improvements in computational power in recent years have resulted in operational numerical weather prediction (NWP) models being run at increasingly higher resolution. Regional operational models used at the National Center for Environmental Prediction (NCEP) are now run routinely at meso-beta and meso-gamma scale resolutions, multiple times per day. In addition, more advanced data assimilation techniques are now being employed at operational forecast centers resulting in improved high frequency mesoscale analyses.

The diagnostic meteorological model (CALMET) uses three-dimensional gridded data from prognostic meteorological models to develop fine-scale winds and other meteorological fields consistent with the terrain and land use on the fine-scale diagnostic grid and optionally assimilates meteorological observations into the analysis. Interfaces have been developed between CALMET and operational models such as the NCEP ETA model and the Forecast Systems Laboratory (FSL) Rapid Update Cycle (RUC2) model as well as the Penn State/NCAR Fifth Generation Mesoscale Meteorological Model (MM5) and the Regional Atmospheric Modeling System (RAMS). Three-dimensional gridded analyses and forecasts are readily available from NCEP and other web sites in real-time. A demonstration is provided in this paper of the use of forecast and analyses field combined with available observational data around a hypothetical nuclear power plant to produce ultra-fine scale analysis and predictions of three-dimensional meteorological fields. The CALMET model has the advantage of being capable of running at higher resolutions than the dynamical models to improve the simulation of meteorological fields. This is especially relevant at coastal boundaries and in complex terrain. The non-steady-state CALPUFF dispersion model uses the three-dimensional meteorological fields from the CALMET model to simulate plume transport and diffusion within spatially and temporally varying flows. Plume transport and dispersion are critical elements for dose assessment and radiation monitoring team dissemination during an accidental release. The ETA/CALMET/CALPUFF forecast/dispersion modeling system is currently operational at two industrial sites in North America providing routine real-time and forecast predictions of dispersion impacts to plant operators.

This paper provides a demonstration of the use of the CALMET/CALPUFF modeling system coupled a forecast model (RUC2) for a well-defined lake breeze event in the summer of 2003. The use of the system to support emergency response operations at nuclear power plants is discussed. The importance of characterizing spatial and temporal changes in the meteorological fields and treating the non-steady-state aspects plume dispersion are also discussed.

2.3 Design Wet Bulb Temperature for Ultimate Heat Sink Spry Pond for Advanced Light Water Reactors

Norris Nielsen, TVA

In the early 1990s, the Electric Power Research Institute (EPRI) produced a design manual for siting new modular advanced light water reactors. Among the design parameters is a zero-exceedance wet bulb temperature. Based on EPRI contractor review of all meteorological data years for nuclear plant applications to the NRC, a value of 81ºF was specified in the draft manual. However, all data years that were used preceded 1980, which experienced a massive heat wave over much of the United States, because there were no new applications after the late 1970s when the Three Mile Island accident occurred. A review of 1948-1990 data for several stations in the TVA region revealed that 1980 stood out far above other years in that period and indicated that a design value of 84ºF would be appropriate. Review of summer 1980 wet bulb temperature values for a number of other stations in the southeast third of the United States supported this conclusion. Review of Local Climatological Data Summaries for TVA region stations since 1990 confirmed that no worse set of wet bulb temperature conditions (worst 30-day period) has been observed in the TVA region since 1980.

2.4 Atmospheric Stability – Methods & Measurements

Bob Yewdall, PSEG

Estimation of atmospheric stability is essential to the determination of relative dispersion in order to calculate radiological effluent concentration and thus dose to a receptor. Regulatory requirements are fairly prescriptive in nature. The US NRC has published a plethora of 'guidance' documents for licensees to follow. The complexity of fluid mechanics has been distilled to a general modeling approach. Based on accepted methodologies, atmospheric stability is indexed in discrete steps according to temperature difference with respect to elevation and/or horizontal differences in wind direction with respect to time (i.e., sigma theta). The purpose of this paper is to compare and contrast the two index schemes using meteorological data collected at the Artificial Island site.

2.5 Calculation and Re-Calculation of 60-Minute Sigma Theta and Stability

Dale Paynter, OMG Seattle

While ANSI/ANS 3.11-2000 does not specify a method for computing s_q, it suggests one-pass methods in Appendix E, including the Yamartino method. For the suggested methods, it also recommends deriving the hourly value of s_q by computing the Root Sum Squared of the 10 or 15-minute averages in order to minimize inflation of the 60-minute s_q due to the effects of plume meander.

This inflation effect was observed while developing a utility to compute missing 60-minute s_q's from partial data or to re-compute this value after portions of the underlying data had been edited. Re-computed s_q's generally are lower than the original values, frequently reducing the associated stability class to a more stable value.

This presentation reviews s_q computation, then details the observed differences between 60-minute s_q's computed from the original sensor data using the one-pass Yamartino method and values computed by RSSing the 15-minute values. One year of actual observations and re-computations are analyzed with respect to differing wind conditions. Lastly, the differences in reported stability class for the two methods are presented.

2.6 Tracing Air Parcel Trajectories Using No-Lift-Balloons

Benjamin Terliuc, Nuclear Research Centre

Free Lift Balloons (FLB) are flying platforms designed to behave as Lagrangian tracers of air parcel trajectories. Among the FLB, Constant Volume Balloons (CVB) are extensively used to explore the kinematic and dynamic structures of the Planetary Boundary Layer (PBL). The CVB is exempted of buoyancy only when flying in an isopycnic level having ambient density equal to the effective density of the system. When dragged to leave its equilibrium level by an external vertical force, a restoring force is developed in the opposite direction, forcing the CVB to return back to the prefixed flying layer. This dynamic effect invalidates the CVB to behave as a true Lagrangian tracer. A different design of FLB, called No Lift Balloon (NLB), overcomes this invalidation by allowing the balloon to match, at each level, its internal pressure and effective density to the ambient pressure and density, in an almost adiabatic process, leaving the vertical motion of NLB to be induced mainly by drag forces exerted by the vertical component of the wind vector. Therefore, bearing in mind some deviations from the dynamic and thermodynamic behavior of air parcels, NLB can be considered Quasi-Lagrangian tracers of air particle trajectories.

The purpose of the present work is to demonstrate the capabilities of NLB, in view of the experimental results obtained with systems implemented by different techniques. Measurements carried out during MAP 99 Intensive Operational Period (IOP) at Ispra, Italy, provide a pictorial description of a three-dimensional trajectory, strongly affected by complex terrain topography, showing a light wind circulation cell that could be induced by lake breeze.

2.7 Using ARCON96 for Control Room Radiological Habitability Assessments

Brad Harvey, NRC

Conclusion: The intent of this paper is to review some of the subtle aspects in executing ARCON96 to generate atmospheric dispersion analyses in support of design-basis CR [Control Room] radiological habitability assessments. Included are highlights of the differences between staff positions discussed in RG 1.194 and the examples given in the ARCON96 User's Guide. The authors hope that the issues discussed here will help licensees avoid common mistakes and improve the quality and acceptability of their submittals.

Session III – Changes in Our World

3.1 Permitting Challenges for the New Generation of Nuclear Power Plants

Ping Wan, Bechtel

The United States' electric power industry has continued to face an unsettled environment, including unprecedented high fuel price, increasing regulatory requirements on emission controls, security/non-proliferation issues, and deregulation of the industry since the late 90s. To meet the future demand and maintain energy security, the Bush administration's National Energy Policy calls for expanding nuclear energy to achieve energy security in the United States. The Department Of Energy's Nuclear Power 2010 initiative focuses on building new nuclear plants in the coming decade.

Title 10, Energy, Code of Federal Regulations, Part 52 sets out the requirements and procedures applicable to the Nuclear Regulatory Commission issuance of an Early Site Permits, Standard Design Certifications, and Combined License for Nuclear Power Plants. Of the three major licensing processes under Part 52, only the design certification process has been demonstrated. Recently there are three utility related companies have announced their intention to proceed with an Early Site Permit (ESP) application, which constitutes a major Federal licensing action. The author of this paper is currently engaged in preparing such an ESP application.

This paper will discuss the permitting challenges for an ESP under the industry deregulation environment. Discussions will be focused on re-defining a "Region Of Interest" for selection of candidate power plant sites, methodology for allowing flexibility in the proposed reactor technology, and utilization of existing information and infrastructures.

3.2 Yucca Mountain Update

Paul Fransioli, DOE/YMP

In 1982, the Nuclear Waste Policy Act (NWPA) established national policy for the disposition of high-level radioactive waste and commercial spent nuclear fuel.

In 1987, the NWPA as amended eliminated all sites but Yucca Mountain to be characterized for a potential repository.

In 1996, Congress directed the Department of Energy (DOE) in the Energy and Water Development Appropriations Act of 1997 to provide a viability assessment of the Yucca Mountain site.

This is an update of the current status and future plans for the Yucca Mountain project.

3.3 Private vs. Federal MET Services – Update from AMS ad hoc committee

Doyle Pittman, TVA

A committee of the National Research Council completed a study in 2002 of academic - private – public partnerships (Fair Weather – Effective Partnerships in Weather and Climate Services).

This presentation is an update of follow-up issues involving the American Meteorological Society (AMS).

3.4 Overview of CCM Program & National Council of Industrial Meteorologists

Matt Parker, Westinghouse Savannah River Co.

Presentation includes overviews of the Certified Consulting Meteorologist (CCM) program—including recent changes by the Ad Hoc Committee on the Continuing Professional Development of CCMs—and on the National Council of Industrial Meteorologists.

3.5 Replacing a Dial-up Weather System with a Web-based Weather Page

Tom Bellinger, Illinois Dept. of Nuclear Safety

In the late 1980's and early 1990 we used Wxview+ to download various weather products (satellite photos, radar images, loops) and forecast information. At previous NUMUG meetings, I have shown numerous Doppler radar loops of lake breeze using this software.

When we upgraded our in-house computers from DOS to Windows 3.1, Wxview+ handled the upgrade well. But when we upgraded our computers again to Windows NT, Wxview+ had problems and we had to migrate to the Weather for Windows software. Using Weather for Windows was adequate for our emergency response needs, but was cumbersome for me to use when trying to store Doppler radar loops to document lake breezes and other interests.

When we upgraded to Windows XP, Weather for Windows did not handle the upgrade well. Since the internet has so many good free weather products and I was using WSI less and less, I thought it was time to bite the bullet, save the $7500/year, and obtain or develop some method of gathering internet weather products myself. Since other responders in our organization are not meteorologists, I did not want to have a bunch of bookmarks that the user could select to obtain products. I searched the internet for various shareware that did some menu selectable downloads, but none were satisfactory for my needs. So I began my initial adventure writing HTML code to gather the data we needed.

For your use, I have included all the HTML code, PowerPoint files, and graphics about my weather page for you on the NUMUG meeting CD. Feel free to modify them to fit your local site needs.