NUMUG POSITION PAPER
What is a Qualified Meteorologist?

ANSI-ANS-3.11-2005(R2010), "Determining Meteorological Information at Nuclear Facilities", and other nuclear industry guidance documents expect certain tasks associated with the atmospheric sciences to be performed by a "Qualified Meteorologist". This qualification recognizes the need for a specific skill set when performing meteorological-related functions, not necessarily a requirement for tasks to be performed by particular individuals.

The meteorologist acts as a critical point of contact and Subject Matter Expert on a multitude of issues dealing with facility operations, emergency management, design, engineering, construction, health physics, information technology, environmental compliance, chemistry, and many other specialized needs. The demand for meteorological information at private and public sector nuclear facilities remains strong, and is expected to continue into the future.

Meteorological information is used in support of regulatory, design, operations, and emergency response applications at nuclear facilities. Accordingly, it is imperative that this information accurately represents the conditions being described, so that correct decisions on important matters are made. Only someone with knowledge of the atmospheric sciences can determine representativeness.

Atmospheric Sciences Skills

The principle underlying component for virtually all aspects of nuclear meteorological support services is a STRONG UNDERSTANDING OF ATMOSPHERIC DISPERSION, especially as it relates to transport and diffusion of radioactive and hazardous chemical airborne effluents. This skill goes well beyond the ability to be an end-user of computerized atmospheric dispersion models. It is necessary to understand how weather conditions influence effluent dispersion, and how to interpret observed and forecast conditions with respect to dispersion.

Beyond this, the nuclear industry requires competence in various other atmospheric science specialties. Since a wide variety of support is always required, it may not be practical for a single person to individually possess all the knowledge and skills sets required. However, the composite meteorological team must collectively have the knowledge and skills to meet the wide-ranging support needs.

- Knowledge of meteorological instruments, measurement techniques, and instrument calibration.

  Accurate meteorological observations are essential to the fidelity of the applications that apply the meteorological information. Meteorological data users need to understand how data are collected, what actions are needed to ensure continued valid measurements, and any limitations that exist in the application of data. This includes data acquired by remote sensing equipment (e.g., sodars, radar profilers, ceilometers).

- Ability to validate meteorological data.

  Even with a high-quality data collection program, erroneous data can be reported. Recognition of data quality is essential for assembling accurate databases that ensure application fidelity.

- Ability to extract specific meteorological information.

  Meteorological and climatological records are available from various sources and in assorted formats. To facilitate planning and design of site structures and processes, available data must be identified and appropriate data selected for specific applications. Temporal, as well as spatial representativeness, needs to be taken into account on a case-by-case basis, depending on the application of the meteorological data.

- Expertise in data interpretation and processing.

  Basic meteorological data are rarely useful until viewed in context for specific applications. Summaries of collected data need to be prepared (e.g., joint frequency distributions and annual reports) for regulatory and other purposes. Relevant information needs to be provided to the balance of the plant for safety and operational concerns (e.g., heat stress, cold weather protection, freezing pipes, flooding, crane lifting limitations from winds and security).

- Skills in weather forecasting.

  Accurate weather forecasts are necessary to perform various activities more effectively (e.g. storm water sampling) and provide advance warning of adverse conditions (icing, strong winds, intense lightning, etc.).

- Ability to perform timely consequence assessment.

  Emergency preparedness and response programs necessitate detailed understanding of relevant meteorological and climatological conditions, especially when using computerized atmospheric dispersion models.

Meteorology Training

The American Meteorological Society (AMS) defines a meteorologist as a person with specialized education "*who uses scientific principles to explain, understand, observe, or forecast the earth's atmospheric phenomena and/or how the atmosphere affects the earth and life on the planet.*"

For a meteorology degree, the World Meteorological Organization defines a core curriculum of atmospheric thermodynamics; dynamic, synoptic and mesoscale meteorology; atmospheric physics; and atmospheric measurements. The non-meteorology core curriculum includes mathematics (calculus and differential equations), physics, chemistry, computer science, statistics, and communications (scientific or professional writing, and oral communications). Meteorology electives focus on fields of specialization; such as, atmospheric measurements, climate monitoring and prediction, mesoscale meteorology and prediction, and air pollution.

A non-meteorology degree in “other sciences and engineering” is equivalent when it includes the meteorology core curriculum and relevant non-meteorology core curriculum.

Unfortunately, few collegiate curriculums include specific atmospheric dispersion courses relevant to the nuclear industry. Therefore, such training must often be obtained from other sources; such as regulators (e.g., EPA Air Pollution Training Institute), vendors, and on-the-job training.

Meteorology Experience

As with most disciplines, education alone is insufficient. An individual is "qualified" *when he/she is competent to perform the specific activity*. Regardless of educational background and/or experience, on-the-job training is critical. Competence is attained by effectively performing specific activities similar to tasks required.

The use of mentors in on-the-job training cannot be over-emphasized. Trade groups also provide important peer review which assist in the training process.

Demonstrating Competence

Competence needs to be demonstrated given that work performed at nuclear facilities is often made available in the public domain. For example, the AMS Certified Consulting Meteorologist (CCM) designation is recognized within the meteorology profession as an appropriate level of achievement to help demonstrate proficiency. Other training programs, such as those administered internally by the Nuclear Regulatory Commission and Environmental Protection Agency, can increase demonstration of proficiency.

However, it is not always practical to attain such formal recognition. In many cases, a "qualification matrix" (preferably prepared or reviewed by a qualified individual) is appropriate. The matrix should identify required experience and list documents that the individual would have to have read, understand, become familiar with, or demonstrate knowledge of. The documents include laws, enabling regulations, guidance documents, facility safety analysis reports, operational experiences, NRC safety evaluation reports, NRC Environmental Impact Statements, NRC information notices, bulletins, etc. Relevant internal procedures and training should also be included.

A suitable evaluation (e.g., exam or interview) and 'sign-off' is also necessary.

References:

ANSI-ANS-3.11-2005, "Determining Meteorological Information at Nuclear Facilities", reaffirmed 2010.

American Meteorological Society Website (*accessed August 27, 2014*).

- Career Center: All About Careers in the Atmospheric and Related Sciences (http://www.ametsoc.org/careercenter/careers.html).
- Certified Consulting Meteorologist Program (http://www.ametsoc.org/amscert/ccmprogram.pdf).

"Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology", Volume I: Meteorology; WMO-No. 258, Fourth Edition, World Meteorological Organization, 2001 (*accessed August 27, 2014* - https://www.wmo.int/pages/prog/dra/etrp/documents/WMO258.pdf).

Merriam-Webster Online Dictionary (*accessed August 27, 2014* - http://www.merriam-webster.com).

NUMUG Position Paper, "The Role of Meteorologists in Nuclear Utilities", 2007.