

February 23, 2012

MEMORANDUM TO: William Ott, Chief
Environmental Transport Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research

FROM: Mark Fuhrmann, Geochemist */RA/*
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SUBJECT: Summary of the Interagency Workshop on Monitoring for Early
Detection of Underground Leaks at Nuclear Facilities

On February 15, 2012, staff from the Office of Nuclear Regulatory Research (RES) hosted a workshop entitled *Interagency Workshop on Monitoring for Early Detection of Underground Leaks at Nuclear Facilities*. During this one day workshop, participants discussed the feasibility of applying geophysical and other monitoring methods to the early detection of underground leaks at nuclear facilities. This workshop provided information that will be used to finalize a whitepaper that is in preparation by RES staff on methods for early detection of subsurface leaks. Ultimately this effort, which is one task in a RES project called Extended In-Situ and Real-Time Monitoring, will provide input to the Long-Term Research Plan. Another task in this project is examining non-destructive tests (NDT) for pipe integrity, consequently the workshop focus is on detection of leaks outside of plant structures, systems and components.

While leaks in the subsurface at nuclear power plants were the focus, other facilities such as engineered covers for waste disposal cells, and tank systems were also discussed. Several approaches to detection of differences in electrical properties of the subsurface were described that could be used to measure changes in temperature, ionic strength of solutions, or moisture content in the vadose zone. The geophysics experts, all were invited speakers, agreed that electrical resistivity measurements were the most advanced and practical approach to the problem of leak detection. A variety of configurations for electrode emplacement at a heavily industrialized site were discussed as were the issues of various types of electrical interferences at power plants. Modeling different electrode patterns can be used to assess the best ways to minimize interference from subsurface pipes, and suggests that downhole electrodes projecting below the pipe infrastructure would be especially useful. While drilling new boreholes in these areas of power plants is not easy, several utility people said that it is commonly done.

The use of fiber-optic distributed temperature sensing systems for leak detection in pipelines was discussed. Perhaps more pertinently, this method can be used as an indicator of where groundwater enters a river or lake, pinpointing pathways where monitoring systems could be most effectively placed. Methods for detection of tritiated water vapor were also presented.

There were 33 participants in the meeting room in Rockville and another 27 participated remotely by GoToMeeting and a bridgeline. A large number of organizations were represented including: NRC, U.S. DOE, U.S. DOT, USGS, NIST, several national laboratories, Rutgers University, U. of Maryland, U. of Arizona, Oregon State University, the Canadian Nuclear Safety Commission, Entergy, EPRI, NEI, ANI, Xcel Energy, PGE, Westinghouse, Arizona Public Service, AMEREN, Exelon, and Progress Energy. A list of participants is attached as is the agenda. Presentations from the workshop will be posted on the NRC website.

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ADAMS Accession No.:ML120540481

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