News Wire from Idaho National Engineering and Environmental Laboratory – Home of Science and Engineering Solutions

Welcome! This is the latest edition of the **INEEL News Wire**, which delivers news about current advances in research and technology at the multiprogram Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL), located in Idaho Falls, Idaho and operated by Bechtel BWXT Idaho for the U.S. Department of Energy. Published by the INEEL Communications Directorate, it delivers news to your desktop and is available at http://www.inel.gov/newswire/, along with an archive of all previous editions.

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Content of March 18, 2004, INEEL News Wire:

Smithsonian Museum announces that model of INEEL probe used at Three Mile Island to be displayed

Idaho Falls, March 10, 2004 – When the Three Mile Island reactor accident happened near Harrisburg, Pa., March 28, 1979, it resulted in a partial meltdown of the reactor core.

Engineers needed to know the extent of damage before they could plan recovery efforts. To help find answers they went to the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory. The INEEL developed several tools to help the nation learn about the TMI accident.

One of the tools was an ultrasonic probe used to examine the core.

A duplicate of the probe, a three-dimensional Plexiglas model built of the damage core area and related materials from the INEEL's support effort will be displayed at The Smithsonian Institute's American History Museum in Washington, D.C., from March 18 through April 30.

Immediately after the accident, the DOE developed a mission to help General Public Utilities Nuclear, owners of TMI, recover from the accident and help the nuclear industry learn more about severe accidents. The INEEL, with decades of nuclear plant design and testing and safety system development work for DOE and the Nuclear Regulatory Commission, became a key player in supporting DOE's immediate and long-term response to the accident.

Following the accident, INEEL engineers did computer modeling that predicted extensive core damage. The ultrasonic probe validated those predictions. INEEL's TMI Core Topography Project team developed the probe. It was a four-foot-long stainless steel tube equipped with six pairs of transducers fixed at different angles. The device operated similar to the sonar of Naval vessels. Focused acoustic beams were emitted from the probe and measured the distance between the device and the boundaries of the core cavity.

The probe was attached to a 40-foot-long "boom" and remotely inserted through an instrument port into the top of the damaged reactor vessel. Lowered into the core area, the probe was stopped about every two vertical inches and slowly rotated 360 degrees at each stop. By emitting acoustic beams and recording the return signal, some 500,000 data points were collected and later translated into an image of the damaged core. The data revealed a large void created when a part of the core melted and slumped to the bottom of the vessel. A Plexiglas model was built using the data to illustrate the damage.

In developing the probe, and before the INEEL team took it to TMI, designers thoroughly tested it at the INEEL and each step of the deployment operation was carefully choreographed.

Paul Forman, curator of the Modern Physics Collection in the National Museum of American History, said the display coincides with the 25th anniversary of the accident. The items donated by the INEEL will be featured in the museum's "history in the news" case

He said the single case display is often used to highlight anniversaries of significant events.

To plan for the anniversary display, museum curators began with half of another copy of the Plexiglas model (it is built in two pieces) that had been given to them by a DOE employee in Washington, D.C. several years ago.

"Starting with that piece of the model and a copy of the technical report on the project (written by the lead ultrasonic engineer, Larry Beller, now retired from the INEEL), we made some inquiries to try and locate a complete model and those who created it and any other artifacts from the technology used to develop it," Forman said.

With a little "legwork" on the INEEL Web site, the museum staff was able to find other Laboratory employees familiar with the project, a complete model of the core and a duplicate probe that was not used at TMI.

An agreement was reached for the INEEL to donate the materials to the Smithsonian with the stipulation that the objects could be borrowed for educational uses. The model will go on display later this year at the Museum of Idaho in Idaho Falls.

The INEEL is continuing its contributions to development of safe nuclear power. The INEEL and Argonne National Laboratory are the Department of Energy's lead laboratories for nuclear technology development. In about a year, INEEL and ANL will merge to form the Idaho National Laboratory and become the nation's preeminent nuclear research laboratory.

INEEL was part of TMI recovery from start to finish

The Three Mile Island nuclear power plant accident happened 2,400 miles from the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory. But INEEL scientists, engineers, technicians and craftsmen quickly became involved in helping respond to the Three Mile Island reactor accident near Harrisburg, PA.

What put the INEEL in this lead role was its recognized scientific and technical expertise in nuclear plant accident analysis and recovery, nuclear fuel handling, the facilities INEEL had to safely perform testing and the severe accident test program already under way.

Three INEEL test reactors became involved in the TMI accident response and analysis.

Within 24 hours of the accident, the INEEL personnel at the Semiscale Facility were gathering data to try and understand what was occurring at TMI. They reconfigured the facility to simulate the TMI plant design so they could run tests to see how a hydrogen bubble that formed in the damaged reactor could be removed from the system without uncovering the core. Semiscale (now decommissioned and dismantled) was a nonnuclear facility that duplicated thermal/hydraulic systems of pressurized water reactors to study plant responses to off-normal events.

Late in 1979, engineers began planning a series of tests at the Loss-of-Fluid Test (LOFT) facility. LOFT (now decommissioned and dismantled) was a small, nuclear-powered test reactor. Starting in 1981, these tests, some duplicating the TMI accident, allowed engineers to collect data and evaluate the performance of emergency systems during accidents from breaks in small pipes carrying cooling water. Engineers evaluated the effectiveness of systems intended to provide emergency reactor core cooling if a pipe broke. The information from these tests let engineers better understand instrumentation and operations of commercial reactors. It helped plant operators predict performance of emergency core cooling systems in large reactors.

The Nuclear Regulatory Commission still uses these analysis techniques to confirm safety margins during reactor plant licensing reviews.

Scientists also used the INEEL's Power Burst Facility (PBF) to subject nuclear fuel to sudden, intense power surges that caused fuel failure. They could extract the damaged fuel and examine it to understand the nuclear fuel damage and fission product behavior. PBF is now decommissioned and defueled.

Within days of the accident, several DOE and INEEL officials were in Harrisburg helping assess the accident. This group was the start of the TMI Technical Integration Office. It became the DOE focal point for learning from the accident and providing that information to the nuclear industry. At its peak of activity, 49 INEEL employees staffed the TIO in Pennsylvania. They provided

technical advice, assisted in various activities including entry into the containment building for inspections, visual inspections inside the reactor vessel, sample retrieval from the damaged reactor vessel core and support of many of the projects associated with eventual removal of the damaged spent fuel and core debris to the INEEL.

At the INEEL, employees in scores of organizations, from physics and thermal analysis to safety standards and engineering, supported the TIO. They developed specialized instruments and techniques to examine and recover the damaged core. They helped safely transport samples of core debris to the INEEL, where scientists performed remote analysis of the debris placed inside hot cells that protected workers from radiation exposure.

Scientists examined the TMI debris to understand how the core degraded. This information led to improved severe accident computer codes used by the nuclear industry to predict reactor response during accidents.

INEEL workers helped, from design to licensing, in developing the shipping casks and rail cars used to bring the core debris to the INEEL between 1986 and 1990. The material was first placed in underwater storage and then, in 2000-2001, moved into safe, above-ground, dry storage awaiting final disposal in a federal repository outside Idaho.

Electronic images available. News Media Contacts: John Walsh, (208) 526-8646, jhw@inel.gov; Keith Arterburn, (208) 526-4845, artegk@inel.gov

For a chronology, photos, historical record and more details on INEEL's role in Three Mile Island visit – http://www.inel.gov/tmi-anniv/

INEEL designing prototype system for Yucca Mountain repository

Idaho Falls, March 15, 2004 – The U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory is designing a prototype remote-controlled system that will permanently close the waste packages of spent nuclear fuel before final disposal in the proposed federal repository being studied at Yucca Mountain in Nevada. The INEEL will also build and test the system at the Idaho laboratory.

Federal law designated Yucca Mountain as the site to be studied for licensing as the national repository for commercial and government spent nuclear fuel and high-level waste. If the repository is licensed, INEEL's Waste Package Closure System will be a key element of the facility's operation.

The INEEL-designed closure system will be used to demonstrate the operations and equipment, and may be used in the operator training facility. The prototype will be constructed and operated at the INEEL.

Philip Wheatley, Yucca Mountain relationship manager, said the project takes advantage of INEEL's established expertise. "The INEEL has been designated as the DOE lead lab for Nuclear Energy Technology. We have a proven history of spent fuel canister welding process development. This expertise will help the Yucca Mountain Project and help meet the nation's need for the safe storage of nuclear waste," Wheatley said.

Wheatley added that other areas of expertise -- in particular, robotics, hot cell operations and design, systems engineering and automated welding developed by the Laboratory in receiving, handling, storing and transporting spent nuclear fuel -- made the INEEL attractive to the Yucca Mountain Project team.

In developing the waste package system, INEEL engineers faced a number of technical challenges. The waste package is two containers, one nested within the other, with three lids. The package can be various diameters and heights. INEEL engineers are integrating off-the-shelf equipment in the design of the closure system. However, the team has had to develop new or modified equipment for some parts of the operation, for instance, a tool to remotely purge and fill the inner container with helium.

The task becomes more challenging and complex because the high radiation fields require the entire operation to be done remotely.

As designed, a cart will move a waste package into the processing cell where all the operations occur. Three separate lids will be installed and welded onto the container using two weld torches rotating around the container on tracks. All the welds undergo one or more inspections visually, ultrasonically, with eddy current, or by a combination of these methods. The inner container will be filled with helium (to prevent corrosion), sealed and leak tested. Stress mitigation on the welds will be performed on the outer lid followed by another set of inspections. Once the waste package closure is complete, it is ready for placement in the repository.

Wheatley noted the INEEL is working on a number of other repository-related projects, including support in preparing the license application, analysis of criticality events, surface facility design, verification and validation of software for modeling the repository and preparing a corrective management plan for systems.

"The waste package closure project will be a significant piece of work for the next three or four years," Wheatley said. "This work allows the INEEL to apply some of our core competencies to help meet the nation's nuclear technology development mission. Engineering and other capabilities used for Yucca Mountain will contribute to future reactor development work."

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http://newsdesk.inel.gov/press_releases/2004/03-15Yucca_prototype.htm

INEEL Finishes GEM Waste Retrieval Project Ahead of Schedule

Washington, DC, March 2, 2004 – As part of the U.S. Department of Energy's ongoing effort to meet its commitments to the State of Idaho, workers at the Idaho National Engineering and Environmental Laboratory have successfully completed the Glovebox Excavator Method project. Workers removed 454 drums of waste from the one-acre Pit 9 site more than eight months ahead of the schedule agreed upon in 2002 by DOE, the State of Idaho and the U.S. Environmental Protection Agency.

"This achievement was possible because of the cooperative spirit in which the Department of Energy, the State of Idaho and the U.S. Environmental Protection Agency approached this project," Secretary of Energy Spencer Abraham said. "In particular, Governor Kempthorne and I worked together to see that real progress was made. This was critical to moving cleanup of this portion of this site from a paper enterprise to a real one. Information gained from this retrieval is one of many tools that our scientists and engineers will use to implement options for safely performing cleanup of buried waste in the rest of the Subsurface Disposal Area that are prudent, effective and environmentally sound."

As part of DOE's accelerated cleanup commitment, DOE is currently discussing with the State of Idaho and EPA options for performing additional waste retrieval and other environmentally protective actions in other portions of the 97-acre Subsurface Disposal Area prior to completion of the process established by the Comprehensive Environmental Response, Compensation and Liability Act-otherwise known as CERCLA or the Superfund. A final decision on the best approach to remediating the rest of the 97-acre disposal site, using the risk-based legal process spelled out by Congress in CERCLA, will be based on a process that includes an assessment of risks, a feasibility study of remedial alternatives, a proposed plan for remedial actions and public input. A final CERCLA decision will be made by DOE, the State of Idaho and EPA after the CERCLA process is completed in 2006. -DOE- R-03-037

Idaho Completion Project officials recognize employees' achievement

On Saturday, Feb. 21, Idaho Completion Project workers at the Idaho National Engineering and Environmental Laboratory completed buried waste retrieval operations at the Glovebox Excavator Method facility, nearly eight months ahead of schedule. ICP senior managers congratulated to the entire GEM project team in a Sitewide memo for their countless hours of hard work in making this project a success.

The GEM project further enhances the reputation of ICP employees getting physical cleanup work accomplished safely, ahead of schedule and in an environmentally compliant manner. The completion of this project also supports the mission of the ICP to accelerate cleanup work and reduce risk.

During the project, 454 drums - a total of 78 cubic yards of waste - was retrieved from a portion of Pit 9 in the Subsurface Disposal Area. After the waste was retrieved, it was sorted, characterized and repackaged and is now awaiting disposal.

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