N203. Scale Models - An Effective Tool for ALARA and Constructability Planning

Nuclear stations are continuously looking for ways to increase the efficiency and effectiveness of their operations, as well as reduce radiation exposure levels to plant personnel to as low as reasonably achievable (ALARA). An effective approach for reducing the amount of time spent in radiation fields is to use a physical scale model.

As part of the outage planning process, a 3/4" = 1'0" scale model was constructed of the Unit 3 drywell area of Commonwealth Edison's Dresden Nuclear Power Station. The model included area equipment, piping with supports, HVAC design, structural steel with galleries, and components with known hot spots and high maintenance history.

It took about two weeks for people to become accustomed to using the model as the focal point for planning specific activities. After they did, there was so much activity around the model that it was nicknamed the "ALARA coffee pot," with as many as 25-30 people around the model.

A major application of the model was to orient personnel who would be working in the contaminated area by providing them with a big picture view of the physical layout of the containment. New people not familiar with the containment layout may have a difficult time finding their way to work locations. For most people, it is easier to orient themselves when they can see the entire drywell in 3-D then when they are given verbal instructions, photographs, or marked-up drawings. The model is color-coded according to types of equipment and has see-through floors. The model has all of the major landmarks so it is easy to show a team exactly where to find a snubber, valve, in-service inspection (ISI) point, or any other work location. The model makes it effortless to get to the right place quickly the first time.

A second outage time saver is simply keeping the number of physical walkdowns to a minimum. By planning major equipment moves, staging areas, and work sequences from the model, the need for physical walkdowns was greatly reduced. Every unnecessary prevented entry into containment resulted in a saving of time, money, and dose. In addition, it is easier to discuss something standing by the model than it is standing under a valve with full plastics and a respirator.

The model really helped when it came to installing temporary lead shielding. The shield installers were shown the correct location and number of blankets on the model. There was also a real time saving on shift turnovers when the ISI crews and insulators could indicate exactly where insulation was partially removed so that the next crew could continue without having to do a walkdown to check progress.

The final result of the outage was an ISI exposure saving of 12 person-rem, a lead installation exposure saving of 25 person-rem, and a total saving of 57 person-rem. The model cost approximately $100,000 and resulted in a financial savings of approximately $540,000 for one outage (1 person-rem = $9,500).

To make the goal of continued reduction in the annual cumulative radiation exposure, new cost-effective tools are required for attaining reduced radiation dose, evaluating alternative designs, and calculating the best strategies to keep workers safe.

Incorporation of ALARA practices, design features, and training procedures does not rely on any single ALARA tool, but rather on a combination of tools. One effective tool is the physical scale model.

Taken from "Scale Model - An Effective Tool for ALARA and Constructability Planning," Roy Lee and Robert Segroves. For futher information, contact Roy Lee (Commonwealth Edison Company), 708/515-6653 or Robert Segroves (Sargent and Lundy) 312/269-6167