

## Anatomy of a Nuclear Plant Planned Outage

*Performing maintenance, equipment inspections and testing, installing technology upgrades and refueling a nuclear generating unit*

Nuclear plant operators periodically shut down generating units for refueling, comprehensive equipment inspections, maintenance, and technology upgrades, which can't be performed while the plant is generating electricity. These planned outages typically occur every 18 to 24 months, and can last anywhere from just under three weeks to three months depending on the scope of work that must be accomplished during the outage.

San Onofre adds approximately 1,000 extra contract workers in order to complete the extensive list of outage tests, inspections and new technology installations.

### Equipment Inspections, Maintenance and Refueling

Detailed planning begins years before the outage for refueling, preventative maintenance work, testing and inspections to meet many rigorous requirements that help ensure safe operation and protection of public health and safety. If additional necessary work is identified during the inspections or testing, then that work is performed before restarting the plant.

SONGS operators constantly monitor plant equipment performance and the "health" of the systems. However, when the unit is offline and not producing electricity, it provides an opportunity to comprehensively test or inspect systems in ways that may not be possible when they are operating.

#### SAN ONOFRE'S 2012 PLANNED OUTAGE WORK AND TECHNOLOGY UPGRADES:

- Performing hundreds of inspections and tests on tubes in the plant's two-year-old steam generators, piping systems such as high-velocity water and steam pipes, and some electrical components and systems
- Replacing reactor vessel heads and high-pressure turbines
- Installing new back-up emergency diesel generators, heat exchangers, transformer radiators and switchyard circuit breakers



One objective of the inspections and tests performed during outages involves additional surveillances and analysis to carefully monitor the effects of age on plant equipment. Examples of this type of testing include X-rays, vibration monitoring and acoustic analysis. The goal is to determine the condition of a component and proactively manage the aging process.

During refueling, the energy source that is used to turn water into steam is replenished. One of the benefits of nuclear power plants is that a small amount of uranium-235 can serve as the heat source for extended periods of time compared to other types of fuel such as natural gas, coal, or oil. At San Onofre, the fuel can provide peak energy output for roughly three and a half years, which means the plant is shut down every 21 months for refueling.

### Nuclear Regulatory Commission (NRC) Oversight

The NRC has full-time independent "resident" inspectors at San Onofre who continuously monitor plant operations and report on their observations. Additionally, during planned outages, specialized NRC inspectors visit the site to observe those aspects of outages for which they are responsible to provide expert oversight.