

## ***EPRI Pilot Tests Life-Cycle Management Approach for Large Power Transformers***

***EPRI's Long-Term Operations Program evaluated the use of two EDF asset management tools in developing an optimized life-cycle strategy for 31 large power transformers across the Constellation Energy Nuclear Group fleet.***

As part of the Long-Term Operations Program, EPRI has completed a successful pilot using tools and methods developed by EDF to support life-cycle management for critical nuclear power plant equipment (EPRI product 1023033). The collaborative study, performed with EDF and Constellation Energy Nuclear Group (CENG), evaluated options for refurbishment, spare parts inventory, and replacement schedules for 31 large transformers at CENG's five nuclear units.

The study used two innovative asset management tools: IPOP (Investments Portfolio Optimal Planning) and VME (Exceptional Maintenance Valuation). The IPOP tool was used to identify the optimal life cycle management strategy and to perform sensitivity studies, such as which transformers to repair and which to replace or procure spares for. IPOP input consists of component reliability models, failure history, component condition, cost information associated with each option, and realistic technical and business constraints. IPOP uses an innovative genetic algorithm to identify an optimum strategy among the vast number of options. The VME tool measures the robustness of a given IPOP solution by recognizing that transformers fail randomly and it's not possible to know precisely when such a failure will occur. For example, VME can create probabilistic distributions of net present value for an optimized strategy relative to a more reactive "do nothing" strategy.

The study produced practical results with reasonable effort using information generally available at utilities for asset planning. CENG has already used insights from the assessment to optimize its transformer asset management strategy. As shown in the figure below, the tools can help determine the most appropriate combination of repair and spare procurement actions to minimize costs while maintaining high reliability. The suggested strategy emphasizes near-term procurement of spares coupled with continued repair of large transformers to minimize management costs. EPRI continues to develop the methods in collaboration with EDF within the Long Term Operation Program for applications to a wide range of complex life-cycle management problems.

### Optimal Life-Cycle Management Strategy for Transformer Pilot Study

