ELECTRIC POWER RESEARCH INSTITUTE

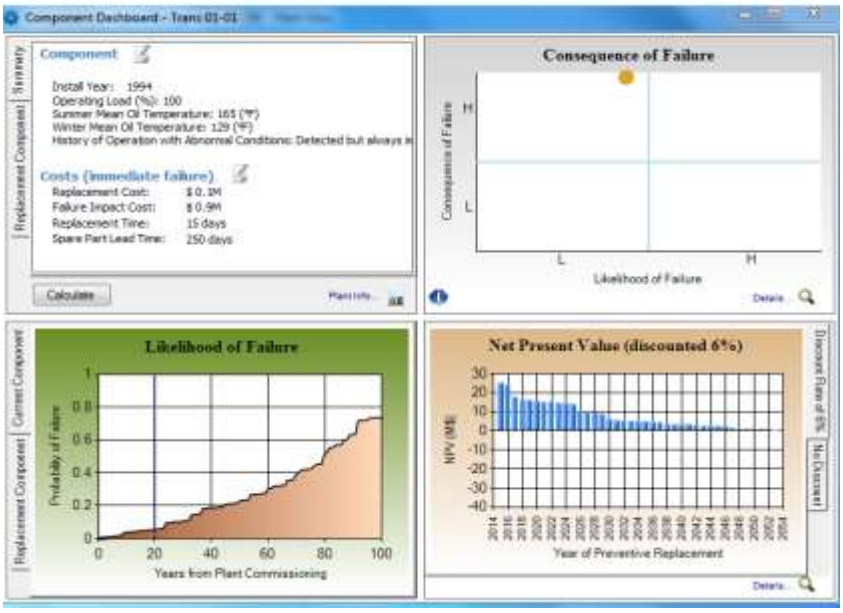
To Replace or Not to Replace…That is Just One of Many Questions

EPRI's Integrated Life-Cycle Management software is now available to support effective decision-making for management of selected nuclear plant and fleet assets.

The Integrated Life-Cycle Management (ILCM) software quantifies decision-making related to large capital investments by integrating equipment failure probability theory with standard accounting methodology to determine the net present value (NPV) for a particular scenario. Such decisions are increasingly important as plant owners determine if and how to extend nuclear plant operations safely and with high reliability.

The software (3002004656, 3002003010) helps system engineers optimize the life cycle of components by: 1) identifying optimum replacement or refurbishment strategies, 2) providing input to spare parts management, 3) balancing investments against the risk of forced outages or unplanned expenses, and 4) graphically providing these results against the normal constraints such as budget and schedule for analyzing capital investment alternatives. Data from the model also will help managers assess investment alternatives when constraints such as budget limits or regulatory requirements make it more difficult to choose among asset management strategies. In short, the software helps decision-makers evaluate the consequences of long-term decisions, such as extension or power uprate, on the asset's life cycle.

The ILCM program can be broken down into four parts: data entry, likelihood of failure (LoF) calculations, NPV calculations, and results. Output is provided in a graphical format as depicted below or in a tabular form.



LoF algorithms have been created for the following components:

- Condensers
- Containment
- Feedwater heaters
- Generator rotor
- Generator stator
- Pressurizer
- Pressurized water reactor (PWR) reactor coolant pump
- Boiling water reactor (BWR) reactor recirculation pump
- Spent fuel pool (SFP)
- Steam generators
- Torus
- Transformers
- Turbine

Because the ILCM project was initially conceived to support long-term operational decisions, the systems, structures, and components (SSCs) chosen to be in the ILCM program were "high-cost, high-consequence" SSCs. Additional SSCs will be added to the database over time. Users also can apply expert judgment to develop a LoF curve based on their own data.

Two utilities have conducted pilot evaluations of the ILCM software to determine whether the LoF curves matched plant operating experience, one focused on transformers and one focused on the torus. In both cases, the curves were validated with minor changes due to different station specific equipment stressors. The first utility then applied ILCM to inform the maintenance and replacement of transformers across its fleet. The optimum strategies recommended through ILCM increased the internal rate of return from 32% to 51%.

EPRI will be conducting two workshops in 2015 to demonstrate the software to interested users. These workshops will be held in conjunction with the Equipment Reliability Working Group summer and fall meetings in June and September. For more information, contact Sam Harvey at 704.595.2637 or sharvey@epri.com.

Electric Power Research Institute
3420 Hillview Avenue, Palo Alto, California 94304-1338 · PO Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 · 650.855.2121 · askepri@epri.com · www.epri.com