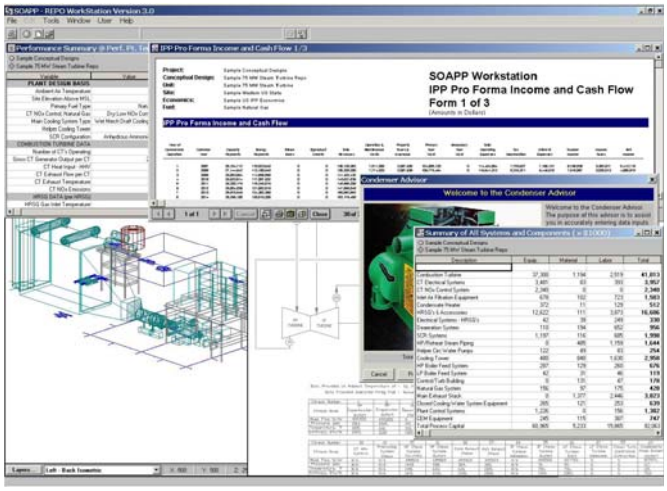
Application of SOAPP Software for Repowering of Arkansas Electric Cooperative Corporation's (AECC's) Fitzhugh Plant

Success Story



The SOAPP software allows planners to readily obtain initial performance and cost estimates for combined-cycle repowering and greenfield plant designs based on site-specific characteristics.

THE CHALLENGE The 40-year-old Fitzhugh plant boiler was close to the end of its design life and was becoming unreliable. However, much of the balance-of-plant, including the steam turbine, had years of useful life remaining. The existing plant also had a number of valuable attributes, including two gas pipelines, rail and interstate highway access, a transmission line, trained staff, simplified permitting requirements, and community acceptance.

The utility needed to decide the best option for the plant as well as how to meet additional capacity requirements. Among the options were: 1) completely refurbish the boiler; 2) retire the 59-MW plant and build a greenfield plant; 3) purchase capacity from merchant generators; or 4) select from a number of repowering alternatives. These latter repowering alternatives included boiler replacement based on fluidized-bed combustion with coal firing, and combined cycle repowering using a gas-fired combustion turbine with a heat recovery steam generator (HRSG) while retaining portions of the existing steam plant.

THE SOLUTION The Electric Power Research Institute (EPRI) provided essential products and services that supported AECC's decision-making process and conceptual plant design. Key among these products and services were EPRI's SOAPP workstation for combustion turbines (SOAPP-CT) and repowering (SOAPP-REPO).

SOAPP-CT is an easy-to-use software program for detailed conceptual design of simple-cycle, cogeneration, and combined-cycle projects. SOAPP software generates detailed, site-specific conceptual designs, heat balances, cost estimates, emission estimates, and technical and economic analyses for bid evaluation and project and proposal development.

SOAPP-REPO integrates process design, costing, and financial analysis for combined-cycle repowering of existing fossil steam plants, enabling users to quickly assess the viability of a repowering scenario on a site-specific basis. SOAPP-REPO includes a re-use plan for the steam turbines, feedwater heaters, and balance-of-plant equipment and critical data inputs for

the existing steam cycle and re-used equipment. The user specifies the repowered plant by selecting a combustion turbine model and the other major new equipment, and enters some key unit, site, fuel, and economic data. The software then configures the repowered plant, sizes and costs the new equipment, and performs detailed performance and financial analyses of the resulting conceptual design. Illustrated wizards guide decisions on condenser refurbishment, utilization of existing feedwater heaters, the capacity of the existing steam turbine, and selection of a combustion turbine model that best matches the existing steam turbine.

AECC utilized the SOAPP-CT and SOAPP-REPO Workstation software packages to readily obtain initial performance and cost estimates for combined-cycle repowering and greenfield plant designs based on site-specific characteristics.

In addition, AECC's participation in EPRI's repowering applications users group from 1994 to 1998 provided a broad perspective on various repowering options and attributes, including performance, cost, and regulatory issues. Background information from that forum coupled with other repowering studies is now offered on a services basis to customers.

APPLICATION AECC was able to examine various technology alternatives and make estimates of the cost and performance of each alternative based on EPRI information and tools. A "fatal flaw" screening was performed to eliminate repowering approaches incompatible from capacity need, technology, and site limitation standpoints. The SOAPP software products generated preliminary estimates of cost and performance for a CT/HRSG system fueled by natural gas.

Cost and performance estimates from SOAPP-REPO, combined with other in-house resources, were used to prepare detailed project capital and operating cost estimates and detailed schedule, and were used by AECC to determine the most economic way to secure additional generating capacity. SOAPP-REPO also helped to establish a reuse plan for existing equipment, recommended potential combustion turbines compatible with the existing steam turbine capacity, and performed overall project economic analysis to help in the optimization of the plant configuration.

The results of the final evaluation showed that combined-cycle repowering of the Fitzhugh plant would be superior to greenfield self-build or power purchase options, given the site and expected operating conditions. Repowering provided the AECC customer base with the lowest cost electricity and reduced risk to potentially high peak market prices in the electricity market. In addition, the local community retained jobs and improved the environment by reducing gaseous emissions of NO_x and CO.

BENEFITS More high quality information was obtained in a timely fashion and at lower cost, as compared to independently assembling such information or hiring consultants and engineering/architecture firms to prepare studies. SOAPP software provided a "hands-on" framework for understanding the important issues in combined-cycle design and plant repowering. More alternatives could be considered and screened effectively, providing a rational way to focus on the most promising alternatives. Initial conceptual design, including performance and cost estimates, was performed on a detailed basis, enabling better scope definition for engineering bids and reserving scarce development resources for important plant condition assessments and detailed design engineering.

"We used EPRI information and SOAPP software tools to work through alternative conceptual designs for repowering our Fitzhugh generating plant," says AECC's David Harris. "By following the same principles, other owners can analyze their own generating resources and make informed choices that will ensure the best value for their investment."

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