

General Electric-Hitachi
partnered with
Idaho National Laboratory

NE-19-17634, Enabling System Technologies to Improve the Economics and Performance of Existing LWRs and Advanced BWR Plants: Improving Off-gas System Performance

YEAR AWARDED: 2019

TOTAL PROJECT VALUE: \$625k (DOE Funds Awarded: \$500k; Awardee Cost Share: \$125k)

STATUS: Completed

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DESCRIPTION: The U.S. boiling water reactor (BWR) fleet is facing significant cost pressures due to the market price of base-loaded electricity. Operations costs continue to rise, and the market cost of base-loaded generation is declining. This cost pressure has resulted in the shutdown of several nuclear plants, significant staff reductions, and financial losses in base-load generation. The base-load power grid in some areas is experiencing stress due to loss of reliable generation. The BWR fleet is aggressively looking for ways to improve BWR systems performance with new and innovative/enabling technologies to help achieve improved economics. It was recently determined that the BWR off-gas systems were significantly oversized. The result is high costs and lack of available system parts to maintain this oversized performance margin.

BENEFIT: Boiling water reactors compose roughly one-third of the United States nuclear fleet, which produces more than half of the nation's carbon-free electricity. As drought and wildfires from climate change threaten the nation's energy grid, fewer and fewer people are disputing the urgent need to reduce greenhouse gas emissions. As part of this DOE GAIN voucher, General Electric-Hitachi, working with the BWR Owner's Group, Argonne National Laboratory and the Idaho National Laboratory, provided improved operational guidance for the current and advanced BWR off-gas system designs and identified off-gas system design improvements for use in BWR SMRs

IMPACT: Having produced nuclear reactors around the world since the mid-1950s, GE Hitachi is committed to keeping the current fleet operating economically and efficiently as it develops new reactors of all sizes, including the BWRX-300 SMR, the first small modular BWR, the first of which it hopes to have in operation by 2027.

NEXT STEPS: The BWR Owner's Group Off-Gas System improvement committee is developing recommendations to use the performance margins found in the Off-Gas Systems and providing recommendations related to improving the Alternate Source term (AST). Information from this project is also being used in ongoing BWR fleet training and knowledge retention programs.