

Facilitating Nuclear Power Upgrades



Are nuclear power plants ready for a new dawn?

Background, Objectives, and New Learnings

Nuclear power's contribution and value in meeting climate goals is being recognized across the globe. To fully realize and maintain this value, however, nuclear power plants (NPPs) need to remain cost-competitive in the energy marketplace. Safely maximizing the power output of existing NPPs not only enhances the economic viability of nuclear plants, but also delivers benefits for the environment and the public.

NPPs around the world are in varying stages of power upgrades, with some doing no upgrade at all, and some implementing one or more of the three standard types of upgrades: Measurement Uncertainty, Stretch, and Extended. There is some reason to believe, however, that there may be additional upgrade potential beyond these types. To maximize the value that nuclear power can contribute to meeting climate goals, NPPs can leverage the latest technology to increase allowed power levels, which *includes going beyond the traditional Extended power upgrade.*

This project will build upon EPRI product 3002022700, *Technology Innovation: A Roadmap to Leverage Existing Nuclear Power Plants to Increase Zero-Carbon Energy Production*, by looking at the technical "pinch-points" that may be preventing NPPs from upgrading to their maximum extent.

The objective of this research is to *identify and assess opportunities and new technologies* that could be used to overcome the technical limitations in systems, structures, and components (SSCs) that are preventing initial and subsequent power upgrades.

- This project will investigate innovative technologies and processes that can address technical barriers (pinch-points) potentially preventing power upgrades.
- Research activities will identify mitigating actions and solutions for overcoming these technical barriers.
- Research results could enable nuclear plant owners to maximize the value of existing plants while meeting climate goals.

The specific technical limitations that may be addressed in this research include, but are not limited to:

- Heat sink temperature
- Environmental discharges
- Heat exchanger efficiencies
- Coolant flow rates
- Turbine-generator performance.

This research will also evaluate potential efficiency improvements, such as reducing house loads, which could directly add to the net generation of the nuclear power plants.

The new learnings from this research will be the technology assessments and method analyses that can inform decisions regarding power upgrades.

Benefits

Through the availability of additional generating capacity from nuclear power plants, the public will benefit from ongoing access to a reliable, economic source of electricity and from the avoidance of additional carbon emissions.

Project participants will benefit from the analysis and potential availability of solutions that could result in increased electrical generation. Participants also may achieve higher NPP reliability since some of the barriers preventing power upgrades may result in valuable modifications and equipment upgrades.

It is expected that the results of this research will be applicable to all reactor types and secondary side suppliers.

Project Approach and Summary

EPRI will form a Technical Advisory Committee to identify and prioritize specific SSCs or technical barriers for further evaluation.

Some of the possible SSCs/areas are:

- Main Generator Strategies
- HP & LP Turbine Opportunities
- Heat Sink Temperature Options

Based on the prioritization and available funding, EPRI will conduct detailed analyses of 2-3 SSCs/technical barriers per year, examining new technologies and strategies to cost-effectively overcome the limitations preventing power uprate.

Recommendations and suggestions will be identified that look at major modifications as well as alternate strategies for addressing low margin SSCs.

Each analysis will include a standalone report to inform site-specific evaluation and implementation.

Future year projects may include the evaluation of additional SSCs/technical barriers and the execution of site pilots implementing proposed solutions and recommendations.

Deliverables

The deliverables for this project are technical reports that describe opportunities, new technologies, and strategies for addressing performance margin concerns with SSCs preventing maximum power uprate capability.

The non-proprietary results of this work will be incorporated into EPRI R&D Programs and made available to the public for purchase or otherwise.

Price of Project

The cost of this supplemental is \$15,000 per participant plus \$5,000 per unit, with a maximum of five units. EPRI will need a minimum of 8-10 funders to conduct 2-3 analyses per year. Participation in this project requires a three-year commitment.

Project Status and Schedule

It is expected that the first round of projects would be completed within 12 months and start in early 2023; subsequent projects would follow a similar time schedule.

Who Should Join

NPP owners looking to maximize the value and output of existing power plants.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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