RECLAMATION
Managing Water in the West

U.S. Department of the Interior
Bureau of Reclamation

Non-dispatchable Renewable Integration

Determining the costs occurred by hydro generation in supporting the integration of wind and solar

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Hydropower's operational characteristics make it a valuable resource to support the integration of non- dispatchable renewable energy, such as wind and solar, into the power system. Providing these services results in increased hydro generator starts/stops and power cycling. This project strives to determine realistic costs realized by hydro utilities when providing these services.

Mission Issue

Assigning realistic costs each time a hydropower generator starts, stops, and is ramped between loads allows planners to determine the most cost efficient and effective way of operating hydro generators. Determining a justifiable life- cycle cost is essential to insuring the long-term viability of hydro generation.

Principal Investigator

Jim DeHaan
Electrical Engineer
Hydropower Diagnostics & SCADA Group
Technical Service Center
jdehaan@usbr.gov

Research Office Contact

Erin Foraker
Renewable Energy and Infrastructure
Research Coordinator
eforaker@usbr.gov

Problem

There is growing concern in the hydro industry that hydro generation costs associated with the integration of non-dispatchable renewable energies such as wind and solar is not well understood, but the costs are significant and there is justification to provide budgetary compensation to hydropower facilities for providing these services.

Solution

Reclamation, along with the hydropower industry, has a significant role in the successful integration of non-dispatchable generation such as wind and solar energy. Hydropower's operational characteristics make it a valuable resource to support non-dispatchable renewable energy. But providing these services comes with a cost. This research effort continues ongoing research work in identifying and quantifying these costs.

The hydro industry as a whole is interested in this topic, Reclamation is working with our hydro generation partners on this research project. This helps leverage Reclamation's efforts and costs. Reclamation’s participation in CEATI International, Inc.

Hydraulic Plant Life Interest Group (HPLIG) provides the access and structure needed for Reclamation to work collaboratively with other utilities and industry experts. Reclamation is participating and helping direct HPLIG projects related to renewable integration to insure the results are applicable. Non-dispatchable renewable integration research work over the last 3 years has focused on two main efforts with HPLIG: (1) determining the effects of starts/stops and load cycling on hydro generators, particularly concerning unit fatigue issues such as rotor pole attachment cracking, and (2) developing a standard methodology to evaluate start/stop and cycling costs and impacts.

"Reclamation is being called upon more frequently to start and stop units to support grid reliability, but the tools and methods available to understand the costs of these start/stops have been lacking. The development of this cost model will provide great value to Reclamation by delivering more reliable start/stop costs through a more user-friendly process."

Mike Pulskamp,
Power Resources Office Manager

Collaborators

CEATI HPLIG Member Utilities

More Information

https://www.usbr.gov/research/projects/detail.cfm?id=2533

https://www.usbr.gov/research/projects/researcher.cfm?id=13

Application and Results

Reclamation has participated in CEATI workshops and reviews that have helped identify components susceptible to fatigue and quantify the impact and expected loss of life as it relates to unit starts/stops and unit cycling. These workshop presentations are not publicly available but are available to all CEATI HPLIG members, including all Reclamation personnel, via CEATI's website www.ceati.com.

Currently, Reclamation is partnering with CEATI HPLIG member hydro utilities to perform and complete a study entitled "Establishing a Standard Methodology to Evaluate Start/Stop and Cycling Costs and Impacts". The study will require about 1 year to complete.

Future Plans

The establishment of a methodology is the first phase of a 3-phase project to determine start, stop, and cycling costs. Phase 2 will involve building a template for specific generator assets, collect data necessary for a preliminary analysis, and refining the methodology as necessary to improve the final result. Phase 3 will involve continuing to refine the methodology through detailed analysis of the collected data. The final product will be a methodology to determine costs associated with starts, stops, and unit cycling along with templates to help collect and analyze the data needed for the study.

Reclamation plant operator starting a hydro generator.