Memorandum from the Office of the Inspector General

December 22, 2025

Allen A. Clare
Robert Bryan Williams

REQUEST FOR FINAL ACTION – EVALUATION 2025-17564 – HYDRO LIFE EXTENSION

Attached is the subject final report for your review and final action. Your written comments, which addressed your management decision and actions planned or taken, have been included in the report. Please notify us when final action is complete. In accordance with the Inspector General Act of 1978, as amended, the Office of the Inspector General is required to report to Congress semiannually regarding evaluations that remain unresolved after 6 months from the date of report issuance.

If you have any questions or wish to discuss our findings, please contact Lindsay J. Denny, Director, Evaluations - Operations, at (865) 633-7349. We appreciate the courtesy and cooperation received from your staff during the evaluation.

Greg Stinson
Assistant Inspector General
(Audits and Evaluations)

RCC:FAJ
Attachment
cc (Attachment):

TVA Board of Directors
Tom W. Barnett
Suzanne H. Biddle
Jessica E. Dufner
Kelie H. Hammond
Tracy E. Hightower
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OIG File No. 2025-17564

Office of the Inspector General

Evaluation Report

To the Senior Vice President, Generation, and to the Senior Vice President, Generation Projects and Fleet Services

HYDRO LIFE EXTENSION

Evaluation Team
Randall C. Clapp
Heather M. Cook

Evaluation 2025-17564
December 22, 2025

ABBREVIATIONS

HLE	Hydro Life Extension
ISD	In-Service Date
MW	Megawatt
TVA	Tennessee Valley Authority

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APPENDIX

Evaluation 2025-17564 – Hydro Life Extension

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

The Tennessee Valley Authority (TVA) has 109 conventional hydroelectric generating units with a capacity of 3,783 megawatts (MW). The hydro fleet supports TVA's mission of providing clean, reliable, and affordable electricity to people and businesses of the Tennessee Valley. As of 2021, 53 of TVA's 109 hydro units had low asset health scores indicating the need for repair.

To extend the life of the hydro fleet, the Hydro Life Extension (HLE) program was formed in 2021. Each HLE project is evaluated to determine the scope necessary to meet four possible intended results:

- **Maximize Availability** – Increasing unit availability to 80-85 percent.
- **Increase Efficiency** – Increasing MWs with the same amount of fuel and meeting contractual specified efficiency targets. According to TVA this goal is only applicable to HLE projects that include a turbine replacement.
- **Increase Flexibility** – Quicker startup times, wider operating range, or increasing the maximum MW output.[i]
- **Maximize Project Execution Efficiency** – Completing project within10 percent of proposed budget and 30 days of agreed in-service date (ISD).

Due to the importance of TVA's hydro fleet in providing low cost, clean, and reliable energy, we performed an evaluation of TVA's HLE program to determine if the program was achieving intended results.

What the OIG Found

We determined the HLE program achieved the intended results on completed projects for availability, efficiency, and flexibility, but did not meet the efficient project execution goal for some projects. Specifically:

- All hydro units that have completed an HLE project have availability greater than 85 percent.

[i] For this evaluation, we focused on increased MW output due to its importance to the TVA system.

EXECUTIVE SUMMARY

- All 4 hydro units that have completed a turbine replacement as part of an HLE project met contractual vendor efficiency guarantees[ii] and increased efficiency.
- All hydro units that have completed an HLE project achieved their intended result to increase generation output capability.[iii] In total, the HLE projects added an additional 29 MWs of capacity.
- All HLE projects met budget targets, but only two met ISD targets. Variances between target and actual ISDs ranged from 59 to 261 days.

While HLE projects have increased the maximum output capability, these additional MWs cannot be transmitted to the system due to transmission limits[iv] for the hydro sites. The transmission limits (1) were not evaluated during HLE project planning and (2) have not been increased due to a lack of funding. In addition, we found one lesson learned related to cost and schedule had not been incorporated into future projects as required.

What the OIG Recommends

We recommend the Senior Vice President, Generation Projects and Fleet Services, (1) develop a plan to address transmission limits at the sites with increased MW generation capability, (2) formalize a process to evaluate transmission impacts in the planning phase for HLE projects, and (3) reinforce the expectation to incorporate lessons learned.

TVA Management's Comments

Prior to issuing a formal response, TVA management reviewed the draft report and provided informal comments that have been incorporated into the final report as appropriate. In TVA management's formal response to the draft report, they provided planned actions to address our recommendations. See the Appendix for TVA management's complete response.

Auditor's Response

We agree with TVA management's planned actions to address our recommendations.

[ii] TVA was unable to perform a complete test for 1 unit; however, a complete test was performed on an identical unit design at the same plant that met contractual vendor guarantee.

[iii] One HLE project did not include an intended result to increase MWs due to operating characteristics.

[iv] Transmission limits were set by an assessment from 2017 as a basis for transmission interconnection.

BACKGROUND

The Tennessee Valley Authority (TVA) has 109 conventional hydroelectric generating units with a capacity of 3,783 megawatts (MW). The hydro fleet supports TVA's mission of providing clean, reliable, and affordable electricity to people and businesses of the Tennessee Valley. As of 2021, 53 of TVA's 109 hydro units had low asset health scores indicating the need for repair.

Prior to 2021, TVA utilized various programs to address extending the life of the hydro fleet. However, due to lack of funding and limited scope of these programs, performance in the hydro fleet declined. To extend the life of the hydro fleet, the Hydro Life Extension (HLE) program was formed in 2021 with dedicated funding and scope. Hydro units are evaluated and prioritized based on the condition of the turbine, generator stator, and generator rotor. As of April 10, 2025, 7 HLE projects had been completed with 16 projects ongoing.

To execute the HLE program, TVA's Hydro Generation and Generation Projects and Outage Management organizations signed an internal service level agreement to best leverage their resources and core-capabilities. Each HLE project is evaluated to determine the scope necessary to meet four possible intended results:

- **Maximize Availability** – Increasing unit availability to 80-85 percent.
- **Increase Efficiency** – Increasing MWs with the same amount of fuel and meeting contractual specified efficiency targets. According to TVA, this goal is only applicable to HLE projects that include a turbine replacement.
- **Increase Flexibility** – Quicker startup times, wider operating range, or increasing the maximum MW output.[1]
- **Maximize Project Execution Efficiency** – Completing project within 10 percent of proposed budget and 30 days of agreed in-service date (ISD).

To continuously improve, TVA documents and incorporates lessons learned to improve processes to work safer, more efficiently, and with higher quality.

Due to the importance of TVA's hydro fleet in providing low cost, clean, and reliable energy, we performed an evaluation of TVA's HLE program.

[1] For this evaluation, we focused on increased MW output due to its importance to the TVA system.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of this evaluation was to determine if TVA's HLE program is achieving intended results. The scope of the evaluation was completed HLE program projects as of April 10, 2025. To achieve our objective, we:

- Reviewed documentation and interviewed TVA personnel to identify the HLE program's intended results.
- Reviewed TVA Standard Programs and Processes 34.000 *Project Management* to identify project management requirements.
- For each of the 7 completed projects, we:
  - Reviewed unit-availability data, after the HLE projects ISD through May 31, 2025, to determine if the post-project availability intended result was met.
  - Reviewed unit-efficiency data to determine if the (1) HLE project achieved vendor efficiency guarantees and (2) unit efficiency increased for the 4 projects with turbine replacements.
  - Compared prior and new MW output to determine if HLE project had increased MWs for the unit.
  - Compared maximum MW outputs to site transmission limits to determine if transmission can support increased maximum MW output.[2]
  - Reviewed transmission screening studies[3] to determine if studies were performed during the HLE project planning phase.
  - Compared actual and forecasted budget and ISD information to determine if projects were within approved budget and schedule. For projects not within approved budget or schedule we reviewed:
    - Lessons learned and completed site interviews to determine causes.
    - Documentation and conducted interviews to determine if solutions identified in lessons learned were incorporated.

This evaluation was conducted in accordance with the Council of the Inspectors General on Integrity and Efficiency's *Quality Standards for Inspection and Evaluation*.

FINDINGS

We determined the HLE program achieved the intended results on completed projects for availability, efficiency, and flexibility, but did not meet the efficient project execution goal for some projects. Specifically:

- All hydro units that have completed an HLE project have availability greater than 85 percent.

[2] Six of seven completed units increased MW output as a result of HLE projects.

[3] Transmission screening studies are performed to estimate potential costs of transmission limit increases.

- All 4 hydro units that have completed a turbine replacement as part of an HLE project met contractual vendor efficiency guarantees[4] and increased efficiency.
- All hydro units that have completed an HLE project achieved their intended result to increase generation output capability.[5] In total, the HLE projects added an additional 29 MWs of capacity.
- All HLE projects met budget targets, but only two met ISD targets. Variances between target and actual ISDs ranged from 59 to 261 days.

While HLE projects have increased the maximum output capability, these additional MWs cannot be transmitted to the system due to transmission limits for the hydro sites. The transmission limits (1) were not evaluated during HLE project planning and (2) have not been increased due to a lack of funding. In addition, we found one lesson learned related to cost and schedule had not been incorporated into future projects as required.

INCREASED MW OUTPUT CANNOT BE TRANSMITTED DUE TO FUNDING AND PLANNING

As previously mentioned, HLE projects have increased the maximum MW output at 6 units; however, the increased MW output cannot be utilized due to current transmission limits. As a result, approximately 29 MWs gained from HLE projects cannot be transmitted to the grid. We identified funding and planning as the two main causes for the issue.

Planning

To increase transmission limits, each unit must go through a transmission interconnection evaluation process, which identifies affected transmission systems and includes estimated project scope and cost. However, the interconnection evaluations can take up to 2 years which does not align with the planning period for HLE projects. To address the timing issues, preliminary transmission screening studies can be performed to estimate costs and schedule for transmission limit increases. However, none of the 7 projects had preliminary screening studies performed during planning. While HLE program personnel are working to increase transmission limits at completed projects, there is no formal guidance or process for transmission impacts to be evaluated and considered during the planning phase for future HLE projects.

[4] TVA was unable to perform a complete test for 1 unit; however, a complete test was performed on an identical unit design at the same plant that met contractual vendor guarantee.

[5] One HLE project did not include an intended result to increase MWs due to operating characteristics.

Funding

TVA has evaluated 5 of the completed HLE projects and determined the cost to increase transmission limits will be approximately $10 million. According to Transmission personnel, Transmission is not responsible for the cost of any transmission upgrades required to increase transmission limits. However, HLE program management does not agree that transmission upgrade costs should be paid out of the program budget. Without agreement on what group will pay to increase transmission limits, TVA is not realizing 29 MWs of additional capacity.

SOME HLE PROGRAM ISDs WERE NOT MET

While all 7 of the completed HLE projects met their budget target, 5 did not meet their intended ISD. Variances between target and actual ISDs ranged from 59 to 261 days. We reviewed the nine lessons learned with the biggest impact on project cost and schedule and found the following themes: (1) discovery of unexpected issues during the outage, (2) difficulty coordinating work with the vendor, and (3) vendor quality of work. We reviewed the actions taken to incorporate the nine lessons learned and determined one related to the inspection method for the generator rotor had not been addressed. TVA informed us that while the HLE program personnel have a process for reviewing lessons learned throughout the project, there is no formal process for confirming that lessons learned have been incorporated. Verifying the incorporation of lessons learned could help the HLE program achieve intended results.

RECOMMENDATIONS

We recommend the Senior Vice President, Generation Projects and Fleet Services:

- In conjunction with the Vice President, Transmission System Projects, and the Vice President, River Operations, evaluate the results of transmission studies and develop a plan to determine which transmission upgrades to pursue and responsibilities for funding.

  TVA Management's Comments – TVA management stated that, in collaboration with Transmission, they plan to formalize a plan to determine which hydro plant transmission upgrades will be economically beneficial for TVA and the appropriate funding source for these projects. See the Appendix for TVA management's complete response.

  Auditor's Response – We agree with TVA management's planned action.

- Formalize a process to evaluate transmission impacts in the planning phase for HLE projects.

  TVA Management's Comments – TVA management stated that in coordination with Transmission, Generation, and Generation Projects and Fleet Services, a formalized process will be documented to evaluation system impacts within the HLE project planning and design phases for Hydro

megawatt uprate opportunities. See the Appendix for TVA management's complete response.

Auditor's Response – We agree with TVA management's planned action.

- Reinforce the expectation to incorporate lessons learned as part of the continuous improvement process.

  TVA Management's Comments – TVA management stated they will develop a communication that will reinforce continued performance of this expectation. See the Appendix for TVA management's complete response.

  Auditor's Response – We agree with TVA management's planned action.

December 12, 2025

Greg Stinson, WT 2C-K

RESPONSE TO REQUEST FOR COMMENTS - DRAFT EVALUATION 2025-17564 HYDRO LIFE EXTENSION (HLE)

This letter is in response to the Draft Evaluation 2025-17564 Hydro Life Extension. Generation Projects and Fleet Services (GP&FS), as well as Generation would like to express their appreciation for Randall Clapp, Heather Cook, and the Office of Inspector General's thorough evaluation of the hydro life extension program. We recognize the importance of continuous improvement, which ensures we are striving to become more efficient and effective within all aspects of our business.

Recommendations:

1. **In conjunction with the Vice President, Transmission System Projects and the Vice President, River Operations, evaluate the results of transmission studies and develop a plan to determine which transmission upgrades to pursue and responsibilities for funding.**

   Response:

   GP&FS and Generation both agree with the recommendation to formalize a plan (in collaboration with Transmission) to determine which hydro plant transmission upgrades will be economically beneficial for TVA, and the appropriate funding source for those projects. CR#2054530

2. **Formalize a process to evaluate transmission impacts in the planning phase for HLE projects.**

   Response:

   In coordination with Transmission, Generation, and GP&FS, a formalized process will be documented to evaluate system impacts within the HLE project planning and design phases for Hydro Megawatt Uprate opportunities. CR#2054530

3. **Reinforce the expectation to incorporate lessons learned as part of the continuous improvement process.**

   Response:

   GP&FS and Generation are in full alignment with this recommendation and will develop a communication that will reinforce the continued performance of this expectation. CR#2054530

Thank you for allowing us to provide these comments. Please contact us if you have any questions.

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