

ES4RR-Energy Storage Sizing Using Technoeconomic and Power System Modeling

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The **Energy Storage for Rural Resilience (ES4RR)** program provides technical assistance (TA) to ten capacity-limited rural utilities. PNNL is delivering tailored assistance in developing the utility's ideas for resilience improvements utilizing energy storage from concept to fully scoped projects based on their identified energy challenges and goals.

The program has engaged public power utilities and electric cooperatives and is executed in partnership with American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA). The TA projects span a variety of techno-economic analysis, modeling, interpretation of regulations and policies to support energy storage project development that can deliver measurable impact to the reliability and resilience of rural electric grids.

This poster describes the TA work for Georgia Transmission Corporation, Tipmont Electric Cooperative, and Wayne-White Electric Cooperative as part of the NRECA partnership.

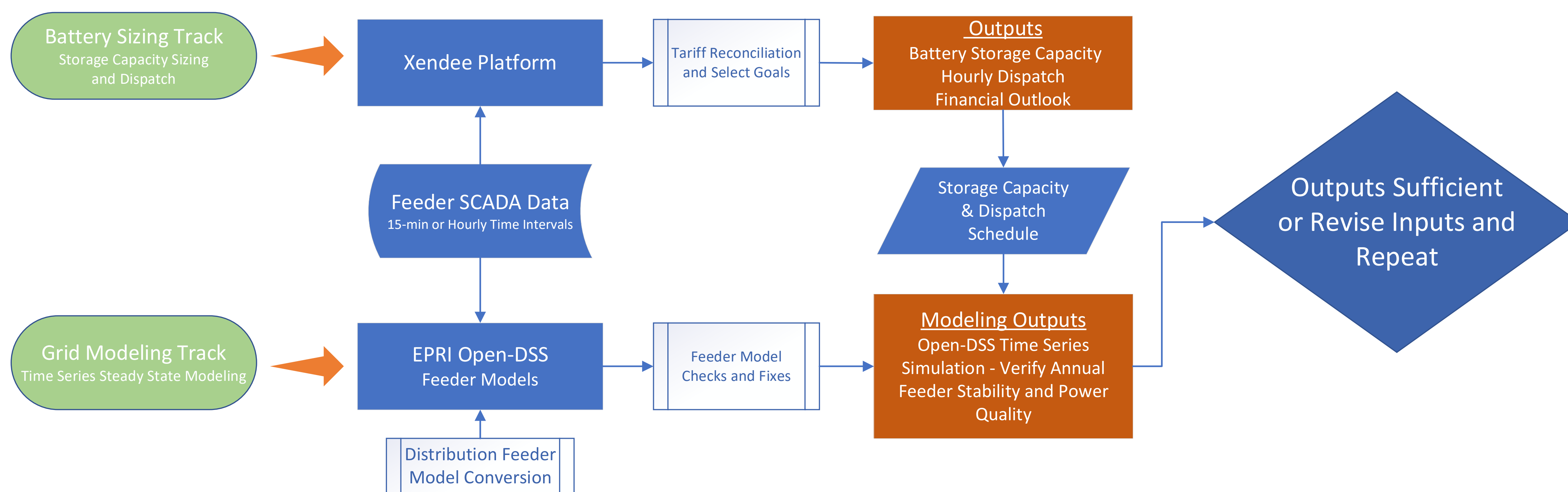


Fig 1: PNNL's approach follows the same basic process described in this block diagram for all three partners. This methodology was selected to be both effective and practical for future use by the three partners. Data needs include time-interval SCADA load data of sufficient resolution and feeder models to accommodate accurate power system modeling and economic returns.

Georgia Transmission Corporation (GTC)

Objective – project support to gain understanding of modeling and data requirements for pilot BESS project designed to meet resilience goals, as well as insight on operational scenarios, protection and control considerations.

Methodology

- **Engineering support** to validate the sizing of the BESS and quantify the benefits as well as perform distribution modeling, resource adequacy analysis, and evaluation of thermal and voltage limits.
- **Convey energy storage operational knowledge** to assess physical and operational considerations regarding roles and responsibilities of GTC and its member cooperatives.

Challenges – proposed project location spans ownership of GTC transmission system and cooperative's distribution system which requires unique collaboration and controls.

Impact - GTC intends to deploy the BESS with confidence that operation will not adversely impact the safety or normal operation of the EMC distribution system.

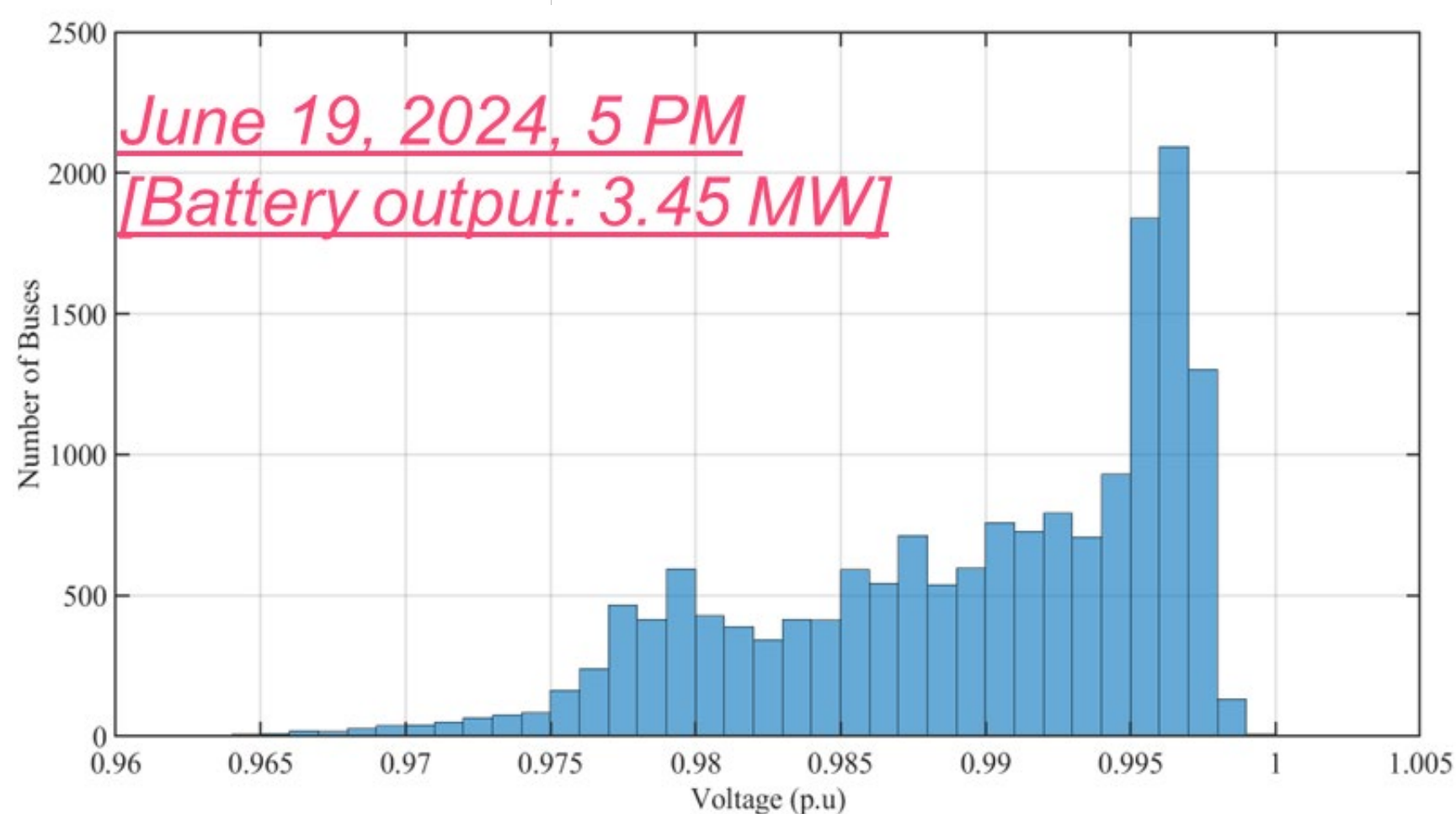
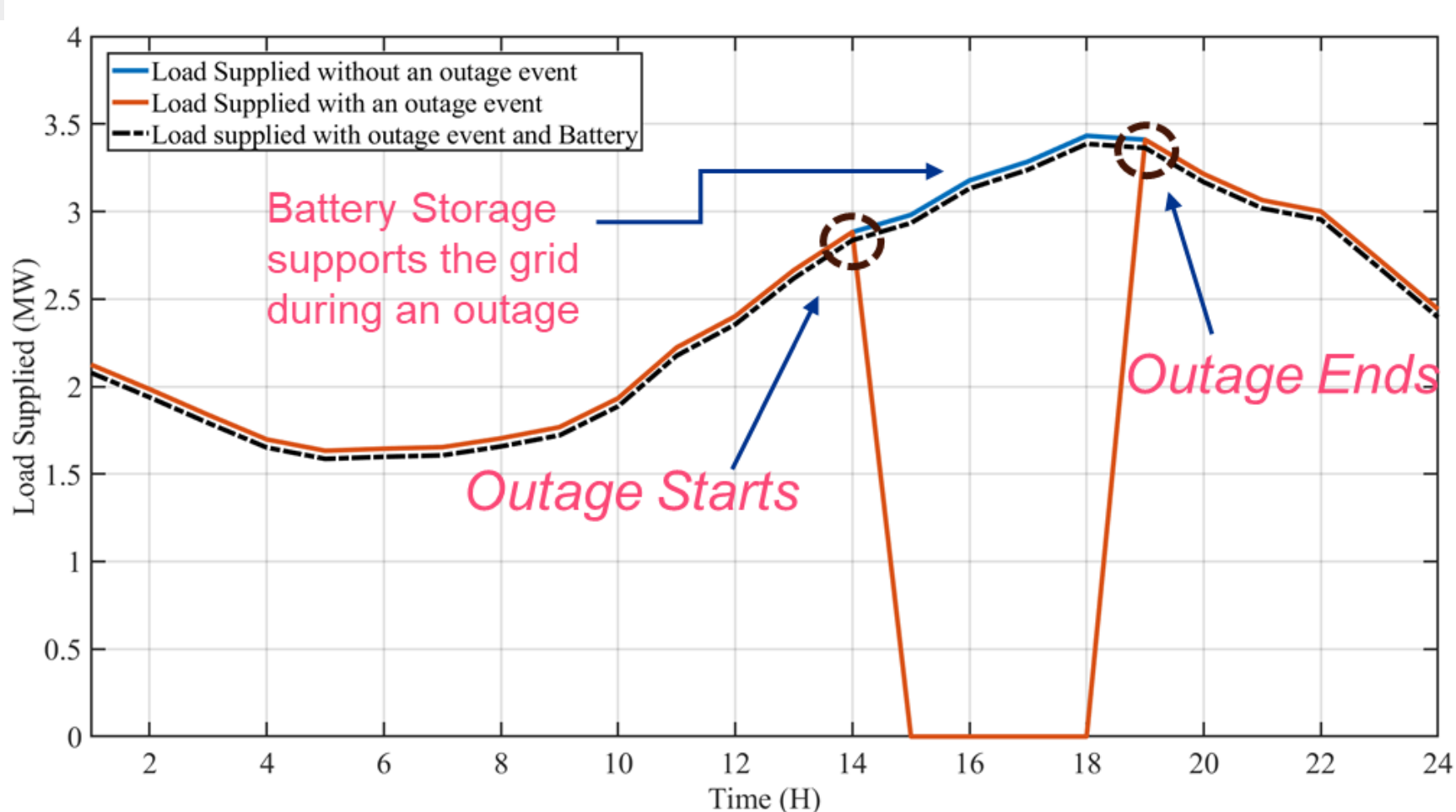


Fig 2: Results of Xendee Battery and Open-DSS Simulation.

Tipmont Electric Cooperative

Objective – assist Tipmont on BESS project design to reduce peak demand and defer infrastructure investment, in addition to collating knowledge of the benefits and drawbacks of different storage technologies.

Methodology

- **Technoeconomic analysis** to review and prioritize potential substations and feeders for project location as well as perform a cost-benefit analysis of the system.
- **Information** on potential use cases and value stacking options for BESS, as well as recommendations for operations and maintenance best practices.

Challenges – fidelity of distribution system model conversion to OpenDSS and uncertainty of financial impact of BESS due to role of market agent.

Impact – Tipmont intends to prepare for potential future funding opportunities with a promising BESS project that is financially and technically viable.

Wayne-White Electric Cooperative

Objective – review BESS project plan and perform financial analysis to estimate potential returns, as well as technical support on protection schemes.

Methodology

- **Technoeconomic analysis** to reassess proposed project, estimate payback period and review impact of material tariffs on project economics.
- **Technical support on protection and controls** to provide assistance and grid modeling of protection and control measures to optimize BESS performance and reliability.

Challenges – variable rate tariff design with coincident demand charges based on MISO's monthly peak demand which requires forecasting and detailed modeling.

Impact – Wayne White intends for this pilot BESS to serve as a successful showcase of the benefits of energy storage to inspire future BESS projects across other substations within their service territory.