



ESTF Update
Arizona Tribal Energy
Association

February 18, 2021

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ESTF update

- The ESTF was organized under the governance of the Joint Guidance Committee in May 2020
- [ESTF Website](#)
- Created three Task Forces
 - ES Operations Task Force (ESOTF)
 - ES Commercial Task Force (ESCTF) and;
 - ES Modeling Task Force (ESMTF)

ESOTF

- ESOTF meets the first Monday of the month
- ESOTF Work Plan
 - Develop Energy Storage Technology Database
 - Characterize Similarities & Differences
 - Identify tasks required /desired for storage
 - Survey utility experiences and operational challenges
 - Correlate existing NERC/WECC requirements
- Collaborate with NERC IRPWG work on Energy Storage

ESOTF update

- BA Energy Storage Survey complete
 - Survey was sent to BAs
 - Sought to inventory storage in WECC and learn how they were being used, what worked, and what didn't
 - Hope for insight into storage user experience and future performance goals was limited
- ESOTF received presentations on various ES topics
- Industry has been publishing papers on storage capabilities
 - NERC report on Inverter-Based Resource and Hybrid Plant Capabilities
 - [NREL report Grid Scale Battery Storages](#)

ESOTF update

- ESOTF refocusing efforts on operating needs and experience to build on, rather than duplicate industry efforts
- ESOTF Survey #2 under development
- Survey will be sent to a much broader audience
- Focus of next survey will be on operational need and experience
 - Storage functions
 - How does ESS fit in resource planning?
 - How is the resource plan executed?
 - Control and monitoring needs and experience
 - Conflicts in operation: Resource vs. ancillary services, contractual constraints
 - Distribution level ESS: How does it feed into BPS operation?

ESOTF update

- Future Plans
 - Complete Survey #2
 - Consolidate and categorize survey findings
 - Targeted follow-up questions to survey responders
 - Continue to receive presentations on relevant topics
 - Coordinate with ESCTF, ESMTF, and ESTF

ES Commercial Task Force

- ESCTF meets the third Tuesday of each month
- Developed Workplan with focus around education
- BESS and hybrid resources (typically, solar + storage or wind + storage) are a dominant new resource on the grid, composing a majority of the interconnection queue in CAISO and other regions
 - In 2020 the ESCTF focused initially on bringing everyone up to speed on capabilities, design features, etc.
- Topics covered included:
 - CAISO interconnection queue and hybrid resources initiative
 - Capabilities of Inverter-Based Resources (IBRs) providing grid services
 - BESS/hybrid degradation, cycling, warranties, O&M, and recycling/end-of-life
 - BESS safety

ESCTF 2021 Focus: Products & Services

- The January 2021 meeting featured brainstorming session on how BESS and hybrid resources can provide reliability services
- Discussion focused on enhancements to existing services and creation of new services to take advantage of enhanced capabilities of IBRs
- Items discussed include:
 - 1 second AGC / frequency regulation product
 - Creation of extraordinary ramp rate option as a premium offering
 - Standardized headroom product for inverter-based resources
 - Black start product (capacity payment) for VERs/hybrids/BESS
- These items were discussed during the February 16 ESCTF meeting
 - In addition, they discussed the benefits of adopting a universal market participation model
- Next step → identify value propositions and metrics of these enhanced offerings, and pursue a study that calculates benefits

ES Modeling Task Force (ESMTF)

- ESMTF meets the third Wednesday of each month
- Purpose: address modeling needs for system performance analyses associated with integration of energy storage devices (ESD)
 - Steady-state analysis – includes power flow and production cost software tools
 - Dynamics analysis – using positive-sequence modeling as well as advanced three-phase modeling software tools
 - Short-circuit analysis – by adapting recently implemented IEEE recommended wind/solar models in software tools
- Product: guidelines, white papers, best practices for WECC stakeholders
- “*Guidelines for Modeling ESDs*” document now available
 - Approved by WECC RAC on Feb-11, 2021

Guidelines for Modeling ESDs

- Intended to serve as one-stop reference for models currently available in widely used commercial software programs (such as PSLF, PSS/E, PowerWorld, GridView, Promod, ASPEN, PSS/CAPE, etc.)
- Addresses ESDs in Storage-only plants as well as in Hybrid plants
- ESD Modeling for each type of analysis is categorized by type of electrical Interface to Grid
 - Synchronous Machine (SM) Interface – e.g. Pumped Storage Hydro (PSH)
 - Inverter Interface – e.g. Battery Energy Storage System (BESS) / Hybrid

Guidelines for Modeling ESDs

1. Introduction
 2. Power Flow Modeling: SM interface & Inverter interface
 3. Dynamic Modeling: SM interface & Inverter interface
 4. Short Circuit Modeling: SM interface & Inverter interface
 5. Production Cost Modeling: SM interface & Inverter interface
- Appendices
 - A – Pumped Storage Hydro Power Flow & Dynamic Modeling References
 - B – Pumped Storage Hydro – Primer & Glossary
 - C – Pumped Storage Hydro Production Cost Modeling References

Guidelines for Modeling ESDs

- Each section provides references to the relevant NERC, WECC, IEEE and/or EPRI documents for more detailed modeling information
 - NERC Reliability Guideline on *Performance, Modeling and Simulations of BPS Connected Battery Energy Storage Systems and Hybrid Power Plants*
 - WECC White Paper on *Modeling Hybrid Power Plant of Renewable Energy and Battery Energy Storage System*
 - IEEE PES Technical Report TR78: *Modification of Commercial Fault Calculation Programs for Wind Turbine Generators*
 - EPRI ISO and RTO Energy Storage Market Modeling Working Group White Paper: *A report on current state of art in modeling energy storage in electricity markets and alternative designs for improved economic efficiency and reliability*



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