Progress on Tribal Energy Storage Analysis

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Abstract: Many Native American reservations in the United States are situated in sparsely populated areas where electricity costs are high and power grid reliability is poor. Reflecting their traditional values of self-determination, these communities are striving for energy independence. Consequently, several solar photovoltaic projects have been established on tribal lands in recent years. In the next phase, tribes are considering adding energy storage systems to these projects to enhance their economic value, increase grid resilience, and improve power quality. The Sandia team has embarked in two energy storage analytics projects. The first analysis investigates the benefits that an energy storage system could provide to the Red Mesa solar farm located within the Navajo Nation. The second analysis focuses on evaluating the benefits that an energy storage system could provide to a behind-the-meter solar PV system located in the Ute Mountain Ute Tribe reservation. In both cases, the team is offering technical support through energy storage analysis to assist Native American communities in making informed decisions about their respective energy future.

Red Mesa Solar Analysis

Background

- The Red Mesa Tapaha Solar Farm has a capacity of 72 MWac/100 MWdc, with 22 inverters and spans 500 acres in San Juan County, Utah.
- The farm uses a 1-axis solar tracking system and bifacial solar PV panels, commissioned in July 2023.
- Owned by Navajo Tribal Utility Authority (NTUA) and operated by SOLV Energy.
- The energy is sold through a Power Purchase Agreement

Technical Problems Addressed by Energy Storage

- Due to transmission constraints, the power output of the PV farm must be curtailed often
- Critical loads connected to the same power line as the PV farm report power quality problems caused by cloud covering
- These problems reduce the economic benefits of the solar farm and lead to power quality-related costs for the local community

Goals of the Analysis

- Since there is an intention to add energy storage to the current system, the Sandia team is working to quantify the benefits of an ESS co-located with the solar farm, including
  - Estimate the potential revenue that an energy storage system (ESS) could generate to the Red Mesa Tapaha Solar Farm from the following potential applications
    - Transmission congestion relief caused by excess PV production;
    - Transmission system upgrade deferral;
    - Voltage support
  - Determine the size of ESS (power, MW, energy capacity, MWh, and footprint) and technology of the ESS
  - Determine scenarios for financial viability of project, including requirements for grants, cost share, and minimum price of sold energy.

Fig. 1 The Red Mesa.

Fig. 2. The Red Mesa Tapaha Solar Farm seen from a vantage point.

Ute Mountain Ute Tribe

Background

- Ute Mountain Ute Tribe (UMUT) has a 1 MW community-scale solar PV facility constructed in 2017, connected behind the meter (BTM) of the local Casino, in Towaoc, CO.
- UMUT is currently working in several energy projects, including the consideration of expanding this PV system
- Revenue from the PV system is turned into electric rebates for tribal members that live in the reservation

Technical Problems Addressed by Energy Storage

- Due to interconnection constraints, the PV system is required to limit generation to 1 MW, leading to curtailment
- Curtailed energy reduces revenue/cost savings of the PV system and would be greater if the solar array is expanded
- Demand charges are applicable to the loads

Goals of the Analysis

- The Sandia team is working to quantify the cost savings generated by a BTM ESS co-located with the PV system
- Applications include storing and selling excess solar PV energy and peak shaving, considering an expansion of the system.
- Evaluate demand cost savings and perform cost-benefit analysis and sizing.

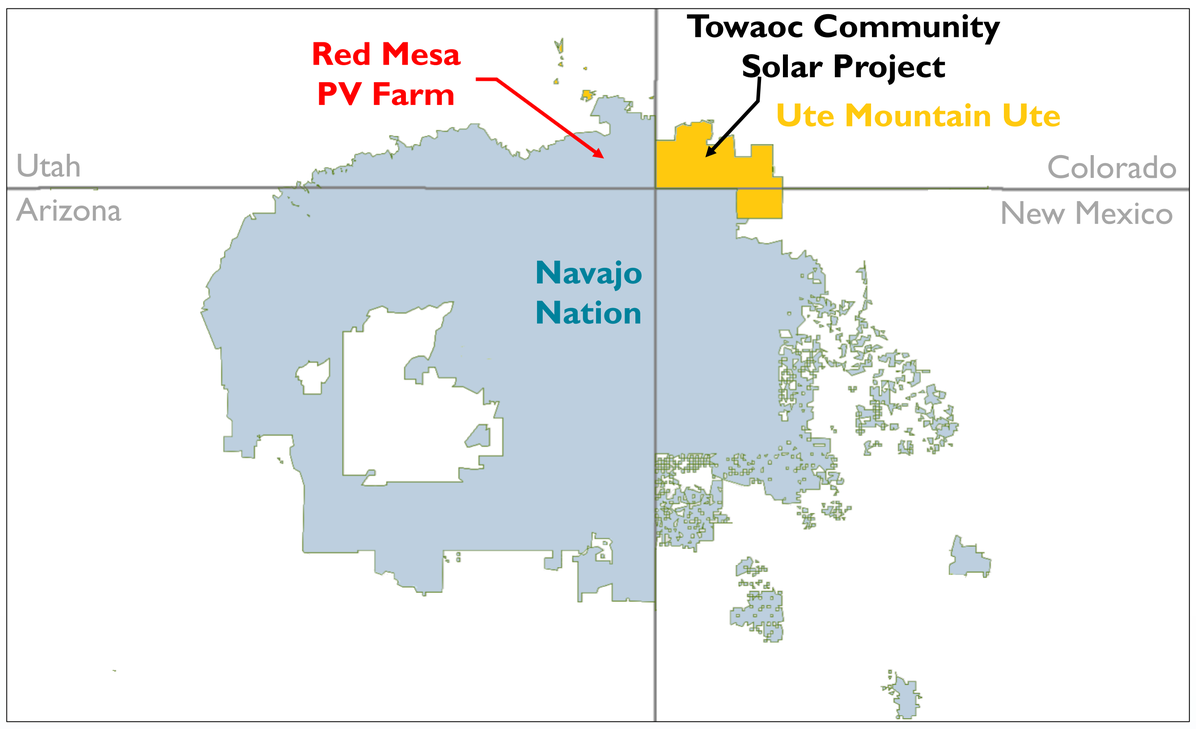

Fig. 3 Map showing the Navajo nation (light blue), the location of the Red Mesa Solar Farm (red), the Ute Mountain Ute reservation (yellow) and the location of the community solar PV plant in Towaoc, CO.

References

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