SAND2021-xxxx x

Sandia National Laboratories

Final CTAP Report
National Technology & Engineering Solutions of Sandia, LLC
Resilient El Rito | Microgrid System Laboratory (Village of El Rito)

STATEMENT OF WORK
Sandia provided technical assistance to Kit Carson Electric Cooperative (KCEC) to assess the technical merits of a proposed community resilience microgrid project in the Village of El Rito, New Mexico (NM).

The project includes a proposed community resilience microgrid in the Village of El Rito, NM, around the campus of Northern New Mexico College (NNMC). A conceptual microgrid analysis plan was performed, considering a campus and community-wide approach. The analysis results provided conceptual microgrid configurations, optimized according to the performance metrics defined. The campus microgrid was studied independently and many conceptual microgrid solutions were provided that met the performance requirements. Considering the existing 1.5 MW PV system on campus far exceeds the simulated campus load peak and energy demand, a small battery installation was deemed sufficient to support the campus microgrid goals. Following the analysis and consultation, it was determined that the core Resilient El Rito team will need to further investigate the results for additional economic and environmental considerations to continue toward the best approach for their goals and needs.

Methodology
A conceptual microgrid analysis plan was established, considering a campus and community-wide approach. The Microgrid Design Toolkit (MDT) was decided as the simulation platform. The microgrid boundaries and loads were collectively defined using Google Earth projects. The loads were then assigned a criticality designation from 1-to-3, with 1 being the most critical.

Load profiles were then estimated for each load for the simulation. Monthly metered data was used wherever available. For certain loads, a daily profile was applied and scaled to match the monthly and annual energy from the meter data. Future looking loads, such as an EV charging hub, were estimated based on hypothetical vehicle fleets and anticipated charging windows. The feeder-level data was then used to estimate the rest of the community loads, designated as residential. The campus loads were estimated from 2010 data to better reflect the last year of attendance at the university, scaled up by 25% for future growth. The community loads were scaled up by 50% for future growth.
Existing generation assets, such as the 1.5 MW campus PV system, were incorporated into the baseline models accordingly. Additional generation assets to optimize to included additional PV, battery storage, and propane generation. The optimization metrics were cost reduction and meeting the energy availability limits and targets of the three tier designations. 30-day outages were simulated.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

National Nuclear Security Administration

U.S. DEPARTMENT OF ENERGY

Summary of Results

The analysis results provided conceptual microgrid configurations, optimized according to the performance metrics defined. The campus microgrid was studied independently and many conceptual microgrid solutions were provided that met the performance requirements. Considering the existing 1.5 MW PV system on campus far exceeds the simulated campus load peak and energy demand, a small battery installation was deemed sufficient to support the campus microgrid goals. Additionally, analysis was done including small propane generation options, which resulted in a reduction in the battery capacity needed, and in turn the purchase cost. The latter designs do however require a small amount of propane fuel storage and will need to consider the environmental impacts of using propane generation. The community microgrid had significantly larger load peaks and energy demands. It was simulated with two approaches: 1) PV and battery options only, with the lowest cost PV/Battery solution for the campus microgrid locked in as a baseline condition; 2) PV, batteries, and propane generation options, with the lowest cost PV/Battery/Propane solution for the campus microgrid locked in as a baseline solution. The PV/Battery only simulation revealed an astronomical need for additional PV and batteries to support the performance goals of the entire community microgrid. Allowing for two small propane generator options greatly reduced the cost and need for PV and batteries, but of course at the cost of using propane as a fuel source. The core Resilient El Rito team will need to further investigate the results for additional economic and environmental considerations to continue toward the best approach for their goals and needs.

Changes to the SOW

None.

DELIVERABLES/OUTCOMES

A presentation with analysis results was delivered on 12/22/21 to core team and additional stakeholders. The presentation and additional supporting documents will be delivered to Microgrid Systems Laboratory (David Breecker) and the rest of the core Resilient El Rito team.

COSTS

Category	Projected Cost	Final Cost
Labor	$8,067.00	$9,151.21
Mileage	--	$0.00
Total	**$8,067.00**	**$9,151.21**