



# Energy Storage Valuation at San Carlos Apache Tribe

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**Abstract:** San Carlos Apache Tribe (SCAT) is located in a sparsely populated region that has limited power generation and transmission resources. Currently, the energy tariffs are high and the system suffers from frequent power interruptions. In this study, we have analyzed the benefits of Energy Storage Systems (ESS) to reduce costs and improve power quality for the tribe. We have conducted two case studies evaluating behind-the-meter ESSs for a casino and a hospital. Results show that energy storage has the potential to reduce electricity costs and provide backup power for critical loads during several hours.

## Challenges at SCAT

- Population: around 10,000 people
- Area: 2,900 sq. miles (2x Rhode Island)
- Scattered loads – three power providers:
  - San Carlos Irrigation Project (SCIP)
  - Arizona Public Service (APS)
  - Graham County Electric Cooperative
- Limited electric power resources
  - Small solar PV, utility-scale planned
- Limited transmission
  - Only 1 69kV transmission line (SCIP)
- Reliability issues
  - Average 100 outages per year
  - Could affect 4,000 to 6,000 people
- Cost of electricity above state average

### Project Goal:

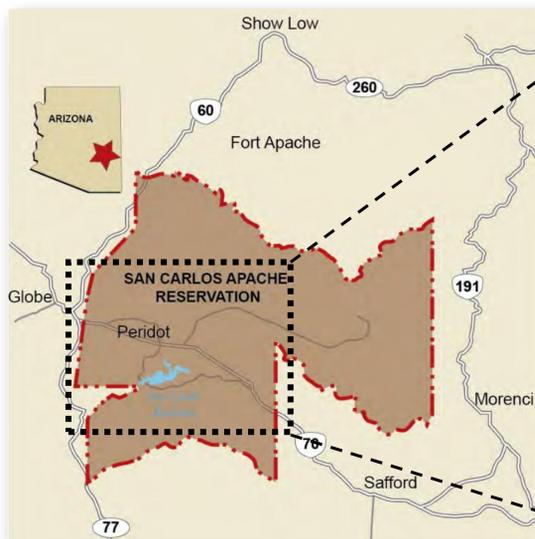
- Provide technical assistance to the Tribe to enable informed decision making with respect to future planning of Renewable Energy Portfolio and show how ESS can enhance system reliability

## Benefits of Energy Storage

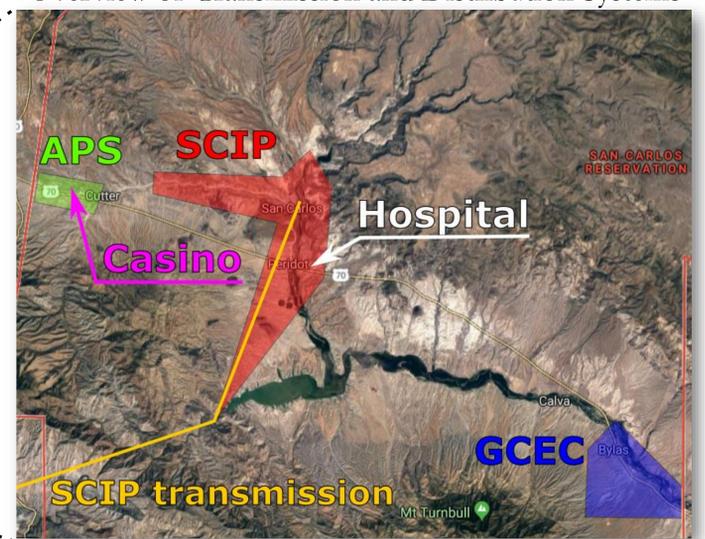
- Increase reliability for critical loads
- Reduce electricity costs
- Behind-the-meter (BTM) cost savings
  - Time of use (TOU) energy
  - Demand
  - Increase value of solar

## Case Studies

- Two BTM applications for ESS
- Case 1 – Apache Gold Casino/Resort
  - APS –TOU (E-35) Primary
- Case 2 – San Carlos Apache Healthcare
  - SCIP – Large commercial

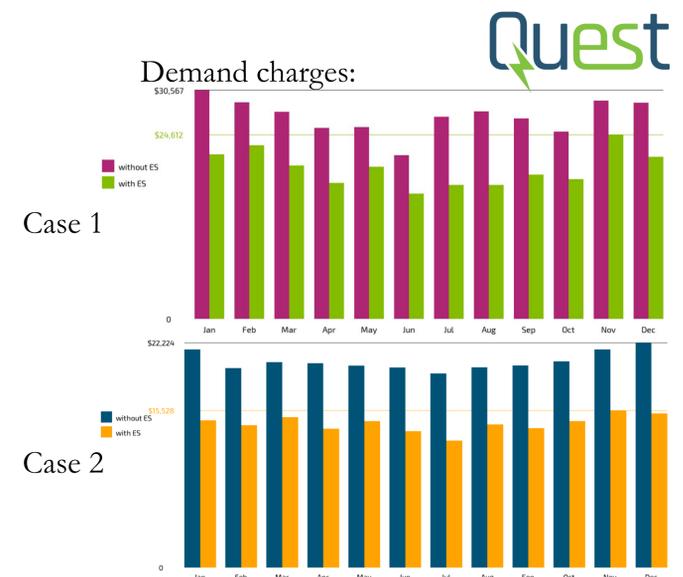
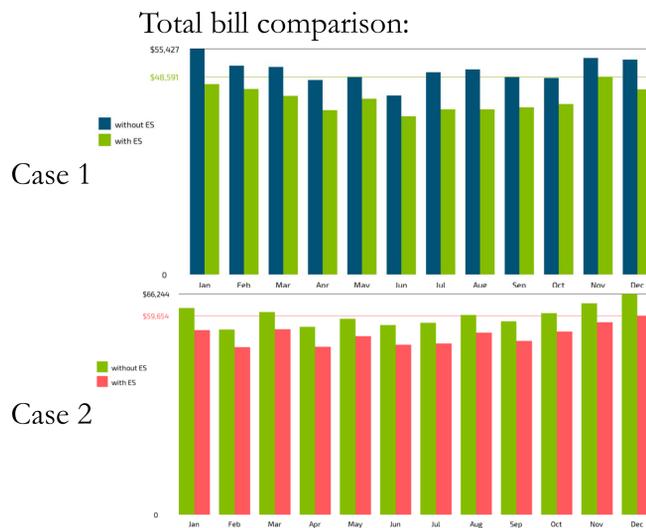


Overview of Transmission and Distribution Systems



## Preliminary Results

- Assumptions:
  - No hourly load data available - estimates
  - Backup power by ESS only
- Assuming 2 cases for backup power:
  - Reduction of load to 20% or 40%
- Case 1 - Apache Gold Casino/Resort
  - Planned 1,100 kW solar PV
- Case 2 - San Carlos Apache Healthcare Hospital
  - Planned 2,000 to 3,000 kW solar PV
- Techno-economic analysis using QuEST BTM



Case	Solar power	ESS power	ESS capacity	Backup time @ 20% load	Backup time @ 40% load	Yearly charges	Total yearly savings	Savings demand	Reduction peak demand
Case 1 - Casino	1,100 kW	500 kW	1,000 kWh	5.87 h	2.93 h	\$601,080.77	\$83,959.77	\$83,867.93	47.23 kW (3.5%)
Case 2 - Hospital	2,000 kW	500 kW	2,000 kWh	8.65 h	4.33 h	\$716,013.93	\$69,365.13	\$73,742.20	478.26 kW (30.13%)

## Conclusions

- ESS can reduce costs and improve reliability of critical load centers in SCAT
- Apache Gold Casino/Resort
  - 500 kW/1,000 kWh system can reduce costs with electricity in about 14%
- Up to 5.8 hours of backup power
- San Carlos Apache Healthcare Hospital
  - 500 kW/2,000 kWh system can reduce annual costs with electricity in about 10%
  - Up to 8.6 hours of backup power
- Future work
  - Obtain load data - Hospital & Casino
  - BTM analysis for other sites
  - Front-of-the-meter analysis (Utility-Scale)

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