A Resilient Solar-Based Autonomous Microgrid Solution (Microgrid-Kayenta)

Electrifying and Broadbanding the Comb Ridge/El Cap Community in Kayenta Chapter of the Navajo Nation

Yá'át'ééh

(Hello)

Team

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Accountant

Craig Brown

Field Office

Pearl Begay
Renae Hoshnic
Genevieve Benally

Kayenta Chapter Staff

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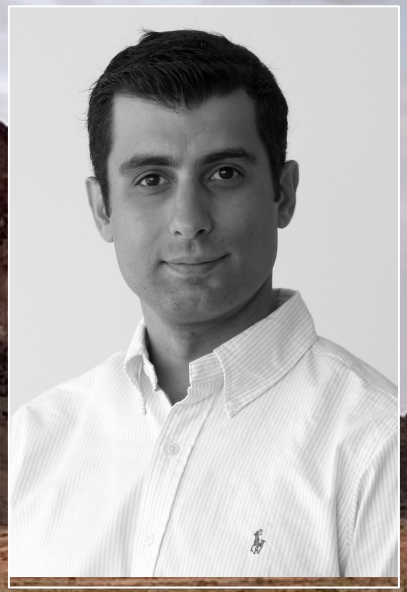

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Shundana Yusaf

Associate Professor
College of Architecture and Planning

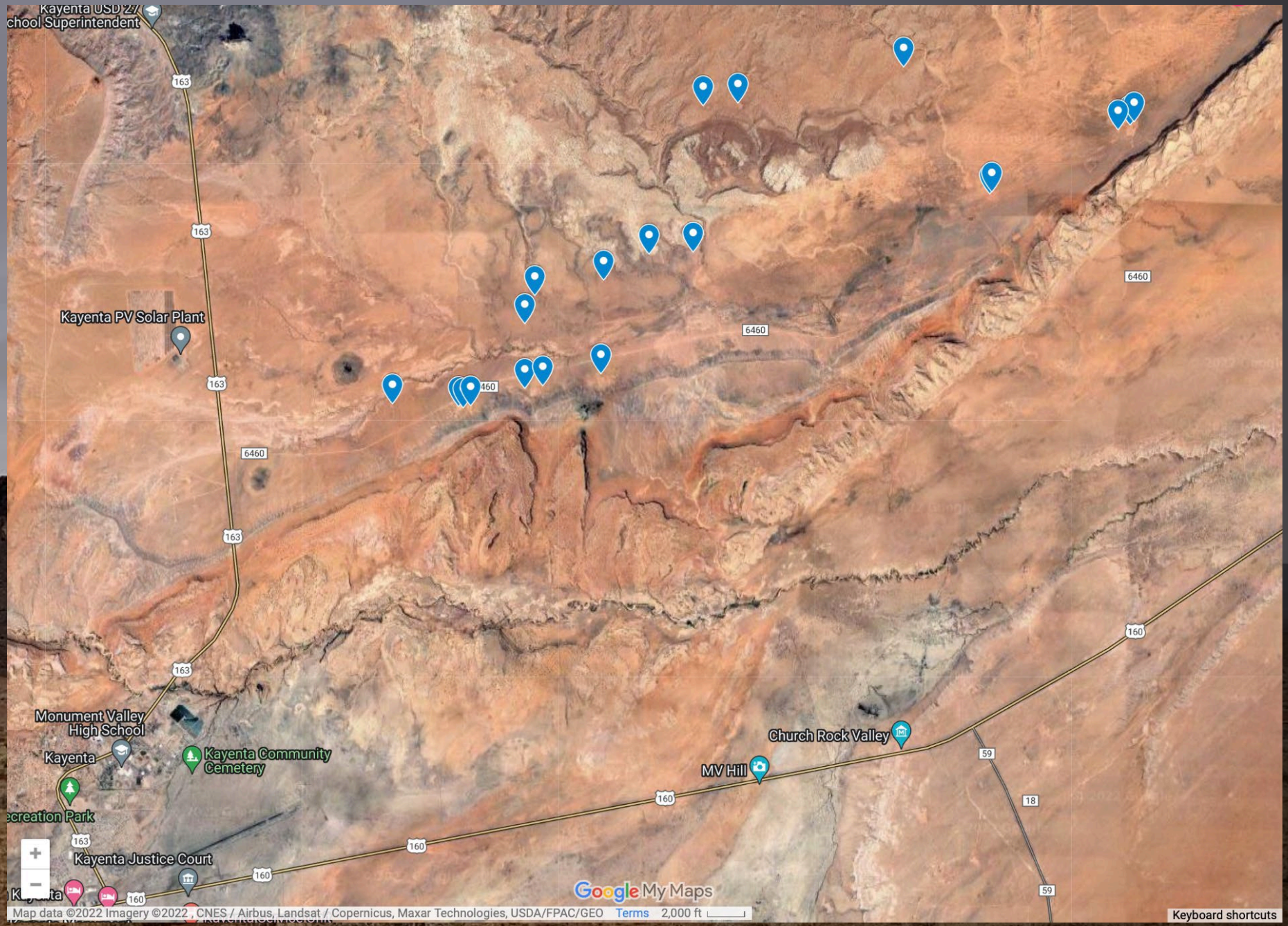
Navajo Nation Tribe - Diné

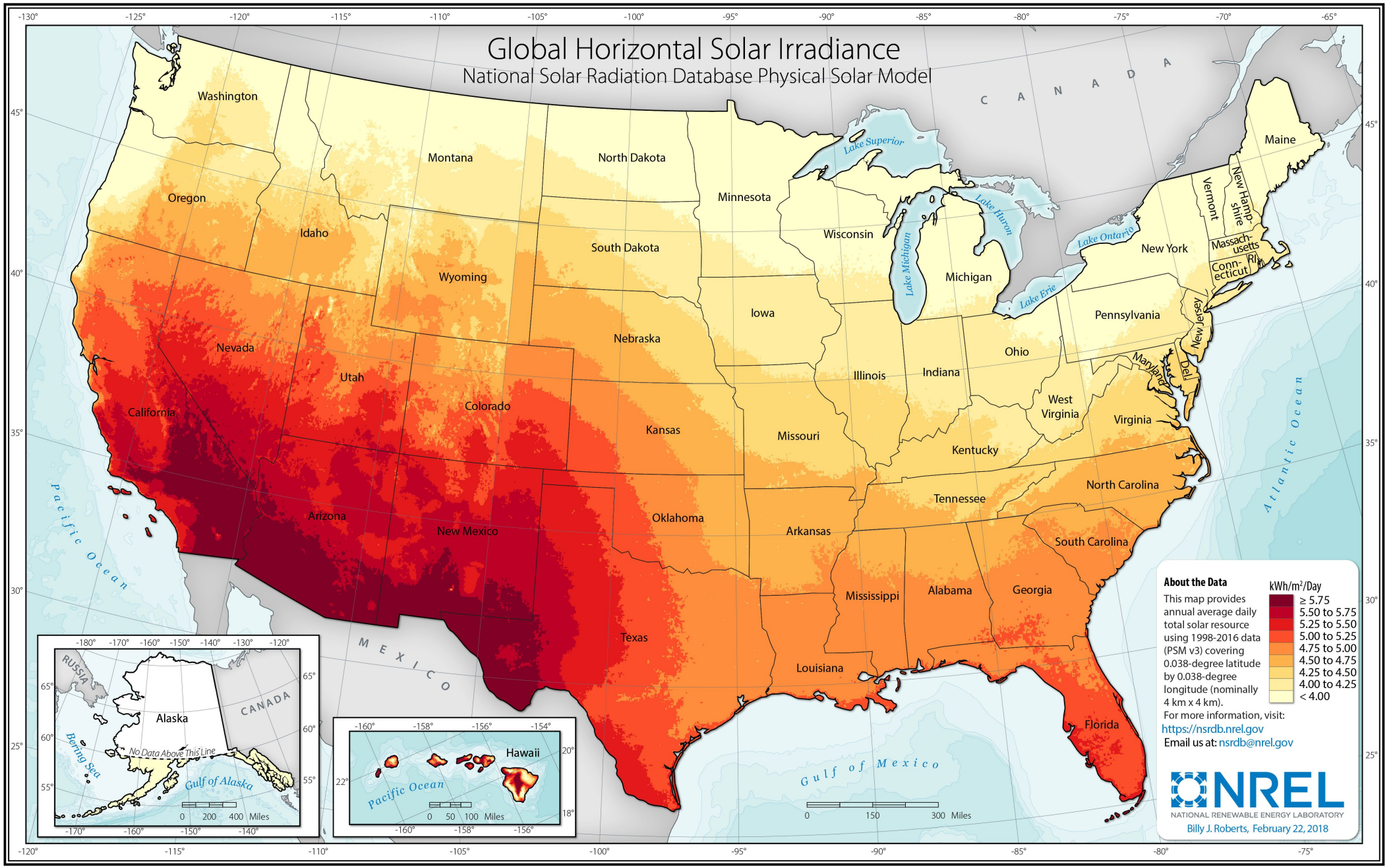
- **Applicant:** The applicant of this grant is the Navajo Nation Tribal Government-Kayenta Chapter.
- **Demographics:** The Kayenta Chapter has an estimated total population of 6,211, with the total of indigenous population of 5,907.
- **Location:** The site for this proposal is in Comb Ridge/El Capitan Region on Indian Route 6460.
- **Recipients:** The project serves 96-120 tribal members in twenty-five households. These are multigenerational homes with approximately 4-8 members.

Project Overview

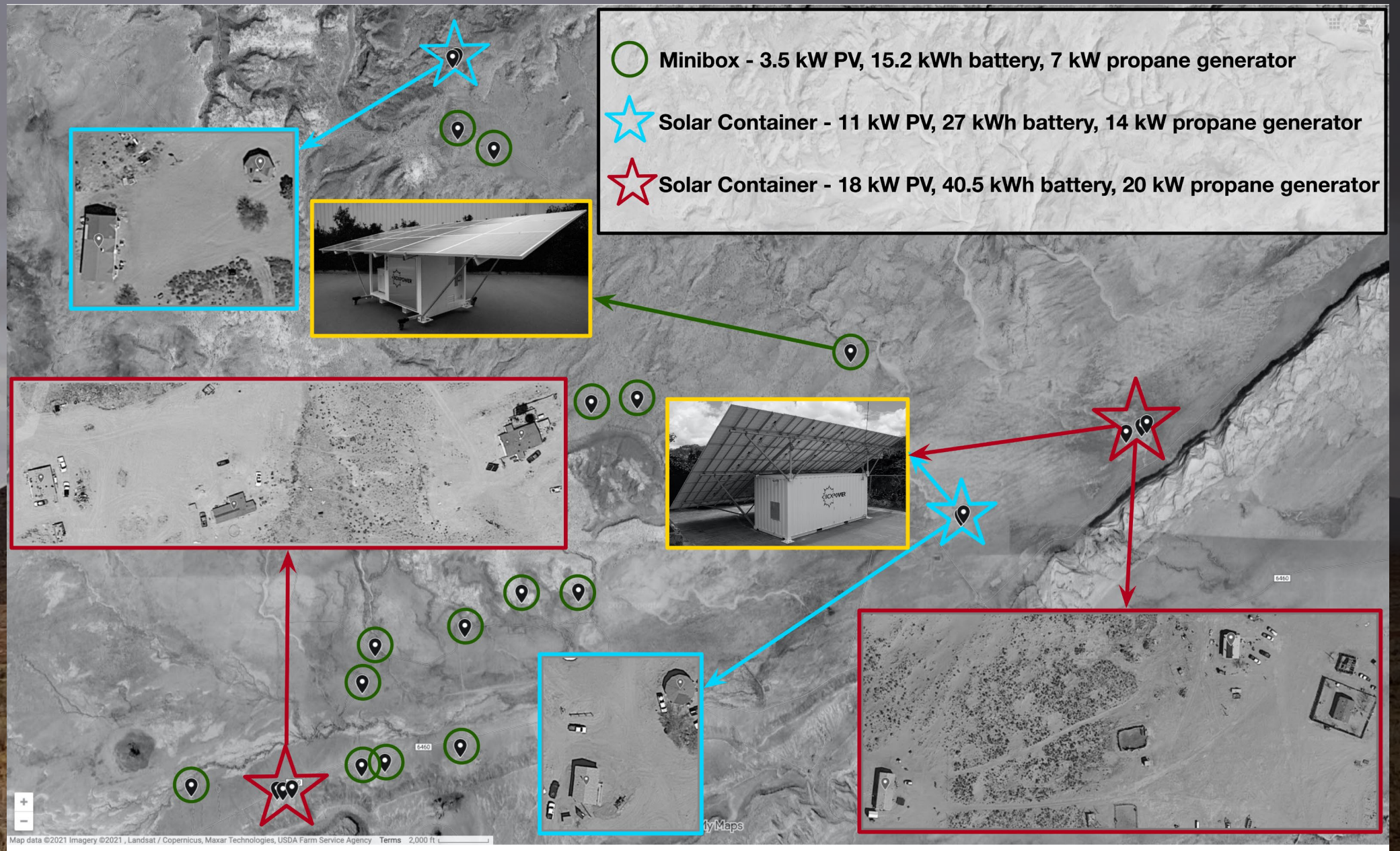
- **Vision**: To develop an integrated energy system to enable reliable and clean electricity supply with full coverage to recipients.
- **Goal**: To build a dependable, smart, and resilient microgrid.
- **Design**: Includes PVs, energy storage systems, and propane backup power going through the design, construction, test, and validation phases.

Project location

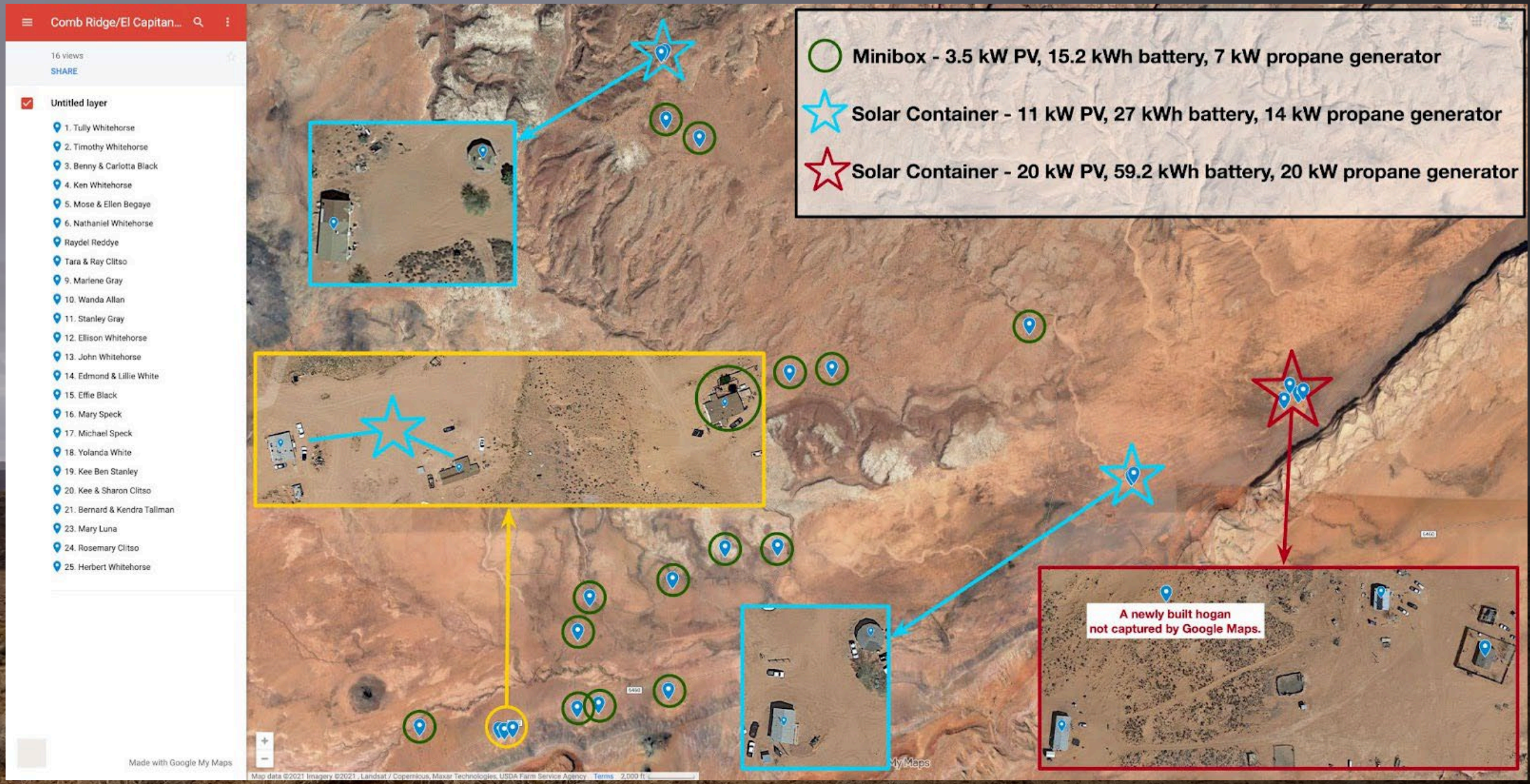

Kayenta USD 27
chool Superintendent
163
Kayenta PV Solar Plant
6460
Monument Valley
High School
Kayenta
Kayenta Community
Cemetery
ecreation Park
Kayenta Justice Court
MV Hill
Church Rock Valley
59
18
160
Google My Maps
Map data ©2022 Imagery ©2022 , CNES / Airbus, Landsat / Copernicus, Maxar Technologies, USDA/FPAC/GEO
Terms
2,000 ft
Keyboard shortcuts


Global Horizontal Solar Irradiance
National Solar Radiation Database Physical Solar Model
Washington
Oregon
California
Nevada
Idaho
Montana
Wyoming
Utah
Arizona
Colorado
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Oklahoma
Texas
Minnesota
Iowa
Missouri
Arkansas
Louisiana
Wisconsin
Illinois
Michigan
Indiana
Ohio
Kentucky
Tennessee
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Virginia
West Virginia
Pennsylvania
New York
Maine
Vermont
New Hamp-shire
Massach-usetts
Conn-ecticut
RI
New Jersey
Del
Maryland
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
CANADA
MEXICO
Pacific Ocean
Atlantic Ocean
Gulf of Mexico
Alaska
RUSSIA
CANADA
Bering Sea
No Data Above This Line
Gulf of Alaska
0 200 400 Miles
Hawaii
Pacific Ocean
0 50 100 Miles
0 150 300 Miles
About the Data
This map provides annual average daily total solar resource using 1998-2016 data (PSM v3) covering 0.038-degree latitude by 0.038-degree longitude (nominally 4 km x 4 km).
For more information, visit:
https://nsrdb.nrel.gov
Email us at: nsrdb@nrel.gov
kWh/m²/Day
≥ 5.75
5.50 to 5.75
5.25 to 5.50
5.00 to 5.25
4.75 to 5.00
4.50 to 4.75
4.25 to 4.50
4.00 to 4.25
< 4.00
NREL
NATIONAL RENEWABLE ENERGY LABORATORY
Billy J. Roberts, February 22, 2018

Original design

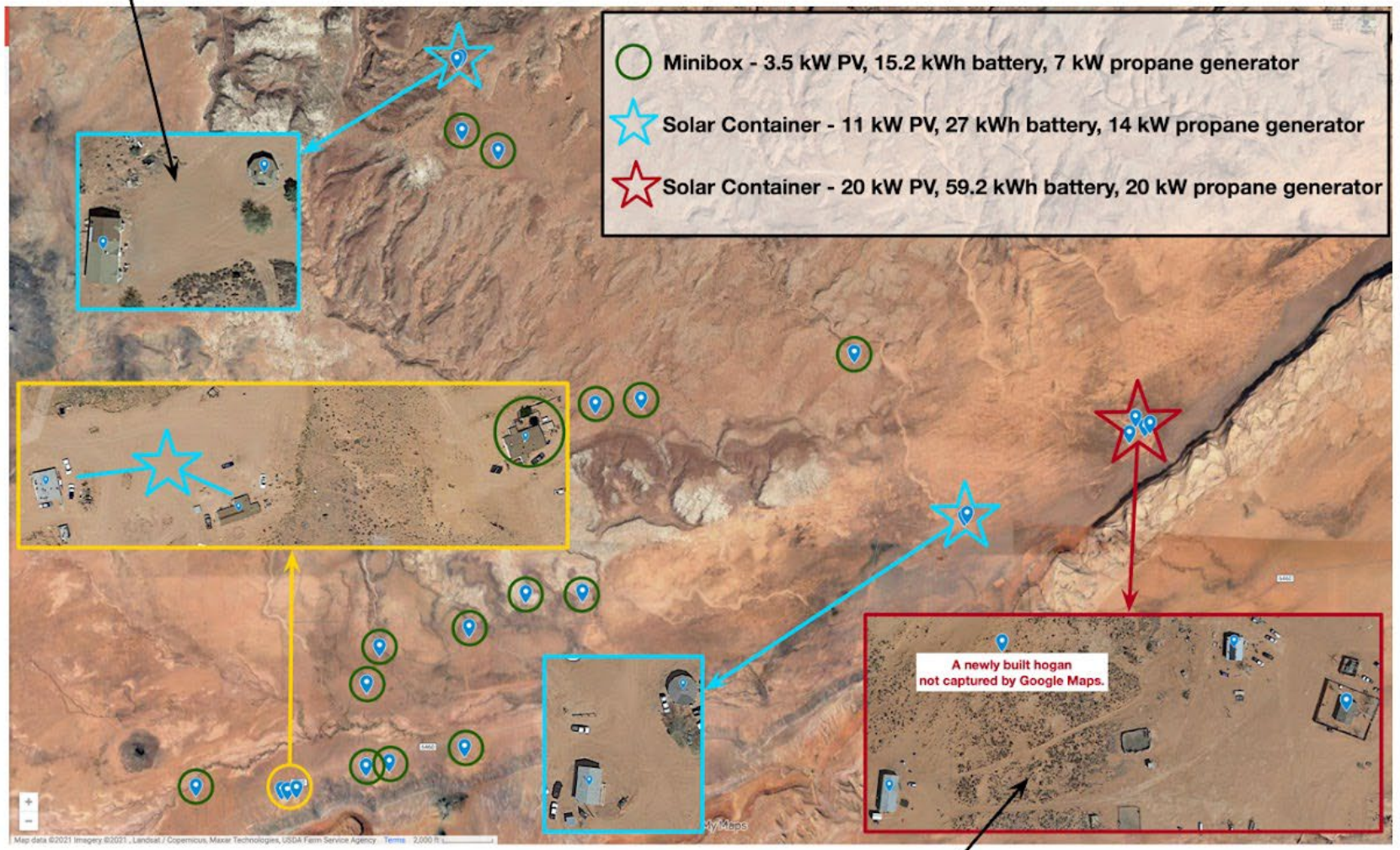


Changes made during the negotiation



Changes proposed after the field trip

Replace with 2 mini boxes



Replace with 1 mini box and 1 smaller-size solar container

Project Highlights

Coal → Solar → External maintenance → Self-sustaining

Capacity

Installed Solar
~110 kW

Power generation
~200 MWh/year

Energy storage
~350 kWh

Benefiting buildings
25

Reduced electricity bills
51-100 members

Highlights

Modular & Scalable Design

- Hybrid centralized & decentralized design with modular components
- Scalable to other native communities

Electricity

- 24/7 uninterrupted power
- Minimum maintenance and backup generation cost
- Minimum environmental footprint

Internet

- Integrated broadband solution provides Wi-Fi signals to up to 15 km
- Enable online education, remote health care, and increased security

Capacity Building

- Energy and digital literacy
- Advanced technical training

Impacts

Industrial Impacts

- Electrifying and broadbanding native communities with TRL-9 products
- Resilient, sustainable, and clean microgrid solution with backup power guarantee

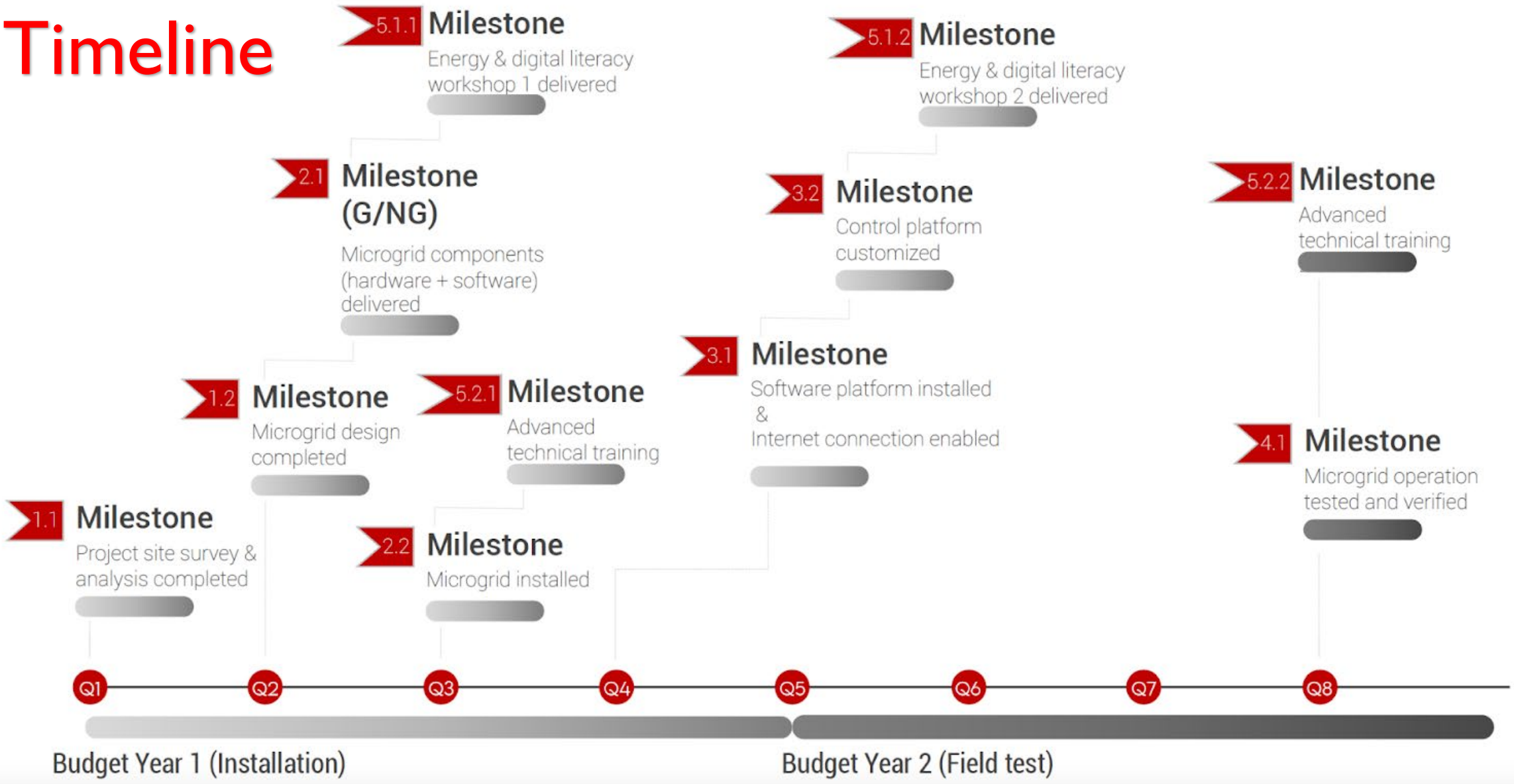
Academic Impacts

- Promote academic research on grid interconnection in remote areas
- Intermediate data support
- Real-time control methodologies

Social & Cultural Impacts

- Boost local economy
- Culture preservation

Timeline


5.1.1 Milestone
Energy & digital literacy workshop 1 delivered
5.1.2 Milestone
Energy & digital literacy workshop 2 delivered
2.1 Milestone (G/NG)
Microgrid components (hardware + software) delivered
3.2 Milestone
Control platform customized
5.2.2 Milestone
Advanced technical training
1.2 Milestone
Microgrid design completed
5.2.1 Milestone
Advanced technical training
3.1 Milestone
Software platform installed & Internet connection enabled
4.1 Milestone
Microgrid operation tested and verified
1.1 Milestone
Project site survey & analysis completed
2.2 Milestone
Microgrid installed
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Budget Year 1 (Installation)
Budget Year 2 (Field test)

Project Partners

Kayenta Chapter

University of Utah

Bow Power

Native Renewables

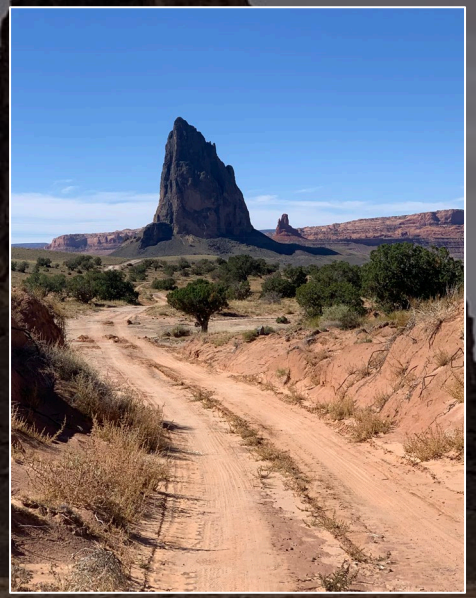
New Sun Road

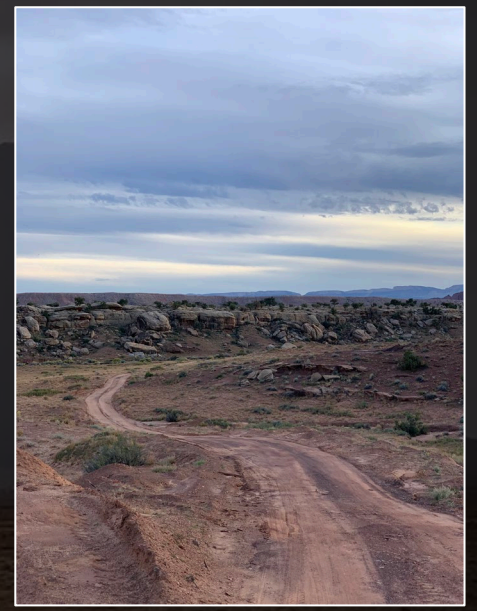
Post-award field trip by all teams

Project Process To-Date

- **Staffing**: Hired 3 DoE project staff at Kayenta Chapter
- **Structuring**: Passed chapter resolutions for the administrative structuring of the project and roles and responsibilities
- **Accounting**: Opened a sub-account for the project under Kayenta Chapter that is accessible only to project accountant. Invoicing system is set up
- **Project Launch**: A community facing launch and luncheon at Kayenta Chapter to announce the project. All partners participated.
- **Field Trip**: Field visit to 25 homes by all partners
- **Community Conversations**: All 25 families have been onboarded and provided with important deadlines pertaining to them. Their consent on solar panels location and wiring has been secured.

Road Conditions

Community Conversations

Launch Party

Community Education

Field Trip Visits

Secretary Jennifer Granholm visit

"We see this project as a down payment to the Navajo Nation"
–Secretary Jennifer Granholm

On-going Project Stats

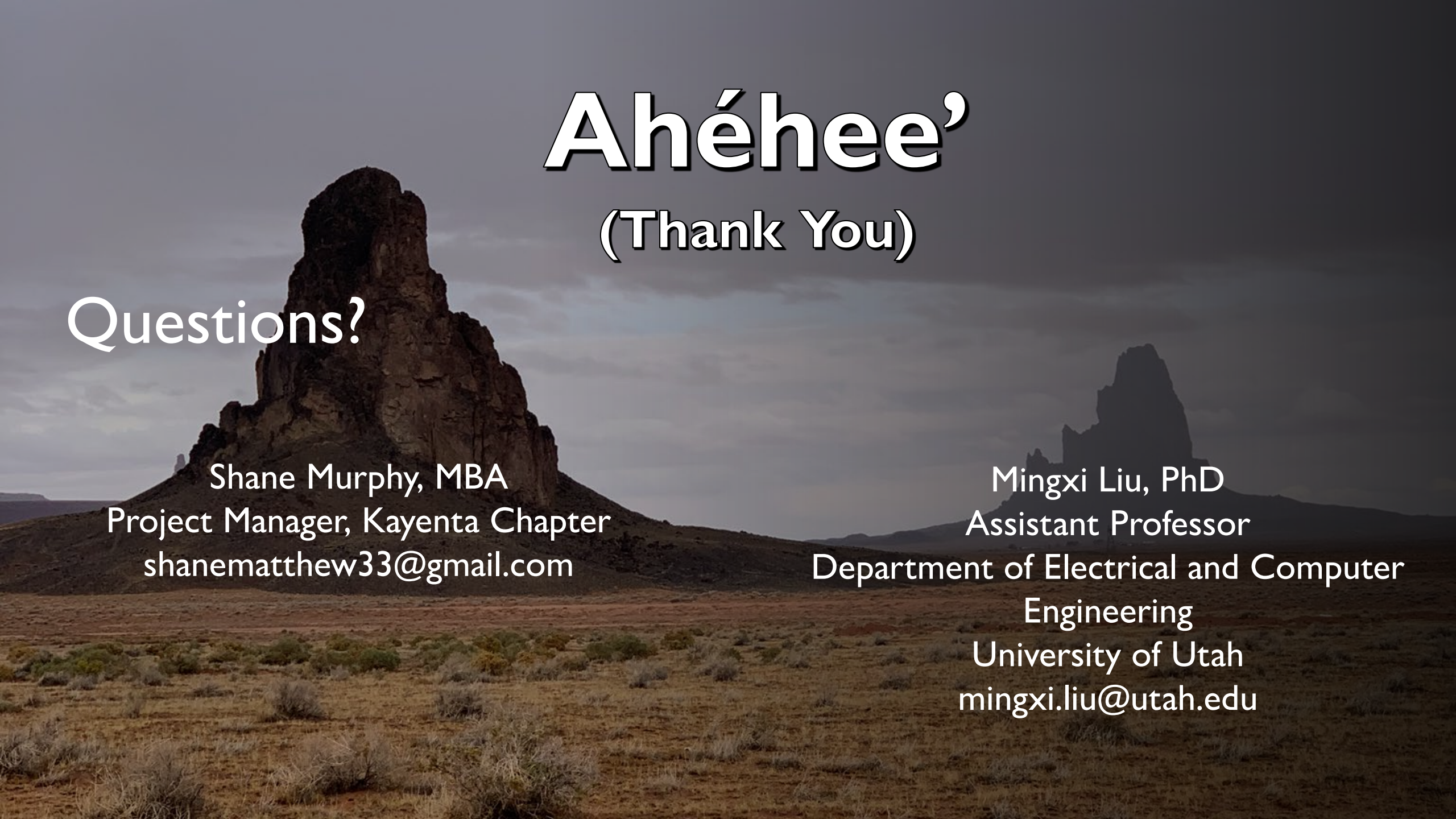
- **Accomplishments:**
  - Project has been inaugurated
  - Field visits data gathered
  - Energy audit completed
  - Designs revised
  - Modifying the budget for the revised design
  - 4 educational work sessions with community completed
- More sessions will be organized and held over the next 2 years
- Weekly meetings among team members
- Support from the NN council via Legislation 0098-22
- Successful hiring: Project Manager, Field Officer, and Accountant

Next Steps

- Partners Meeting
- Finalize the Design
- Get cost share funds into the project account
- Procurement of the equipment
- Equipment delivery
- Installation
- Development of a website page

Future Plans

- Meet with partners to finalize the design
- Money going into the Chapters account
- Procurement of the equipment



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(Thank You)

Questions?

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