

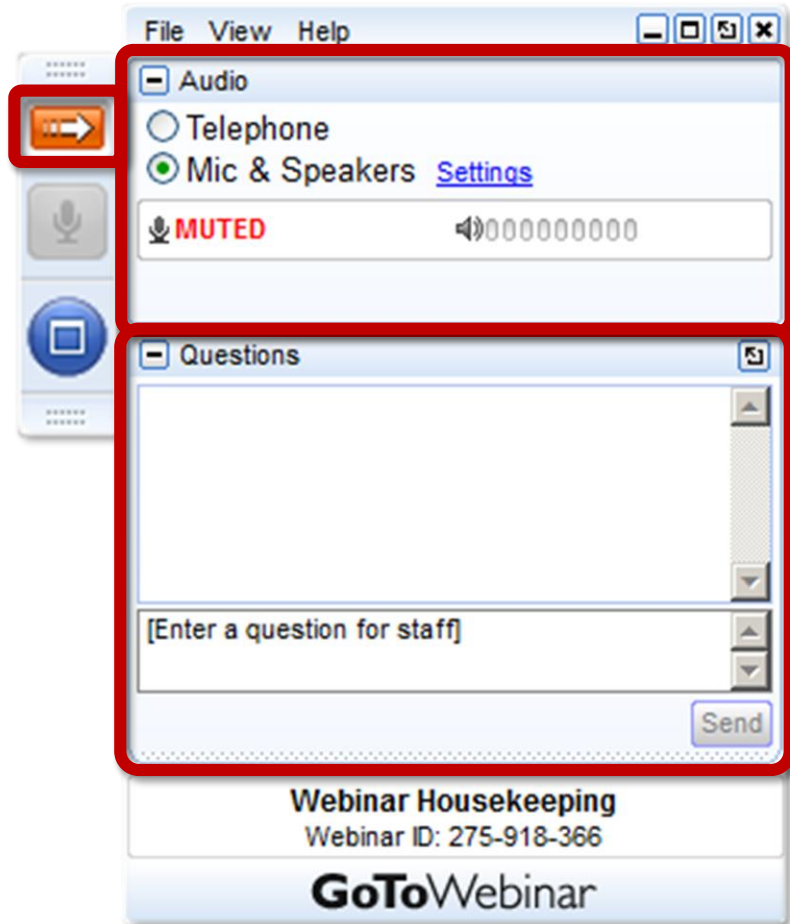
# RESILIENT POWER

A project of **CleanEnergy**Group



## Cimarron District Office: Supporting Firefighters in New Mexico with Solar+Storage

# HOUSEKEEPING



Join audio:

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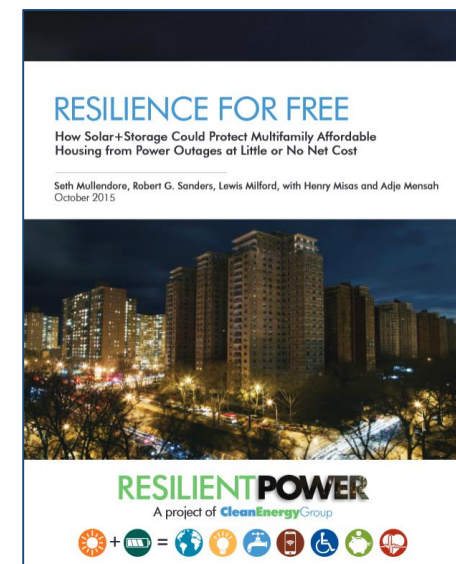
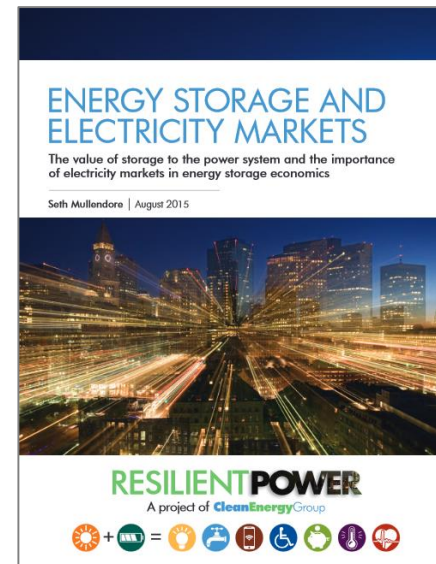
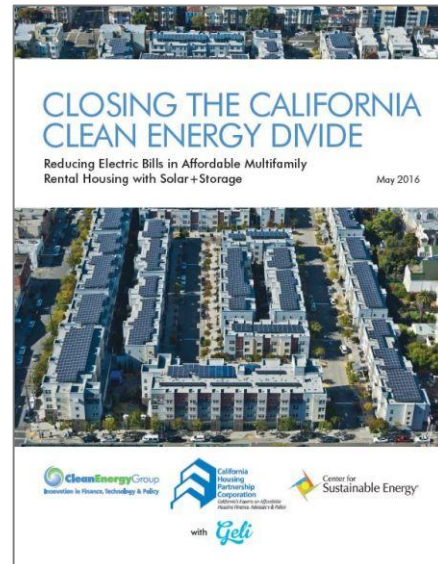
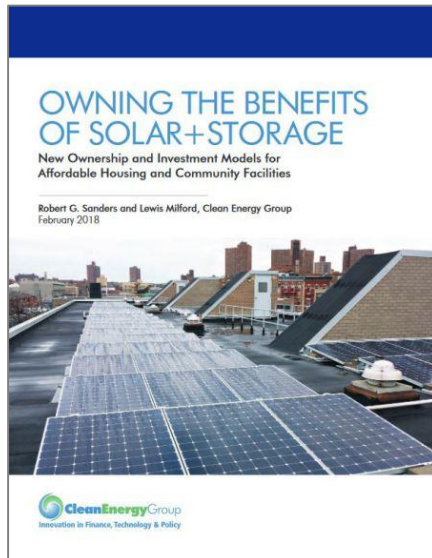
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# THE RESILIENT POWER PROJECT

- Increase public/private investment in clean, resilient power systems (solar+storage)
- Protect low-income and vulnerable communities, with a focus on affordable housing and critical public facilities
- Engage city, state and federal policy makers to develop supportive policies and programs
- Visit [www.resilient-power.org](http://www.resilient-power.org) for more information and resources



# SUPPORTING 150+ PROJECTS ACROSS THE COUNTRY



Boulder: Nonprofit transportation center serving elderly and disabled residents



Boston: Multiple housing properties representing 1,000+ units of senior and affordable housing

DC: First solar+storage resilience center at affordable housing in DC



New Mexico: Added resilience for remote wildfire operations command center



Puerto Rico: Supporting the installation of solar+storage at multiple community medical clinics

- Project type**
- Leadership Initiative
  - Affordable housing
  - Community services

# Webinar Speakers

- **Louise N. Martinez**, Division Director, Energy Conservation and Management Division of New Mexico
- **Mark Gaiser**, Clean Energy Program Manager, Energy Conservation and Management Division of New Mexico
- **Arnie Friedt**, Cimarron District Forester, EMNRD, Forestry Division
- **Seth Mullendore**, Vice President & Project Director, Clean Energy Group (moderator)



# Cimarron District Office: Supporting FireFighters in New Mexico with Solar + Storage

LOUISE N. MARTINEZ, DIVISION DIRECTOR, ENERGY CONSERVATION AND MANAGEMENT DIVISION OF NEW MEXICO

MARK GAISER, CLEAN ENERGY PROGRAM MANAGER, ENERGY CONSERVATION AND MANAGEMENT DIVISION OF NEW MEXICO

ARNIE FRIEDT, CIMARRON DISTRICT FORESTER, NM EMNRD, FORESTRY DIVISION

SETH MULLENDORE, VICE PRESIDENT AND PROJECT DIRECTOR, CLEAN ENERGY GROUP

Ute Park Fire  
May 31, 2018

The first day

- ▶ Photo from US Forrest Service Air Attack aircraft



# Ute Park Fire June 3, 2018 The fourth day

Burned 36, 740 acres, Destroyed 14 buildings on Philmont Scout Ranch

On June 3 the resources fighting the fire were:

- 13 Crews of 498 personnel
- 8 Helicopters
- 19 Fire Engines
- 2 Bulldozers
- 6 Water tenders

District office is on generator power

Fire contained on June 19, 2018





Ute Park Fire from Porch of Cimarron Forestry District Office

# Late Summer 2018 in Santa Fe

- ▶ Initial discussions at ECMD occurred about how to improve power and resiliency at the Cimarron Forestry District Office
  - ▶ Reduce computer failures and replacements due to poor power quality
  - ▶ Ensure power would be available even if the power lines failed
  - ▶ Improve the resiliency of the site through solar power in conjunction with the back-up generation
  - ▶ The need was urgent because of the severe drought in New Mexico
- ▶ In mid-August, Jeremy Lewis, Bureau Chief for NM Energy, Conservation and Management Division asked Seth Mullendore of the Clean Energy Group about the potential to have an analysis performed that would guide the development of a solar plus storage microgrid that would increase the reliability and resiliency of the energy supply for the Cimarron Forestry District Office.
- ▶ Potential funding means for the project were put together by the ECMD Director and the Forestry Office Director, with a project completion date of June 30, 2019

# Aerial view of District Office 2018

- ▶ Two office buildings
- ▶ Two shop buildings
- ▶ One on-site living quarters (since removed)
- ▶ Helipad
- ▶ At end of Kit Carson Electric Coop 15kV radial feeder line ~ 55 miles long
- ▶ Located on US 64 east of Ute Park and the entrance to the Philmont Scout Ranch



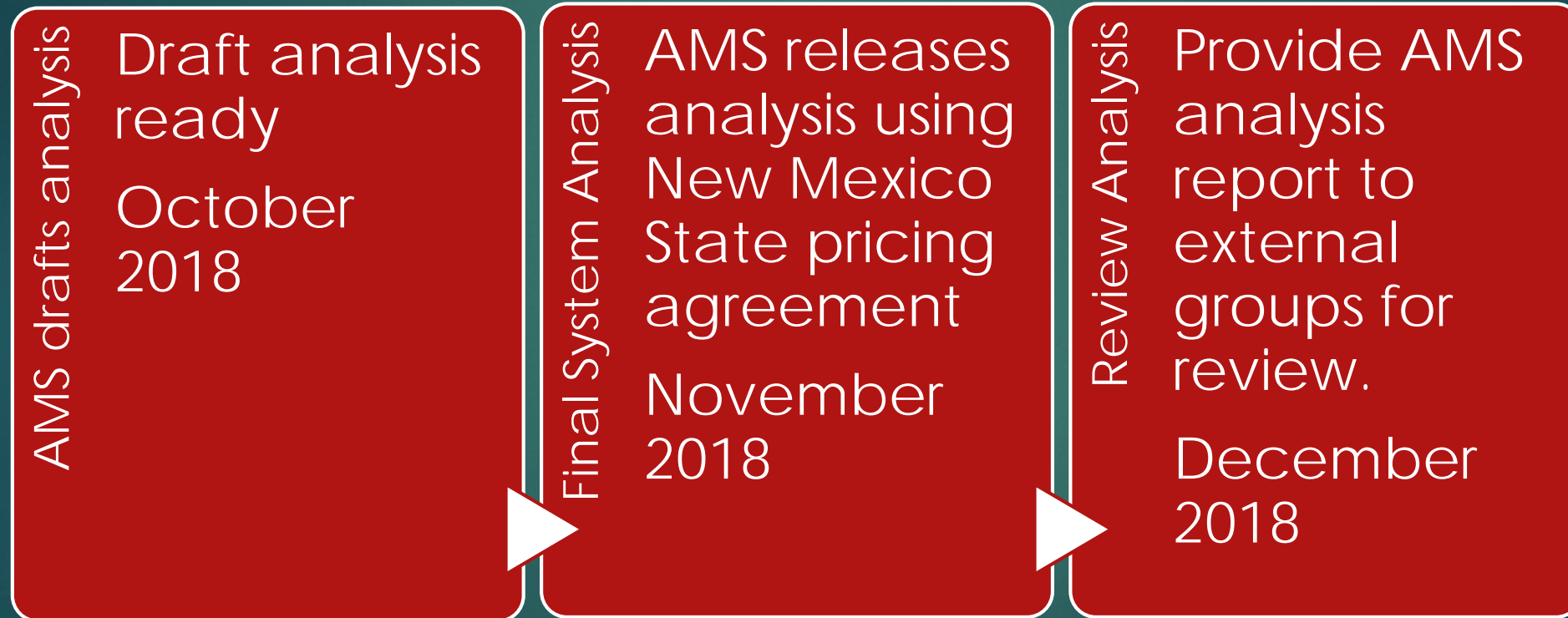
# Project Takes Form

Nine months to completion



# Project Definition

Eight months to completion



# Cimarron Resilient Power Goals

AMS provides matrix of goals based upon inputs from New Mexico

Mode	Operational	Financial	Other
<b>Normal Mode</b>	<ul style="list-style-type: none"> <li>• Provide continuous power to all facility loads</li> <li>• When facility becomes Command Center, serve surge loads of additional users and longer hours</li> <li>• Support power quality (no dips, sags, brownouts, flickers)</li> <li>• Minimize hands-on operational requirements</li> <li>• Provide remote system monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce utility cost</li> <li>• Reduce cost of replacing damaged equipment due to power quality issues</li> <li>• Meet capital budget requirement (~100K)</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce carbon emissions from generating and delivering energy to serve facility</li> </ul>
<b>Outage Mode</b>	<ul style="list-style-type: none"> <li>• Provide power to Critical Load (=100% of normal load) during an extended outage up to 72 hours</li> <li>• Hedge fuel supply risk with supplemental generation to propane unit</li> <li>• Minimize hands-on operational requirements</li> <li>• Provide remote system monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Optimize cost to serve critical load</li> </ul>	<ul style="list-style-type: none"> <li>• Support facility mission to protect and preserve the regional environment</li> </ul>

*Resilient Power operates in two conditions: Normal Mode (>99.9% of time on average) and Outage or "Island" Mode.*

# Resilient Power Objectives

- **Power Quality:** Facility operators report power quality issues which contribute to premature failure of electronic equipment
- **Reliability:** While the site experiences a reported 2 to 3 power outages per year, the brownouts are an operational threat, particularly during forest fires or extreme weather events
- **Power Resilience:** Facility operators seek to operate in both Normal and Outage modes with uninterrupted power to certain loads (computers, etc.) but do not require instantaneous failover
- **Financial:** While utility cost savings is important, the primary financial goal is a system within available capital budget constraints (~\$100K).
- **Fuel Supply Risk:** The legacy 20kW propane generator has a 500 gallon tank. The delivery route is generally reliable, but closed 1-2 days per year adding 6-8 hour delays.
- **Operational Ease:** With a limited staff and training in power system operations, Cimarron seeks a solution that minimizes hands-on requirements (“It should be invisible”).
- **Remote system monitoring:** As this facility has variable staffing level, Cimarron seeks to monitor system status in real-time remotely.

# Cases Analyzed

To produce the analysis, we evaluated several cases with different combinations of generation and storage assets

- **Base Case:** Utility + Generator
- **Solar Only:** Utility + Solar PV (grid-tied) + Generator
- **Resilient Power<sub>1</sub>:** Utility + Solar PV + Battery 1x (AC coupled) + Generator
- **Resilient Power<sub>2</sub>:** Utility + Solar PV + Battery 2x (AC coupled) + Generator
- **Full-Site Double-Conversion UPS:** Utility + Solar PV + Battery (AC coupled) + Generator
- **Power Quality Correction:** Power conditioning addressed independent of Resilient Power solution as it is required in all scenarios. Note: Power Quality Correction may vary with the solutions above.

## Option 2: PV and Battery (AC coupled)

- System:
  - Ground-mount solar PV AC-tied near meter
  - Battery storage grid-tied near meter
- Pros:
  - Islanding includes solar (when available)
  - Common and reliable installation and components
  - Systemwide PV and battery power
- Cons:
  - Well pump, HVAC units and compressors may need inrush current limiters
  - May still require power quality correction
  - Large electric loads like heaters may need to be put on a non-backup circuit (or lightly used when in Island Mode)

	Base Case	Solar Only	Resilient Power <sub>1</sub>	Resilient Power <sub>2</sub>	Double-Conversion UPS
Solar PV sizing	NA	9.7kW	9.7kW	9.7kW	9.7kW
Battery sizing	NA	NA	8kW/16 kWh	16kW/32kWh	16kW/48kWh
Generator sizing	20kW propane	20kW propane	20kW propane	20kW propane	20kW propane
Resilience Hours (with generator)	72 hours	72 hours	72 hours	72 hours	72 hours
Average Additional Resilience Hours (solar + storage only)	0 hours	0 hours*	8.3 hours	17 hours	24 hours
Solar Penetration (Percentage of annual load offset by solar PV generation on site)	0%	100%	100%	100%	100%
Est. Capital Cost (ROM)	\$0	\$38,800	\$54,800	\$70,800	\$119,800

\* - Depending on the configuration of the solar array, it may produce incremental resilience during an outage. This varies considerably with weather, time of day, season, atmospheric conditions (e.g. smoke from a forest fire) and electrical infrastructure. For the purpose of this analysis, we use this case to evaluate Solar PV on the results absent other solutions.

# Project triggered

Six months to completion



# Installation Photos



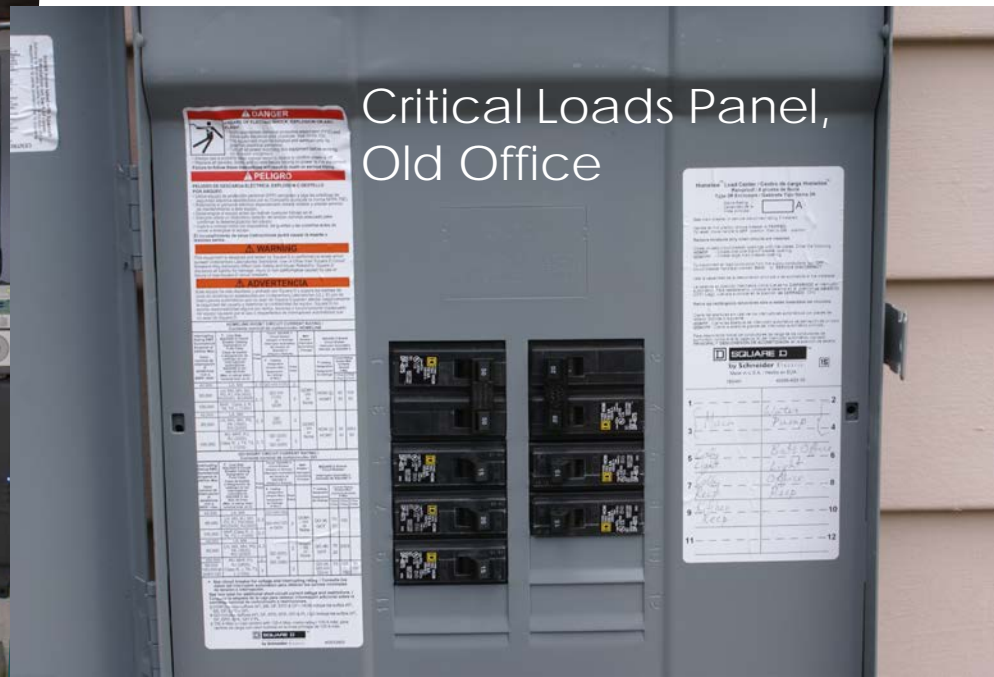
Rooftop array



Battery Bank



Inverter and Controls



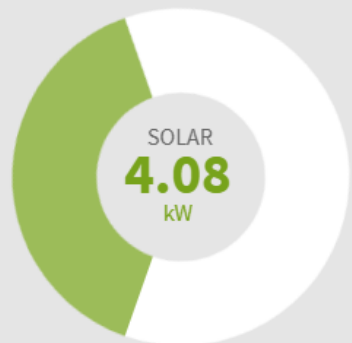
Critical Loads Panel, Old Office

# Some statistics

- ▶ Cost \$79,200 + Internet cable and phone line repair = \$83,672
- ▶ Time from concept to completion 11 months.
- ▶ Construction time 12 weeks

# District Office System Production to date

CURRENT SYSTEM STATUS : 09/12/2019 13:24

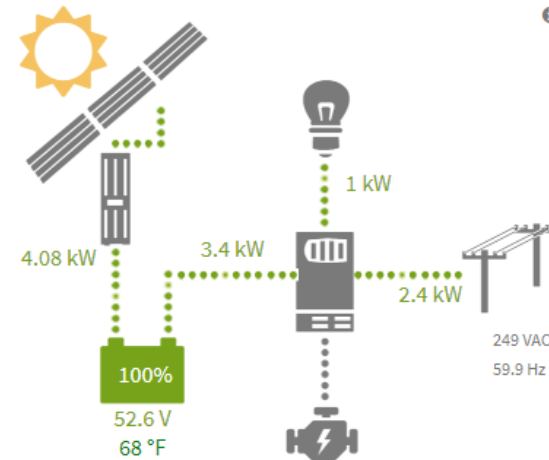


Right Now, You are

## SELLING

Solar	4.08kW
Grid	2.4kW
Load	1kW
Generator	0kW

POWER FLOW



The Year Of

< 09/12/19 >

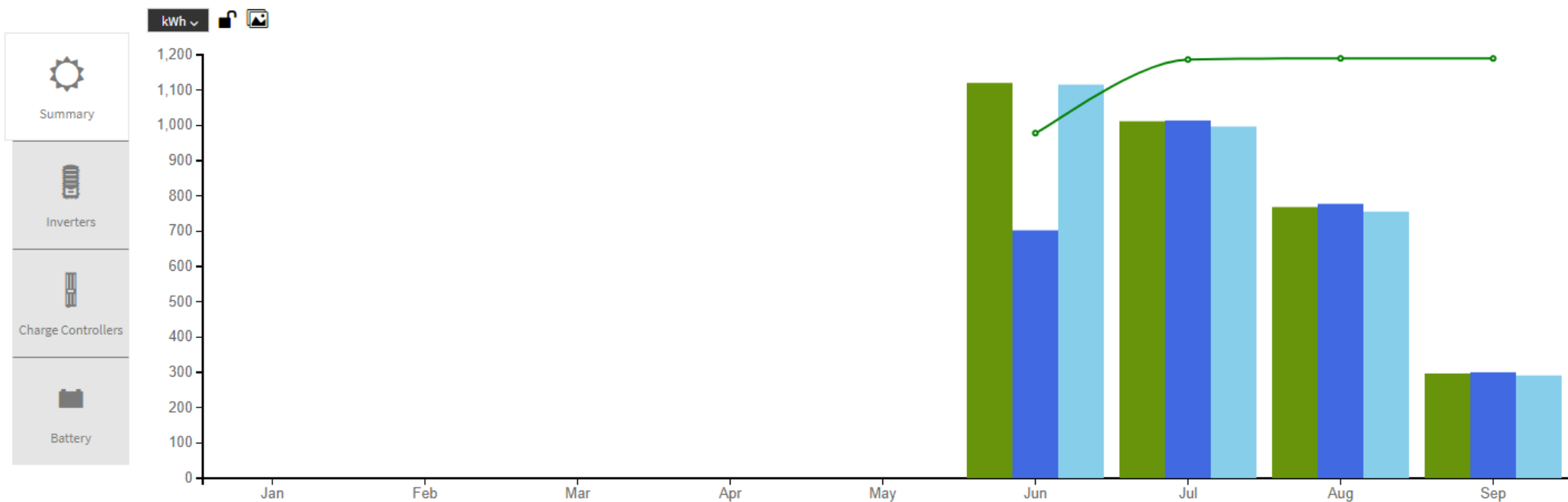
TODAY

INVERTER DATA

Solar  
3,197.4kWh

To Battery  
2,794.43kWh

From Battery  
3,159.12kWh



- Summary
- Inverters
- Charge Controllers
- Battery



Cimarron Forestry District Office from US 64 road with solar panels installed.



# NM ECMD next project: Hyde State Park Microgrid 2020 70 kW to 140 kW solar + storage

- ▶ New Mexico Energy Conservation and Management Division, Forestry Division and IT Services wishes to thank:
  - ▶ Seth Mullendore, Clean Energy Group
  - ▶ Geoff Oxnam, American Microgrid Solutions
  - ▶ Travis Simpkins, MuGrid
  - ▶ Julie Howe, US Department of Energy, State Energy Program
  - ▶ Daniel Weinman, Marti McDonald and Andy O'Reilly, Paradise Power Company
  - ▶ Luis Reyes, CEO, Kit Carson Electric Coop
  - ▶ And the many other supporters that helped make this project successful

# Thank you for attending our webinar

**Seth Mullendore**

Vice President and Project Director

Clean Energy Group

[seth@cleanegroup.org](mailto:seth@cleanegroup.org)

**Find us online:**

[www.resilient-power.org](http://www.resilient-power.org)

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[www.facebook.com/clean.energy.group](https://www.facebook.com/clean.energy.group)

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# Upcoming Webinars

## **FERC 841 Compliance Update**

Tuesday, October 1, 3-4pm ET

## **Replacing Power Plants with Low-Income Residential Solar+Storage**

Thursday, October 10, 1-2pm ET

Read more and register at [www.cleanegroup.org/webinars](http://www.cleanegroup.org/webinars)