HGA

DESIGN AND CONSTRUCTION OF A NET ZERO ENERGY SCHOOL

OREGON SD: FOREST EDGE ELEMENTARY

Show and Tell to WiDRC – Wisconsin Distributed Resources Collaborative
April 8, 2022

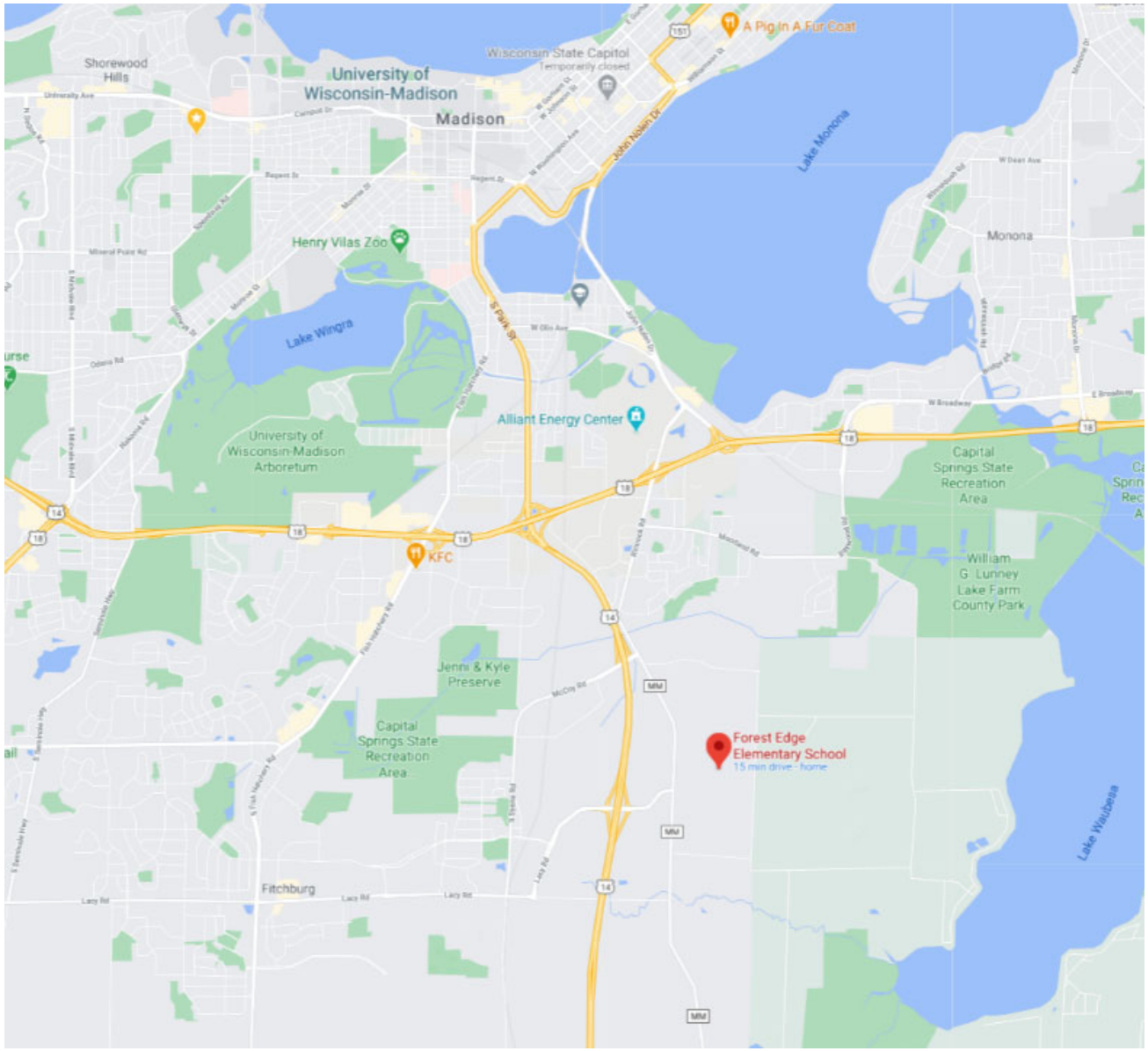
MINNEAPOLIS ROCHESTER MADISON MILWAUKEE WASHINGTON D.C. ALEXANDRIA BOSTON LOS ANGELES SAN JOSE SAN FRANCISCO SAN JOSE

ENGINEERING | ENERGY + INFRASTRUCTURE | LANDSCAPE ARCHITECTURE | SUSTAINABLE DESIGN | DESIGN INSIGHT GROUP (DIG) | DIGITAL PRACTICE GROUP

Why a Net-Zero Energy School?

OREGON SCHOOL DISTRICT

Andy Weiland
OSD Business Manager
Project Champion


A Pig in A Fur Coat
Wisconsin State Capitol
Temporarily closed
Shorewood Hills
University of Wisconsin-Madison
Madison
Lake Monona
Monona
Henry Vilas Zoo
Lake Wingra
S Park St
Alliant Energy Center
University of Wisconsin-Madison Arboretum
Capital Springs State Recreation Area
KFC
William G. Lunney Lake Farm County Park
Jenni & Kyle Preserve
Forest Edge Elementary School
15 min drive · home
Fitchburg
Lake Waubesa

NZE Project Team

HGA

OREGON SCHOOL DISTRICT

bray architects

Findorff
BUILDERS SINCE 1890

Schneider Electric

MUERMANN ENGINEERING
A DIVISION OF MSA

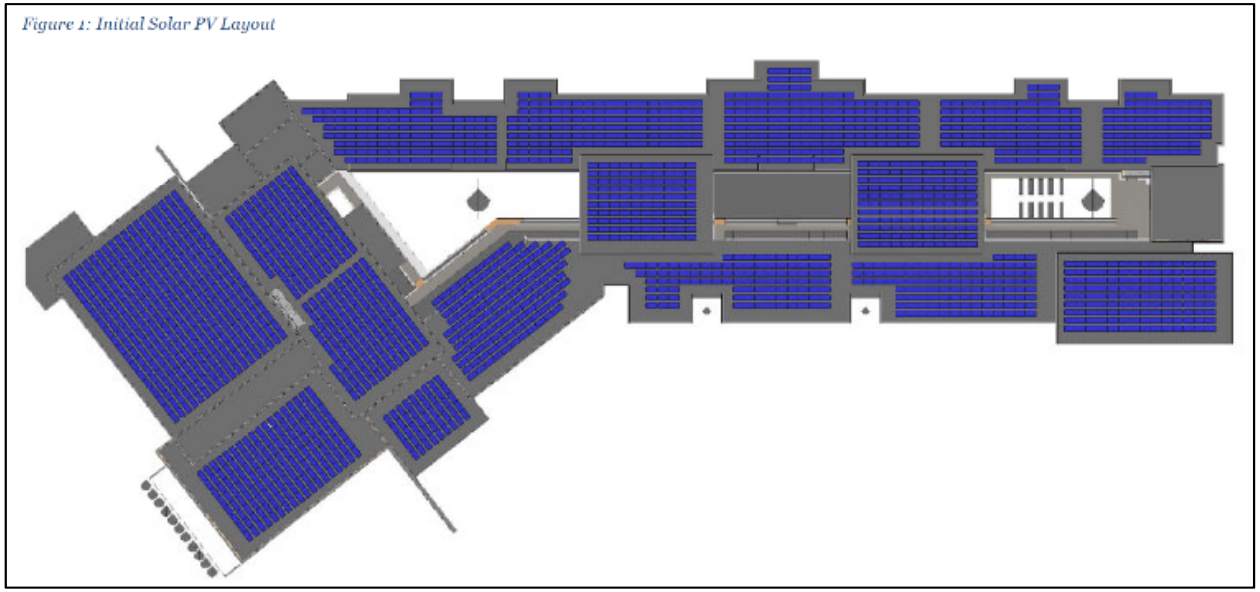
Electric Construction inc

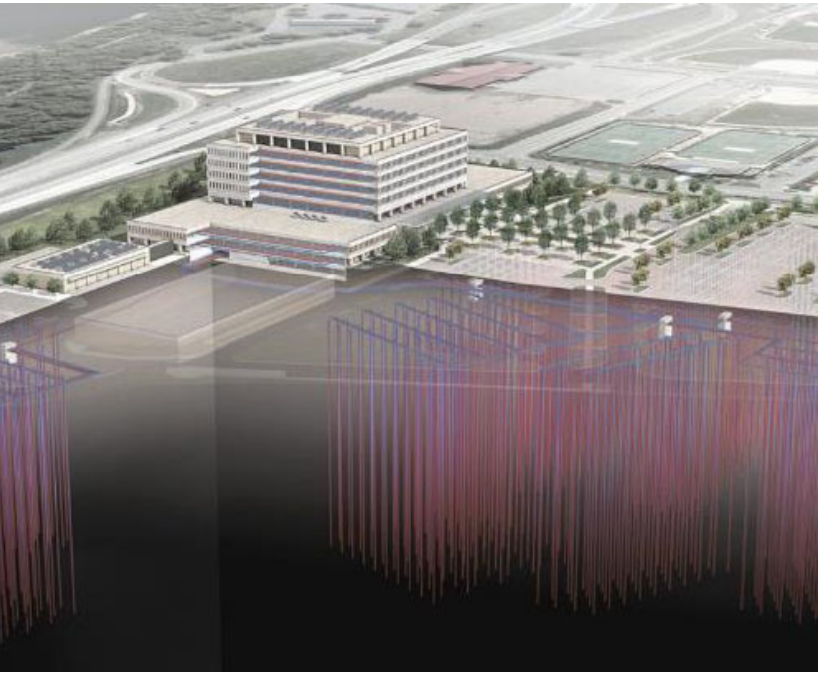
ALPHA controls & services

FREDERICKSEN Engineering

FULL SPECTRUM SOLAR

SURE FIRE

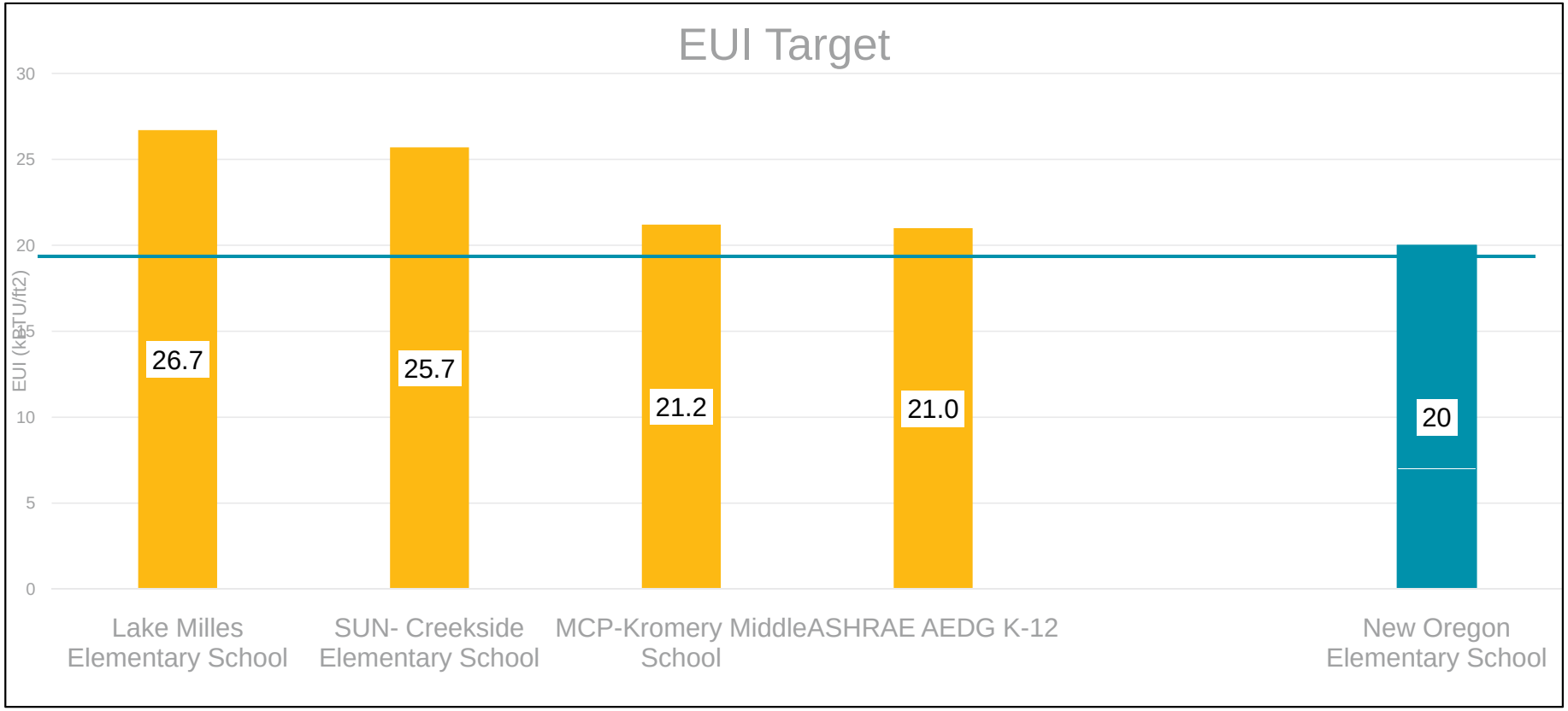




HGA's Project Roll

- Energy Modeling
- Geothermal, PV and Battery design
- Commissioning
- Measurement and Verification

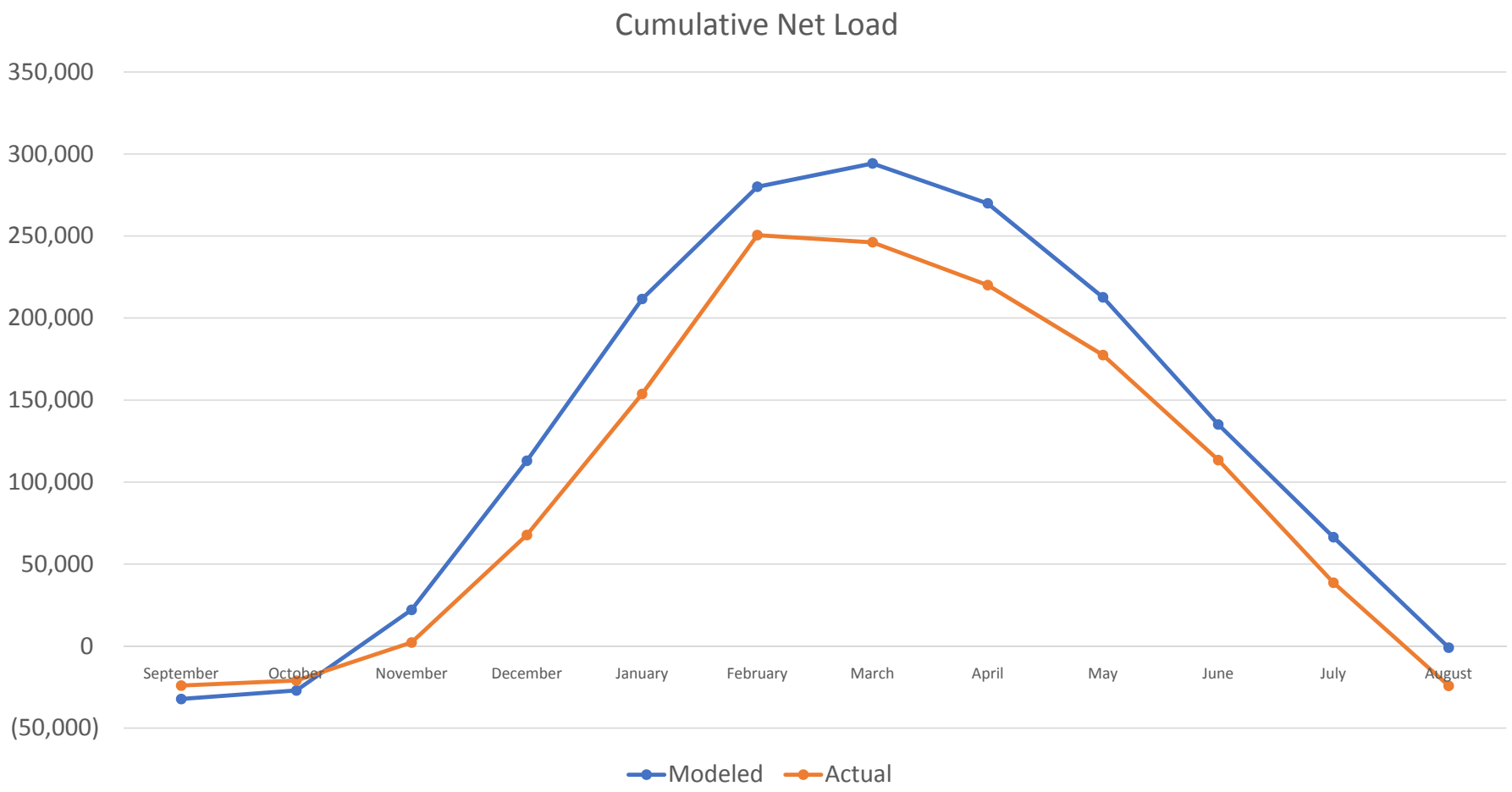
Design Process: EUI Target



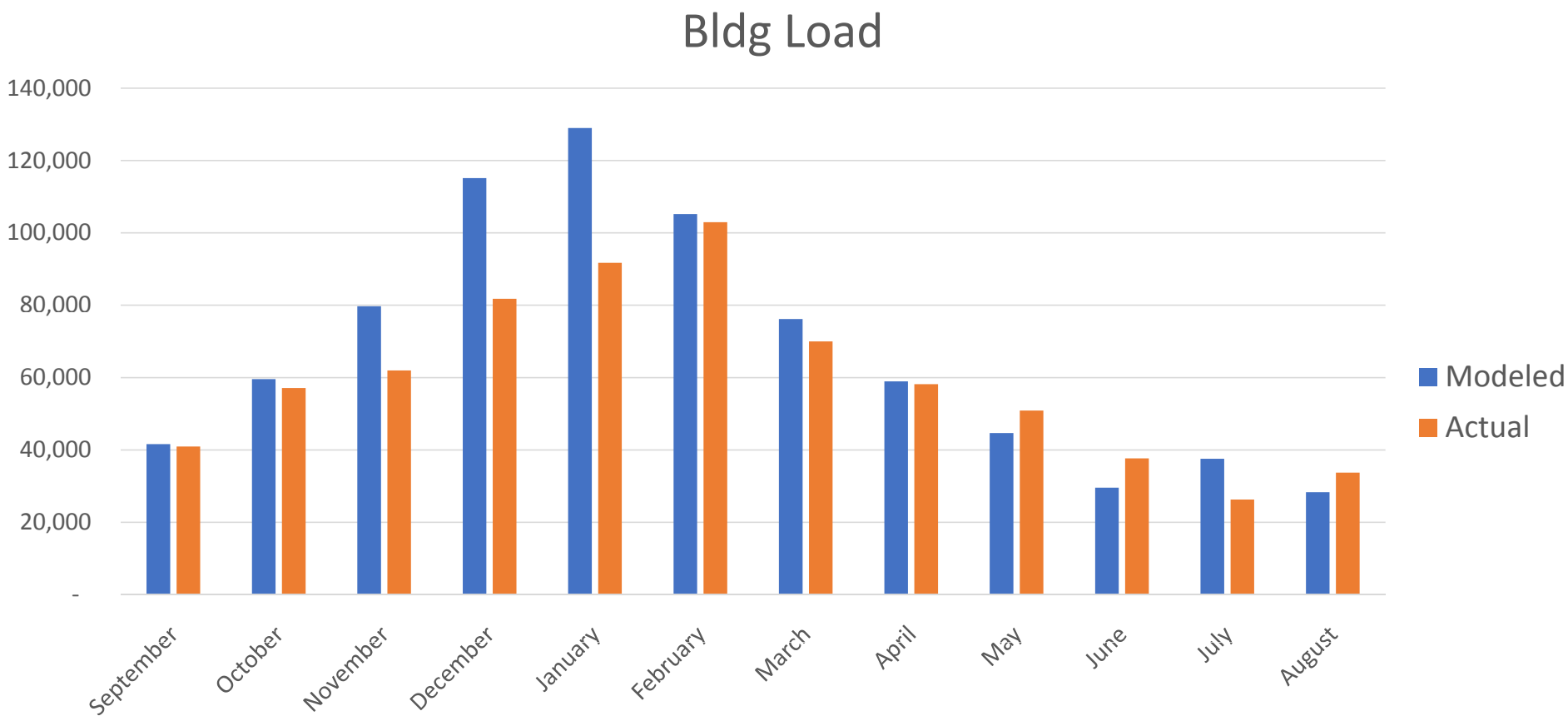
Modeling Results- Predicted vs. Actual

Project	Design Modeled Data (kBTU/SF)site	Actual Utility Data (kBTU/SF)site	Accuracy
Waunakee MS	29	25.5	88%
Kromery MS	21	19.3	92%
Creekside ES	24.1	23.5	98%
Horizon	24.1	23.5	98%
Lake Mills MS	34.5	29.1	84%
Lake Mills ES	26.7	26.7	100%
		Average:	93%
Oregon ES- NZE	21.7	19.2	88%

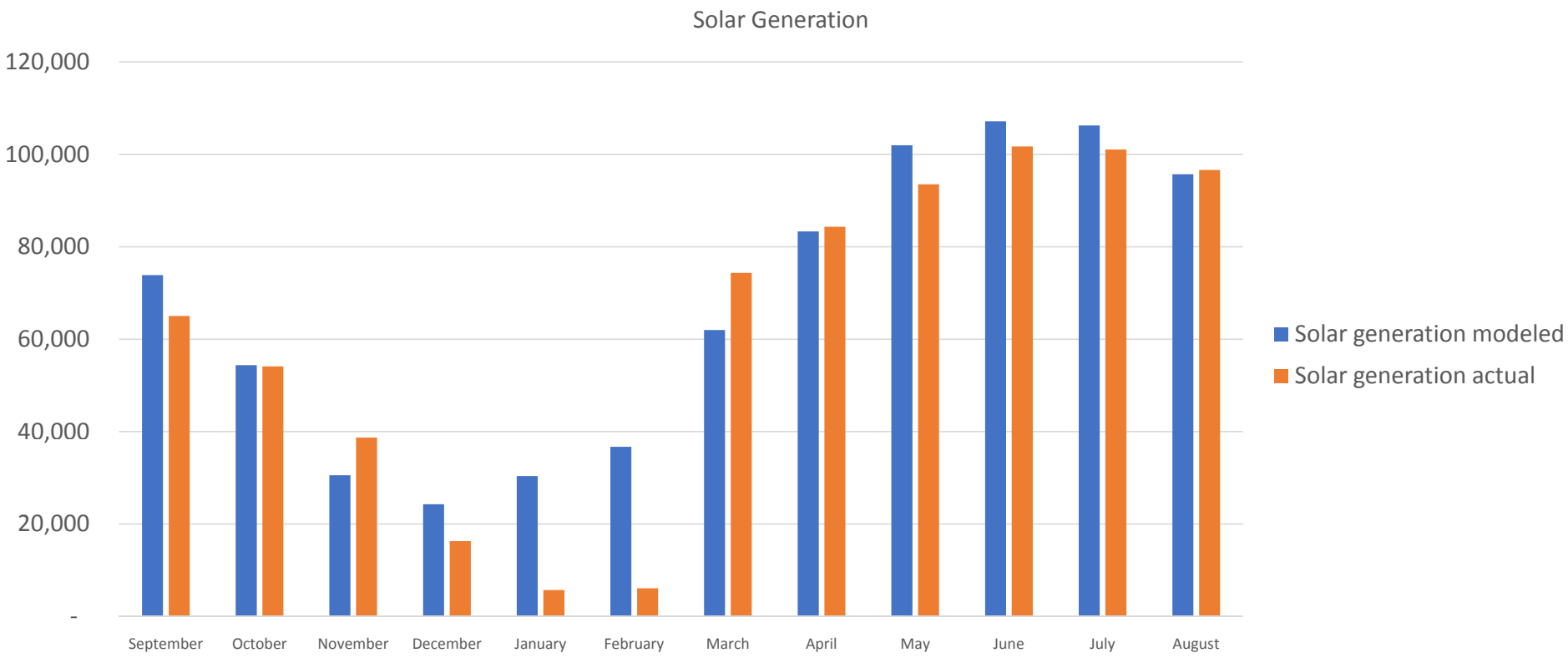
Actual Building Performance



Actual Building Performance - Consumption



Actual Building Performance - Production



Map and List | Analysis

NBI Getting to Zero Buildings Database

Use the filters on the left to filter projects in the map, and/or select a bubble on the map to filter the table below.
Click on the **Analysis** tab above to see the big picture and create customized charts.

Reset Filters

ZE Status — **Count**

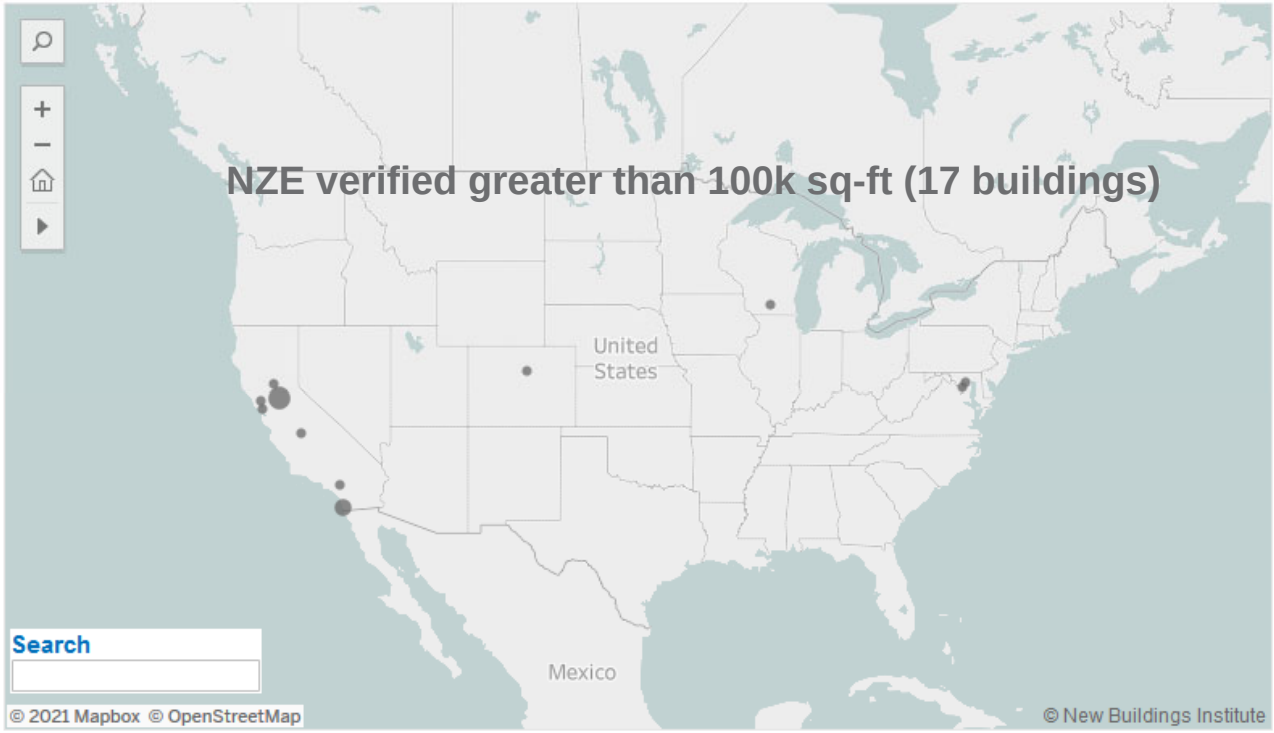
- [ ] Emerging 79
- [x] Verified 17

State or Province

- [x] (All)
- [x] Alabama
- [x] Alberta
- [x] Arizona
- [x] Arkansas
- [x] British Columbia
- [x] California
- [x] Colorado
- [x] Connecticut

Building Type

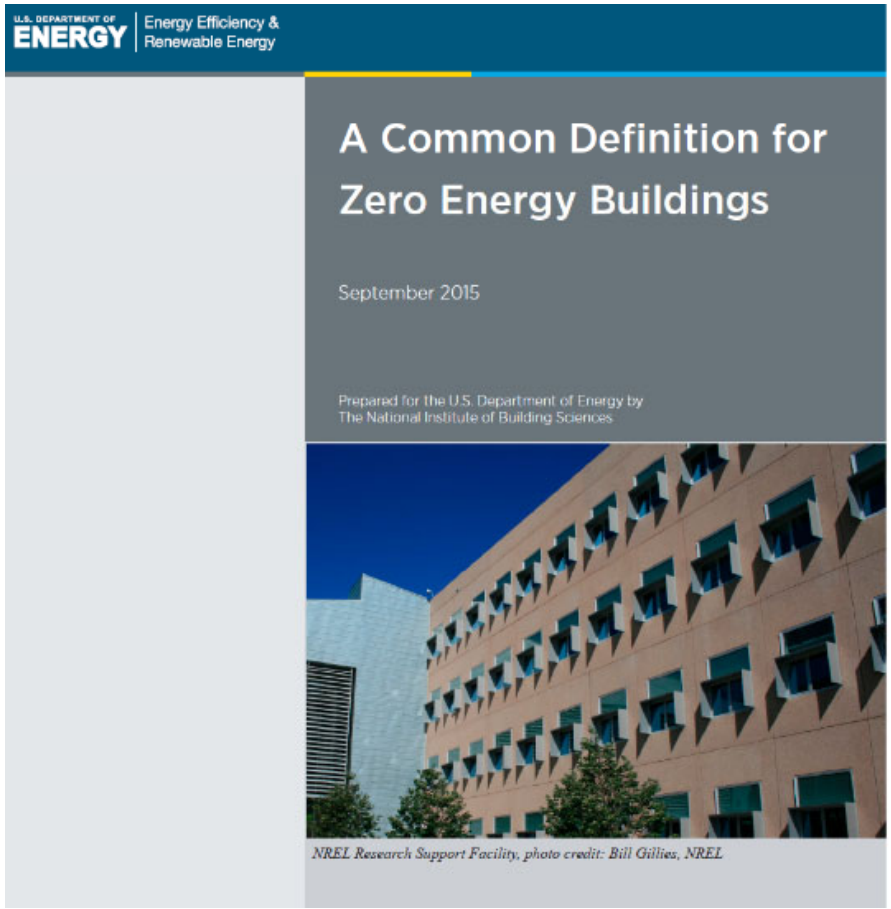
- [x] (All)
- [x] Education
- [x] Food Sales
- [x] Food Service
- [x] Health Care (Inpatient)
- [x] Health Care (Outpatient)
- [x] Lodging
- [x] Mercantile (Enclosed a...
- [x] Mercantile (Retail Othe...



ZE Status	State or Province	Name	Certifications	City	Building Type	Size (sf)	Total Site EUI	Net Site EUI
Verified	CA	Silver Oak Winery		Sonoma	Other	109,000		
Verified	CO	NREL Research Support Facility		Golden	Office	222,000	46	0
Verified	MD	United Therapeutics Unisphere		Silver Spring	Office	135,000	23	-1
Verified	MD	Wilde Lake Middle School		Ellicott City	Education	106,622	13	-11
Verified	WI	Forest Edge Elementary School		Fitchburg	Education	126,580	19	0

Key Ingredients for NZE

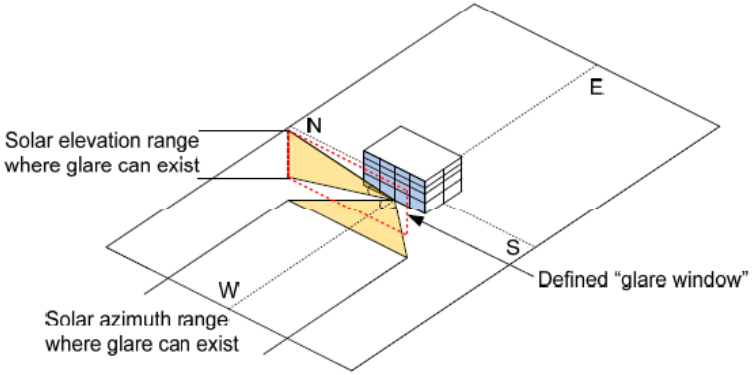
- Geothermal (ground source) HVAC
- Solar PV Covering Roof
- High performance envelope
- Aggressive lighting control
- Rigorous commissioning
- Operational excellence



Interesting Design Elements

- Green bond
- No natural gas connection
- Electrochromic lighting
- ECM motor pump skid for geo pumps
- Submetering of loads
- Solar PV roof
- Advanced lighting control

Interesting Design



Interesting Design

Power - Chart

Save

22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0

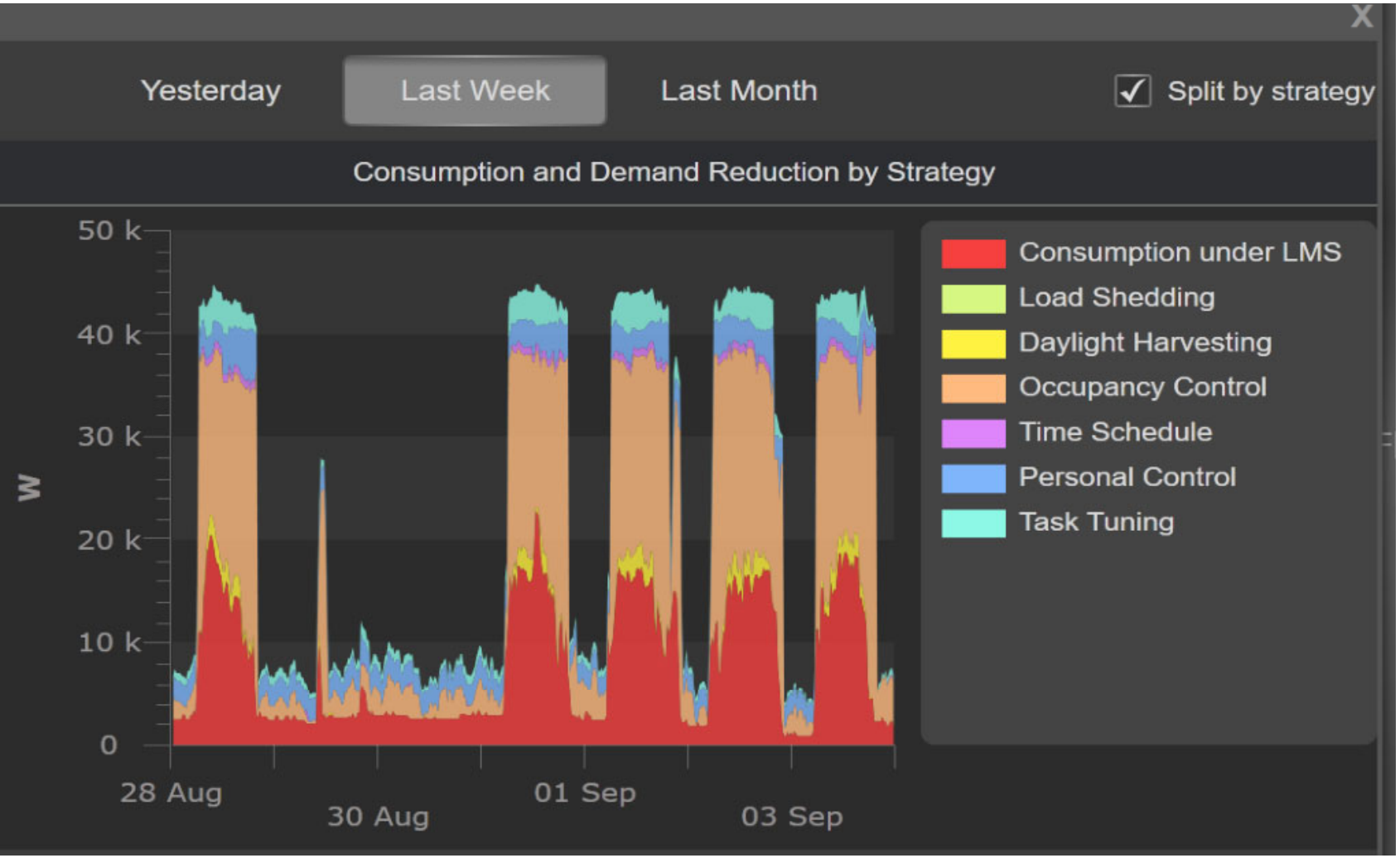
Power
0.4 kW
10/10/2020 11:34:55 PM

06:00 PM | 08:00 AM | 10:00 PM | 12:00 PM | 02:00 AM | 04:00 PM | 06:00 AM | 08:00 PM | 10:00 AM | 12:00 AM | 02:00 PM

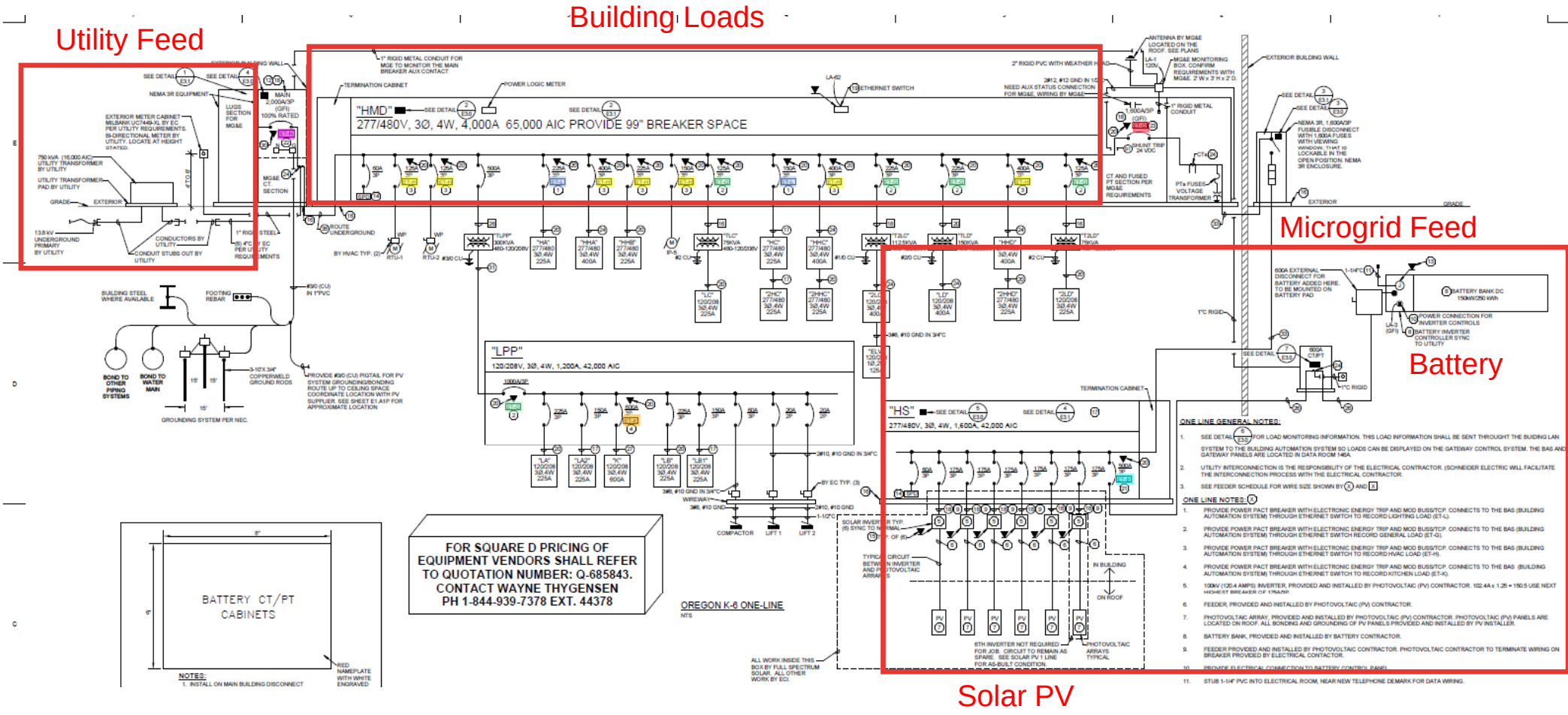
Oct 05, 2020 | Oct 12, 2020

Power (kW)

Interesting Design



Interesting Design Elements

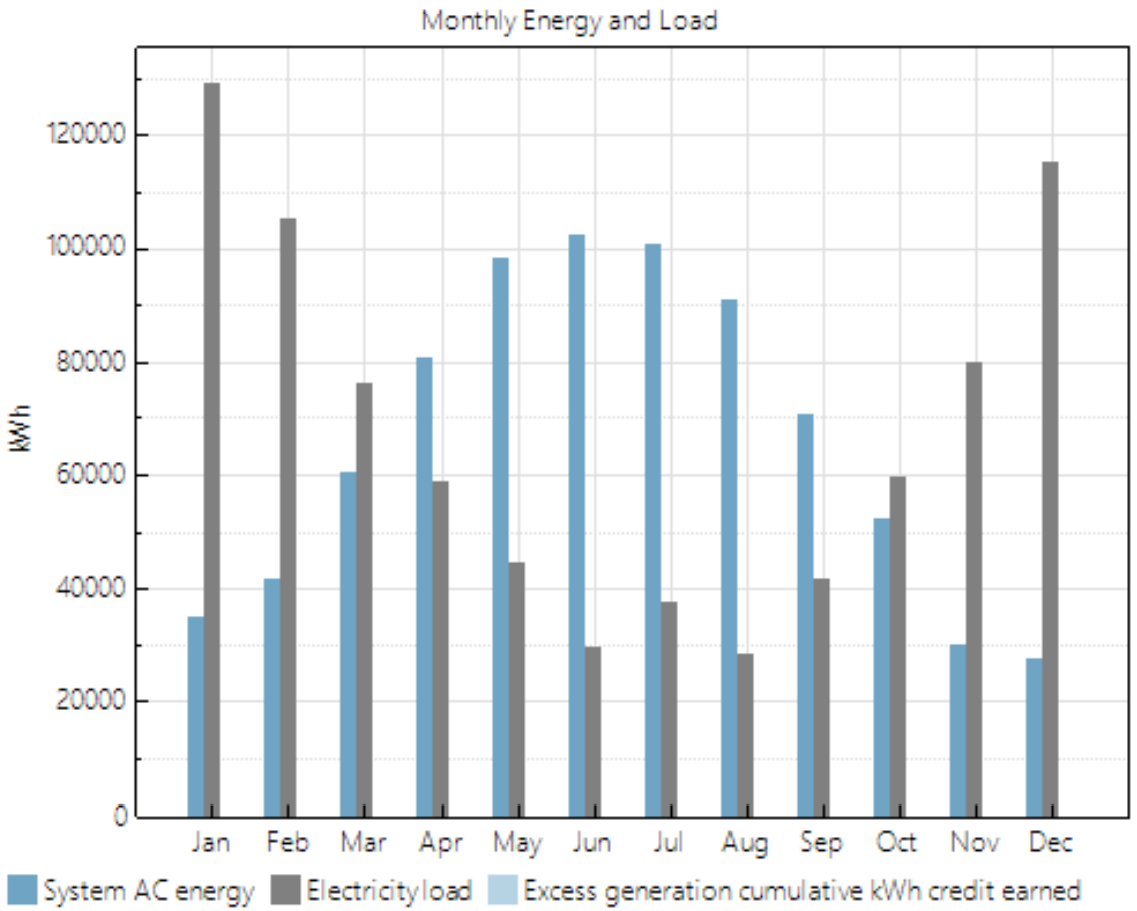


Interesting Design Elements

Solar Inverters

Battery Goals

- Reduce peak charges
- Self consume more solar PV
- Include microgrid capability
- Allow for future flexibility
- Limitations: long term storage



Battery Use

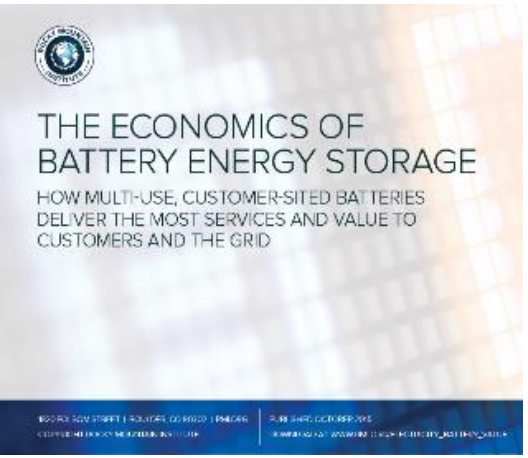
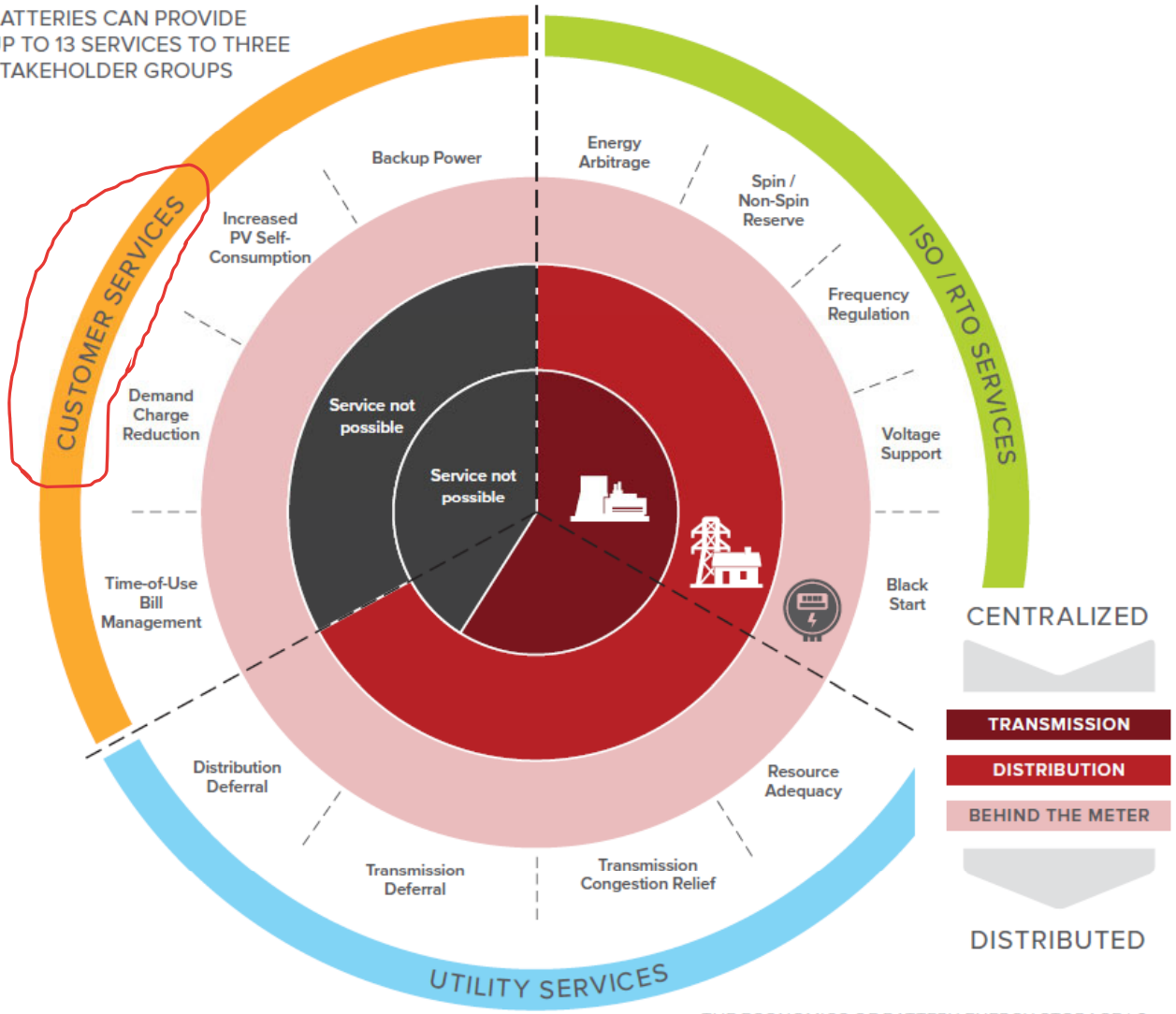


FIGURE ES2
BATTERIES CAN PROVIDE
UP TO 13 SERVICES TO THREE
STAKEHOLDER GROUPS



Battery Procurement

- Performance spec for 125kW/250kWh
- Pricing near $800/kWh
- Most bids disqualified for not meeting design requirements (primarily software/control)

Selected System

- Schneider with LG Chem Batteries
- Delivered 10/14

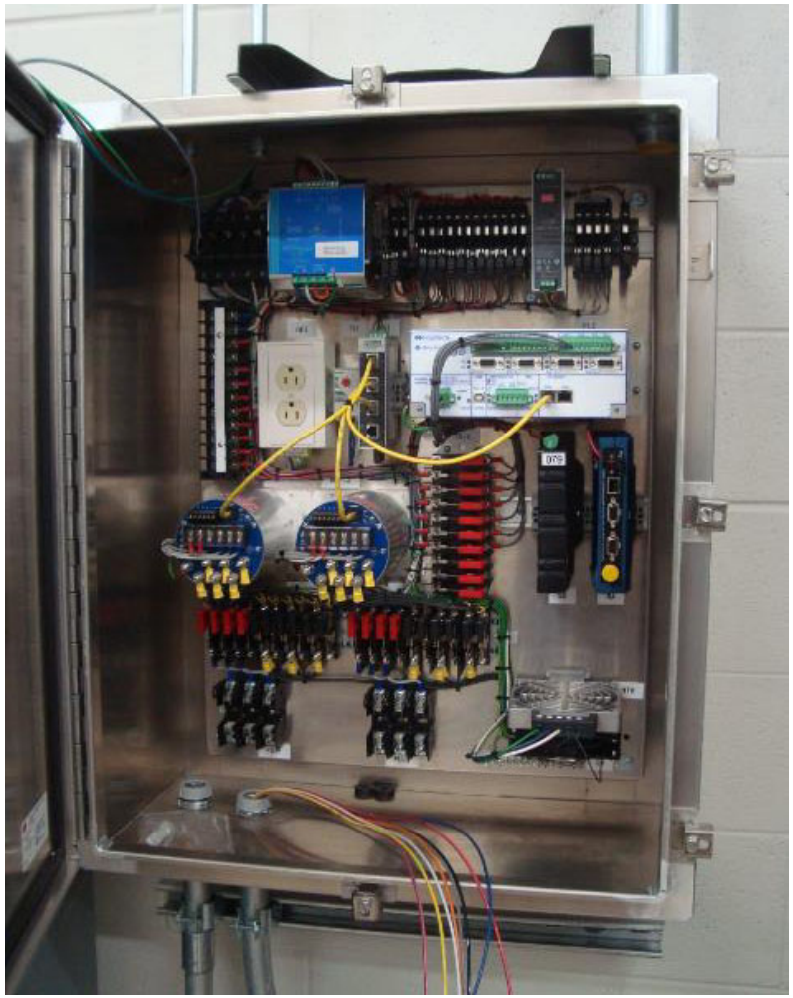
125 kW/250 kWh system


Schneider
Electric

Solar / Battery Interconnection Process

- Initial submission December 2019
- Conditional approval July 2020
- Distribution study $20k
- Remote monitoring and disconnect $35k

MGE Monitoring Box



- CTs and PTs in the 1600A switchboard to monitoring the total net generation of both the solar and the battery.
- CTs and PTs for the 600A battery
- MGE owned monitoring box, which includes the following:
  - Wires to each set of CTs and PTs
  - Shunt trip to the 1600A generation breaker
  - Status wires of the 1600A generation breaker
  - Status wires of the 2000A main breaker
  - Communications wire to the roof
  - Radio antenna on the roof
- Labor to build, install, test, and commission the monitoring and trip setup.

MGE's Interconnection Concerns

- Proper islanding and grid reconnection
- Transient impacts with MGE generation on buss

Utility Engineer: IA Process Recommendations

- Incorporate IEEE 1547-2018 into updated PSC 119
- Allow for more visibility of DER’s to utility

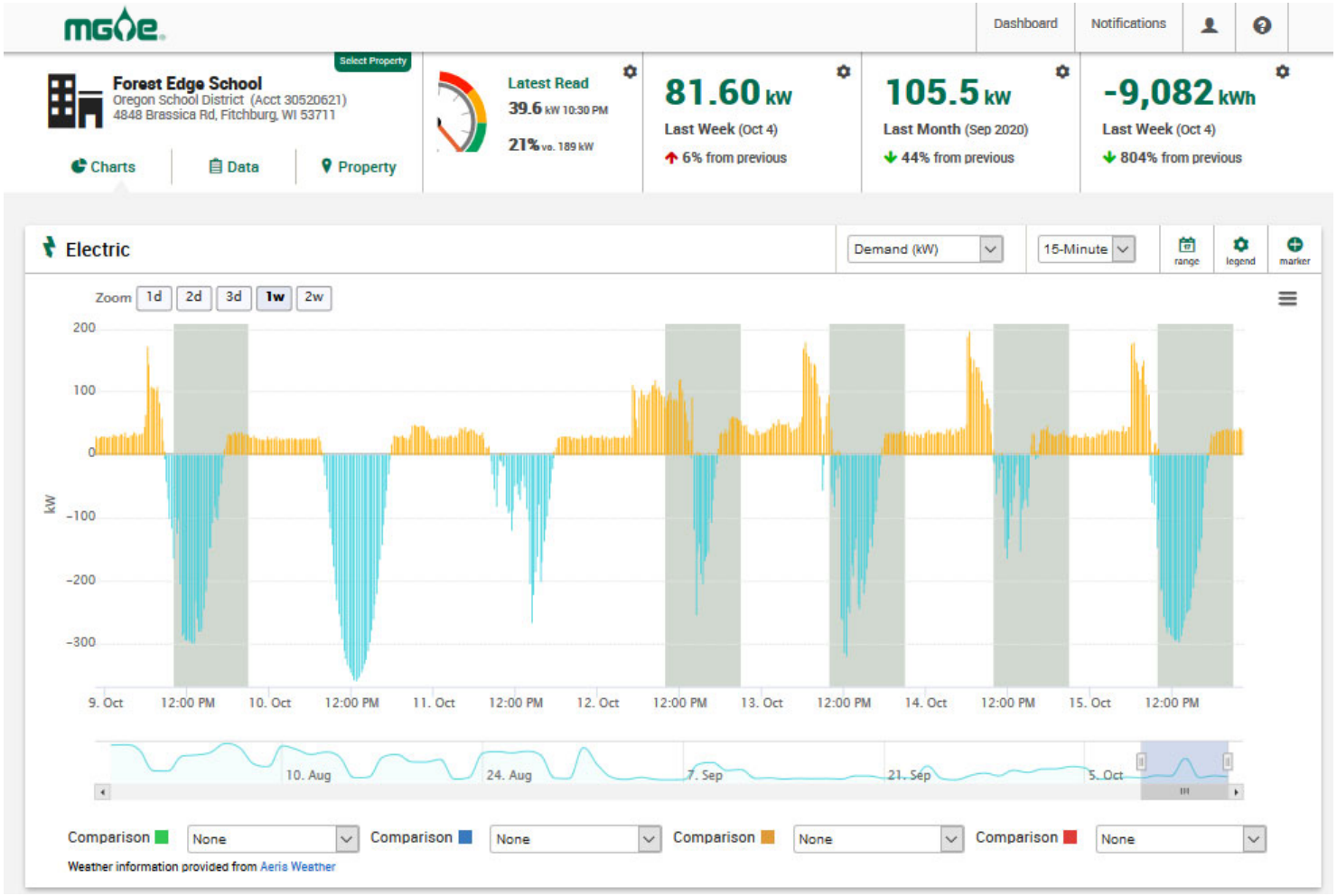
Owner/Engineer Recommendations

- Provide process for cost estimates prior to submission of interconnection application
- Include battery requirements into PSC 119
- Establish common interconnection standards among all utilities for batteries and solar

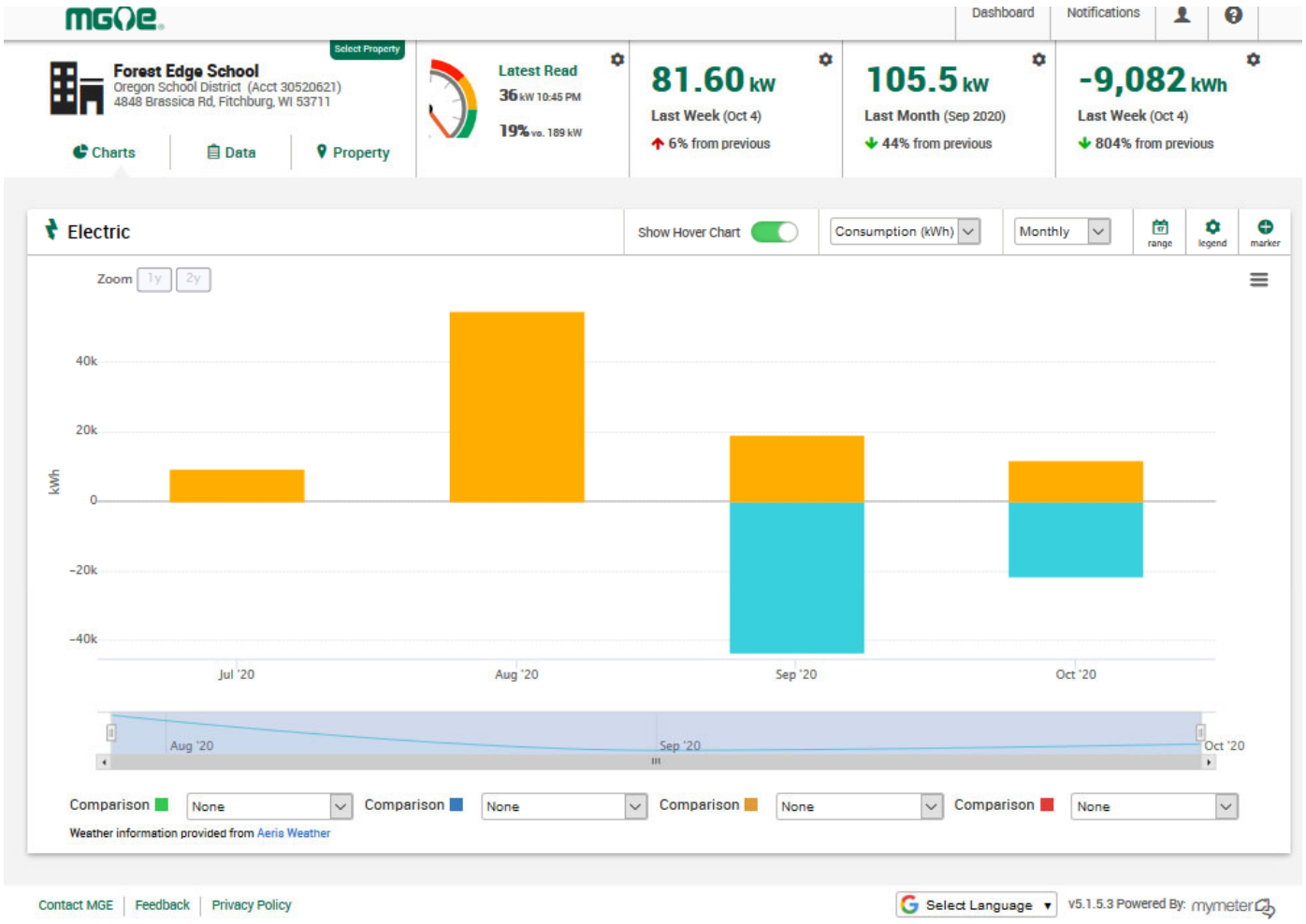
Monitoring Tools

- MGE MyMeter
- SolarEdge Monitoring
- Panel level monitoring
- BESS Monitoring

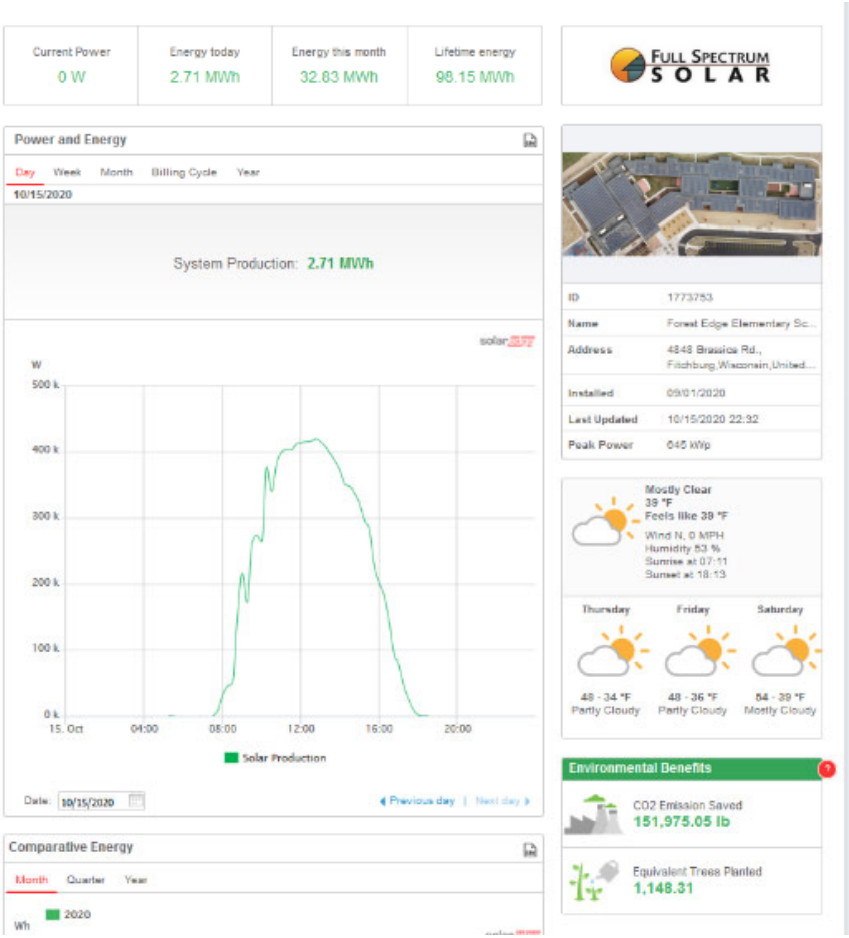
MGE MyMeter


mgoe
Dashboard
Notifications
Select Property
Forest Edge School
Oregon School District (Acct 30520621)
4848 Brassica Rd, Fitchburg, WI 53711
Charts
Data
Property
Latest Read
39.6 kW 10:30 PM
21% vs. 189 kW
81.60 kW
Last Week (Oct 4)
6% from previous
105.5 kW
Last Month (Sep 2020)
44% from previous
-9,082 kWh
Last Week (Oct 4)
804% from previous
Electric
Demand (kW)
15-Minute
range
legend
marker
Zoom 1d 2d 3d 1w 2w
200
100
0
-100
-200
-300
kW
9. Oct
12:00 PM
10. Oct
12:00 PM
11. Oct
12:00 PM
12. Oct
12:00 PM
13. Oct
12:00 PM
14. Oct
12:00 PM
15. Oct
12:00 PM
10. Aug
24. Aug
7. Sep
21. Sep
5. Oct
Comparison
None
Comparison
None
Comparison
None
Comparison
None
Weather information provided from Aeris Weather

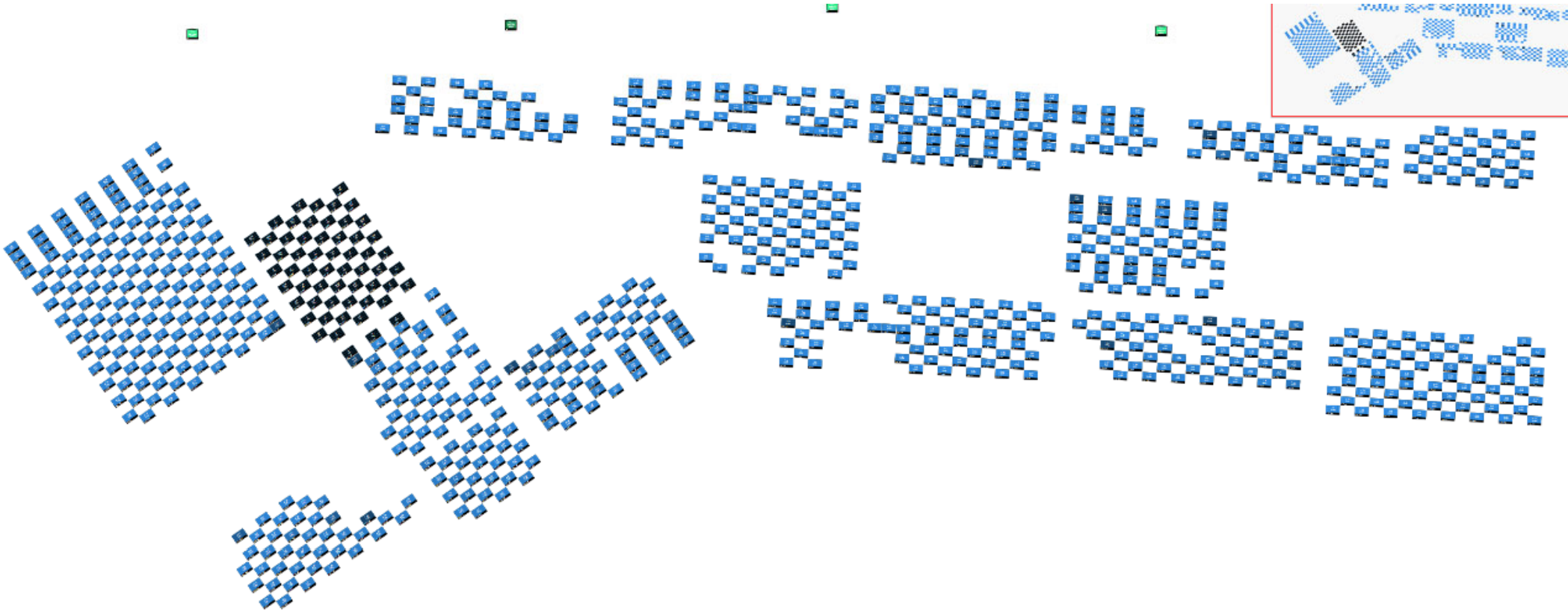
MGE MyMeter


mgoe
Dashboard
Notifications
Select Property
Forest Edge School
Oregon School District (Acct 30520621)
4848 Brassica Rd, Fitchburg, WI 53711
Charts
Data
Property
Latest Read
36 kW 10:45 PM
19% vs. 189 kW
81.60 kW
Last Week (Oct 4)
6% from previous
105.5 kW
Last Month (Sep 2020)
44% from previous
-9,082 kWh
Last Week (Oct 4)
804% from previous
Electric
Show Hover Chart
Consumption (kWh)
Monthly
range
legend
marker
Zoom
1y
2y
40k
20k
0
-20k
-40k
kWh
Jul '20
Aug '20
Sep '20
Oct '20
Comparison
None
Weather information provided from Aeris Weather
Contact MGE
Feedback
Privacy Policy
Select Language
v5.1.5.3 Powered By: mymeter

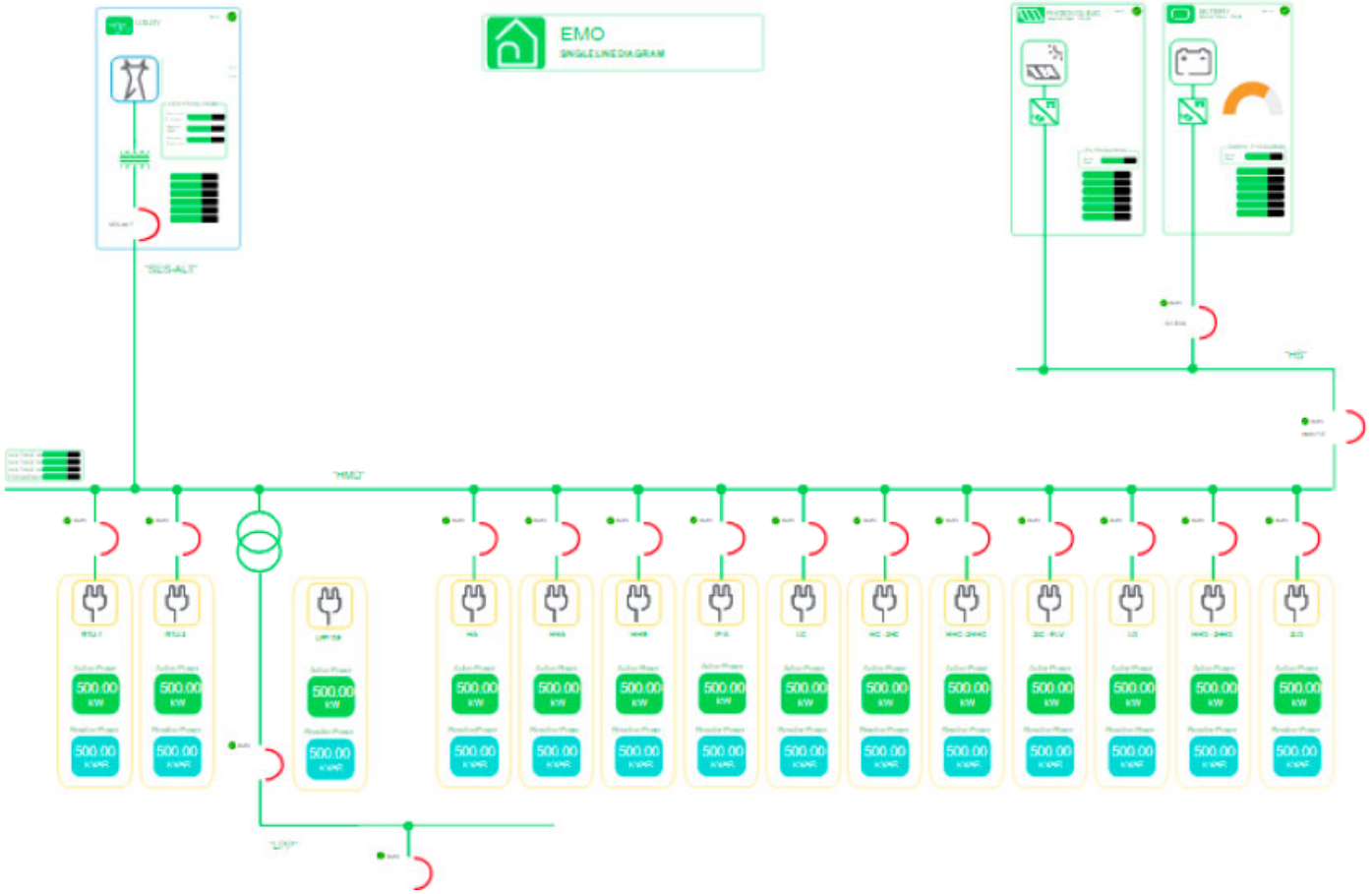
SolarEdge Monitoring



SolarEdge Monitoring



BESS and Panel Level Monitoring



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Thanks

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Project Manager

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