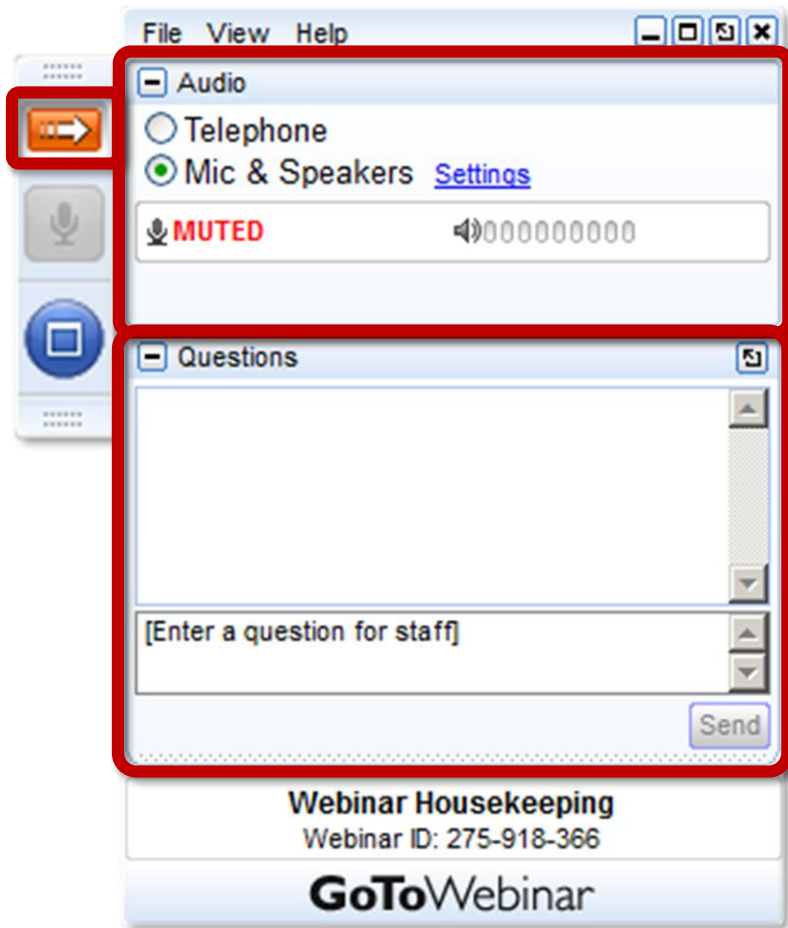


Energy Storage for Rural Affordable Housing: The McKnight Lane Redevelopment Project



September 27, 2017

Housekeeping



Use the red arrow to open and close your control panel

Join audio:

- Choose Mic & Speakers to use VoIP
- Choose Telephone and dial using the information provided

Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. Resilient Power Project webinars are archived online at: www.resilient-power.org

Clean Energy States Alliance



www.cesa.org

ESTAP is a project of CESA

Clean Energy States Alliance (CESA) is a non-profit organization providing a forum for states to work together to implement effective clean energy policies & programs:

State & Federal Energy Storage Technology Advancement Partnership (ESTAP) is conducted under contract with Sandia National Laboratories, with funding from US DOE.

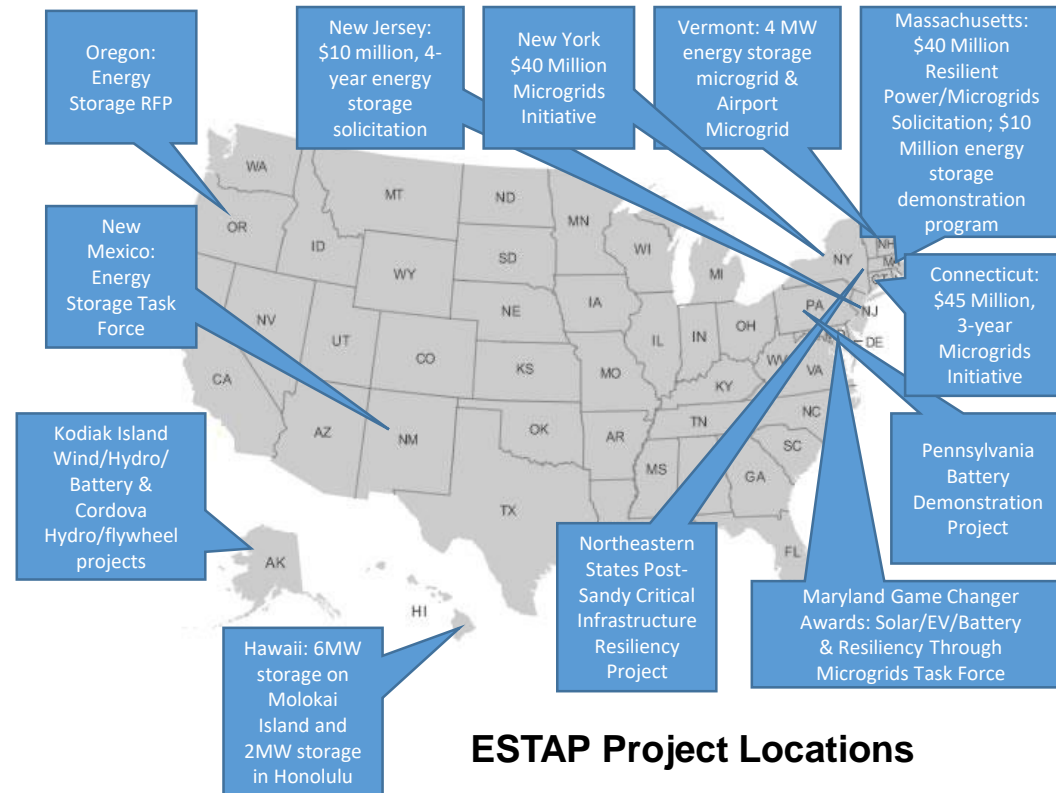
ESTAP Key Activities:

1. Disseminate information to stakeholders

- ESTAP listserv >3,000 members
- Webinars, conferences, information updates, surveys.

2. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment

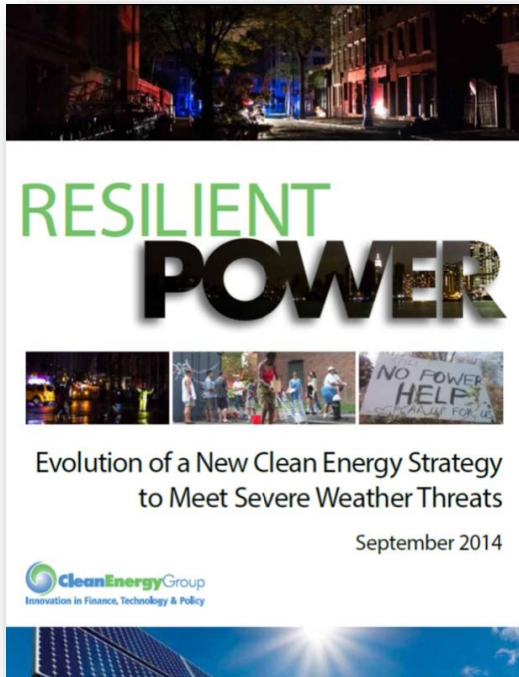
3. Support state energy storage efforts with technical, policy and program assistance



ESTAP Project Locations



The Resilient Power Project



www.cleangroup.org

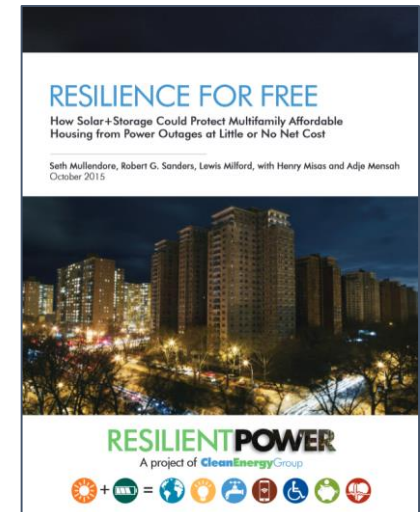
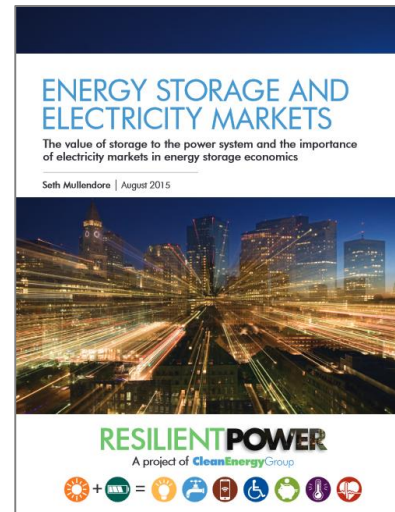
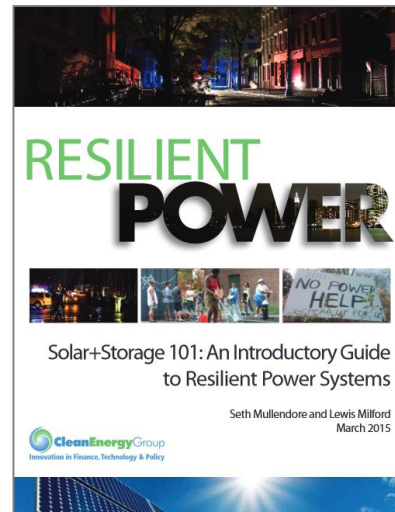
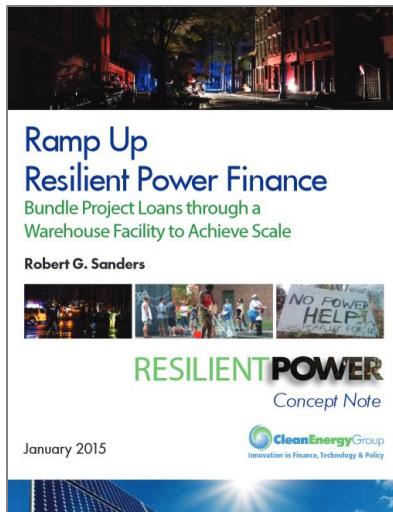
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SURDNA FOUNDATION
Fostering sustainable communities in the United States

Resilient Power Project

- Increase public/private investment in clean, resilient power systems
- Engage city officials to develop resilient power policies/programs
- Protect low-income and vulnerable communities
- Focus on affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings



Today's Speakers

- **Peter Schneider**, Vermont Energy Investment Corporation (VEIC)
- **Craig Ferreira**, Green Mountain Power
- **Todd Olinsky-Paul**, Clean Energy States Alliance (moderator)



Thank you to **Imre Gyuk** of US DOE-OE and **Dan Borneo** of Sandia National Laboratories

McKnight Lane: zero energy modular and solar+storage case study

peter schneider

partners



Agency of Commerce & Community Development



pill-maharam architects



zero energy modular redefines affordable housing

- Quality – craftsmanship and durability
- Healthy - fresh air ventilation and material selection
- Long Term Affordability – energy efficiency and asset value



Waltham, VT

HDD: ~7500

Design Temp: -4F

Solar Radiation: 3.7
kWh/m²/Day

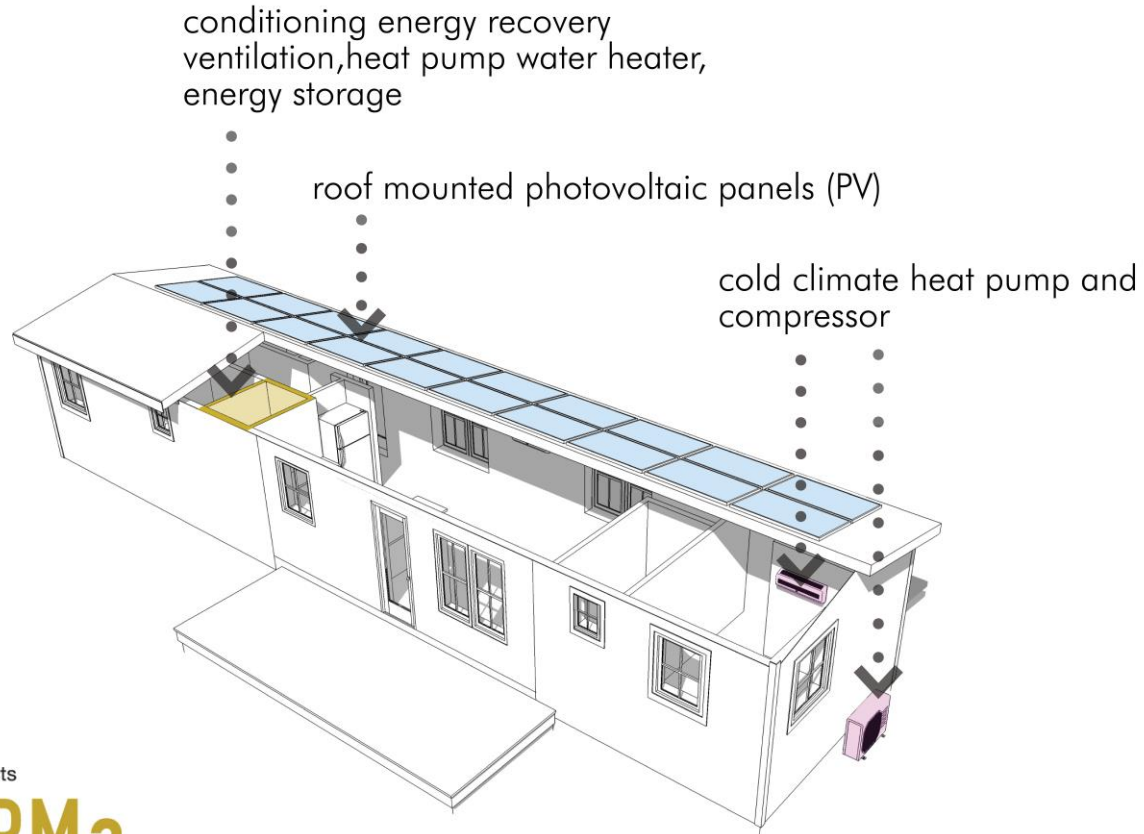
Design Load:
7kBtu/hour

Climate Zone: 6a



how do we get there ?

efficient mechanical and electrical systems



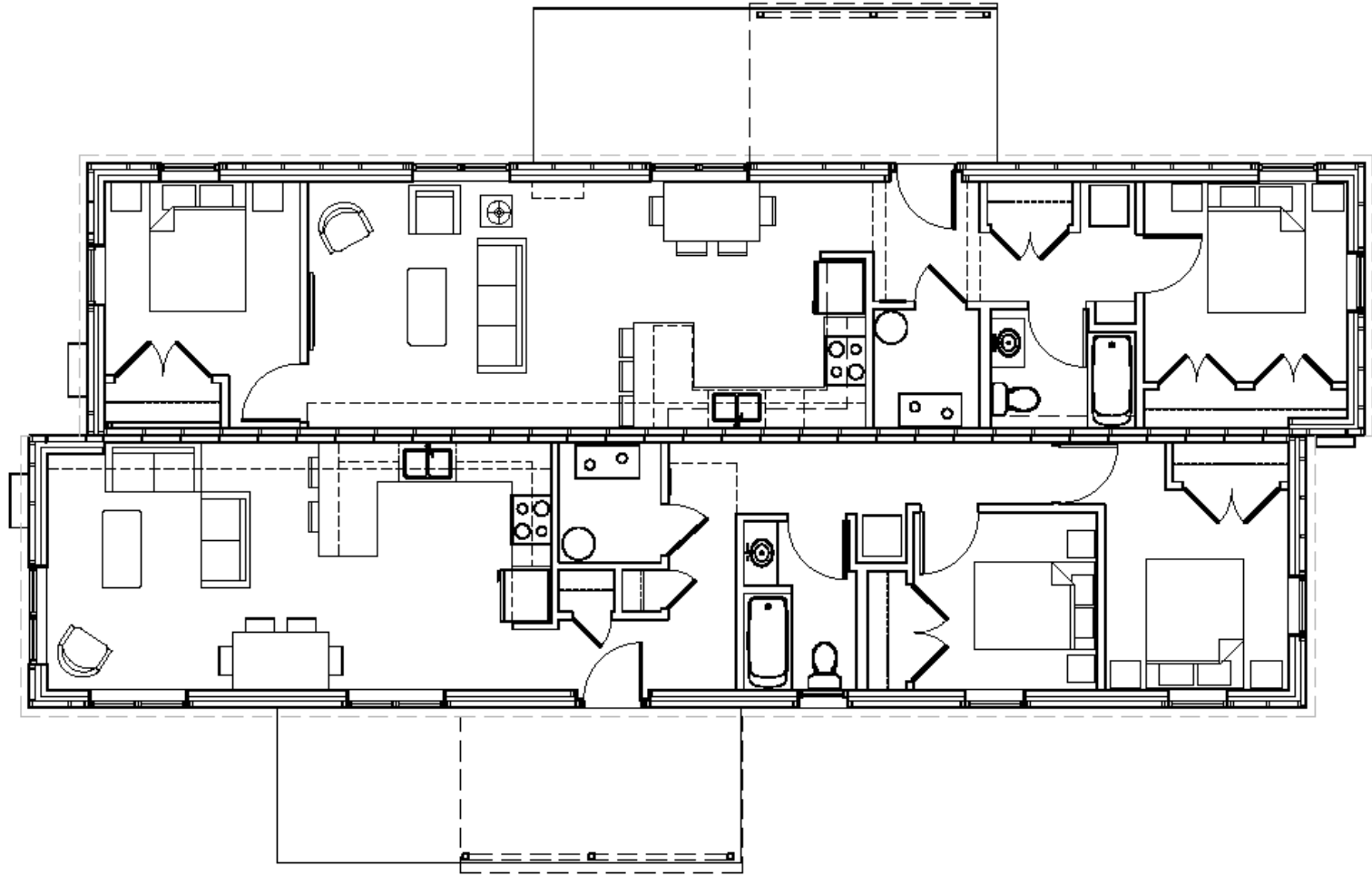
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PMa

mcknight lane duplexes – waltham, vt







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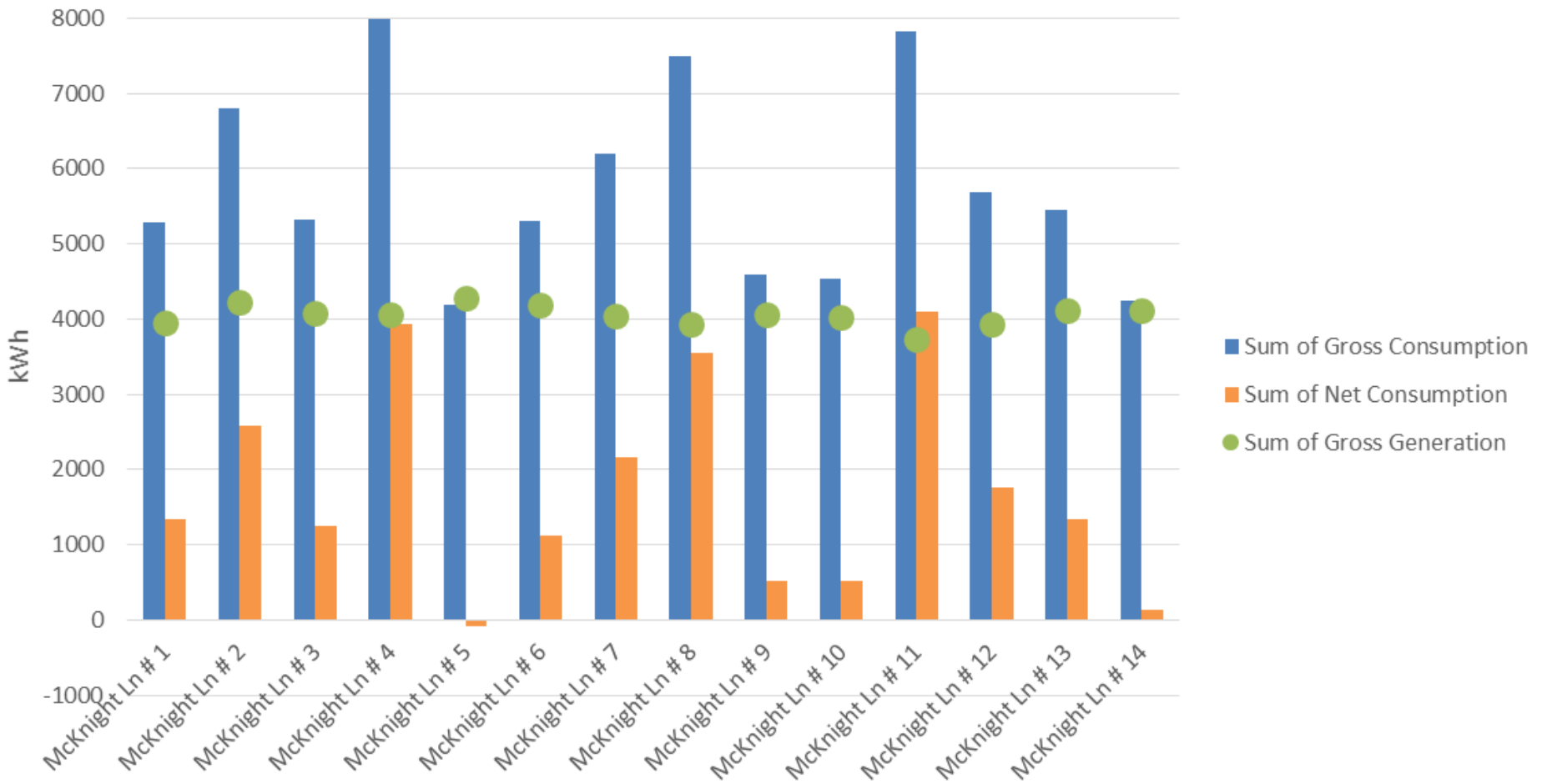
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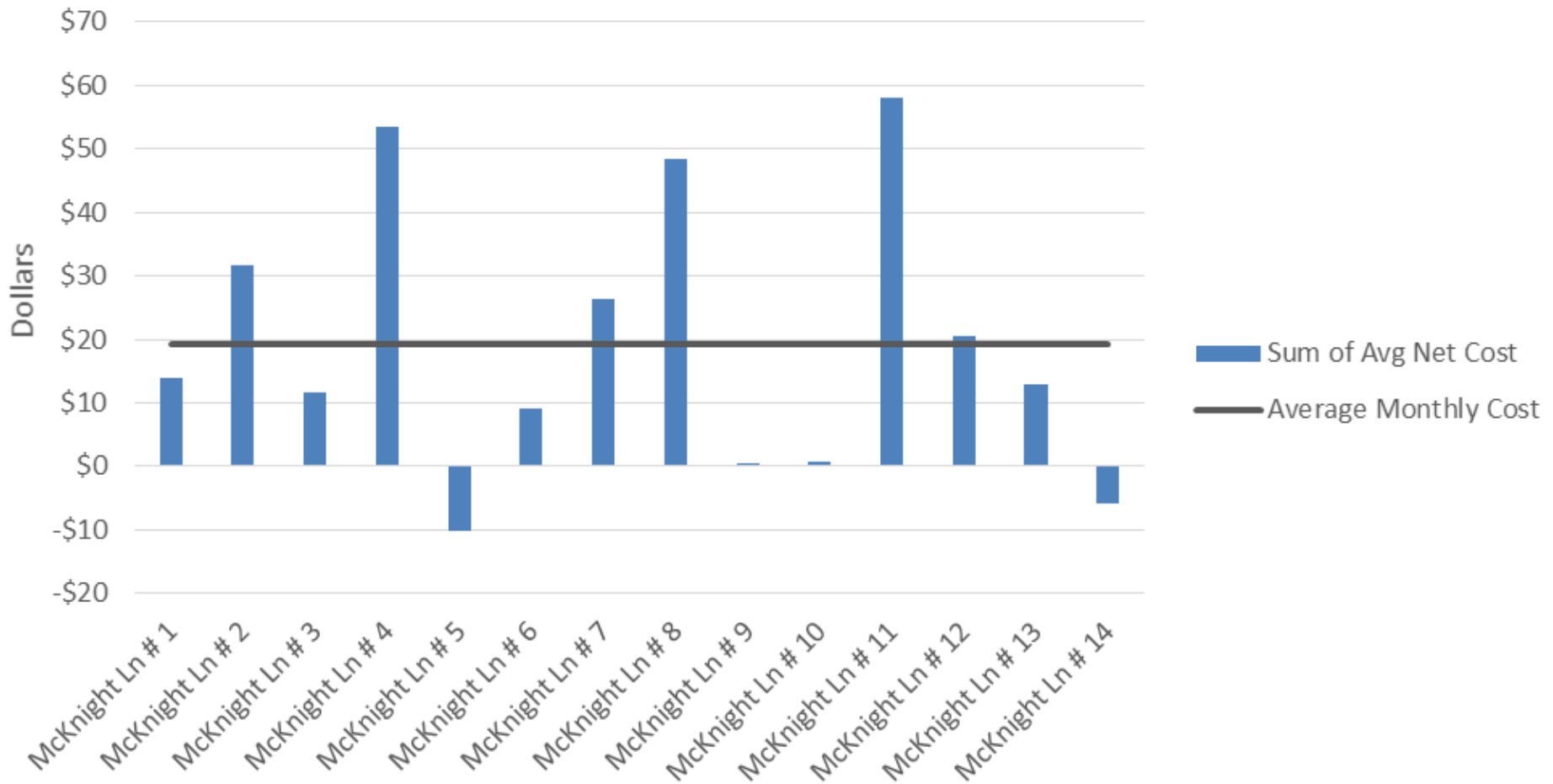




Sum of Gross Consumption Jan - Aug, 2017



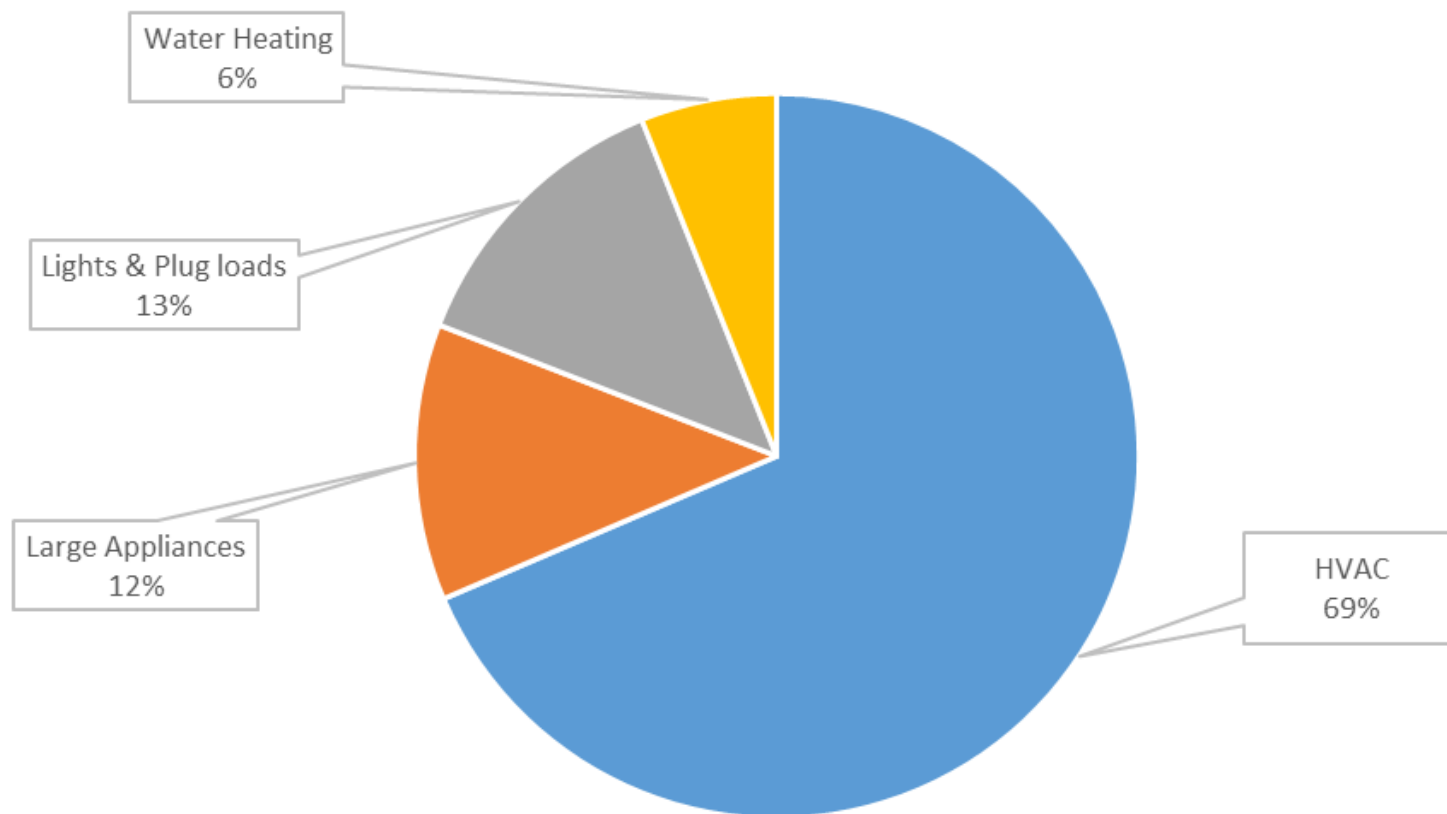
Average Monthly Customer Costs Jan - Aug, 2017



Total Consumption by End Use Category

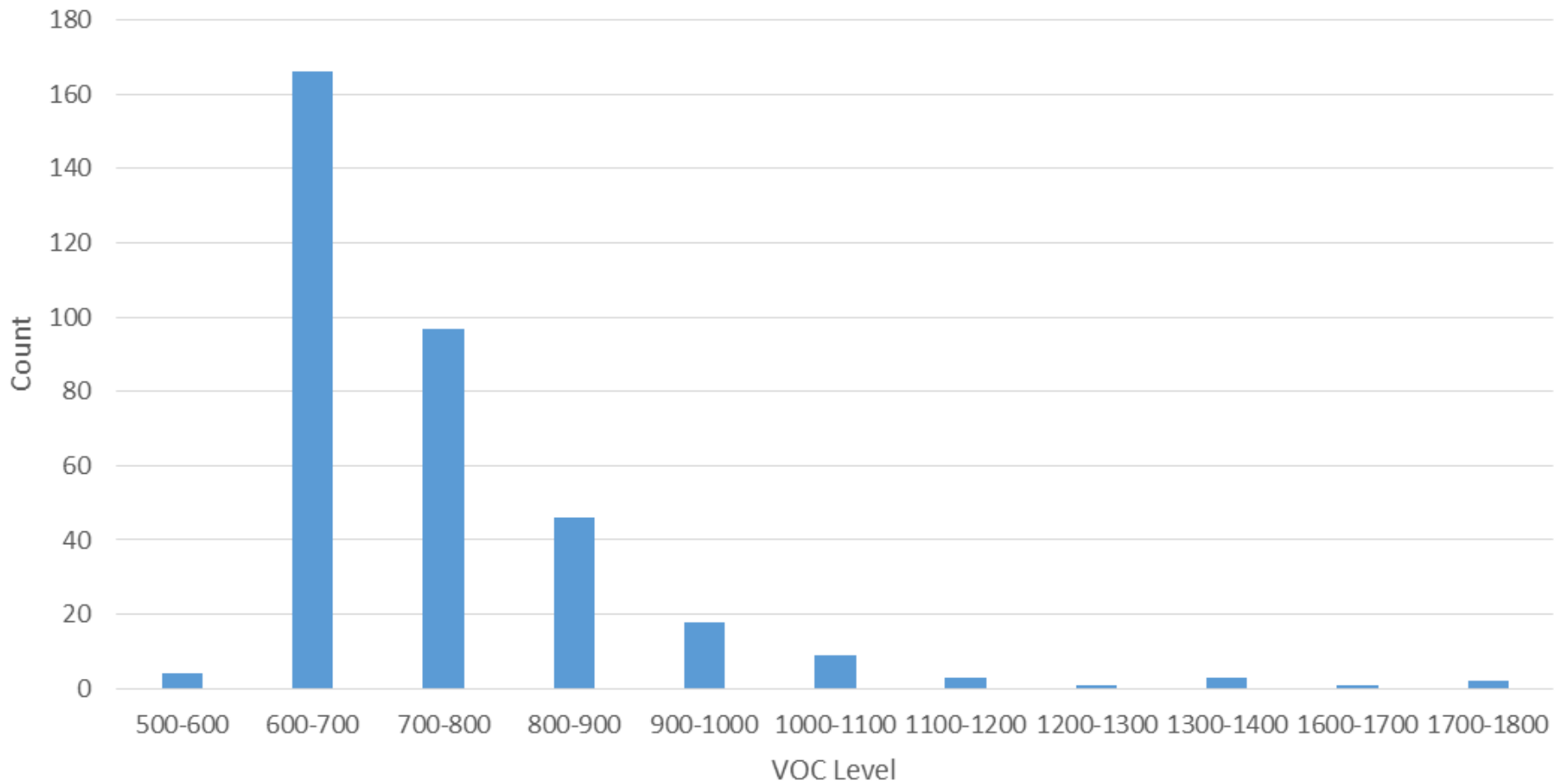
Total Gross kWh: 4,461

9/21/16-9/20/17



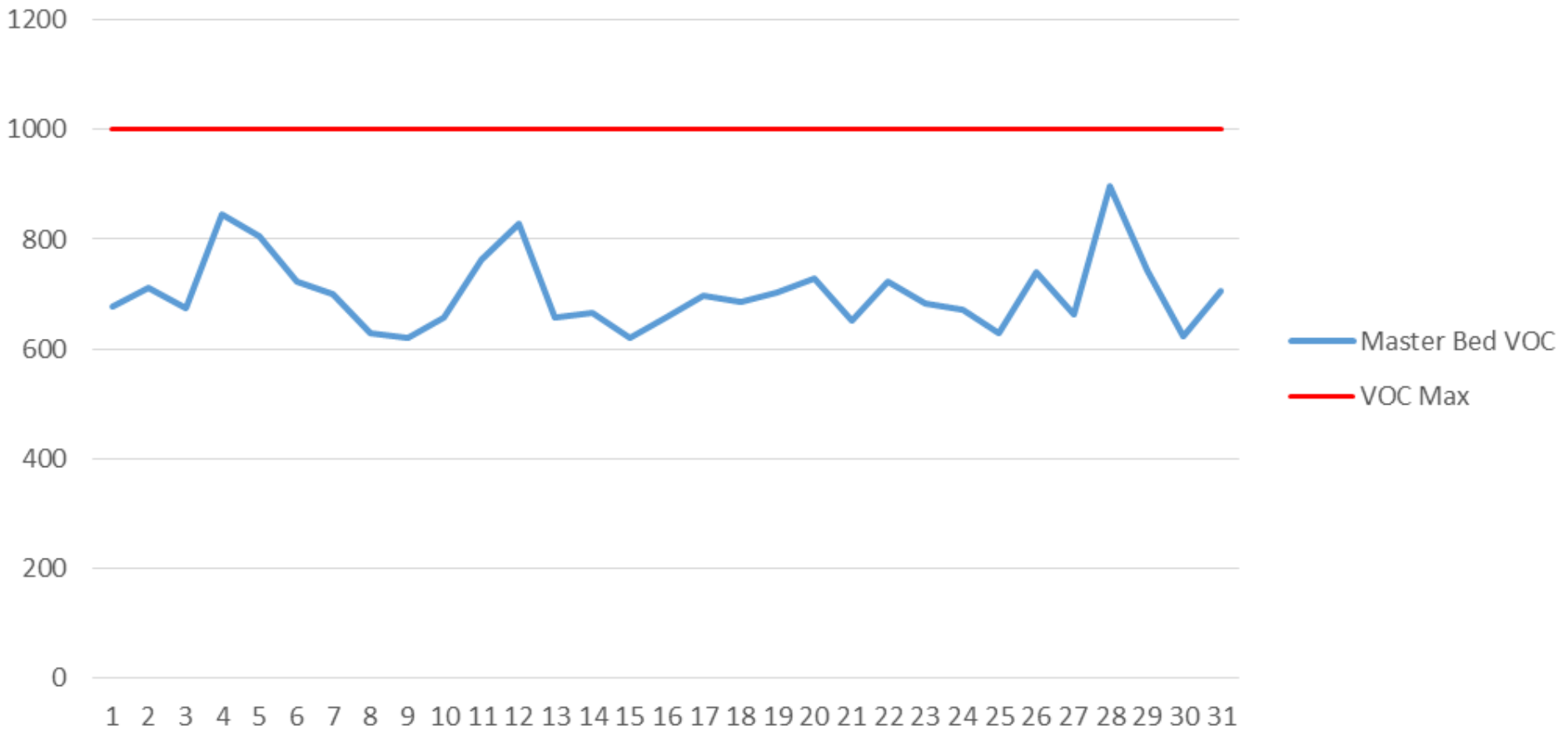
Frequency of VOC Level

9/21/16 - 9/20/17



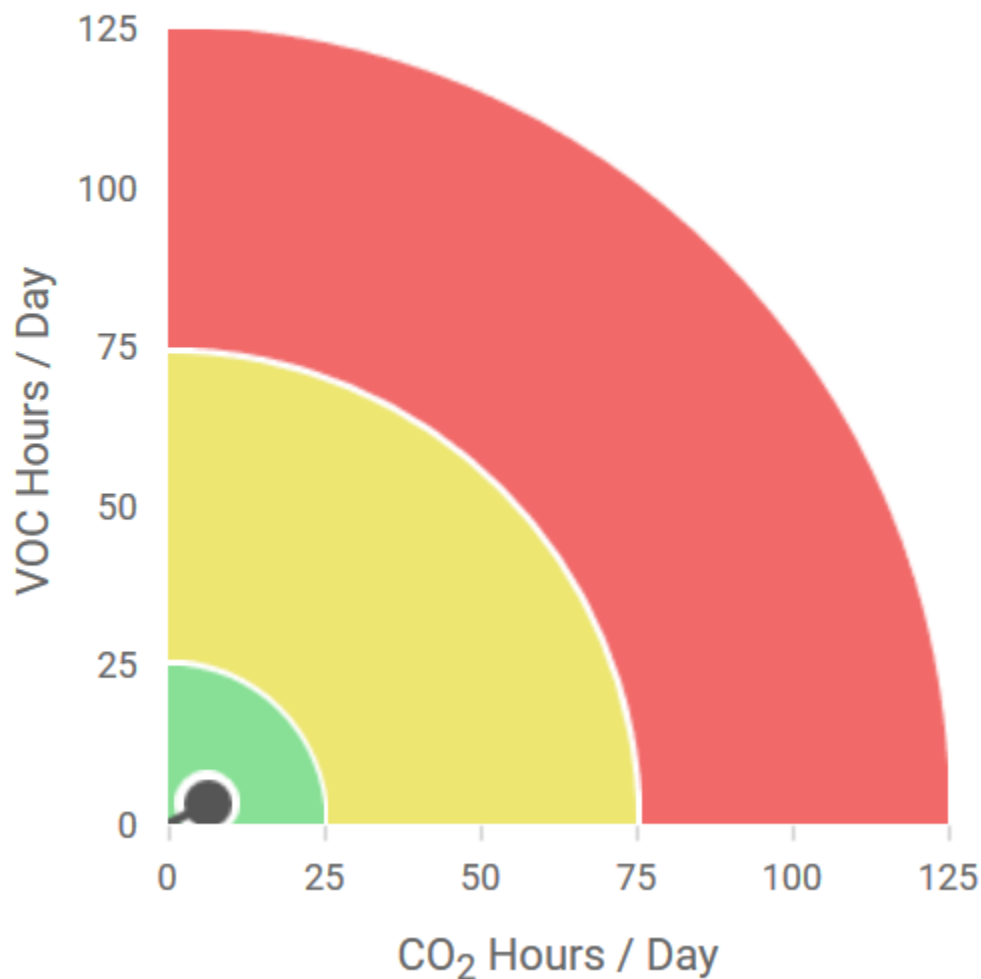
VOC Level in Master Bedroom

January, 2017



Pollutant Exposure Time

< This Week >
09/15/17 - 09/22/17



- CERV Preferred Range (<24)
- ASHRAE 62.2 Range (<72)
- Poor IAQ Range (>72)

● 3.1 VOC Hours/Day

● 6.4 CO₂ Hours/Day

● 7.6 Pollutant Hours/Day

future developments



SALISBURY BLOCK
HOUSING

Randolph Area
Community Development Corporation

WARD JOYCE DESIGN
OPEN SPACE | ARCHITECTURE

pji-maharam architects

PMa

This drawing is the exclusive property of PJI-Maharam Architects. The illustration above may vary. You may not use this drawing without express written permission of PJI-Maharam Architects.



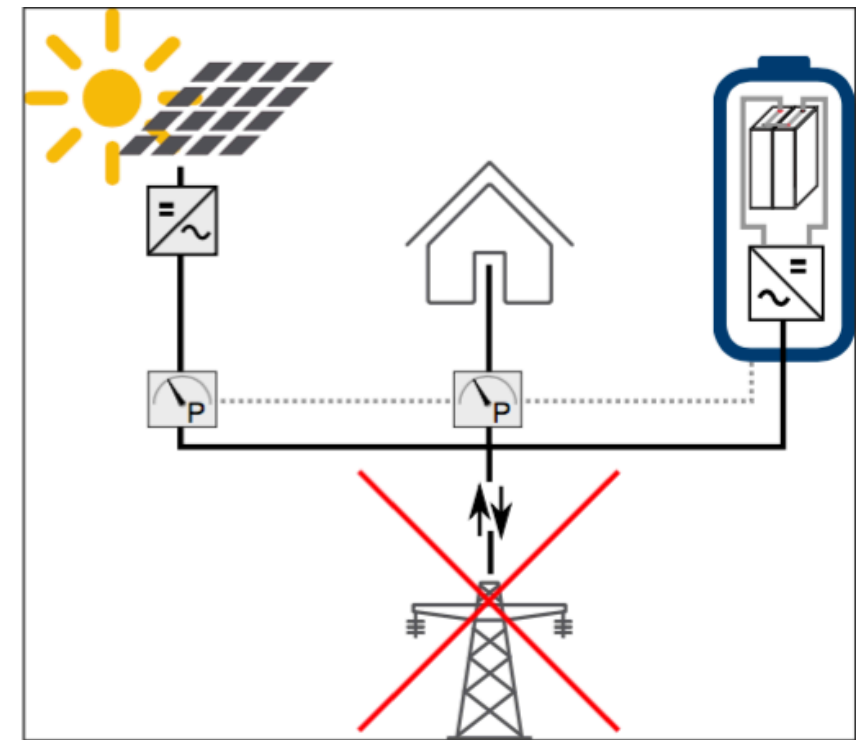
thank you.



- Energy Storage Benefits to McKnight Ln Customers
 - Reliability
 - Simulated Outage
- Energy Storage Benefits to GMP
 - Peak Reduction
 - Energy Arbitrage
 - T&D Deferral/Grid Congestion Relief
- System Performance Issues/Lessons Learned
- GMP Residential Energy Storage Pilot

Reliability at McKnight Lane

- Provides backup power to customers during a grid outage, effectively keeping the power on at all times
- Integrated Automatic Transfer Switch senses when grid power goes down, and switches battery into backup mode until it senses grid power is restored
- Usually, when the grid goes down, the PV array cannot generate electricity. The addition of the battery allows PV to continue generating, possibly extending the amount of backup time available to each customer.



Critical Loads	Average kW	3-hour Load (kWh)
Cold Climate Heat Pump	0.70	2.10
CERV Heat Pump	0.45	1.35
CERV Fans	0.09	0.27
Refrigerator	0.08	0.24
Lights & Plugs	0.33	0.98
Total	1.65	4.94

Sonnen ECO6

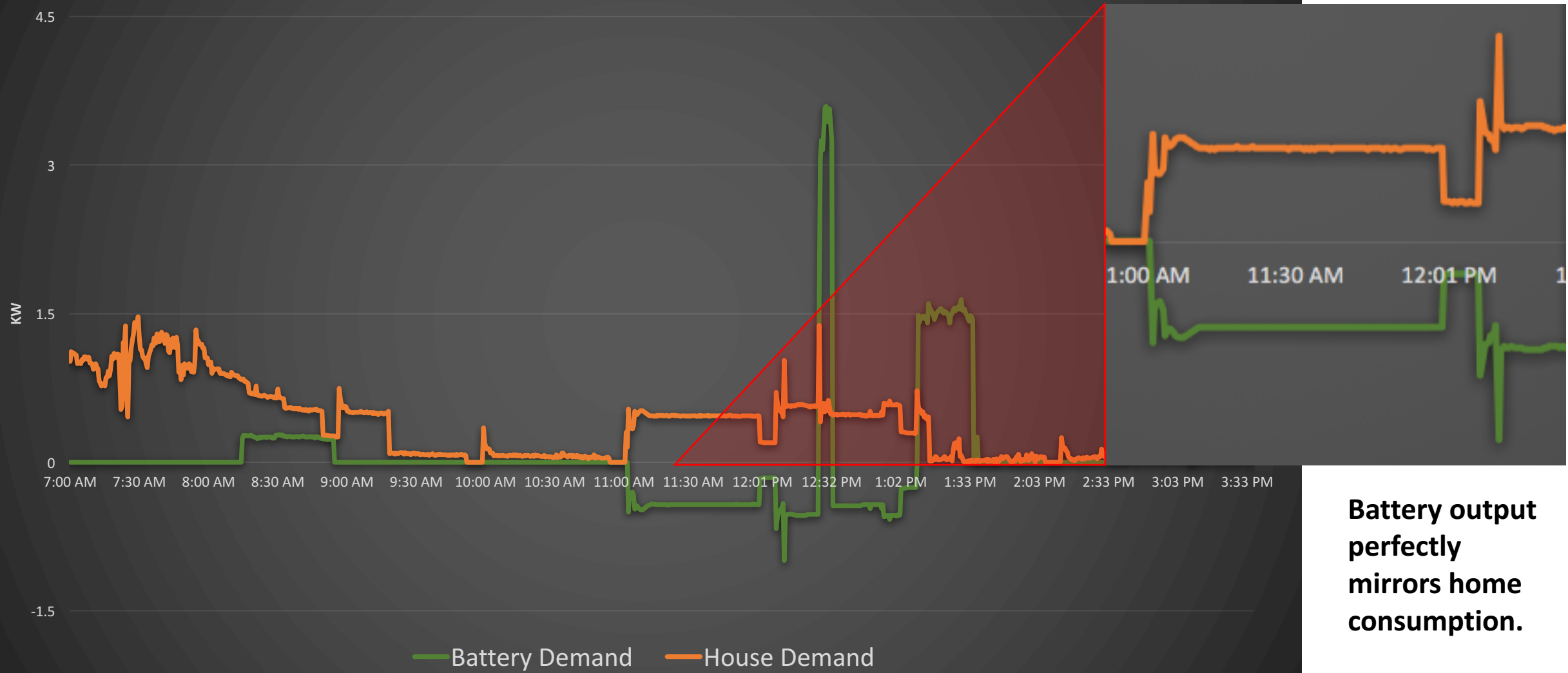
Provides over 3 hours of backup for customer and over 3 hours of peak shaving for GMP to lower costs for customers

Sonnen ECO8

Provides almost 5 hours of backup for customer and almost 5 hours of peak shaving for GMP

Average GMP outage is 2 hours

McKnight Outage Simulation



Battery output perfectly mirrors home consumption.

Event Schedule:

Time	Event	Duration
11:00 am	Grid Outage	2 hours
1:00 pm	Grid Connection	-

Peak Shaving

Distributed Energy Resources (DERs) provide an opportunity for GMP to reduce costs during peak events. This is currently GMP's primary use of residential energy storage.

Forward Capacity Market (FCM)

- New England Peak
- 1 event per year

Regional Network Service (RNS)

- Vermont Peak
- 1 event per month

<u>Year</u>	<u>Date</u>	<u>Hour</u>
2017	6/13/17	17

<u>Year</u>	<u>Date</u>	<u>Hour</u>
2017	4/5/17	8
2017	5/18/17	20
2017	6/12/17	20
2017	7/19/17	21
2017	8/22/17	18

M T W T F S S

Start Time (24hr) 19 0 Duration 2 h 0 min Timezone US/Eastern

Include notification

Commands

Device Type Battery Mode Dispatch Limit Power Power (W) 2800

Value to GMP

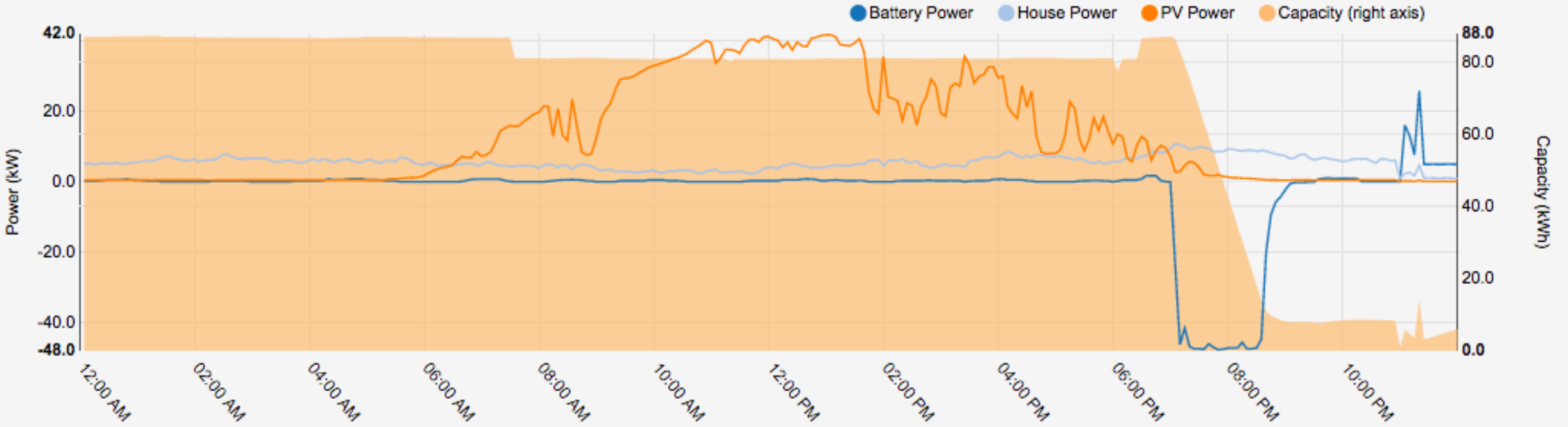
Peak Reduction: 44.65 kW

Monthly Cost Reduction: ~\$400

Battery Demand

Day

06/12/2017



Energy Arbitrage



Energy Arbitrage is the process of charging or discharging the batteries based on market prices of energy. This represents a new value stream available to GMP.

GMP has partnered with Virtual Peaker to provide this functionality and is close to making arbitrage with these systems a reality.



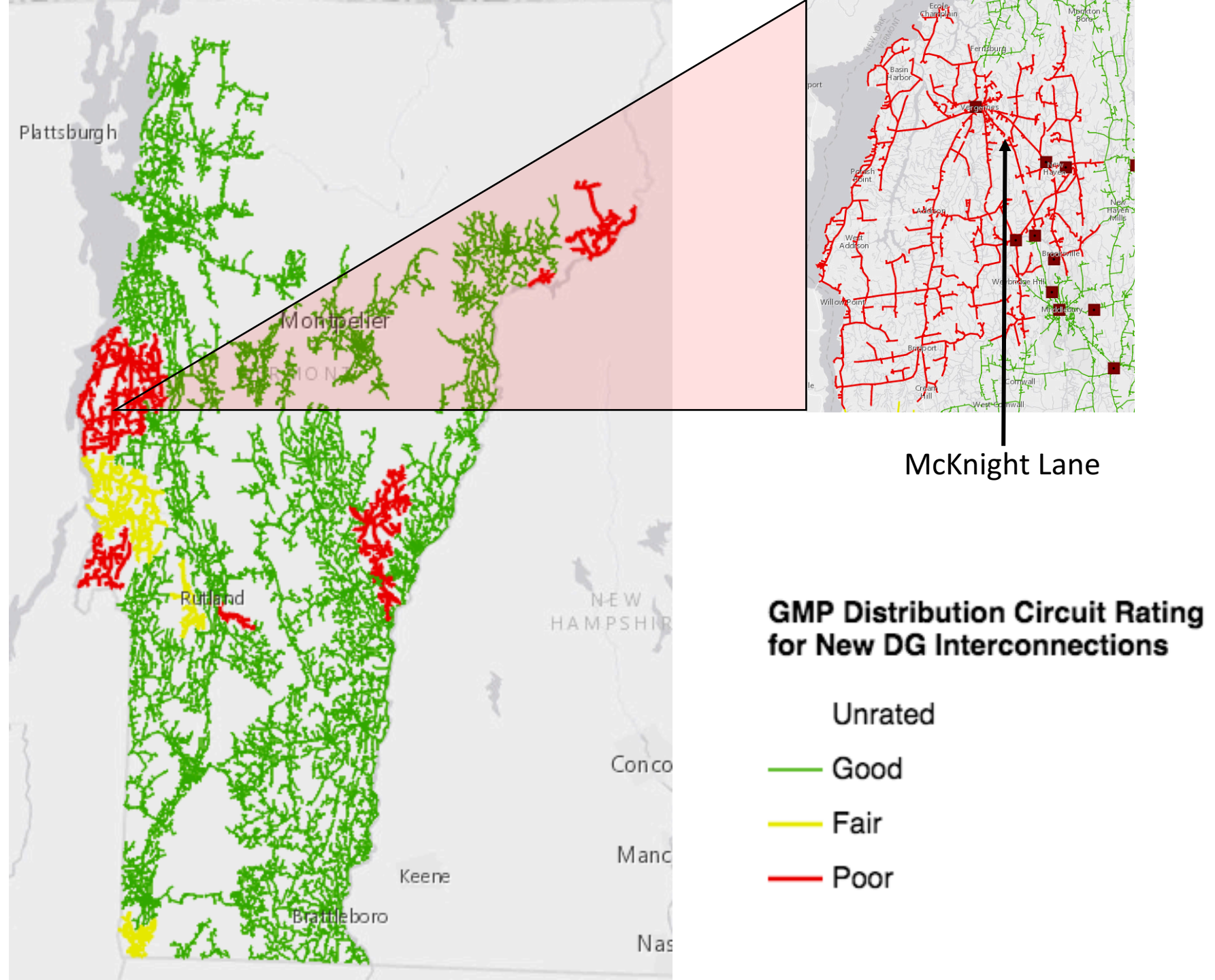
Additional Benefits to GMP

Grid Congestion from PV

Store energy at time of high PV penetration to “Soak Up” excess solar in a certain area

T&D Deferral

Small amounts of distributed energy storage may delay, or completely alleviate the need for wire or transformer upgrades that may be overkill for a small increase in capacity in a given area



System Performance Issues

- Software
 - Communication
 - Response to commands
- Hardware
 - Modems/SmartFunctions
 - One bad inverter
 - One bad battery cell

Lessons Learned

- Expect the unexpected
- Communication is key
- Being on leading edge of technology has rewards as well as risks

GMP Residential Energy Storage Pilot: Tesla Powerwall

Available to all GMP Residential Customers

\$15 per month for 10 years

-or-

\$1,500 one-time up front charge

Performance

Usable Capacity

13.5 kW

Power

5.0 kW continuous, 7 kW peak

Operating Temp.

-4°F to 122°F

Enclosure

Rated for indoor and outdoor installation.





Generating Possibilities Together

Craig Ferreira

Craig.Ferreira@greenmountainpower.com



William Burke PhD

Founder and CEO

Virtual Peaker, Inc.

<http://www.virtualpeaker.io>

502-689-6397

THANK YOU

Thank you for attending our webinar

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Clean Energy States Alliance
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