

SFCC's Journey to Sustainability

for the
**2022 Distributed Energy Summit -
Net Zero**

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SFCC's Journey to Sustainability

SIEMENS



MICROGRID
Systems Laboratory



SFCC's Journey to Sustainability

- Recap of Program Progress in FY21-22
- SFCC's campus microgrid and energy performance contract
- The nested microgrids of SFCC

Smart- and Microgrid Training Center @ SFCC



Overall Objective

Develop workforce training for next-generation electric power production and delivery, and strengthen the pipeline between community colleges and the research universities

Lessons Learned

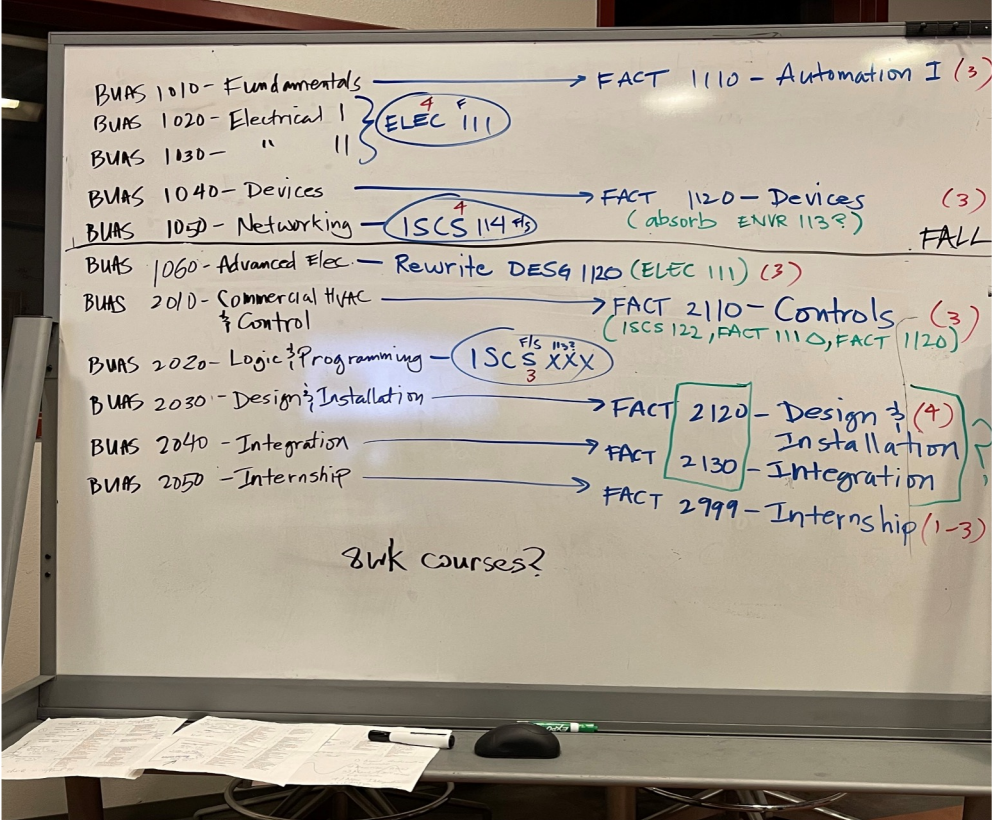
Lessons learned from the first year of course delivery are being used to refine the curriculum and make the course more relevant

Intro to Power Systems, Intro to Smart Grids being updated

Certificate condensed slightly to reflect course changes/availability

New courses in automation, devices, and integration

Summit: Links to the summit



817 DESG Classroom whiteboard, photo 4/20/20 J. Deisler

SEED Grant

SEED- Generator controls for microgrid generator, energy monitoring equipment on order- install this summer

- EDA supplied the generator, but the SEED funding upgrades the controls to integrate the generator into the microgrid

Energy monitoring equipment is being fed to a real-time display, design includes expansion to PLC with future funding

Small energy storage system to support a third, nested microgrid for experimental technology



SFCC Community Solar Display.

Energy Monitoring for Gen Tech 60kW generator
(Gen Tech)

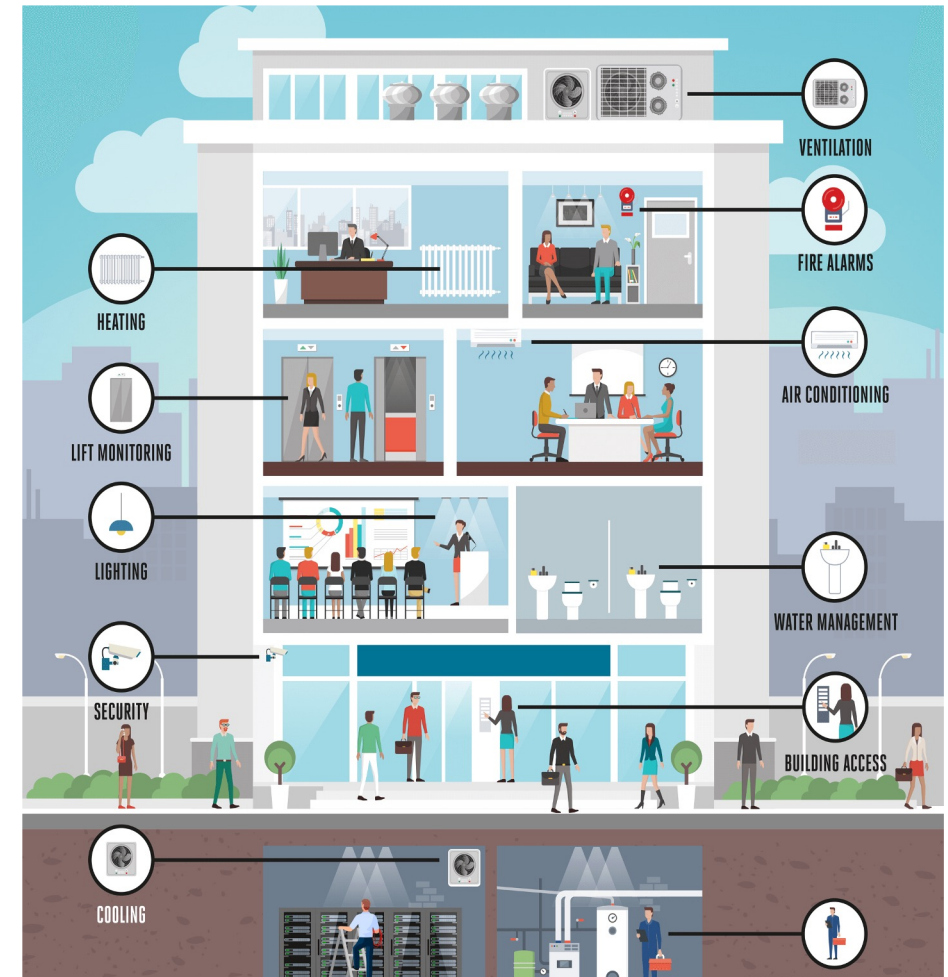
New Curriculum

Courses that support the DES program

- Automation
- Devices
- Integration

Building Automation Systems (BAS)-
curriculum for automation courses that
expand on curriculum developed through
EPSCoR grant funding

New workforce program complimenting
curriculum developed through the EPSCoR
funded DES program



Control and monitoring of systems within a building. (Atalian Servest)

SFCC DES for all NM-EPSCoR

SFCC DES will be available for EPSCoR partners to gather data

Associate of Applied Science Degree

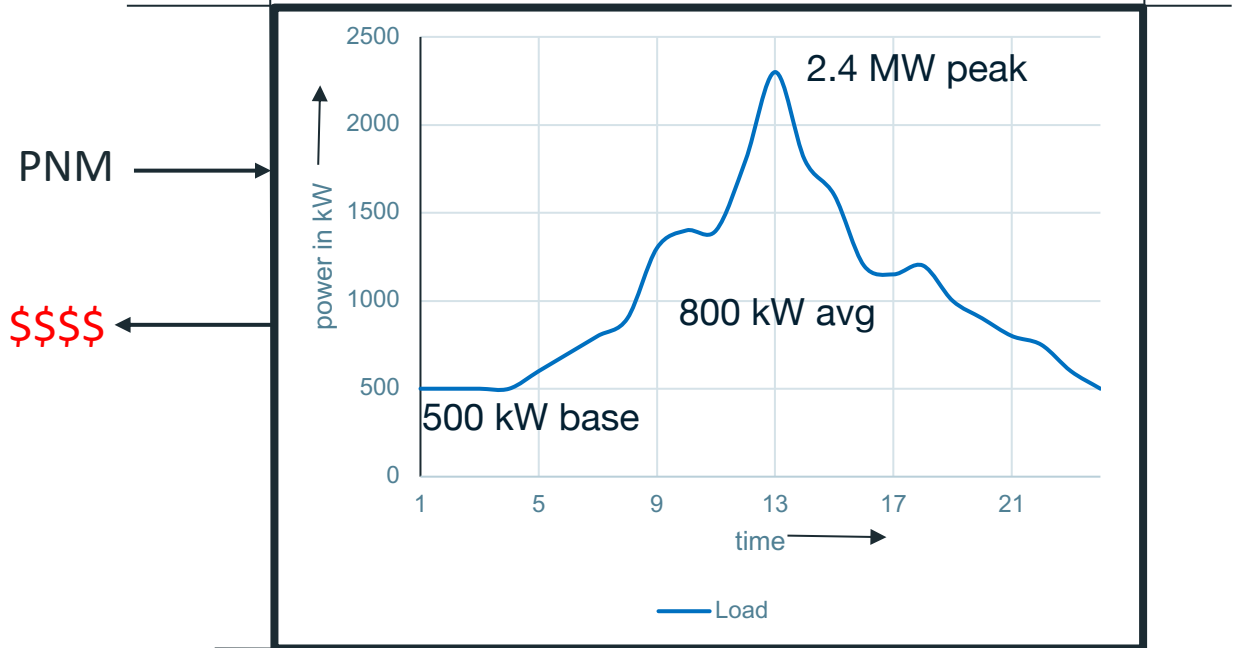
Working to find partnerships for internship, future funding opportunities



1.5 MW Solar array at SFCC



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For most of its existence, SFCC has been just another load on the PNM system...

This is equivalent to greenhouse gas emissions from:

671 gasoline-powered passenger vehicles driven for one year ?

This is equivalent to CO₂ emissions from:

350,476 gallons of gasoline consumed ?

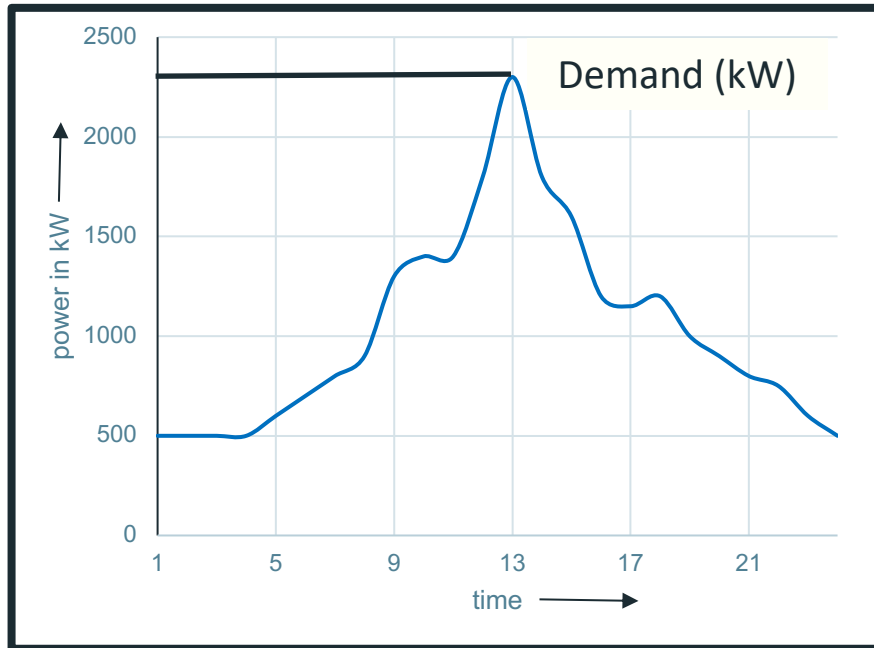
3,446,110 pounds of coal burned ?

\$325k Energy Charges - \$450k Demand Charges
~3,400 tons of carbon annually

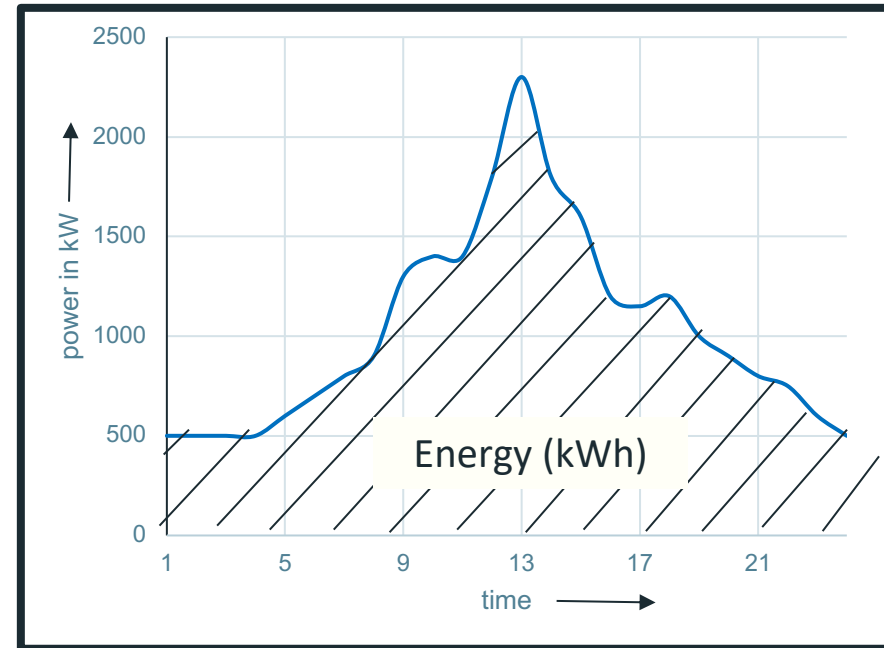
Source: EPA Greenhouse Gas Equivalencies Calculator

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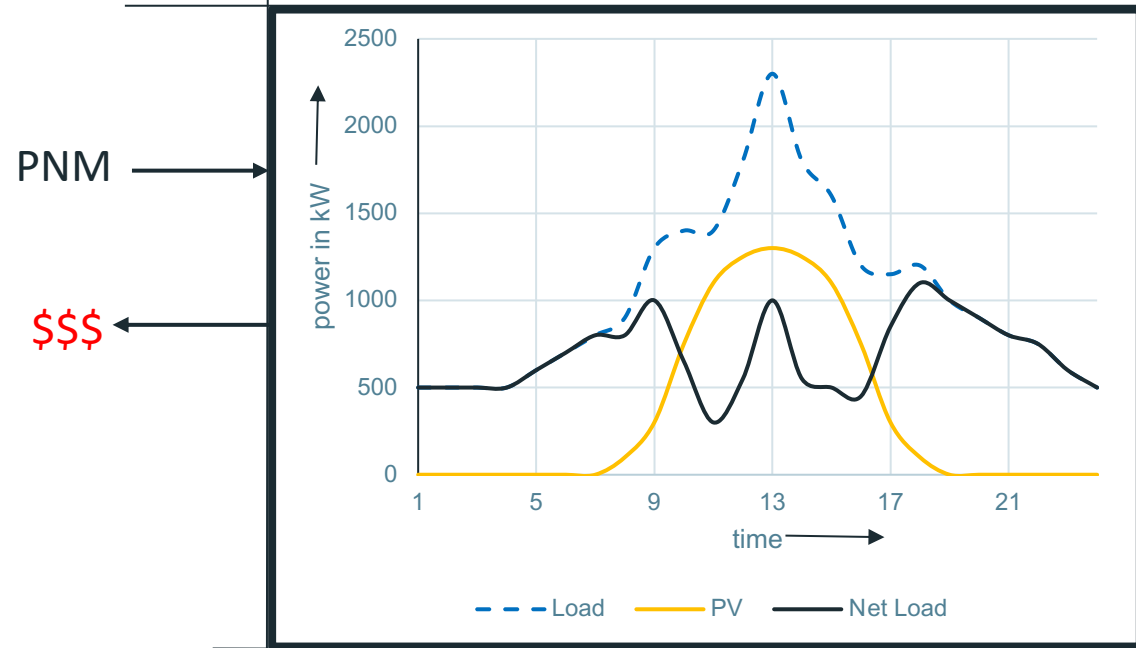
Demand – Instantaneous power, highest power monitored during billing period - kW



Energy – all of the area under the curve, the sum of power over time - kWh



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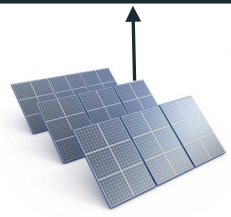
PNM

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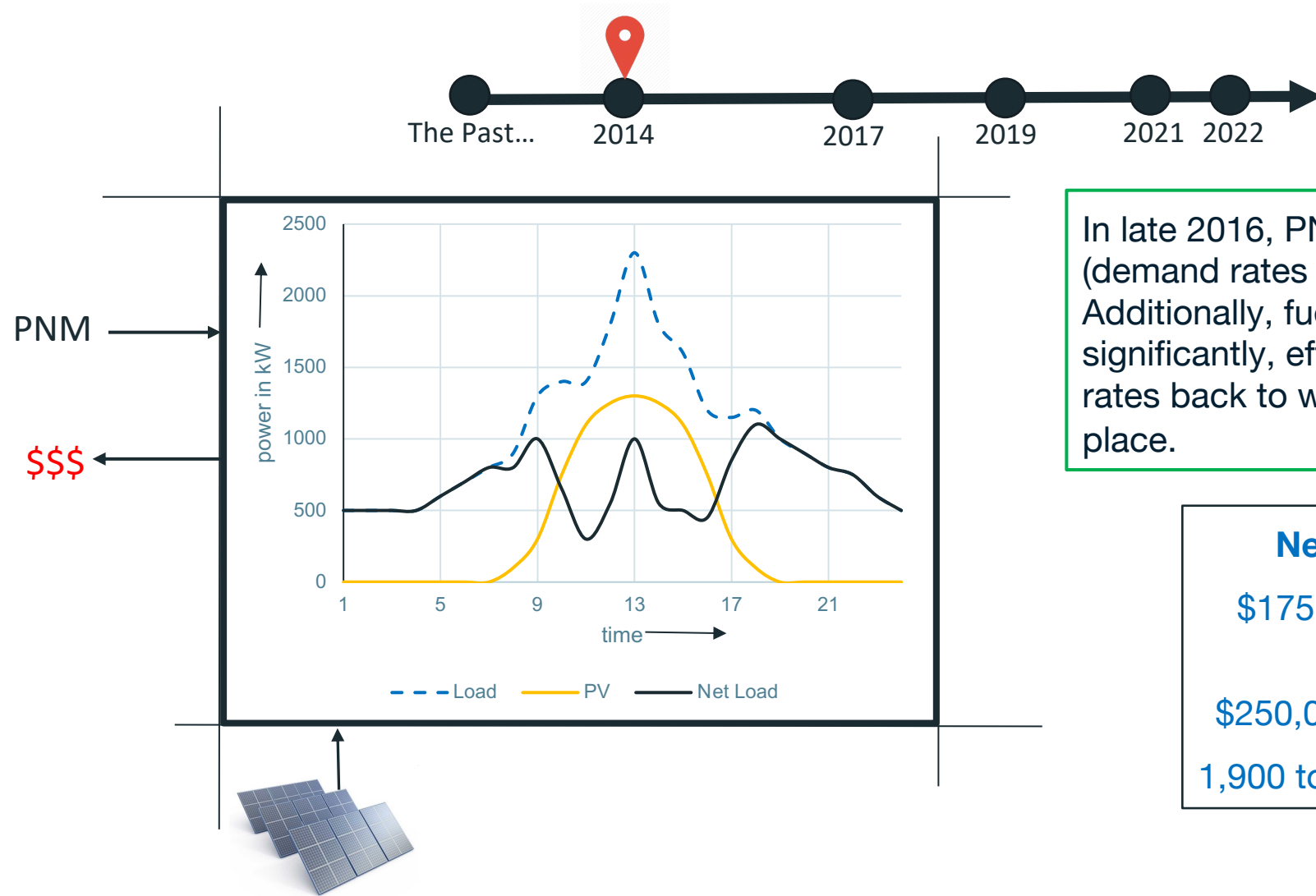
In 2014, SFCC installed a 1.5 MW PV array.
 The project was contracted under a net-metering agreement with PNM until late last year.

New energy costs:
 \$189,000 Energy Charges
 \$267,000 Demand Charges
 1,900 tons of carbon annually

42% Reduction in PNM charges!



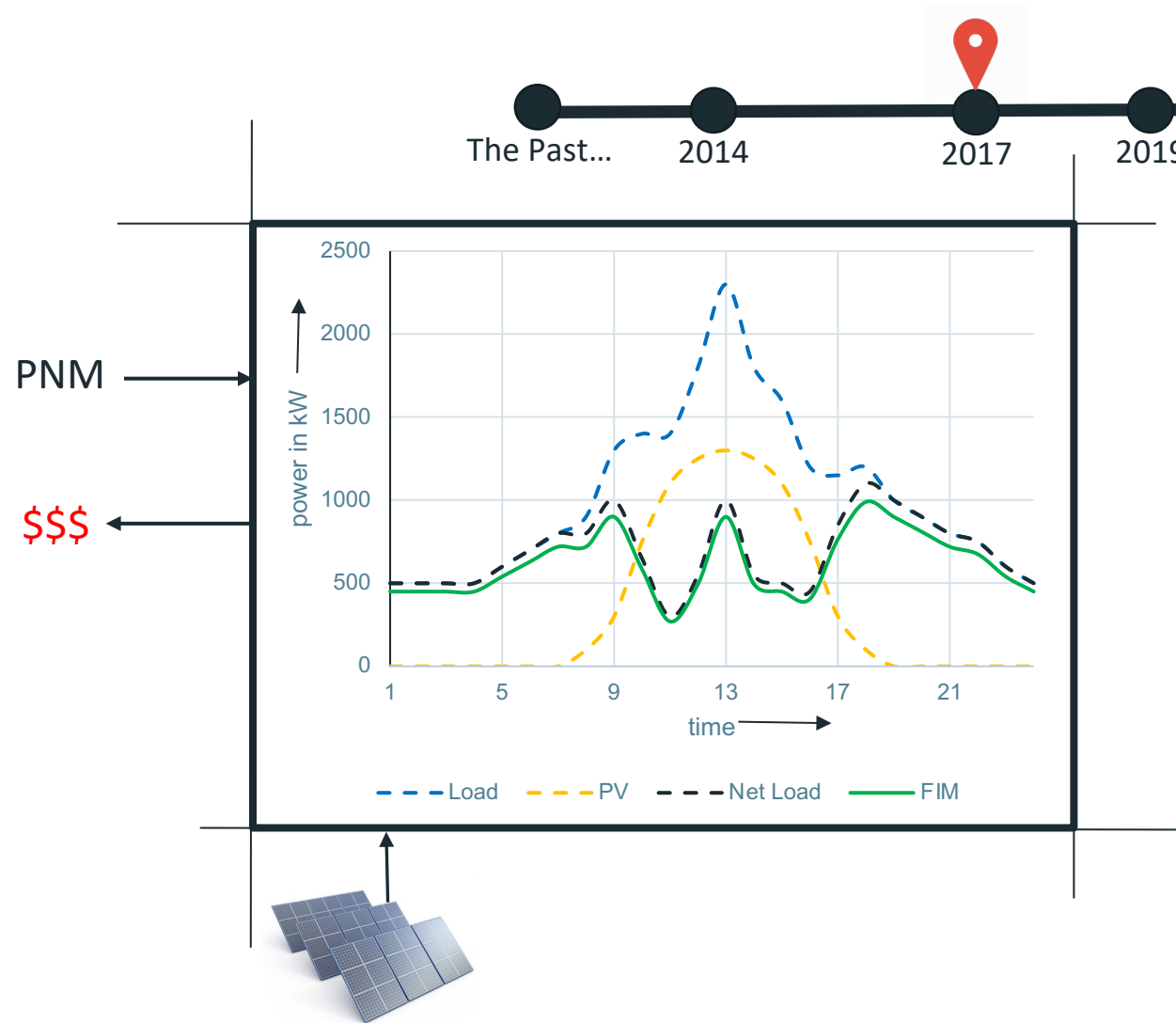
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In late 2016, PNM energy rates dropped, (demand rates stayed pretty constant). Additionally, fuel cost adjustments jumped significantly, effectively doubling energy rates back to where they were in the first place.

New energy costs:
 \$175,000 Energy-related Charges
 \$250,000 Demand Charges
 1,900 tons of carbon annually

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In 2017, SFCC contracted Siemens for an Energy Performance Contract to reduce energy use even further...

- Reduced water use
- Reduced natural gas
- Reduced electricity

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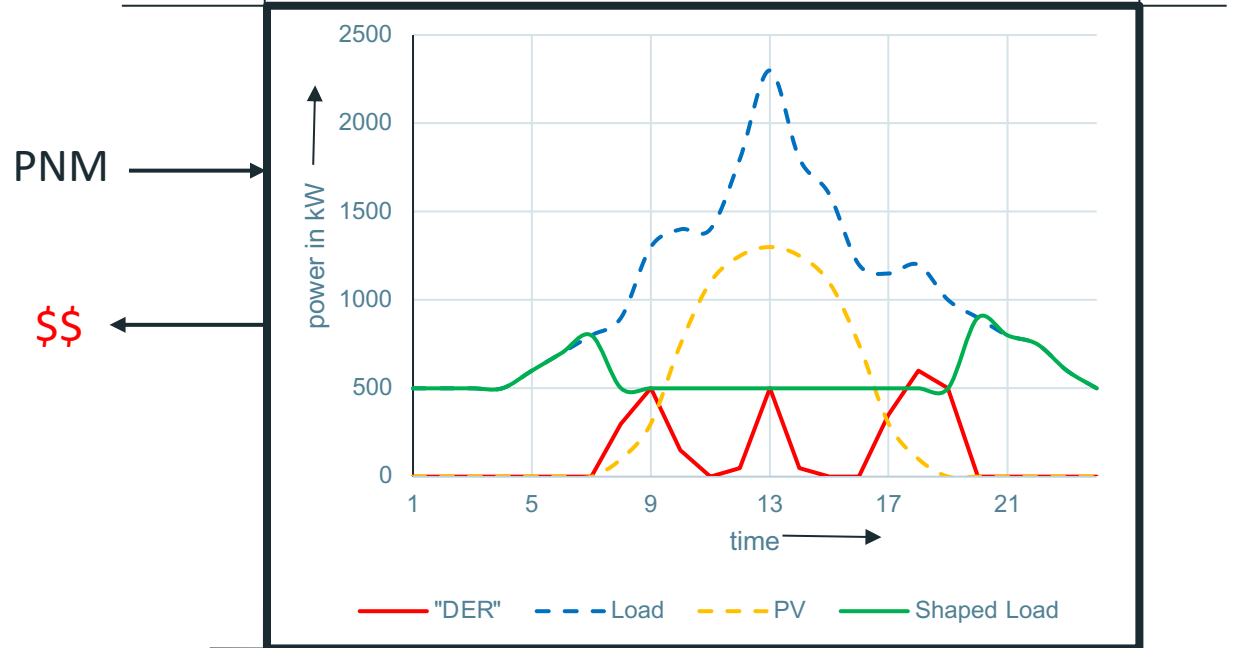
An Investment Grade Audit, completed in 2019, identified a number of Facility Improvement Measures (FIM's) that would reduce SFCC loads and decrease demand...

- FIM 1: Lighting Retrofits (LED's)
- FIM 2: Water Retrofits
- FIM 3: Building Envelope Improvements
- FIM 4: Boiler Replacement
- FIM 7: Equipment Scheduling
- FIM 8: Convection Steamer Replacement
- FIM 9: Kitchen Hood Controls
- FIM 12: Hot Water Booster Pump Vibration Isolation
- FIM 21: Engineering Study for Existing Solar Thermal System
- FIM 13: Microgrid

Projected Annual Energy Savings:

- 2,028,042 kWh (Energy)
- 3,326 kW (Demand)
- \$275,945 estimated annual energy savings

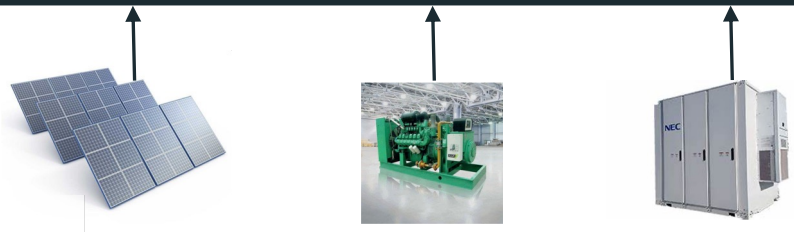
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PNM →
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FIM 13, the microgrid, identified energy resources which would reduce energy and demand charges, as well as make SFCC much more resilient.

1 MW Natural Gas Generator
 1 MW/780 kWh Li-ion Battery



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The natural gas generator is used primarily for demand reduction, but will assist in islanded operation.

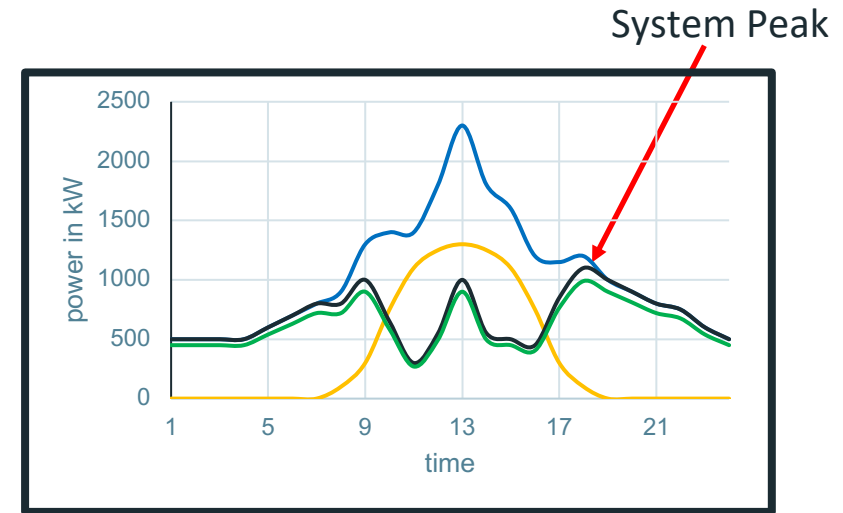
The Lithium-ion battery will be primarily for resilience (islanded operation), but can be used to backup demand reduction.

Besides reducing energy consumption, the microgrid will allow the campus to operate in islanded mode during system outages.

According to PNM:

System Average Interrupt Frequency Index (SAIFI): 2 outages per year

System Average Interrupt Duration Index (SAIDI): average 90 minutes to repair



Note that the peak demand tends to occur in the evening around 6pm – after the PV has stopped producing for the day, so it was determined that further investment in solar was not economical.

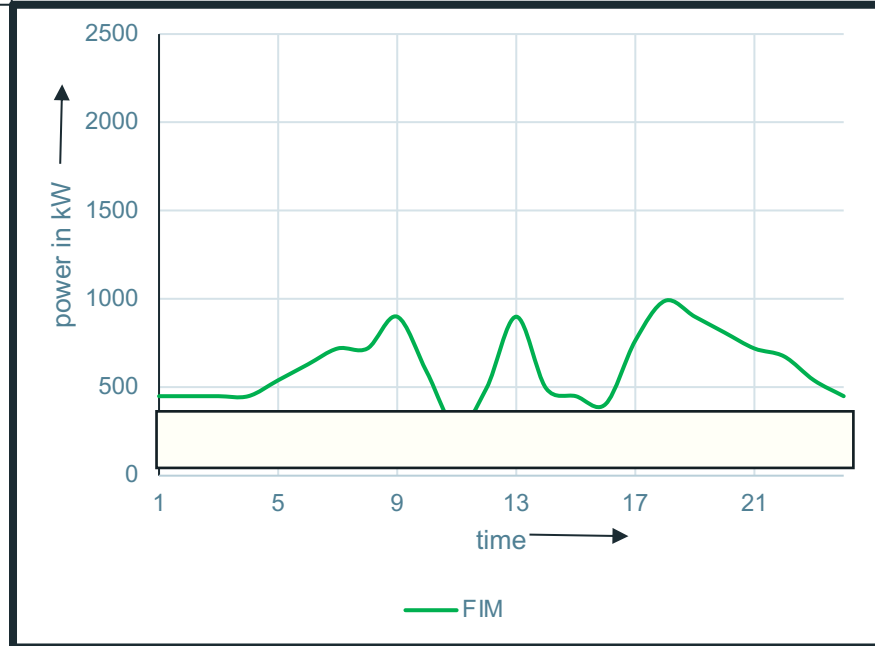
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In Spring of 2021, SFCC and Siemens submitted an Interconnection Request to PNM to implement the microgrid. The initial interconnection studies were completed in April of 2022, about a year later than expected. We are now waiting for an Interconnection Agreement that will allow construction to begin. Various PNM delays have us about a year behind on the energy savings expected from the energy performance contract.

Supply chain delays may push our savings back even further into 2023...

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Renewable Energy Fraction:
$$\frac{\text{Energy Produced By Renewables}}{\text{Annual Energy Consumption}}$$

Today, SFCC's PV array provides approximately 40-45% of our annual energy consumption

Hoping for about 50% once FIM's are completed

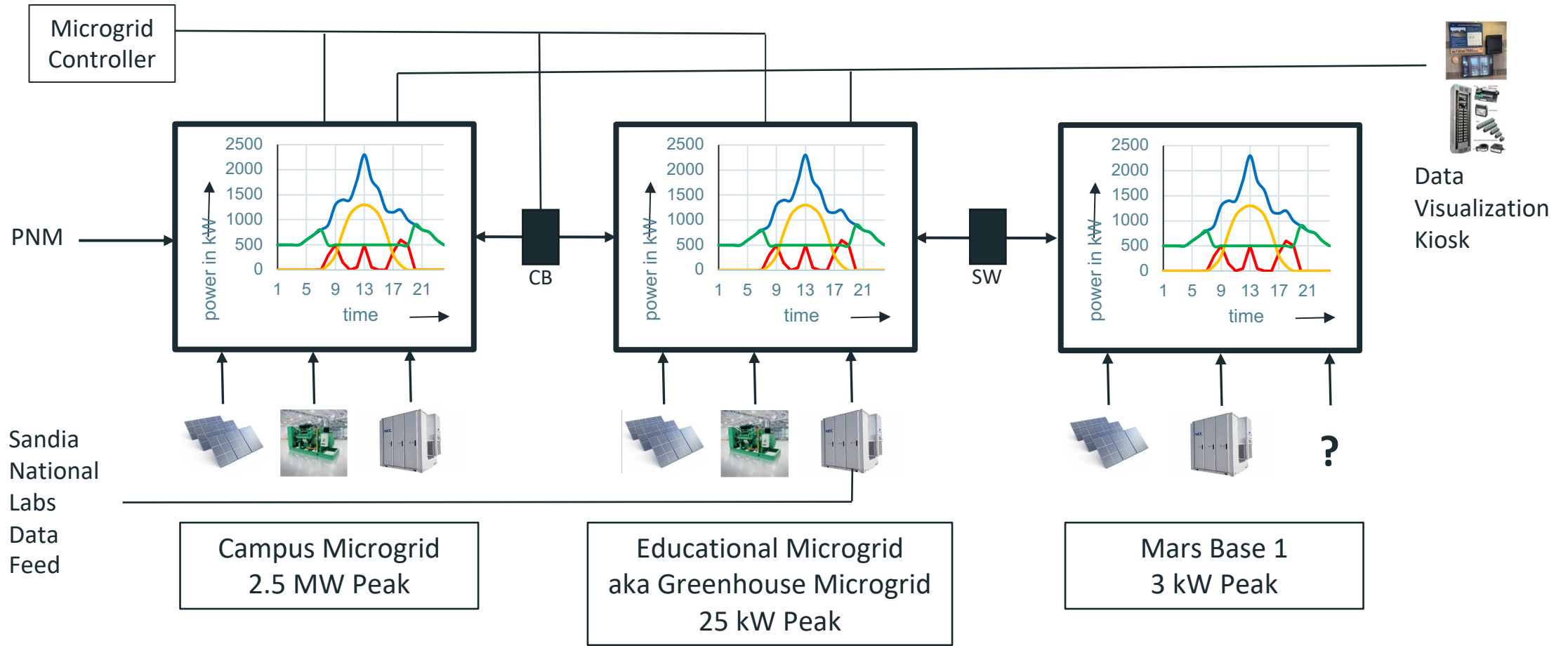
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SFCC's goals thus far have been in carbon neutrality and energy independence, not specifically Net Zero. Net Zero includes all resource consumption, both direct and indirect. We have taken measures to reduce other forms of energy (water, gas), but there is still work to do to achieve a net zero footprint.

Next Steps

- More Solar?
- Other Energy Technologies (E.g., CHP)?
- Other: Composting, expanding transportation opportunities to reduce vehicle use...
- Workforce Development to train the coming generation of energy workers
- BAS Program – demand side

SFCC's Nested Microgrids



- 1.5 MW PV Array
- 1 MW NG gen
- 1 MW/780 kWh ES

- 12 kW PV Array
- 60 kW NG gen
- 100 kW/85 kWh ES

- 4 kW Concentrating PV
- ES TBD

THE END

Special thanks for the support of many people without whom various aspects of our journey to sustainability would not be possible:

Dobby Schmidt and Andrea Mueller of SFCC Facilities

Julia Deisler, Dean of Trades, Advanced Technologies, and Sustainability

Selena Connealy and Brittney Van Der Werff of NM EPSCoR

David Breecker of Microgrid Systems Laboratory

The Energy Storage Demonstrations Team at Sandia National Laboratories

Bill Kipnis and his team at Siemens

Anyone whose name wasn't mentioned – you know who you are...

