SFCC’s Journey to Sustainability

for the
2022 Distributed Energy Summit - Net Zero

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SFCC’s Journey to Sustainability
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- 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
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
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
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
For most of its existence, SFCC has been just another load on the PNM system...

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

- Reduced water use
- Reduced natural gas
- Reduced electricity
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
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.
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…
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

Microgrid Controller

PNM

Campus Microgrid
2.5 MW Peak
- 1.5 MW PV Array
- 1 MW NG gen
- 1 MW/780 kWh ES

Educational Microgrid
aka Greenhouse Microgrid
25 kW Peak
- 12 kW PV Array
- 60 kW NG gen
- 100 kW/85 kWh ES

Mars Base 1
3 kW Peak
- 4 kW Concentrating PV
- ES TBD

Sandia National Labs Data Feed

Data Visualization Kiosk

SFCC.ic
innovation center

New Mexico EPSCoR

New Mexico SMART Grid Center
THE END

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