



Glendale Community College

Board of Trustees

Facilities Report: Sustainability Updates and Hydrogen Fuel Cell Project Overview

October 20, 2020

Presented by Joel Peterson, Director of Facilities

Agenda

GCCD Sustainability Programs, Projects, and Initiatives

- Buildings and Construction
 - General Overview
 - Recently Completed Projects
 - Current Projects
 - Planned Projects
- Recycling, Solid Waste, and Pollution
- Water

Hydrogen Fuel Cell Project

- Project details for BOT Consideration



Buildings, Construction and Operations

General Overview and Current Policies/Initiatives

- ✓ 2003 BOT directed all new facilities to meet LEED Standards created by the U.S. Green Building Council (USGBC); all new construction in compliance since
 - SV building certified LEED Silver
- ✓ All Measure GC new construction is designed to meet LEED Silver standards (Title 24, Section 6 of CA Building Code effectively now mandates LEED Silver standards)
- ✓ Campus and building energy savings projects continuing pursuant to campus energy efficiency audit recommendations
 - Continuing to seek funding from the State and other sources for energy projects
- ✓ Minimize energy wastefulness such as use of portable space heaters and personal minifridges
- ✓ Ongoing conversion of electric appliances to meet energy efficiency standards



Buildings, Construction and Operations

Recently Completed Projects related to Energy Efficiency and Sustainability

1. San Gabriel Building:

- New fan coils, trim kits (control valves, strainers, isolation valves, and ETC) installed
- Upgraded standalone zone controls to Distech Controls

2. Verdugo Gym:

- Upgraded control system to Distech Controls and converted Tridium Ax to Tridium N4 (We are migrating to the more capable Niagara 4 Architects Application campus-wide)

3. Sartoris Field:

- Stadium lights – converted to LED and controls upgraded

4. San Rafael Building:

- Refurbished 50 variable air volume (VAV) boxes and installed Distech Controls

5. Administration Building:

- New thermal efficient and double pane windows installed; Distech Controls installed in HR

6. Sierra Vista:

- Digital control graphics and air balancing implemented



Buildings, Construction and Operations

Current Sustainability Projects and Initiatives

1. Central Plant 1 (CP1) Expansion and Upgrade:

- Expand chilling capacity from 500 tons to 1,500 tons to add additional buildings
- Upgrade chillers from R22 refrigerant to R134 and from mechanical to magnetic bearings

2. Building HVAC Energy Use Management:

- Use BMS to monitor and manage building HVAC use
- Shutting down air conditioning/chilled water from 4 pm – 6 am, Monday – Saturday; all day Sunday
- Reducing electrical use 35% - 40%, translates into 20% utility cost savings (\$8,500/week)



Buildings, Construction and Operations

Planned Sustainability Projects

1. Administration Building:

- Upgrade AHU and install Distech Control System.
- Replace Pneumatic Controls with Distech Controls

2. Auditorium Building:

- Replace Pneumatic Controls with Distech Controls

3. Cimmarusti Science & Camino Real:

- Replace Schneider Controls with Distech Controls

4. Sierra Madre:

- Replace Package/Split Dx units with chilled water AHUs and fan coils (exception: Police Department)

5. Aviation/Art Building:

- Replace multi-zone units and expanding chilled water (from CP2)



Buildings, Construction and Operations

Planned Sustainability Projects

6. Bookstore:

- Chilled water expansion (from CP2)

7. San Rafael Building:

- Chilled water expansion (from CP1 - after plant is upsized)

8. Campus-wide:

- Convert final fluorescent lights to LED (currently at 80% LED); replacing on an as needed basis

9. Fuel Cell installation:

- Connecting 500 KW system to reduce grid use and dependency; reduce GHG and pollution

10. Solar Energy System installation:

- Solar panels to be implemented on current and future buildings as feasible to contribute to GCC's movement towards using more green energy

Recycling, Solid Waste, and Pollution

Current Sustainability Programs

- 1. Trash Disposal:** Partner with vendors (e.g., Southland Disposal) who assists us in collecting trash, food waste, vegetation waste, and recyclable waste
 - Vendor separates all waste off site and send waste to applicable receiving destinations (e.g., composting, metal, plastic, paper recycling, etc.)
 - Reduces separation error; minimizes trash theft
- 2. Hazmat Disposal:** Partner with vendors (e.g., North State Environmental) for cleanup, disposal, and recycling of our hazardous material waste (e.g., biohazards, chemical wastes, and electrical/electronic waste)
- 3. Paper Reclamation:** Partner with vendors (e.g., Paper Recycling & Shredding) to shred collected documents district-wide and reclaim the paper product for re-use
- 4. Biodegradable and Nontoxic:** All cleaning products and custodial supplies are certified environmentally friendly/nontoxic; all bags are recycled plastic bags which are re-recycled

Water

Current Sustainability Programs

1. Restrooms:

- All new buildings use reclaimed water for toilets
- All buildings include waterless urinals

2. Grounds:

- All irrigation water is reclaimed water
- All new plantings are drought tolerant and migrating existing to drought tolerant

3. Storm Water Drainage:

- Removed trash and debris from storm drains district-wide and going forward
- Implemented Ocean Protection Council (OPC) guidelines
- Installed stormwater drain grates on all applicable drains to minimize debris in system

4. Drinking Water:

- All upgradable drinking fountains converted to drinking fountain/water bottle filling station
- Drinking water quality improved with Semi-annual Water Filter Replacement Program

HYDROGEN FUEL CELLS (HFC):

CLEANER, CHEAPER
ONSITE POWER



Project Goals

- **Priority 1** - Looking to meaningfully reduce electricity cost, without spending upfront capital
- **Priority 2** – Benefit local community by reducing carbon/smog emissions onsite
- **Backup Power** – Not concerned with PSPS, but rolling blackouts in Sept due to overstrained grid/transformer explosion
- **Solar** – Can do HFC and Solar, NOT mutually exclusive.
- **Verdugo Campus** – Main meter is large enough for 500 kW project
- **Other Campuses** – Too small for a HFC project



EDUCATIONAL INSTITUTIONS WITH HFC (10+ MW)

Caltech



**Santa Clara
University**



**SAN DIEGO
COMMUNITY COLLEGE
DISTRICT**
City College • Mesa College
Miramar College • Continuing Education



7.1 MW



1.5 MW



1.0 MW



COLLEGE OF THE CANYONS

LIU



University of San Diego®



FORDHAM UNIVERSITY
THE JESUIT UNIVERSITY OF NEW YORK

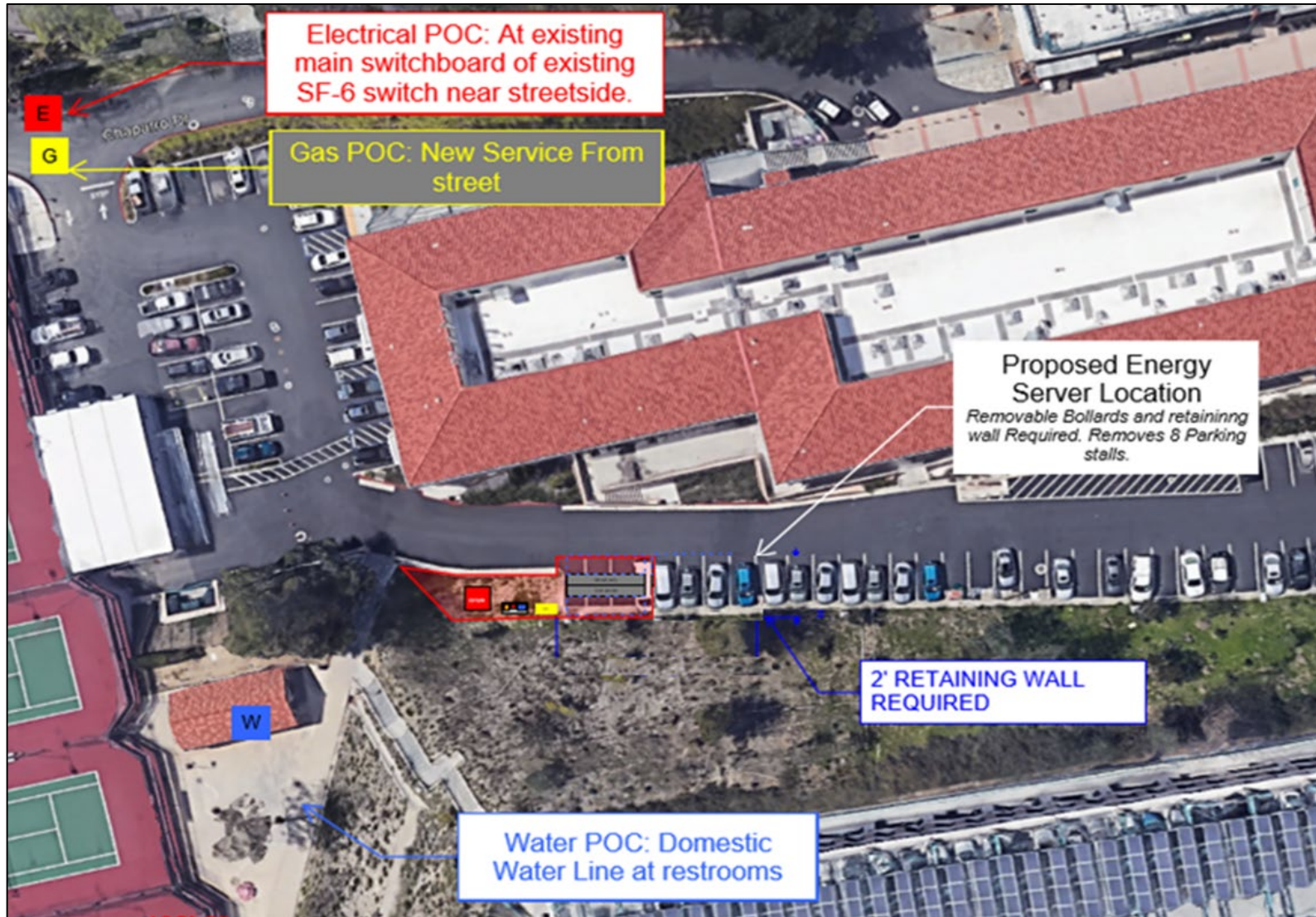


CONNECTICUT COLLEGE
1911

HFC INSTALLATION LOCATION & LAYOUT



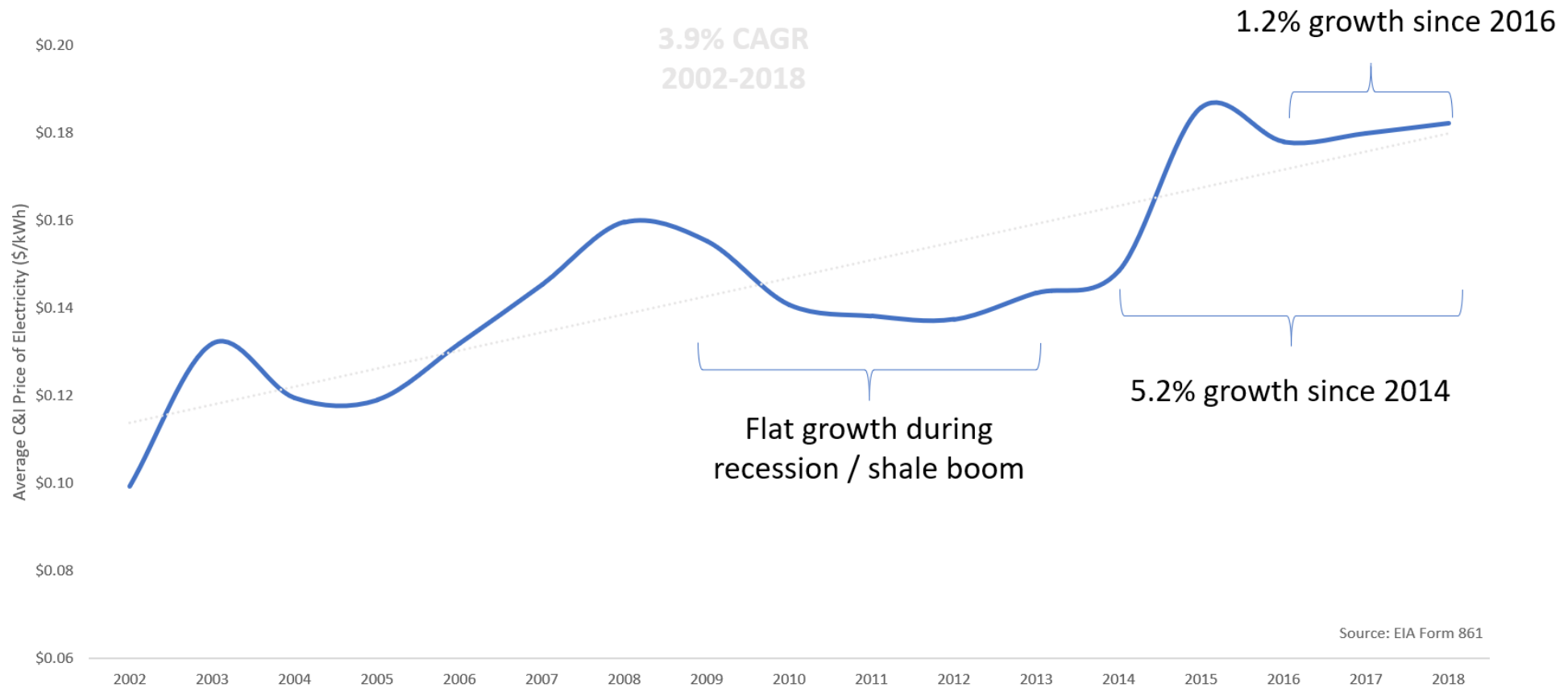
Aerial View of Energy Server Location



GLENDALE W&P - ELECTRICITY RATES OVERVIEW



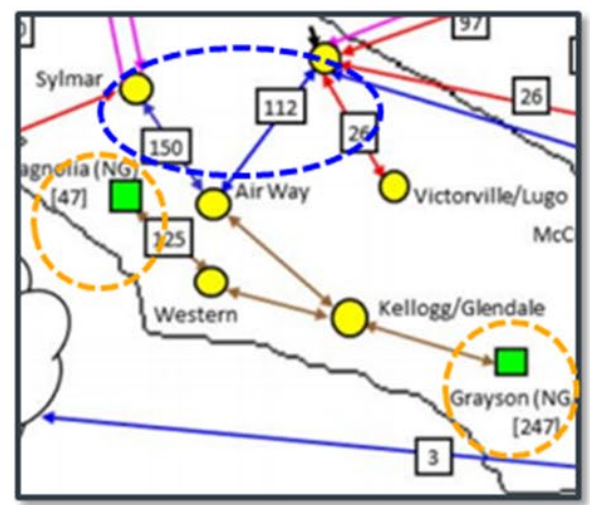
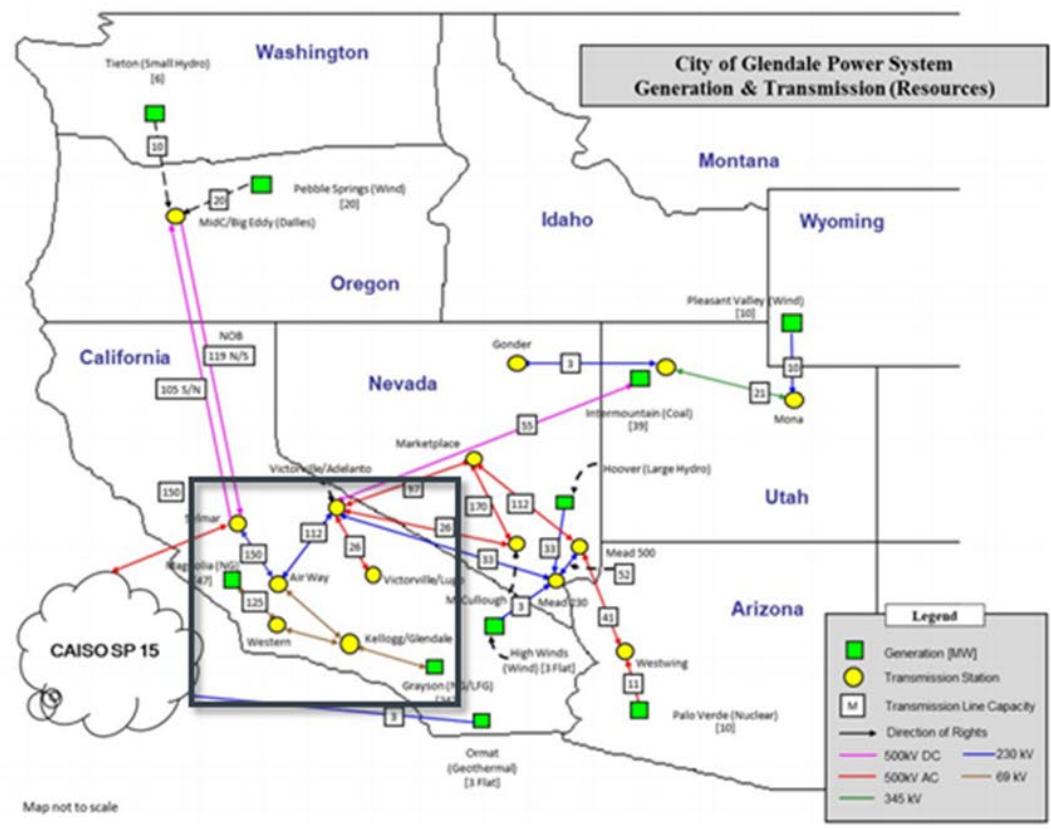
GWP - Historical Price Trend C&I Customers



GWP Natural Gas Plants make up “Margin” due to GWP “Load Pocket”

GWP has ~350 MW of load, but is served by only 2 transmission lines capped at 200 MW.
 Remaining load is served by local generation.

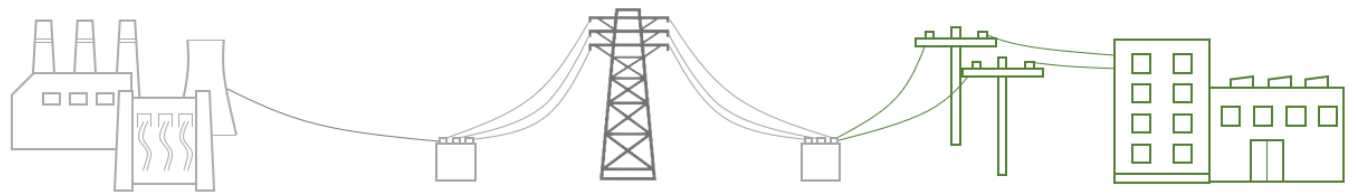
Renewable resources are remote, come through 2 transmission lines, while fossil resources are local.



Local fossil generation is ‘dispatchable’, so onsite projects allow GWP to reduce NG output.

What Goes into electricity rates

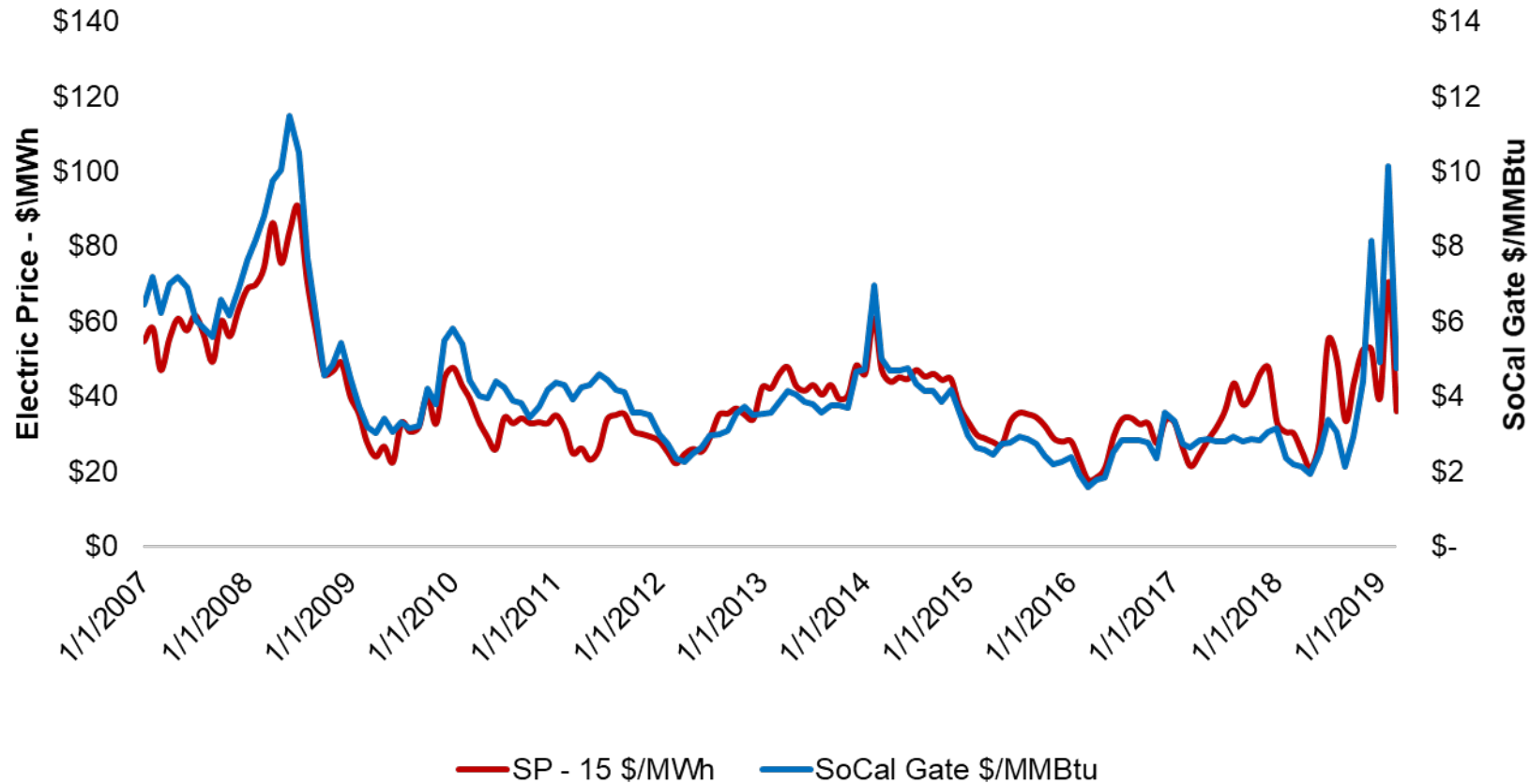
Utilities charge customers for the cost of running the entire grid.



50%	10%	40%
Power Supply	Transmission	Distribution
<u>Cost of generating</u> electricity.	<u>Cost of delivering</u> generation to local grids.	<u>Cost of delivering reliable</u> power to customers.
<i>Fuel prices</i>	<i>Maintenance & repair</i>	<i>Line & pole work</i>
<i>Pollution controls</i>	<i>Wildfire prevention</i>	<i>Storm hardening</i>
<i>RPS mandates</i>	<i>Renewable integration</i>	<i>Grid modernization</i>
<i>Long-term planning</i>	<i>Losses</i>	<i>Losses</i>

Electricity Generation Costs - Follow Natural Gas Prices

- Natural Gas is a cost for both HFC **AND** for the grid (status quo)
- HFC uses natural gas more efficiently than gas fired generators
- HFC systems may lower the risk of price fluctuations by using multi-year wholesale purchases of natural gas



Delivery of Electricity – Trend of rate increases Likely to Continue

Near-Term Increases



Cost of Capital

- Utilities are seen as riskier investments after PG&E’s looming bankruptcy
- Cost of Capital is increasing

Long Term Forces



Declining Sales

- Utility costs decoupled to sales
- Leading to higher unit costs



Wildfire Mitigation

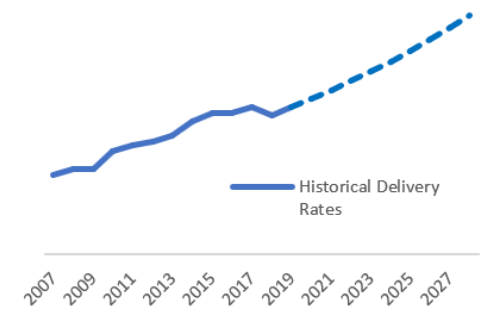
- Long term wildfire mitigation costs uncertain

Regulatory Uncertainty

- RPS mandates
- Legislative policies

Outlook

Long Term CAGR
5-6%



PROJECT ECONOMICS

AND

SUSTAINABILITY BENEFITS

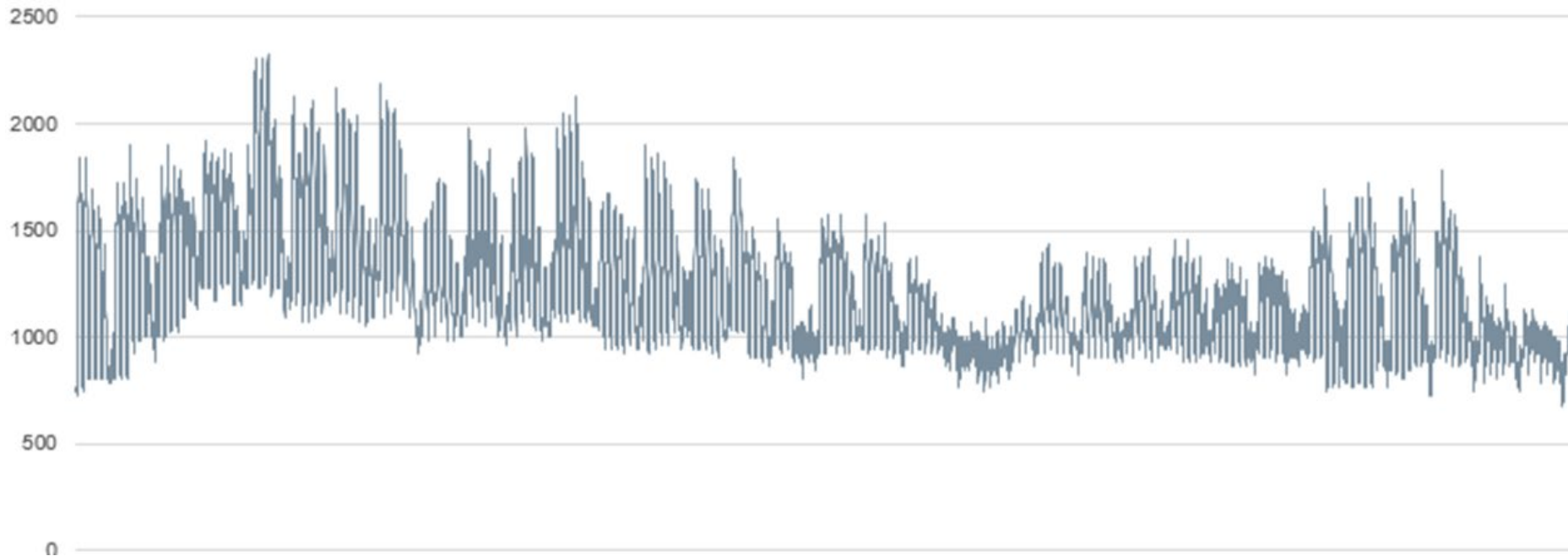


Glendale CC (Fuel Cell Size = 500 kW)



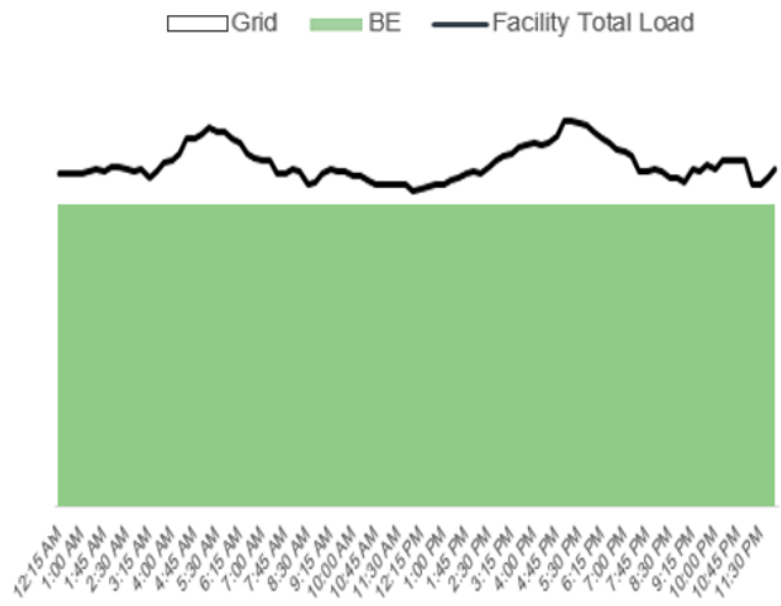
Savings Around the Clock - 24 x 7 operations demand a fuel cell solution that delivers at all hours of day

Simple - No fuel cell maintenance required by Glendale CC



Glendale CC Electricity Offset by Bloom

Avoided Cost of Electricity (COE) for initial year in HFC financial model is based on the *level of HFC output* if it had been billed at utility rates.
 HFC offsets energy charges and demand charges.



**Avoided by HFC
in 2020
\$0.141 / kWh**

**Average of entire
campus
~\$0.155 / kWh**



20 Year ESA Pro Forma – Economic Summary

500 kW Grid Parallel Installation

Project Impact						
Install Location	Bloom \$/kWh (Year 1)	GWP Offset \$/kWh (Year 1)	Year 1 Savings	Average Annual Savings	Total Savings	% Reduction vs. Grid
See Slide 7	\$0.092	\$0.146	\$236,450	\$206,110	\$4,122,196	24%

Note: Model assumes a conservative 3.5% annual escalator for Glendale W&P electricity rates over next 20 years. Historical rate increases have been 3.9% annually.

Note: GWP Demand Charge Year 1 is already accounted for in savings (Bloom to pay on behalf of GWP, so doesn't show up in model as a cost)

Note: Bloom ESA Toll is \$0.053 p/kWh in Years 1 (Covid Cash Boost), Yrs 2-4 \$0.095 p/kWh, and Years 5-20 \$0.117 p/kWh, with 0% tolling escalator.

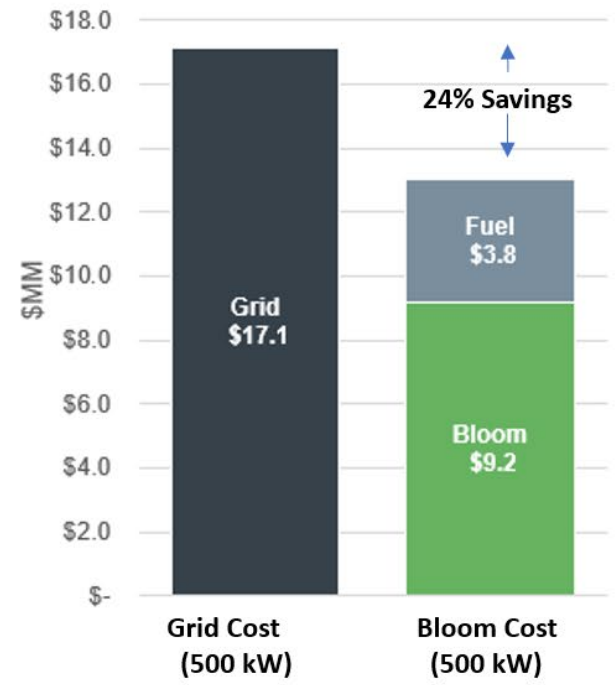
20 Year Power Purchase Agreement

No Capital Required, Set Rates

Standard Bloom Energy Services Agreement	
Structure	Billing for kWh generated
Rate	Tolling rate with 0% escalator, Discounted Years 1-4
Term	20 years
Natural Gas	Customer contracts directly with third-party gas provider
Warranties	BE standard warranties

Economic Summary

20-year Cost of Ownership



Annual Opex Savings



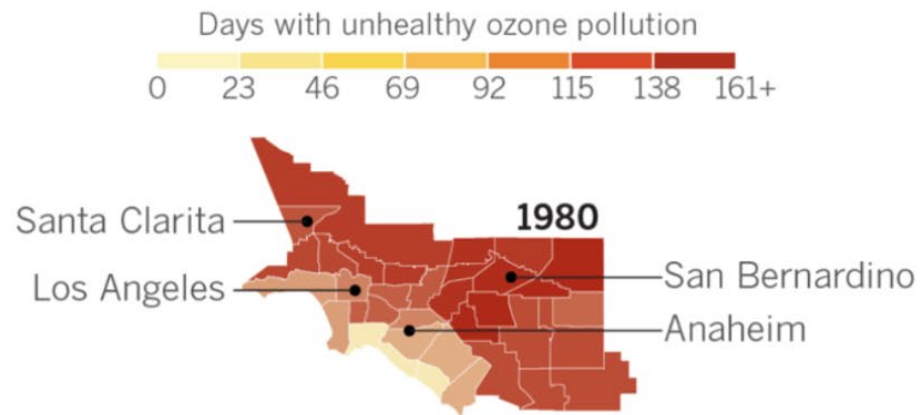
Glendale W&P Grid Escalation

Cumulative Savings	1%	2%	3.0%	3.5%	5%	6%
	\$7,382	\$1,496,344	\$3,189,745	\$4,122,196	\$7,312,481	\$9,814,389

Potential local air quality benefits from HFC Project

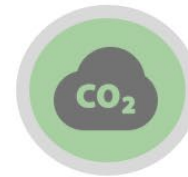
Southern California's bad air days stagnate after years of improvement

Inland communities, such as San Bernardino, are now logging more than 100 bad air days a year, a level not seen since the mid-1990s.



LA Times, July 1, 2019
<https://www.latimes.com/local/lanow/la-me-smog-southern-california-20190701-story.html>

Sustainability Benefits Glendale Community College & Bloom Project



CO ₂ Reductions
825,652 lbs/yr

20%
GHG Reduction



NO _x	SO ₂
3,588 lbs/yr	242 lbs/yr

99%
Smog Reduction

equivalent to:

Greenhouse gas emissions from

Carbon sequestered by



80
Passenger
vehicles driven
for one year



440
acres of U.S.
forests in one
year

1) Project-level accounting using marginal emissions rate. Based on Bloom Energy emissions at 789 lbs/MWh
 Source: EPA eGRID 2016. <https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid>
 Equivalency Data: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>



Overall Summary

- ✓ **ESA Term:** 20 Years
- ✓ **Savings vs. Grid:** 24%
- ✓ **Simple:** All-electric, Service by Bloom
- ✓ **Clean:** 99% Less Smog & 20% Less GHG

\$4.1M+
in OPEX savings
over term
(+\$236k in Year 1)

Independent, Third Party Analysis



EcoMotion – Sustainability Solutions

“This Fuel Cell Energy Strategy Validation Study was commissioned by Glendale Community College District. It is an independent, third party analysis of the Bloom Energy fuel cell proposal that has been presented to GCCD.”

“EcoMotion validates the College’s analyses that the fuel cells provide both economic and environmental savings.”