

UC San Diego

STRATEGIC ENERGY TOWN HALL

MAY 31, 2022

Resource Management and Planning

SETTING THE STAGE



STEPHEN JACKSON

ASSOCIATE VICE CHANCELLOR, RESOURCE MANAGEMENT & PLANNING

WELCOME

John Dilliott, Director, Utilities & Sustainability

Josh Kavanagh, Executive Director, Triton Auxiliary Programs and Services

Byron Washom, Director, Strategic Energy Initiatives

Michelle Perez, Energy & Sustainability Manager

Jen Bowser, Sustainability Engagement Manager

Questions & Answers

LAND ACKNOWLEDGEMENT

The UC San Diego community holds great respect for the land and the original people of the area where our campus is located. The university is built on the unceded territory of the Kumeyaay Nation. Today, the Kumeyaay people continue to maintain their political sovereignty and cultural traditions as vital members of the San Diego community. We acknowledge their tremendous contributions to our region and thank them for their stewardship.

BEFORE WE BEGIN

Questions:

- Were submitted during registration
- Can be submitted in Q&A Zoom feature

We'll answer as many questions live as time allows

This webinar is being recorded.

DECARBONIZING SCOPES 1 & 2



JOHN DILLIOTT

DIRECTOR, UTILITIES & SUSTAINABILITY

A SMALL CITY – LA JOLLA CAMPUS



- Campus population over 50,000...and growing
- Heavy in research and as a medical institution, two to four times energy density of commercial buildings
- Over 15 million sq. Ft. of buildings
- Peak electricity of 48 MW

GREENHOUSE GAS (GHG) EMISSIONS – DEFINITIONS

Scope 1 – Direct Emissions from Stationary and Mobile Combustion Sources

- Cogeneration Plant
- Centralized steam boilers at main campus and hospitals
- Decentralized Heating Systems
- Fleet Unleaded, Diesel & CNG
- Emergency Diesel Generators

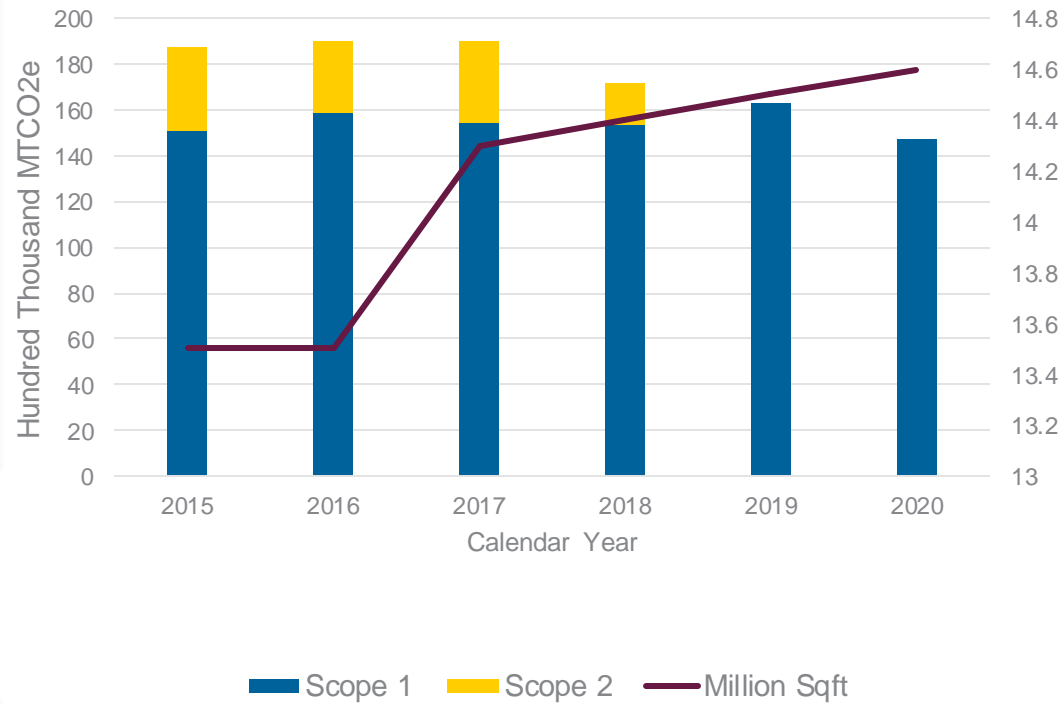
Scope 2 – Indirect Emissions from Purchased Electricity

Scope 3 – Indirect Emissions from UC San Diego Commuter and Air Travel

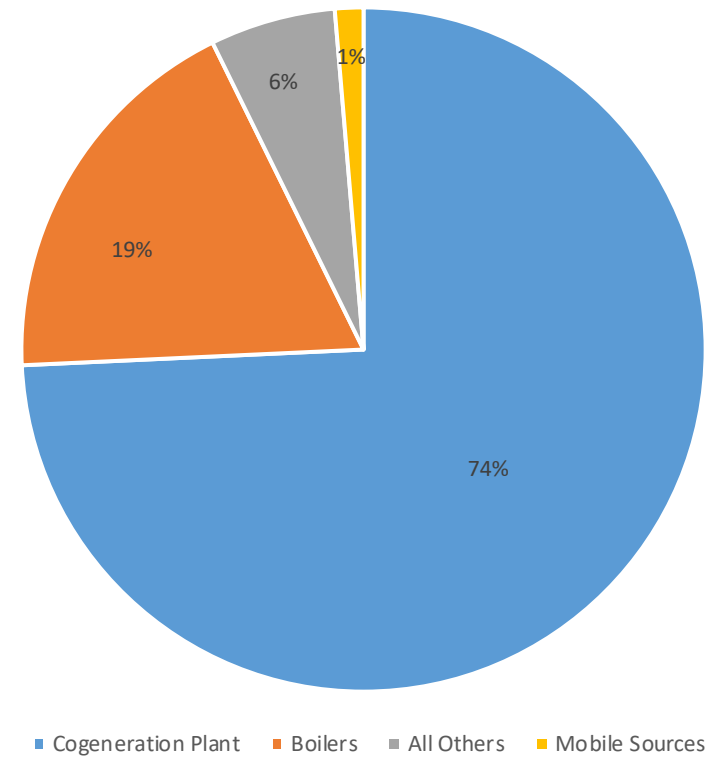
2020 POWER CONTENT LABEL				
The Regents of the University of California				
Greenhouse Gas Emissions Intensity (lbs CO ₂ e/MWh)		Energy Resources	UC Clean Power Program	2020 CA Power Mix
UC Clean Power Program	2020 CA Utility Average	Eligible Renewable¹	35.0%	33.1%
593	466	Biomass & Biowaste	0.0%	2.5%
		Geothermal	0.0%	4.9%
		Eligible Hydroelectric	0.0%	1.4%
		Solar	35.0%	13.2%
		Wind	0.0%	11.1%
		Coal	0.0%	2.7%
		Large Hydroelectric	0.6%	12.2%
		Natural Gas	0.0%	37.1%
		Nuclear	1.5%	9.3%
		Other	0.0%	0.2%
		Unspecified Power²	62.9%	5.4%
TOTAL			100.0%	100.0%
Percentage of Retail Sales Covered by Retired Unbundled RECs³:			63%	
¹ The eligible renewable percentage above does not reflect RPS compliance, which is determined using a different methodology. ² Unspecified power is electricity that has been purchased through open market transactions and is not traceable to a specific generation source. ³ Renewable energy credits (RECs) are tracking instruments issued for renewable generation. Unbundled renewable energy credits (RECs) represent renewable generation that was not delivered to serve retail sales. Unbundled RECs are not reflected in the power mix or GHG emissions intensities above.				
For specific information about this electricity portfolio, contact:		The Regents of the University of California 510-287-3360		
For general information about the Power Content Label, visit:		http://www.energy.ca.gov/pcl/		
For additional questions, please contact the California Energy Commission at:		Toll-free in California: 844-454-2906 Outside California: 916-653-0237		

TRACKING GHG EMISSIONS

Scope 1 and Scope 2 Emissions

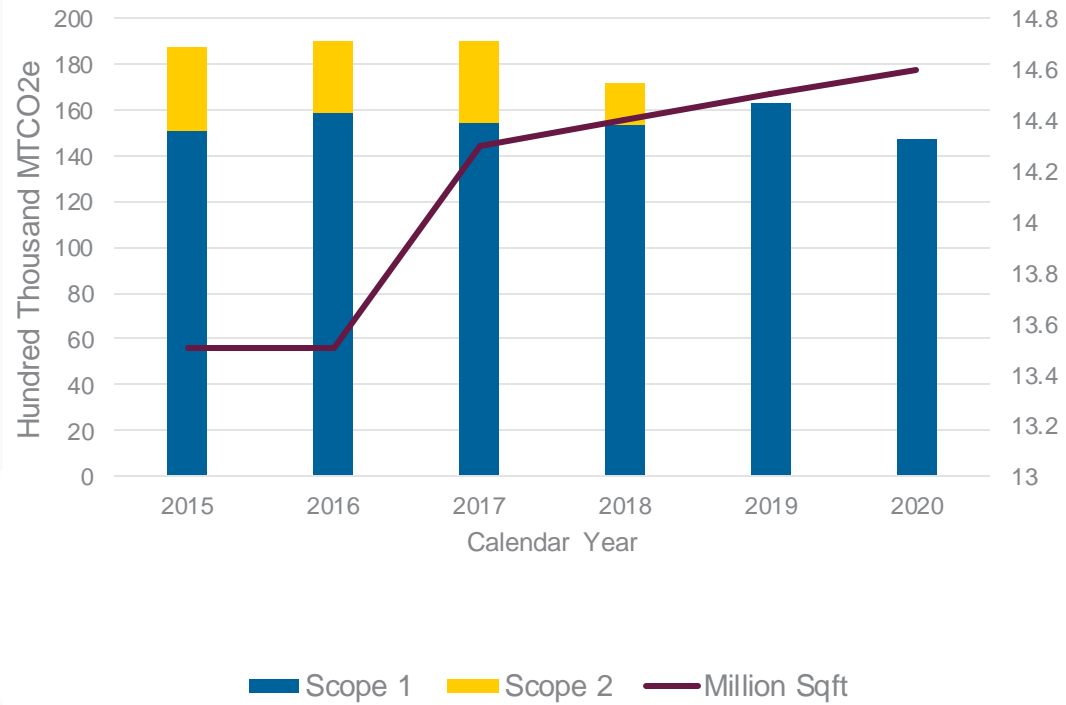


2020 GHG Emissions by Source (MTCO₂e)

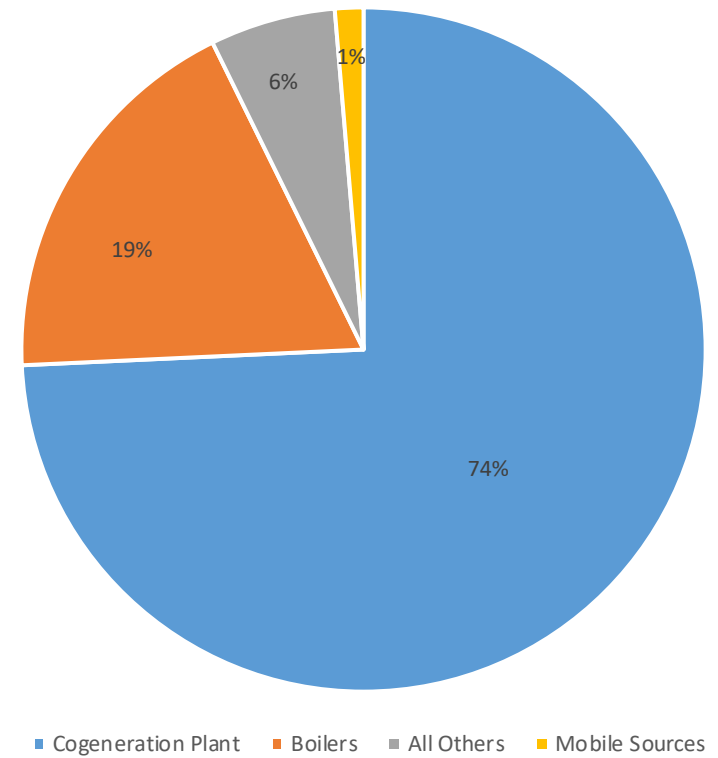


TRACKING GHG EMISSIONS

Scope 1 and Scope 2 Emissions



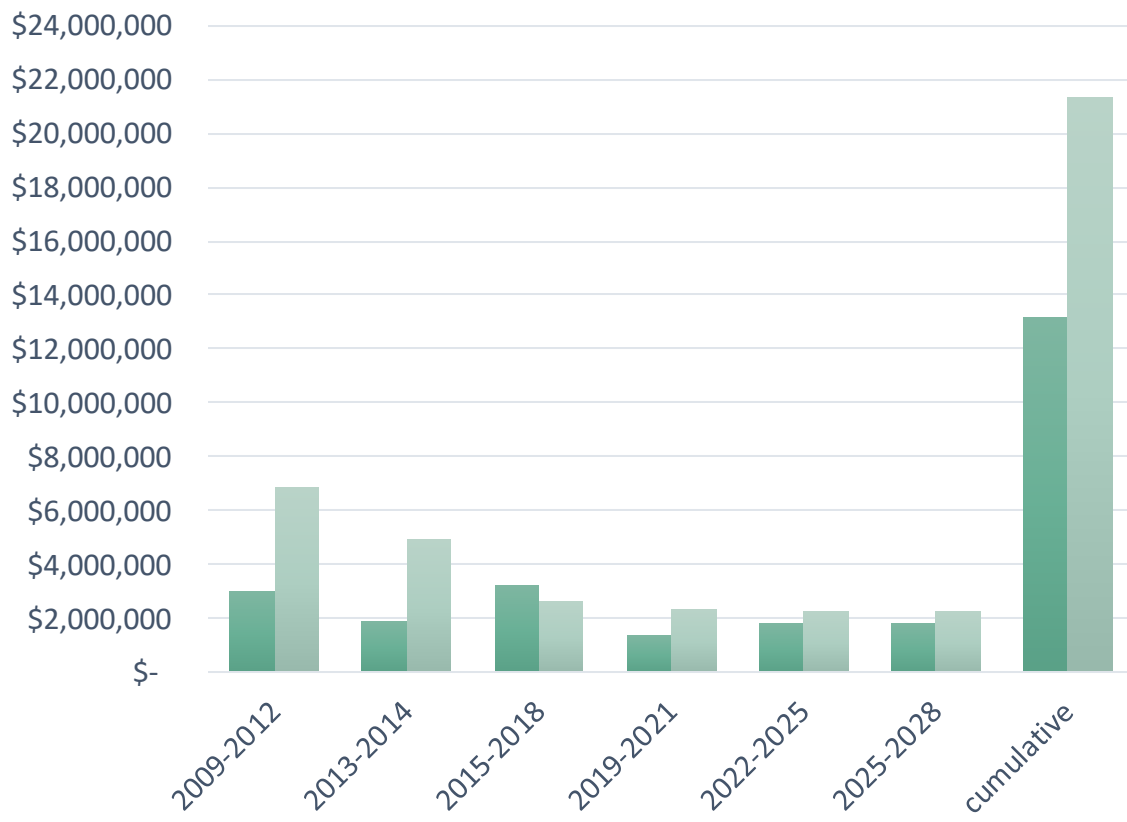
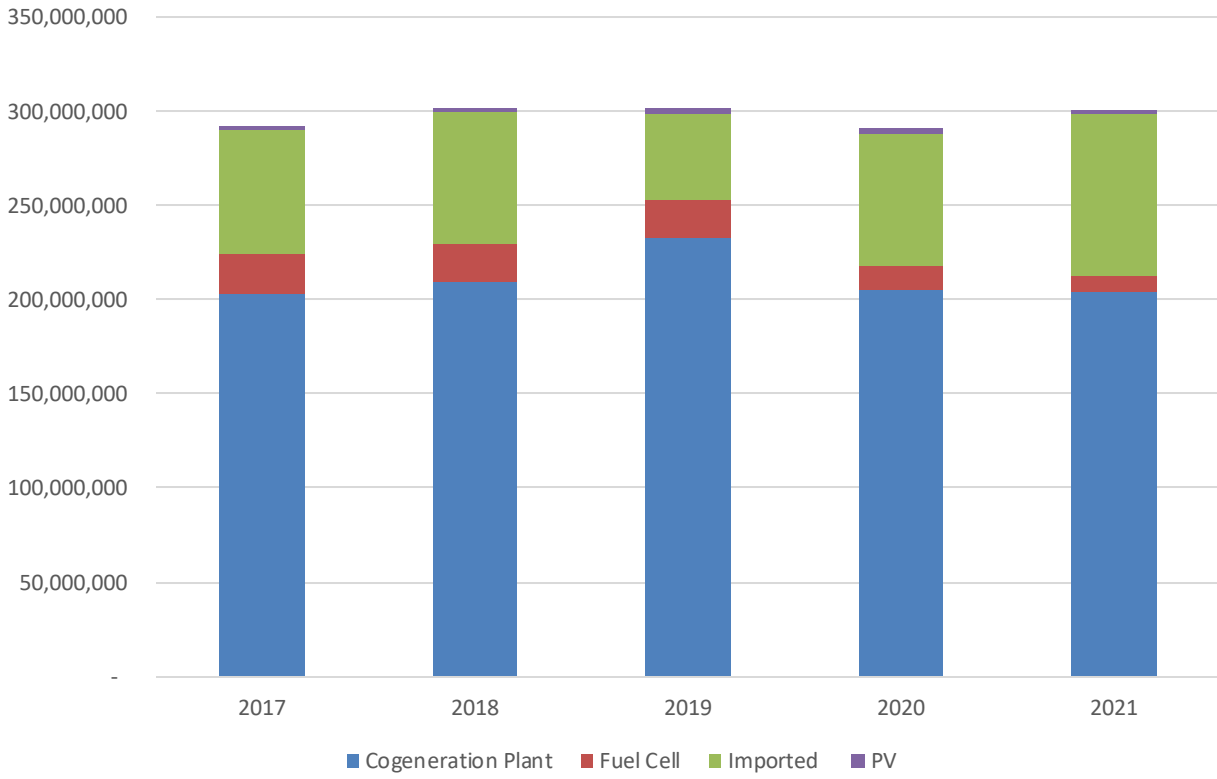
2020 GHG Emissions by Source (MTCO₂e)



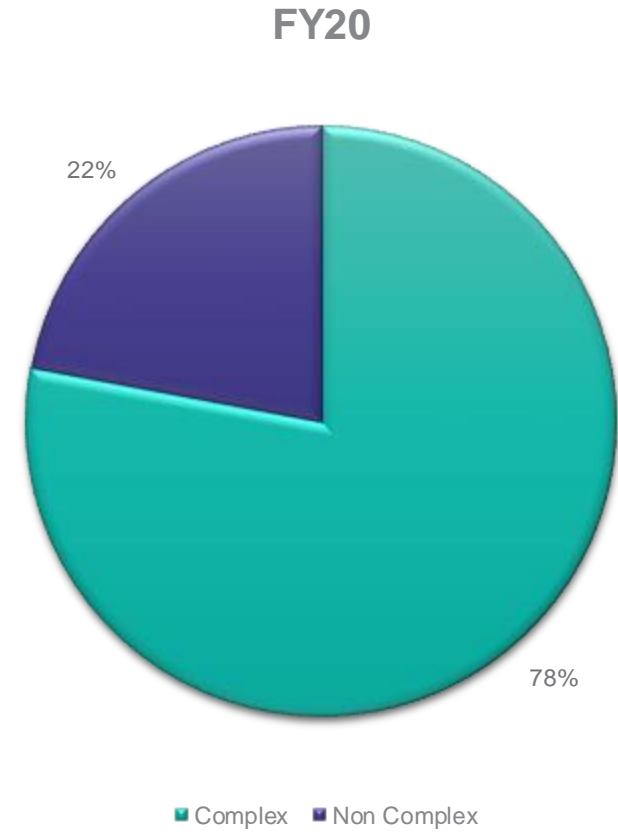
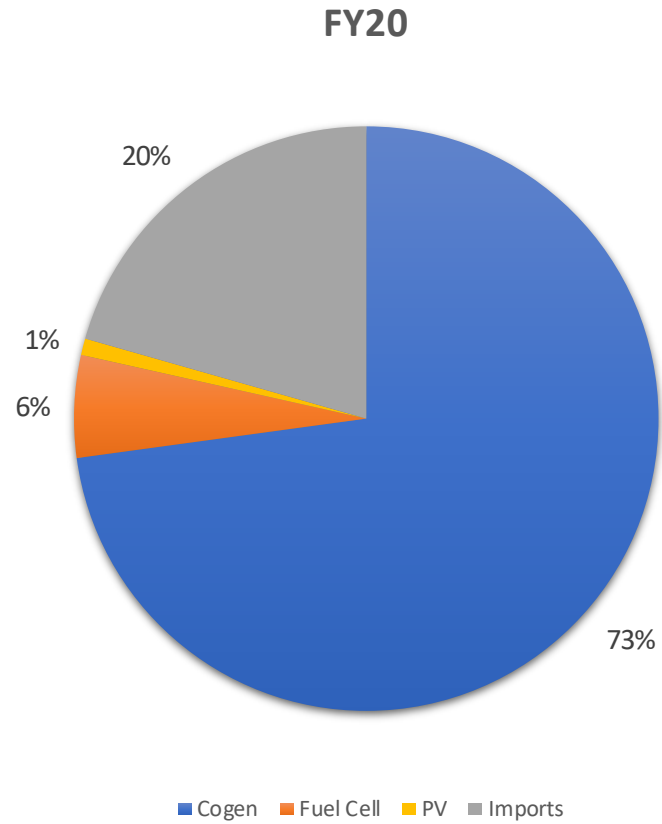
ENERGY EFFICIENCY

Since 2009, UC San Diego has completed nearly \$100M of projects and received \$18M in incentives.

Total Campus Load



ENERGY SUPPLY AND HIGH-TEMPERATURE WATER CONSUMPTION



UC SAN DIEGO MICROGRID

30 MW Cogeneration plant

- 2 x 13.5 MW Gas Turbines Generators
- 3 MW Steam Turbine Generators

2.8 MW Fuel Cell + 300 Ton Absorption chiller

3 MW PV (on & off-campus)

8 MG Thermal Energy Storage

- 4 MG on main campus
- 4 MG on East campus

2.5 MW/5 MWh Advanced Energy Storage

15 MW Dispatchable Back-up Diesel Generators



UC SAN DIEGO MICROGRID – SERVICES

Power

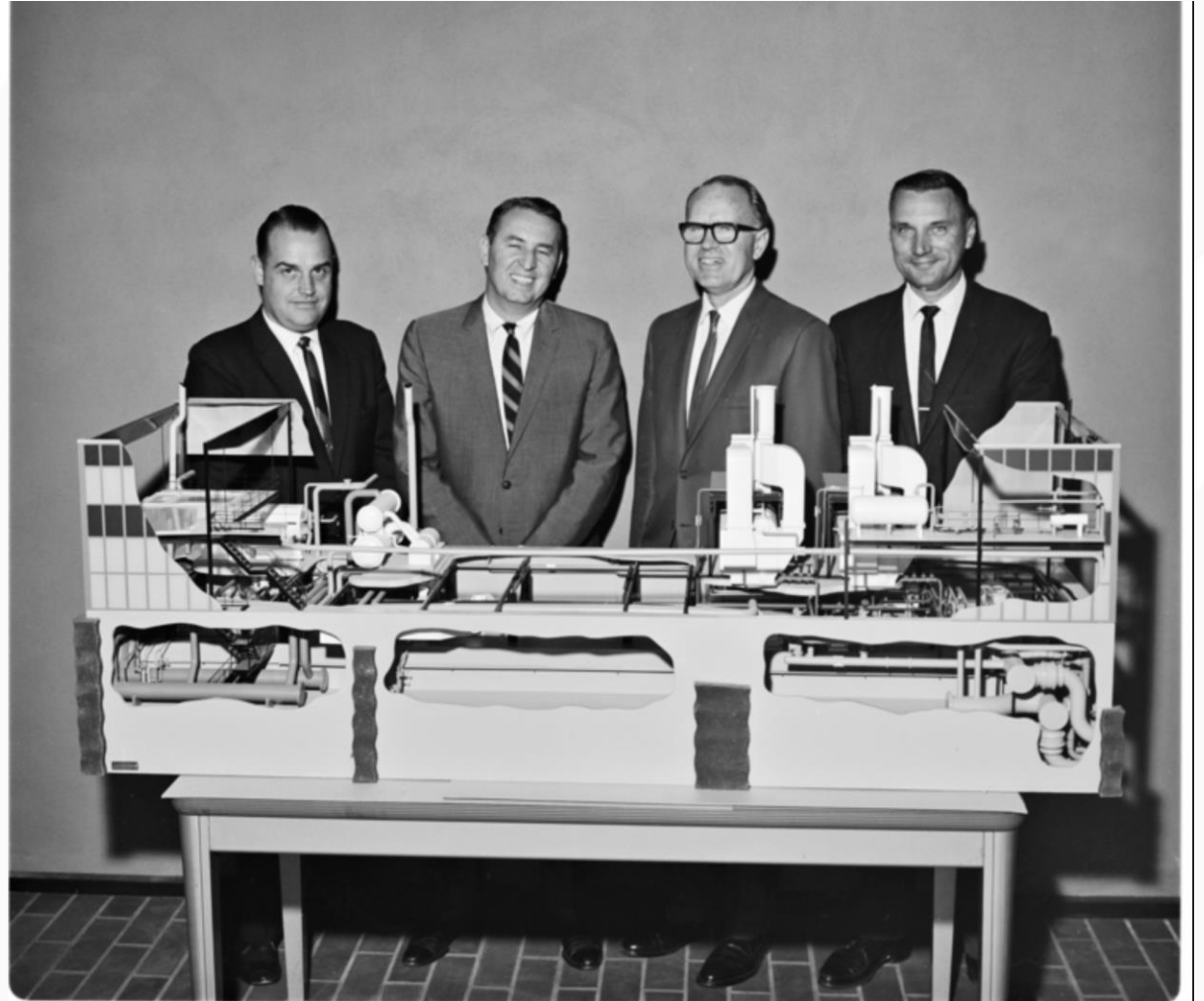
- Cost effective
- Efficient
- Resilient to regional grid disturbances

Heating

- 350F pressurized hot water
- Reliable

Cooling

- 43F chilled water
- Reliable
- Base-loaded, steam-powered chillers
- Thermal storage and electric chillers for peak



CARBON REDUCTION STRATEGIES – CURRENT PLAN

Present to 2025

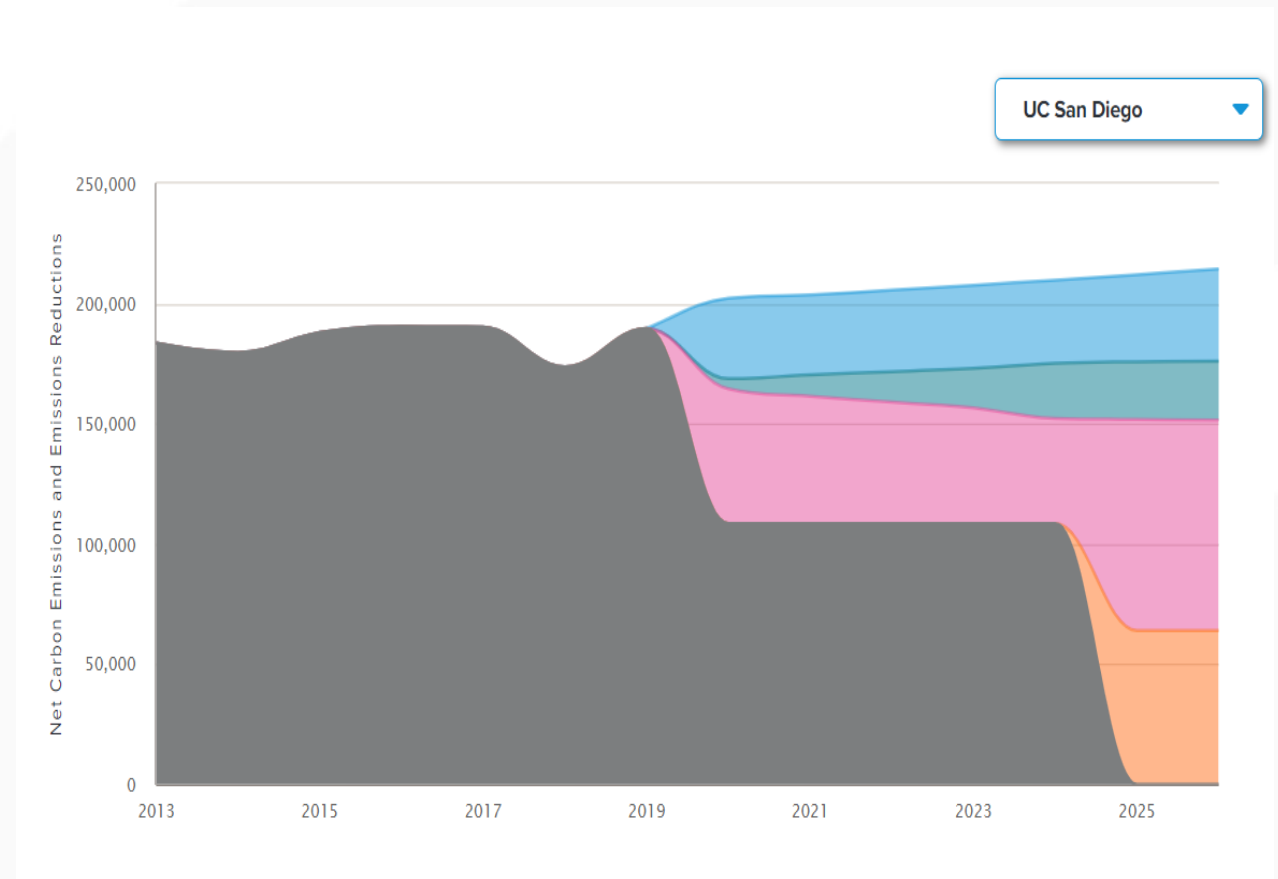
- Full operation of cogeneration plant
- 100% carbon-free imported power

2025–2032

- Full operation of cogeneration plant
- UCOP supplies biogas ~ 15% of load
- Purchase offsets for remaining emissions
- 100% carbon-free imported power

2032 and Beyond

- Retire cogeneration plant
- 100% UCOP biogas supply for heating and steam chillers (100% of supply secured)
- 100% carbon-free imported power



NON-BIOGAS CARBON REDUCTION OPTIONS

Electricity Supply Options:

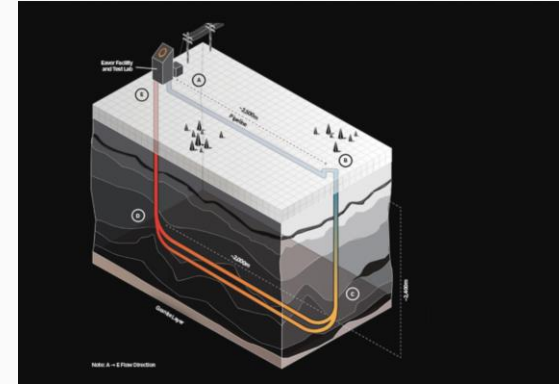
- 100% grid renewable sources – Cost and resiliency concerns
- Hydrogen supply for cogeneration plant – Cost and fuel delivery concerns

High-Temperature Heating Supply Options:

- Electric boilers – Cost and load concerns
- Deep closed-loop geothermal – Studying feasibility with UC San Diego researchers

Low-Temperature Heat Supply Options:

- High-temperature system needed
- Heat-recovery chilling – Requires significant space and hot water tanks
- Solar thermal – Studying feasibility with UC San Diego researchers



SCOPE 3: ELECTRIFICATION OF TRANSPORTATION



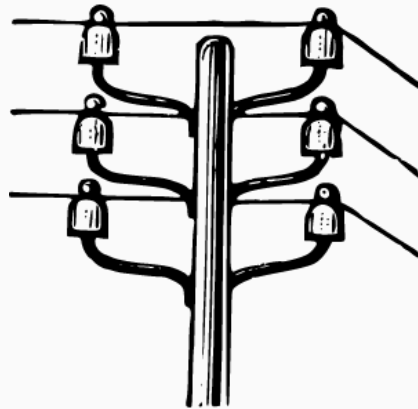
JOSH KAVANAGH

EXECUTIVE DIRECTOR, AUXILIARY PROGRAMS & SERVICES

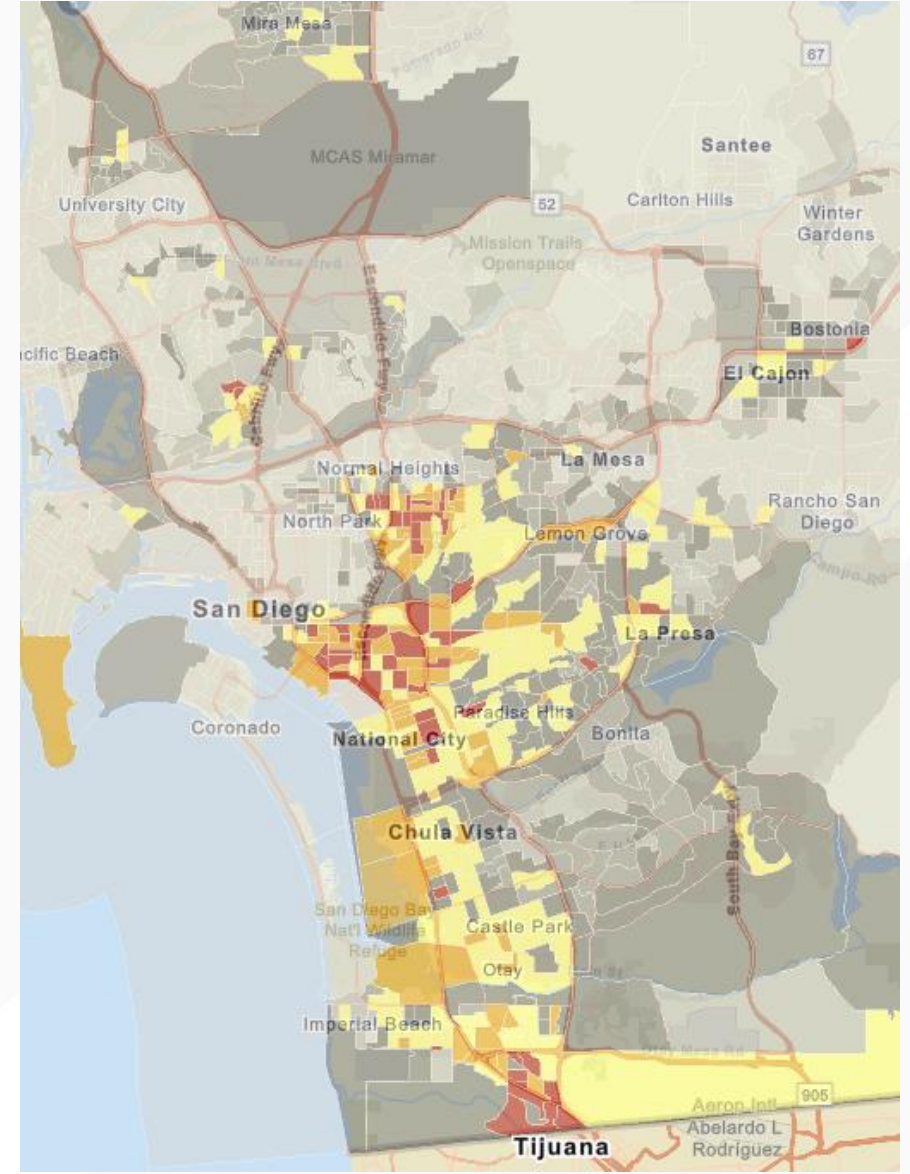
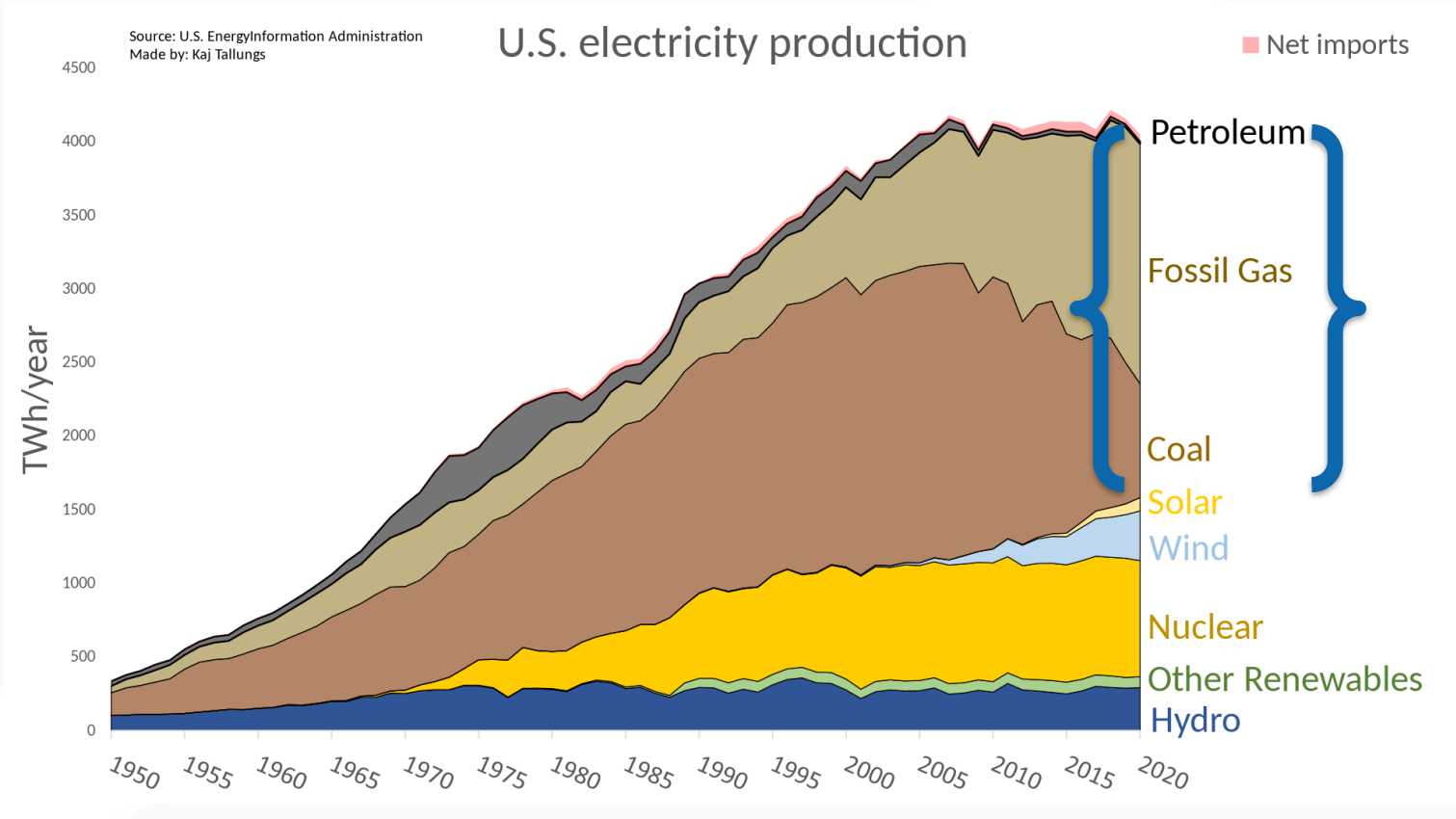
WHAT IF YOUR ELECTRICITY IS DIRTY?



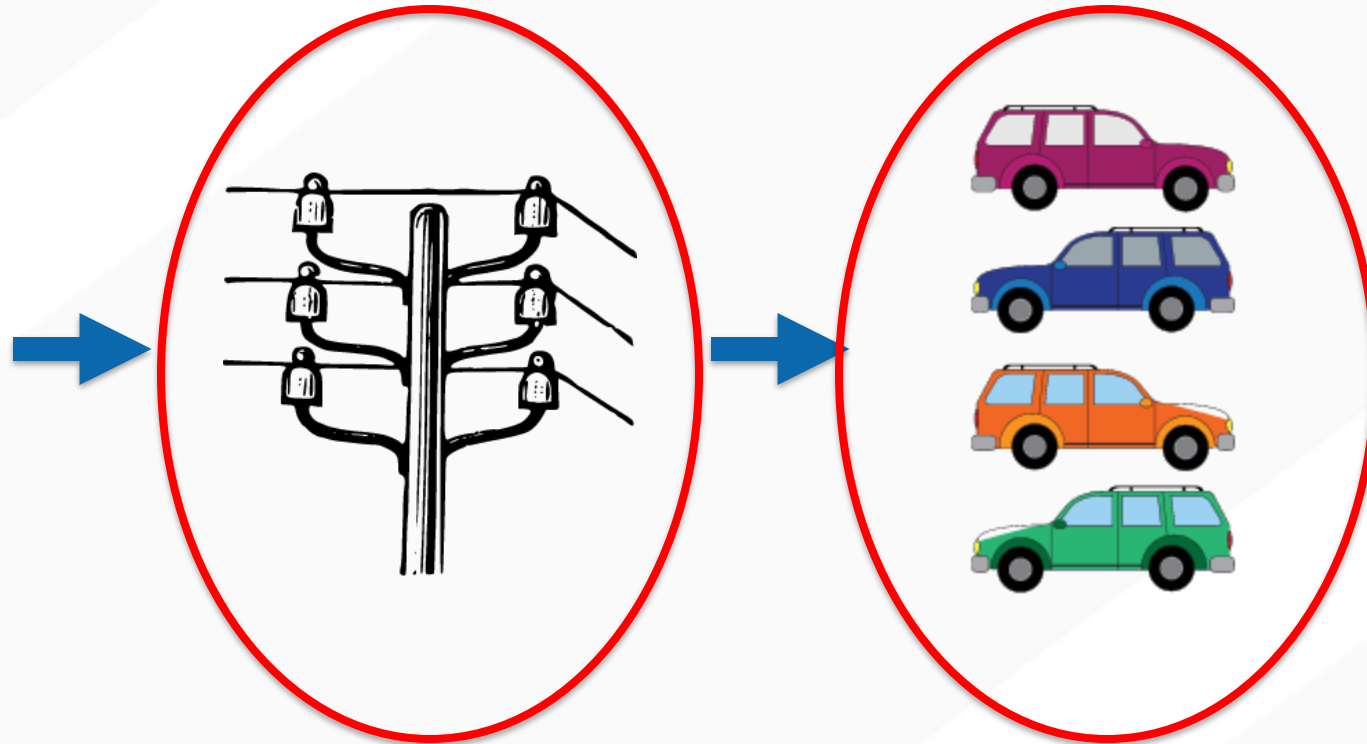
Coal



POINT VS. NON-POINT EMISSIONS



ACCELERATING BENEFITS FROM CLEAN GENERATION

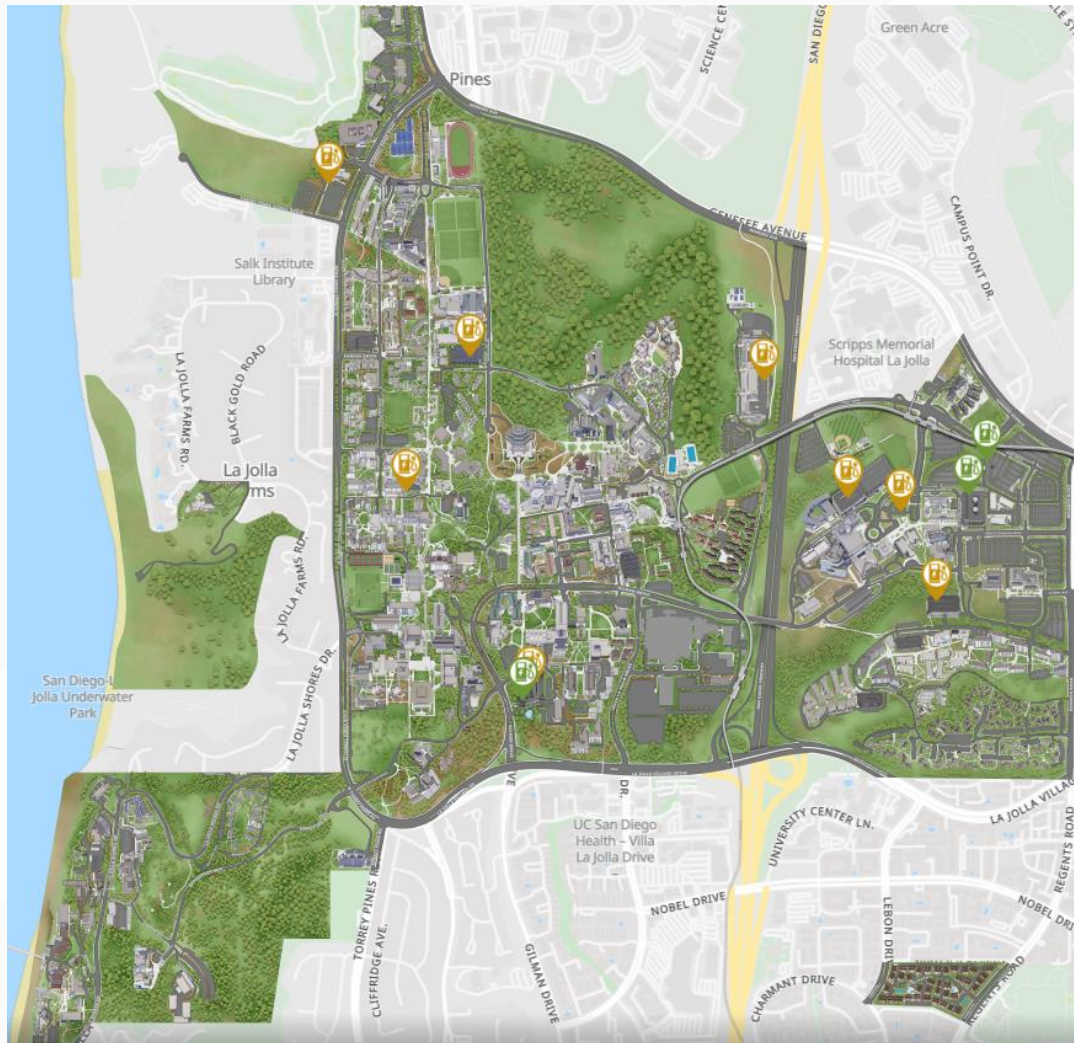


\$5T in infrastructure
remains useful

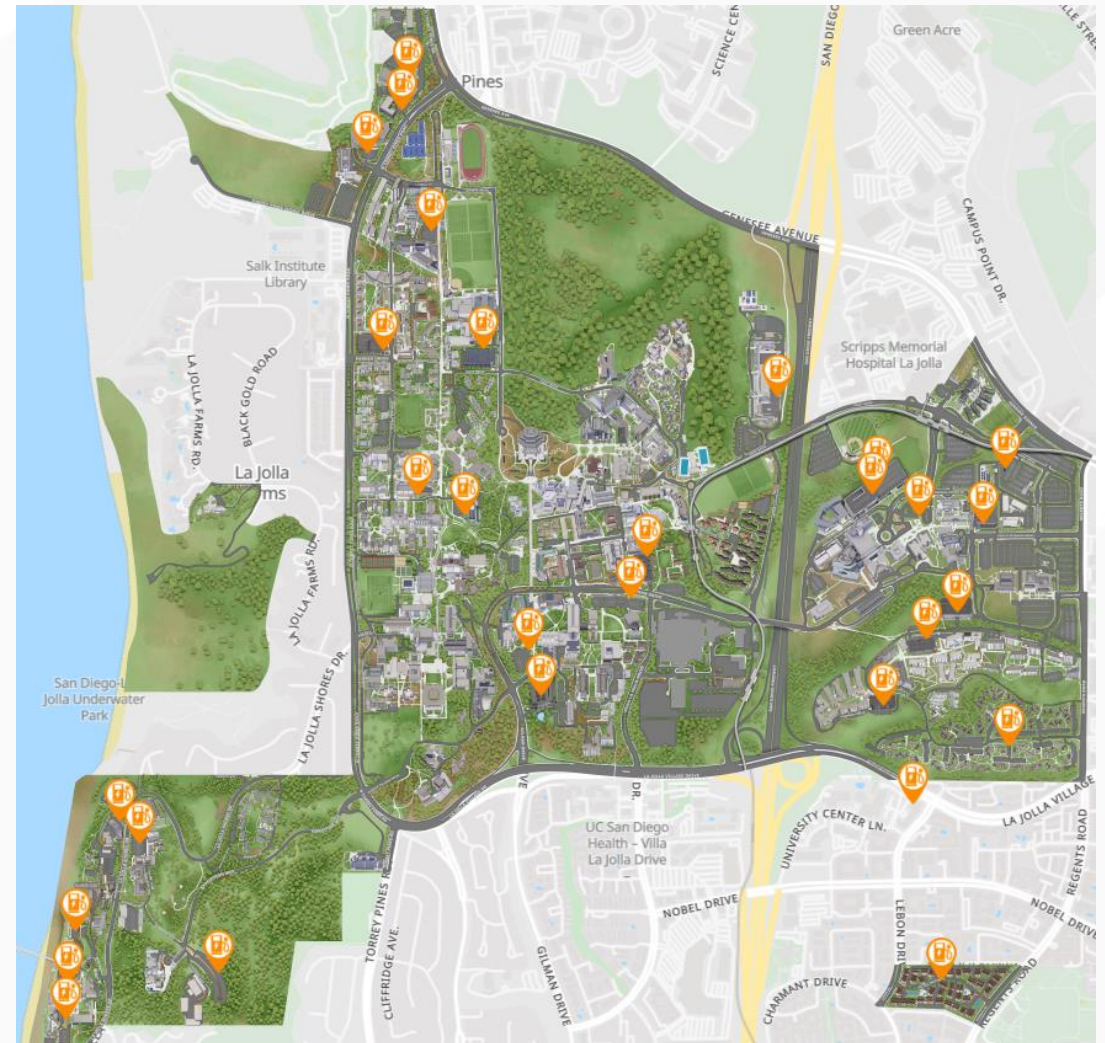
261m vehicles
get cleaner faster

SCHOOL AND WORKPLACE CHARGING

DC Fast Charging Perimeter Ring



Destination-Adjacent Level 2 Charging



SEGMENTATION BY TRIP TYPE

EV
1 HOUR

Pit Stop



EV
4 HOURS

Retail or
Single Class



EV
12 HOURS

Traditional Work
Schedule



VOIGT ELECTRIC MOBILITY HUB: ELECTRIFYING THE LAST-MILE



VOIGT ELECTRIC MOBILITY HUB: ELECTRIFYING THE LAST-MILE



400 EV charging stalls
No need to move mid-day
130% increase in public
L2 charging on campus



Public EV car sharing
One-way, no membership required



Shared electric fleet vehicles to
decongest the campus core and
accelerate transition
to an electric fleet



VOIGT ELECTRIC MOBILITY HUB: ELECTRIFYING THE LAST-MILE



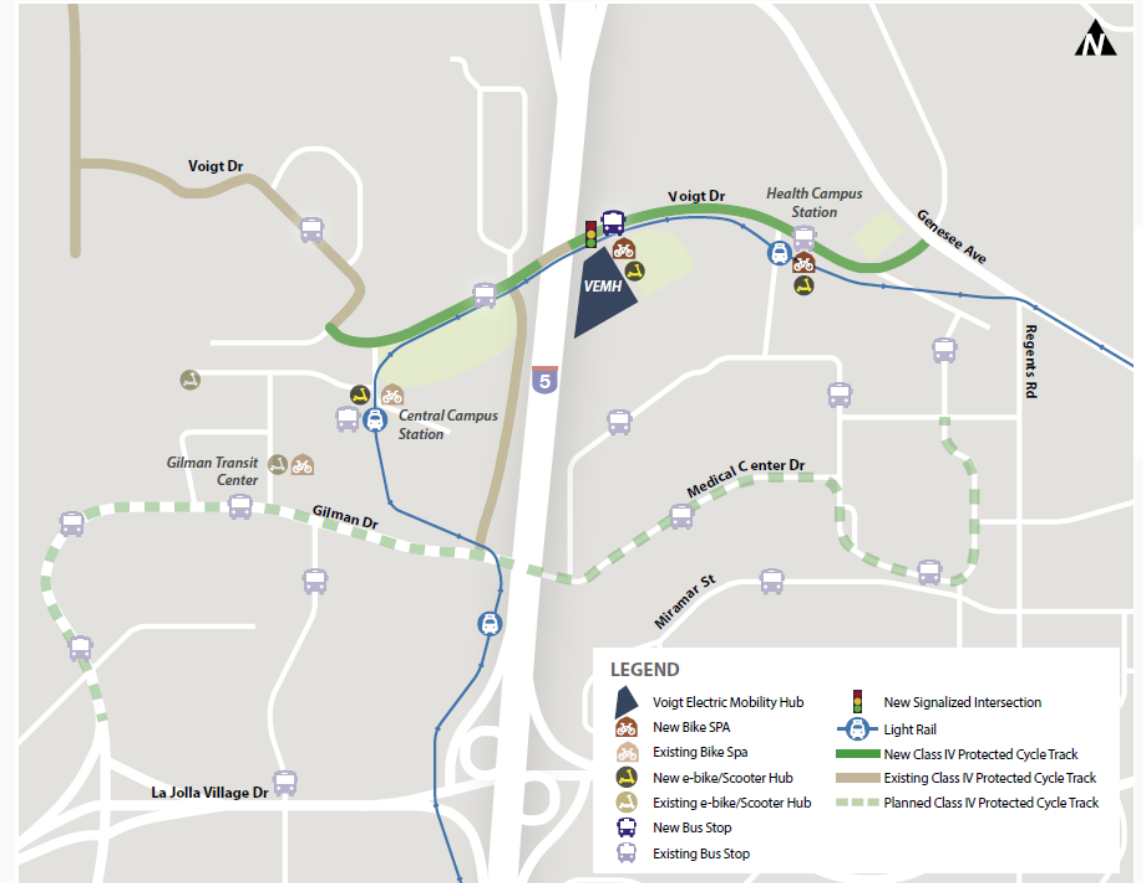
New shared electric bike and scooter hubs at both light rail stations and Voigt Electric Mobility Hub



Two new 100 stall bike stations with e-bike charging, personal items storage controlled access, and security cameras



1.25 additional miles of Class IV (buffered and delineated) bikeway



VOIGT ELECTRIC MOBILITY HUB: ELECTRIFYING THE LAST-MILE



- Depot charging for 24 transit buses and additional parking for 16 electric shuttles and 23 micro/paratransit vehicles
- Lays foundation for 100% electric transit operation by 2030




- Shared on-street 450 kW charging for transit and delivery vehicles
- Touchless, autonomous heavy-duty charging
- Driver training & licensing facility
- HD EV technician training
- Permanent Triton Transit operations base



LEARN MORE AND LEND YOUR SUPPORT ON OUR WEBSITE

UC San Diego

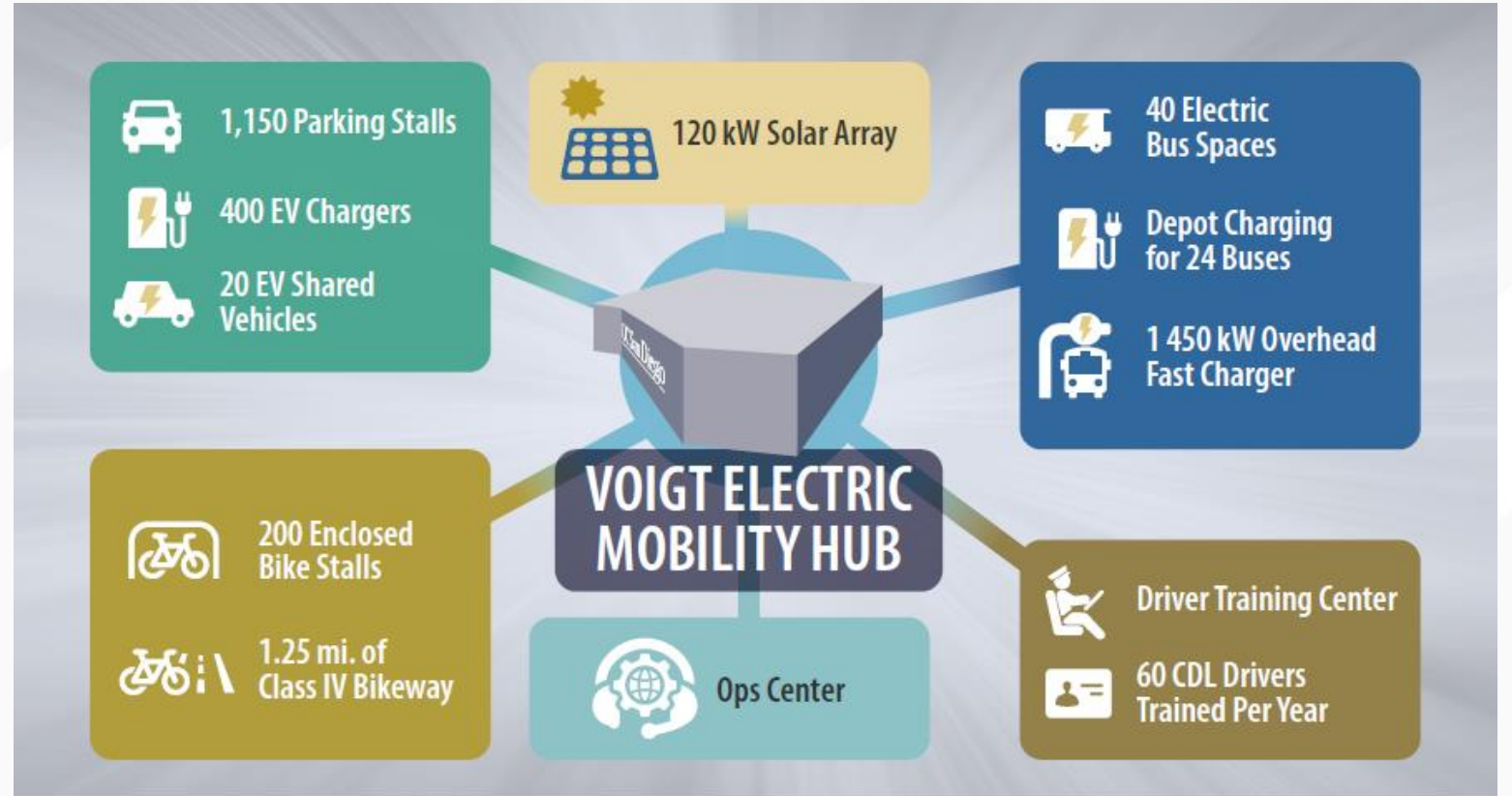
Voigt Electric Mobility Hub



2022 USDOT RAISE Grant Application

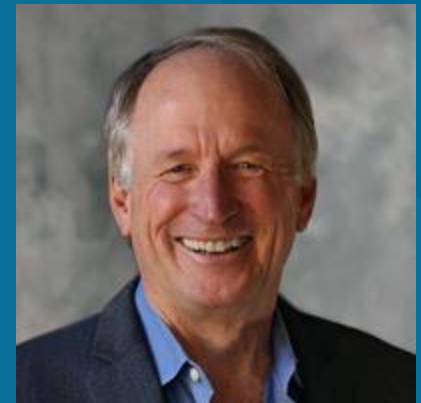
Total Project Costs: **\$65,012,000**
Local Match: **\$37,300,000**
Previously Expended UC San Diego Funds: **\$2,712,000**
Requested RAISE Funds: **\$25,000,000**

Submitted by:
University of California San Diego
UBIR: UYTTZ16G9DT1
April 14, 2022



<https://voigtelectricmobilityhub.ucsd.edu>

RESEARCH AND INNOVATION MEET OPERATIONS



BYRON WASHOM

DIRECTOR, STRATEGIC ENERGY INITIATIVES

STRATEGIC ENERGY INITIATIVES



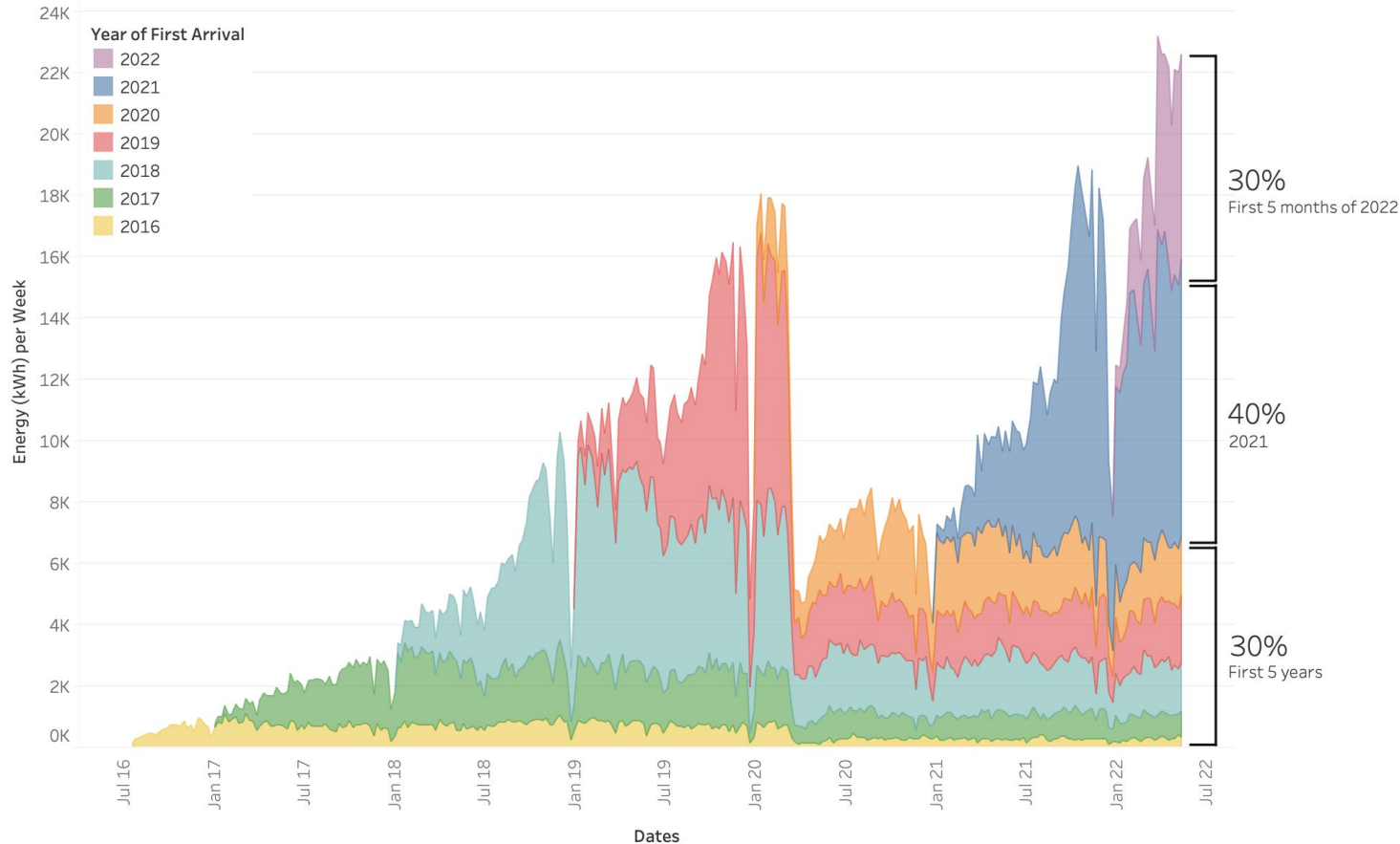
Serves as the funding facilitator and collaborator between faculty research interests and the early adoption and deployment of vetted Distributed Energy Resources (DER) onto the UC San Diego microgrid

While utilities and industry are generally risk averse to early adoption, UC San Diego has been a pioneer and Initial Adopter of innovative DER technologies from private sector collaborators that are vetted to provide reliability, survivability, resiliency, safety, environmental benefits and economic competitiveness to the microgrid while enhancing the furtherance of faculty research

Co-Funding to offset the uneconomic costs of being an “Lab to Market” Initial Adopter has been cobbled together with state, federal, industry and international sources to leverage UC San Diego’s scarce resources. UC San Diego is often one of the top recipient of CA incentives.

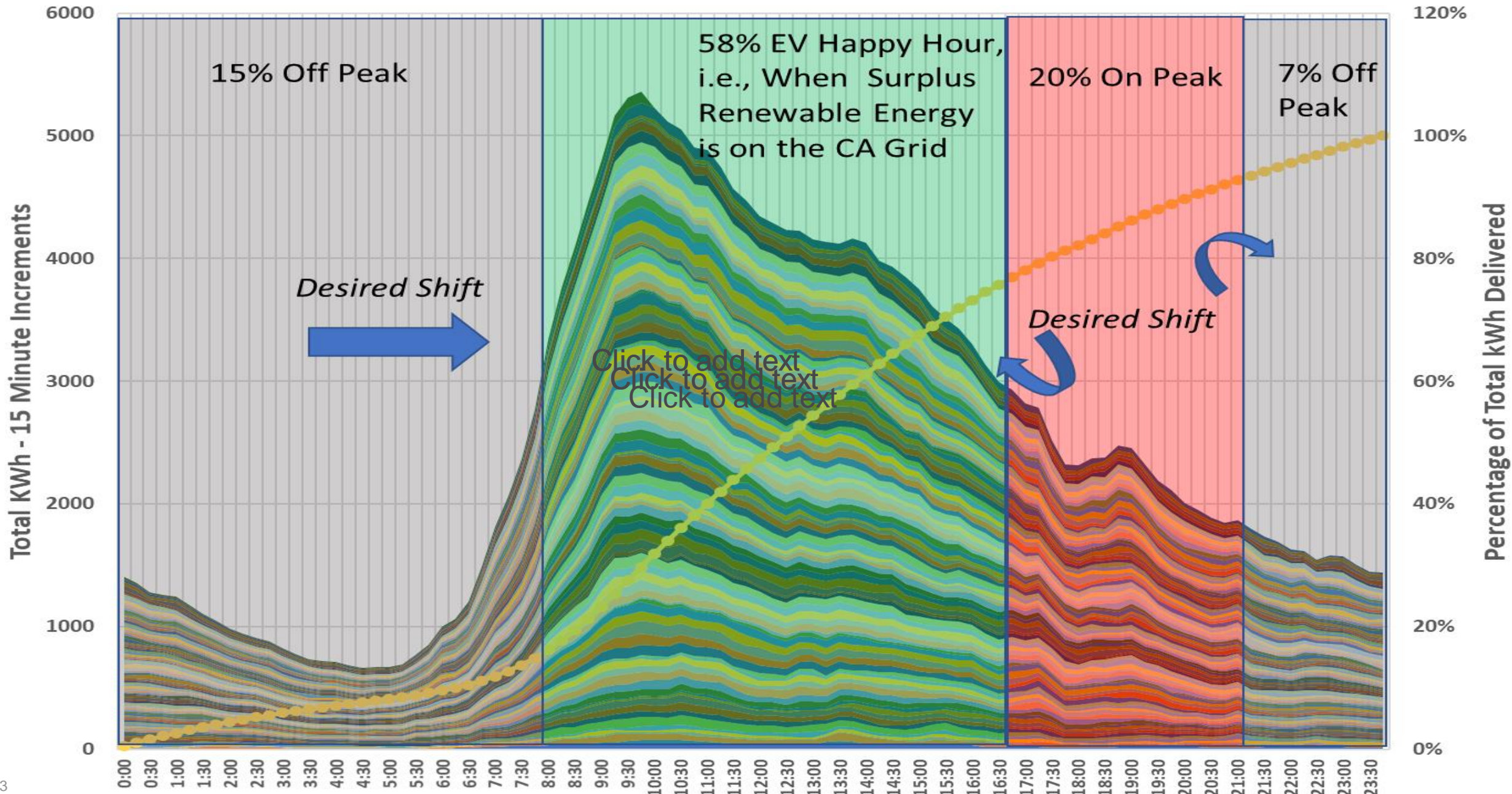
SHAPING, SHIFTING AND SHEDDING OF EV LOAD MANAGEMENT FOR MAXIMUM ENVIRONMENTAL BENEFITS AND INCENTIVE REVENUE

Retention of All ChargePoint Customers Unfiltered as of May 21, 2022



- Rebounding in the Shadow of COVID-19 (ChargePoint data only)
- 100 MWH/Month has returned
- 70% of MWH Volume is from brand new unique drivers in the past 16 Months (Encouraging!)
- Pre-2021 MWH Volume is 30% of current indicating a shift to home charging or continued work from home
- More drivers are shifting to EV-12 for the convenience of 12 hours of permitted dwell time that concurrently permits “smart charging” technology to shift peak demand when the Carbon Intensity of the CA grid is lowest and monetize credits are highest
- Anticipate a return to EV manufacturers offering UCS an Diego Affiliates discounted pricing

90 Day EV Charging Load Profile of 244 MWh Consumed by 2,523 Unique Drivers During 22,842 Sessions Resulting in 175,000 kg GHG Savings Delivered by 250 ChargePoint Ports at UC San Diego, 1/13/22 - 4/12/22



TEN YEARS OF OPERATING THE LARGEST FUEL CELL AT ANY UNIVERSITY



The surplus methane from the Pt. Loma Waste Water Treatment plant was being flared into the atmosphere until UC San Diego provided the financial means to purify it, and for the first time in CA, injected the renewable fuel into a common carrier pipeline.

UC San Diego entered into a Power Purchase Agreement in 2012 to off take the renewable directed biogas and deploy a 2.8 MW baseload fuel cell on the microgrid.

In 2017, the waste heat was captured and fed into an absorption chiller to produce an additional 300 tons of chiller capacity that was fed into 2.4 million gallons thermal storage tank built into the Athena Parking Structure.

The net result is a world class efficient Combined Cycle fuel cell with near zero local pollutants utilizing the methane produced at Pt. Loma that would otherwise be flared.

SEVEN YEARS OF OPERATING A LARGE BATTERY ENERGY STORAGE



In 2015, UC San Diego deployed a 2.5 MW/5 MWh Battery Electric Energy Storage System to help shave peak loads and serve a load sink for the gas turbines when overnight demand is low.

The Center for Energy Research has subsequently won research grants for:

- 2nd Life EV battery research
- Vehicle-to-grid demonstration
- Used EV battery recycling
- Small-scale test bed demonstrations
- Demand response auction market revenue

The \$39M NSF DERConnect grant will utilize the 13,500 sq. ft. (5X) area set aside in 2014 for further testing of advanced energy storage.

HYDROGEN POWER FOR OCEAN VESSELS AND AVIATION

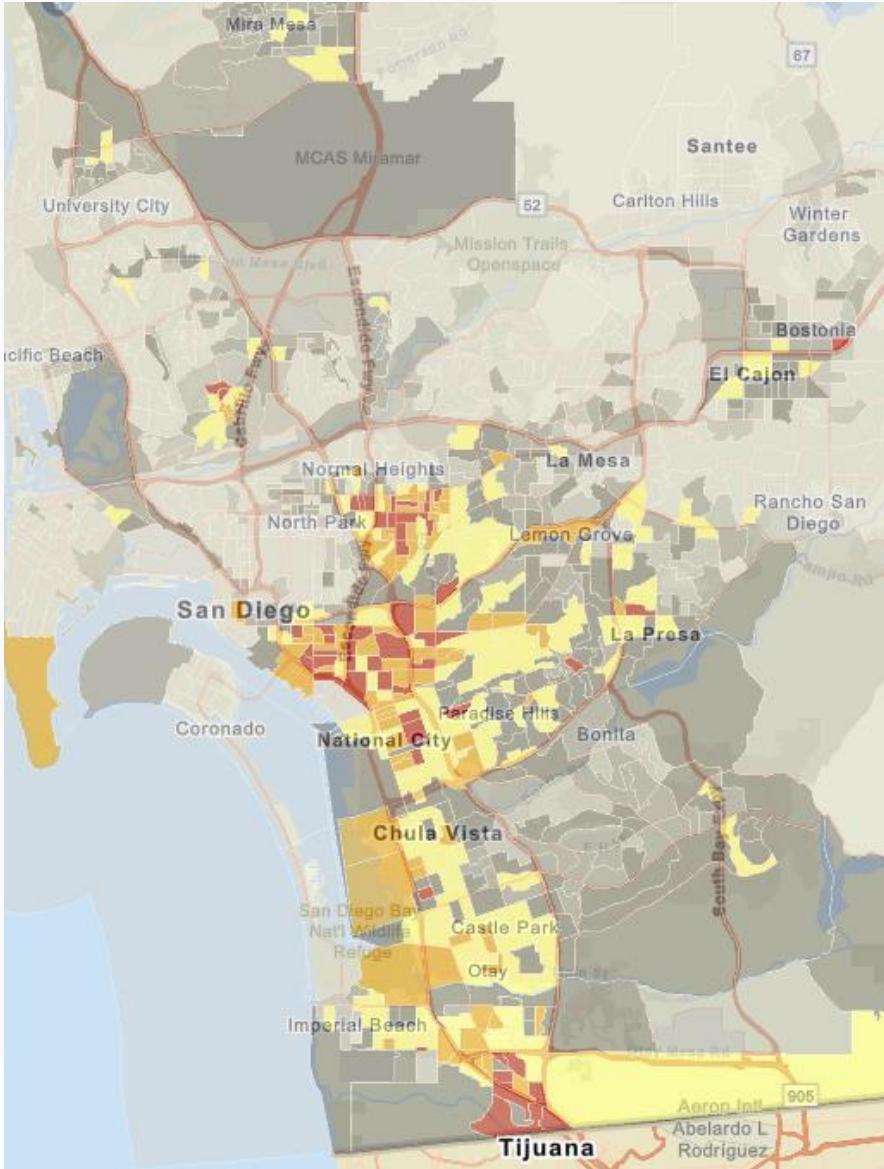


Scripps Institution of Oceanography has received \$35M of state funding to build the first ocean-going research vessel partially powered by hydrogen energy.

The Center for Energy Research has received a large ARPA-E grant for using advanced fuel cells for aviation transportation in the future.

UC San Diego is in discussions with SDG&E to possibly blend green hydrogen with delivered natural gas for on-campus applications.

KNOWLEDGE TRANSFER AND ACCELERATION OF COMMERCIALIZATION OF AFFORDABLE AND ACCESSIBLE CLEAN TECHNOLOGY



Knowledge transfer on microgrid and distributed energy resources to:

- SoCal Tribal Accelerated Clean Energy Economy Initiative
- CA Native American Tribal Council
- San Diego Port Authority
- U.S. Navy facilities southwest
- Miramar Marine Corp Base
- U.S. Navy facilities worldwide

**NEXT STEPS:
YOUR CHANCE TO GET INVOLVED**



MICHELLE PEREZ

ENERGY & SUSTAINABILITY MANAGER

NEXT STEPS

Focus Groups This Summer

- We aim to get representation from our diverse campus community
- You can express your interest to participate via survey that we will send after the town hall.
- Written feedback will also be an option if you are unable to participate in a focus group.

Future Town Halls Covering Various Sustainability Topics

QUESTIONS & ANSWERS



JEN BOWSER

SUSTAINABILITY ENGAGEMENT MANAGER

UC San Diego