STRATEGIC ENERGY TOWN HALL
MAY 31, 2022
Resource Management and Planning
SETTING THE STAGE
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
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
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 GHG Emissions by Source (MTCO2e)

- Scope 1: 74%
- Scope 2: 19%
- Mobile Sources: 6%
- All Others: 1%

Scope 1 and Scope 2 Emissions

- Calendar Year 2015: 0
- Calendar Year 2016: 20
- Calendar Year 2017: 40
- Calendar Year 2018: 60
- Calendar Year 2019: 80
- Calendar Year 2020: 100

Hundred Thousand MTCO2e

- Scope 1: Blue
- Scope 2: Yellow
- Million Sqft: Red
Since 2009, UC San Diego has completed nearly $100M of projects and received $18M in incentives.
ENERGY SUPPLY AND HIGH-TEMPERATURE WATER CONSUMPTION

FY20

- Cogen: 73%
- Fuel Cell: 20%
- PV: 6%
- Imports: 1%

FY20

- Complex: 78%
- Non Complex: 22%
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 → Electric Grid → Cars
POINT VS. NON-POINT EMISSIONS

U.S. electricity production

- Petroleum
- Fossil Gas
- Coal
- Solar
- Wind
- Nuclear
- Other Renewables
- Hydro

Source: U.S. Energy Information Administration
Model by Kai Tullberg
ACCELERATING BENEFITS FROM CLEAN GENERATION

- $5T in infrastructure remains useful
- 261m vehicles get cleaner faster
HOUSING STOCK DRIVES CHARGING OPTIONS
SEGMENTATION BY TRIP TYPE

Pit Stop
EV 1 HOUR

Retail or Single Class
EV 4 HOURS

Traditional Work Schedule
EV 12 HOURS

ChargePoint
Available
DC Fast
EV Charging Only
ChargeOn.
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

https://voigtelectricmobilityhub.ucsd.edu
RESEARCH AND INNOVATION
MEET OPERATIONS

BYRON WASHOM
DIRECTOR, 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.
• 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

15% Off Peak

58% EV Happy Hour, i.e., When Surplus Renewable Energy is on the CA Grid

20% On Peak

7% Off Peak

Total kWh - 15 Minute Increments

Percentage of Total kWh Delivered

Desired Shift

Click to add text

Click to add text

Click to add text

Click to add text

Click to add text

Click to add text
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.
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.
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
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
UC San Diego