

UC San Diego Energy Town Hall

November 7, 2023

UC San Diego

SETTING THE STAGE



STEPHEN JACKSON

ASSOCIATE VICE CHANCELLOR, RESOURCE MANAGEMENT & PLANNING

WELCOME

- Carrie Metzgar, Campus Sustainability Officer
- Dr. Jan Kleissl, Director, Center for Energy Research
- Melanie Davidson, Hydrogen Commercial Development Manager, SDG&E
- Carl Salas, Founding Principal, Salas O'Brien
- Michelle Perez, Energy and Sustainability Manager
- John Dilllott, Director of Utilities & Sustainability

BEFORE WE BEGIN

- This webinar is being recorded.
- Presentations are on our Town Halls webpage:
<https://sustainability.ucsd.edu/about/town-halls.html>
- **Questions**
 - Were submitted during registration
 - Can be submitted in the Zoom Q&A feature
- We'll answer as many questions live as time allows.

AGENDA

1. UC Climate Policy Update
2. Energy Research in the UC San Diego Living Laboratory
3. Net Zero
4. Hydrogen Blending
5. Q&A

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.

- UC San Diego Intertribal Resource Center

UC Climate Policy Update



Carrie Metzgar
Campus Sustainability Officer

LOCATION REQUIREMENTS

Total Emissions

Reduce total emissions (scope 1, 2 and 3) by at least 90% by 2045

Scope 1

Set reduction targets for 2030, 2035 and 2040 by January 1, 2025 (based on decarbonization studies)

Scope 2

Purchase 100% clean electricity beginning in 2025 (LBNL will follow federal requirements)

Scope 3

Set scope 3 emissions reduction targets in alignment with State of California's goals

Energy Research in the UC San Diego Living Laboratory



Jan Kleissl
Director, Center for Energy Research

COLLABORATIVE RESEARCH OVERVIEW

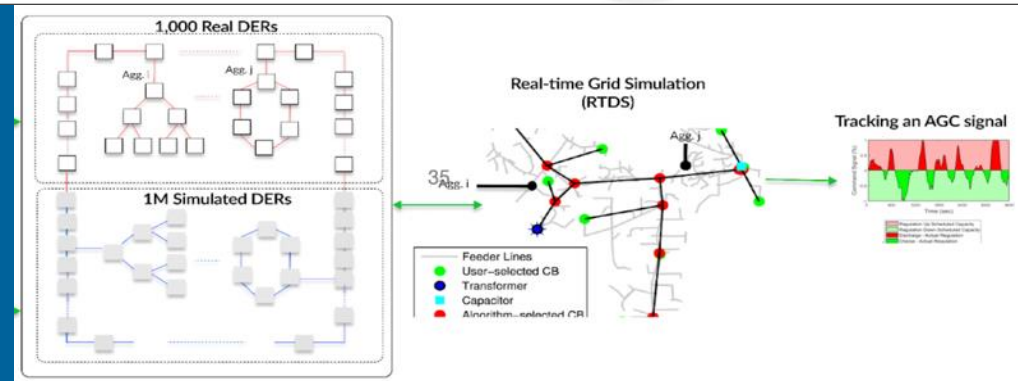
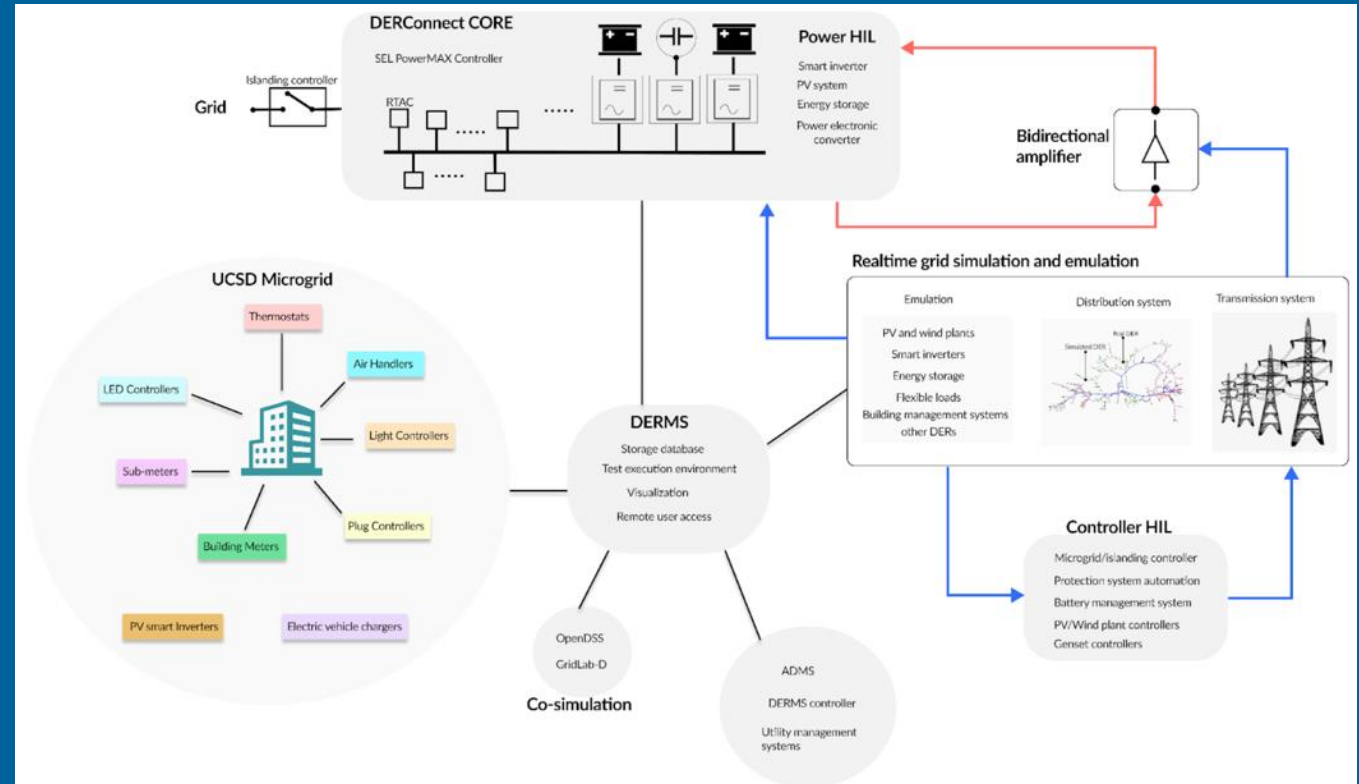
Electric vehicle charge scheduling

Battery energy storage system scheduling



DISTRIBUTED ENERGY RESOURCES CONNECT

- \$42M National Science Foundation national testbed for distributed control of flexible loads
- Larger fluctuations in grid net load due to variable renewables
- Most economical and robust solution: real-time scalable control of controllable loads
- Millions of DERs
 - Energy storage. Electric Vehicles (EVs). Heating Ventilation and Air Conditioning (HVAC). Lighting.



DERCONNECT BUILDING

- Flexible load testing headquarters
- Construction nearing completion



BATTERY PARTICIPATION IN ENERGY MARKETS

1.8 MW / 3.6 MWh Battery Energy Storage System (BESS)

Largest BESS on any university campus in the world at time of install

Optimized demand charge reduction with demand response markets

Operational since summer 2020

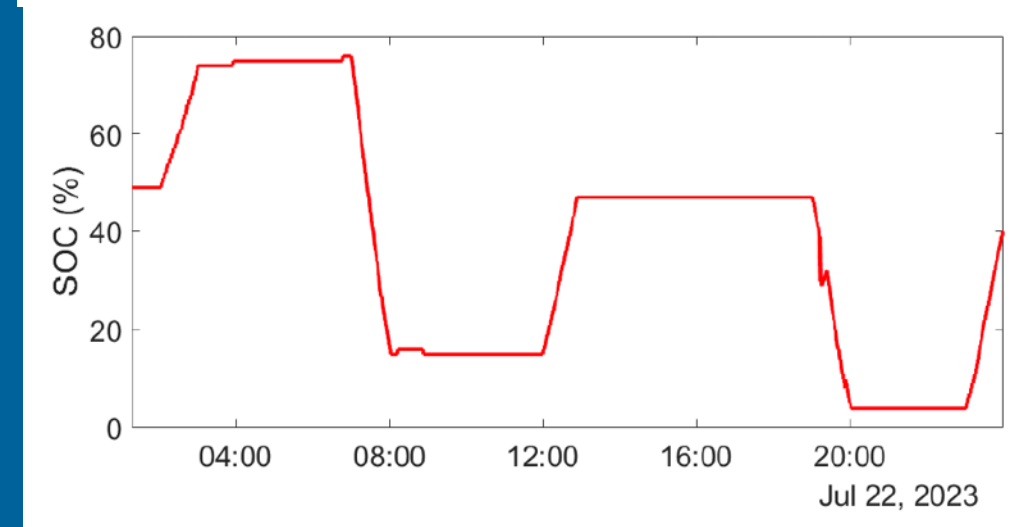
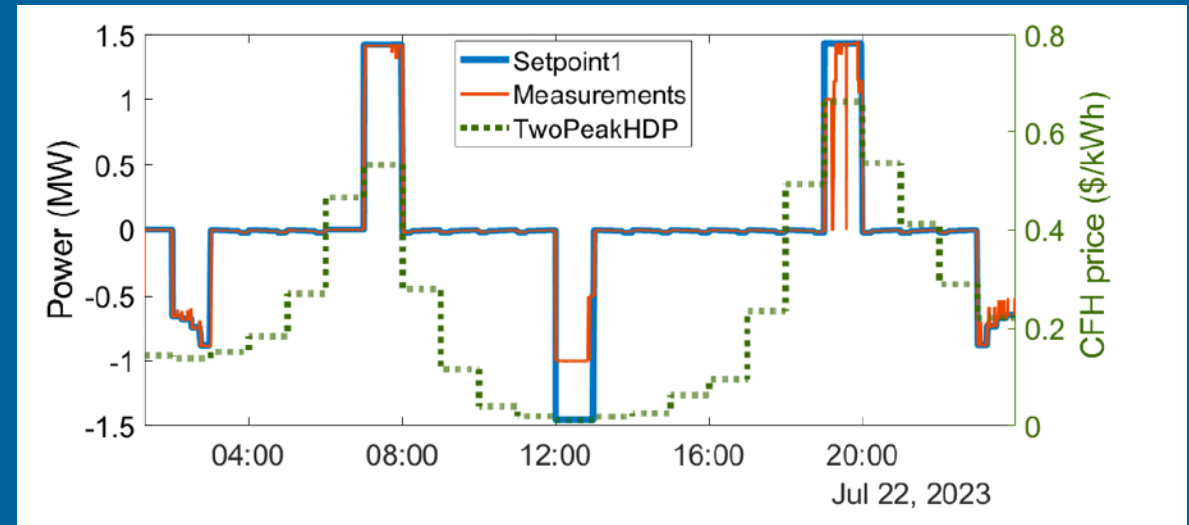


BATTERY PARTICIPATION IN ENERGY MARKETS

Demand Response Auction Mechanism (DRAM) market participation

- Daily option to bid
- July + August 2020 revenue \$98k

July 2023: Dynamic pricing experiments: Revenue of \$1,347 / day

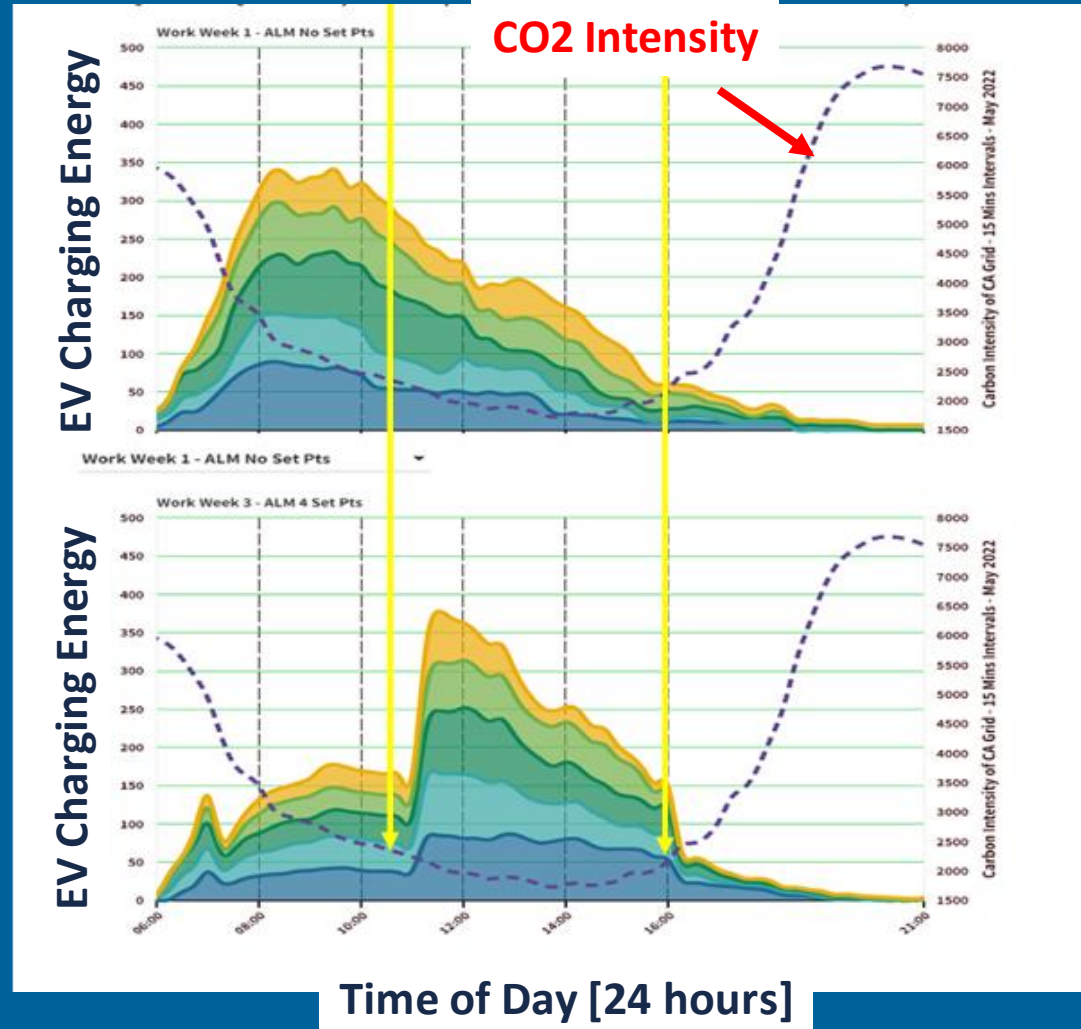


FLEXIBLE LOW-CARBON EV CHARGING

Charging Station Portfolio:

- 19 DCFC
- 110 Level 2 with Adaptive Load Management (ALM, 12 h dwell time)
- 250 Level 2 without ALM (4 h dwell time)

Plans to add 700 more charging stations



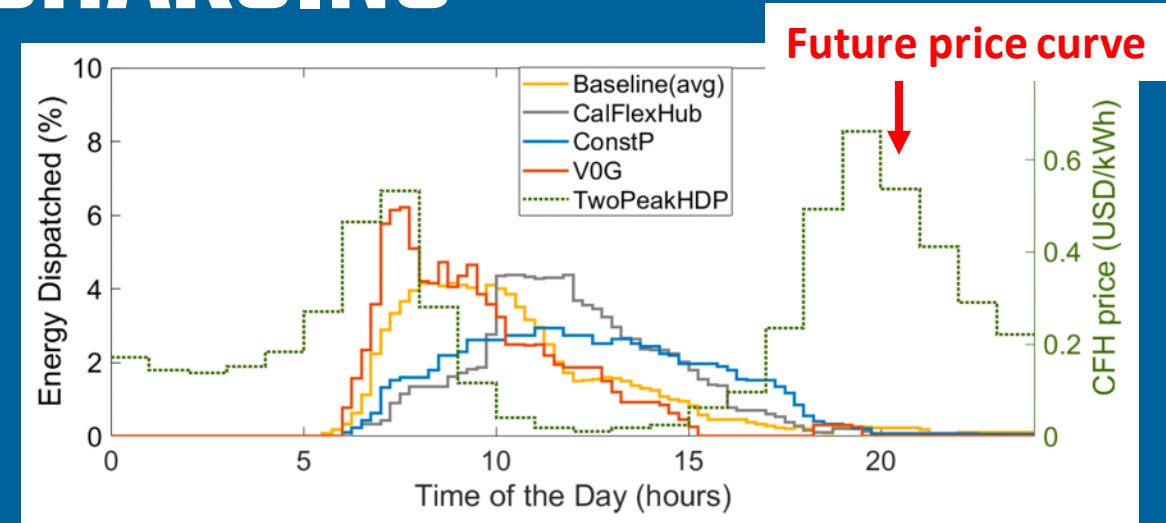
Adaptive Load Management Disabled

ALM Enabled, Charge during hours of lowest CO2 intensity

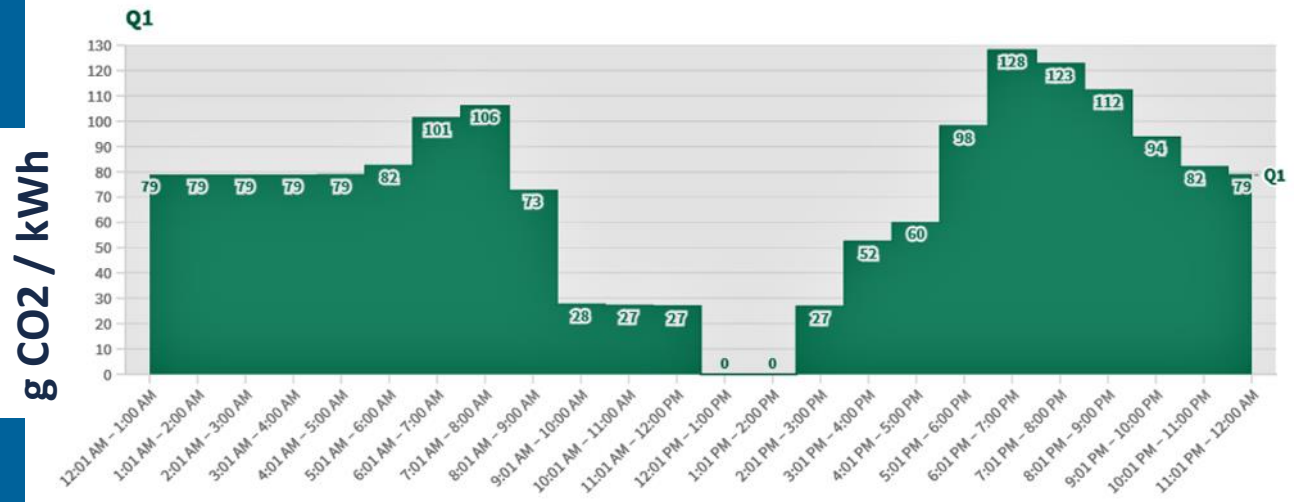
FLEXIBLE LOW-CARBON EV CHARGING

EV Field Test Summary & Takeaways:

- Delaying charging until after 10am until 4pm significantly reduces CO2 emissions.
- Future rate structures will incentivize midday charging

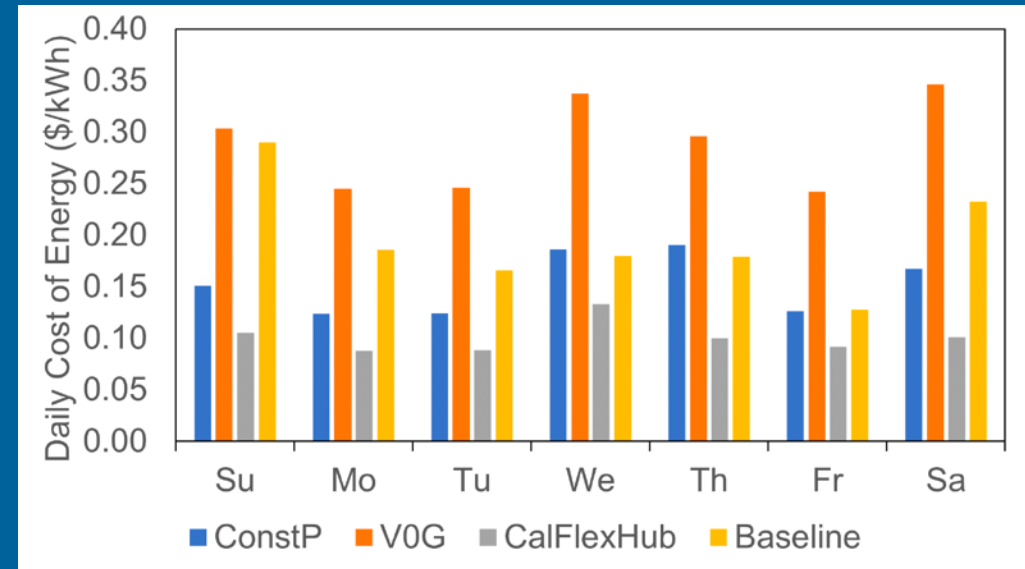


California average Q1 Grid Carbon Intensity g CO₂ / kWh



Source: CARB https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/2021_elec_update.pdf

Time of Day [24 hours]





Hydrogen Blending

Melanie Davidson
Hydrogen Commercial Development Manager
SDG&E

Email: hydrogen@sdge.com



Hydrogen Blending

- California Hydrogen Updates
- Hydrogen Blending: Context Setting
- Blending on UC San Diego Campus: Project Details

Selected Regional Clean Hydrogen Hubs

\$7 Billion
Awarded by
US DOE

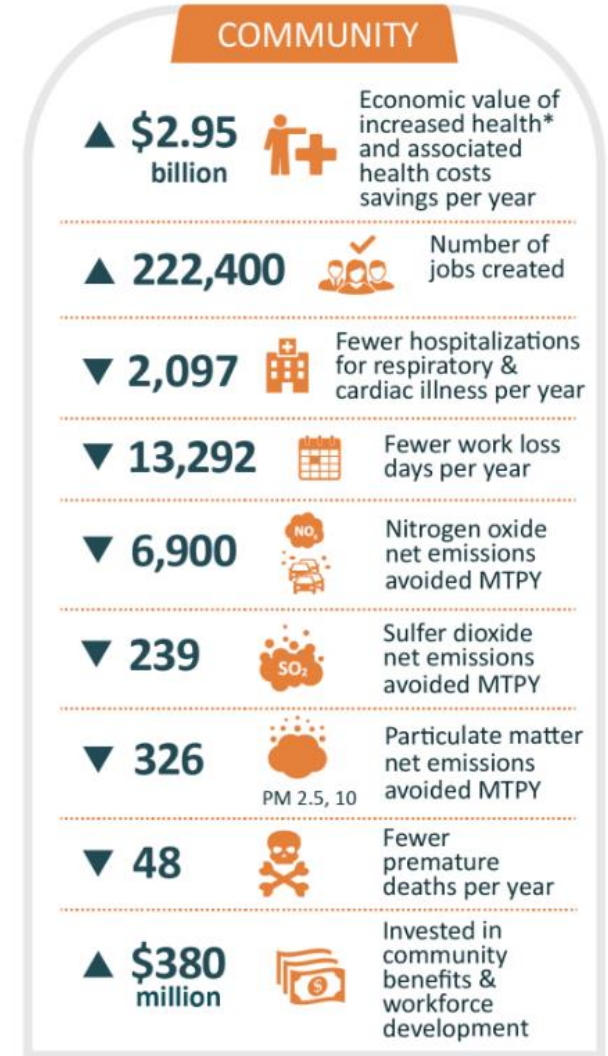
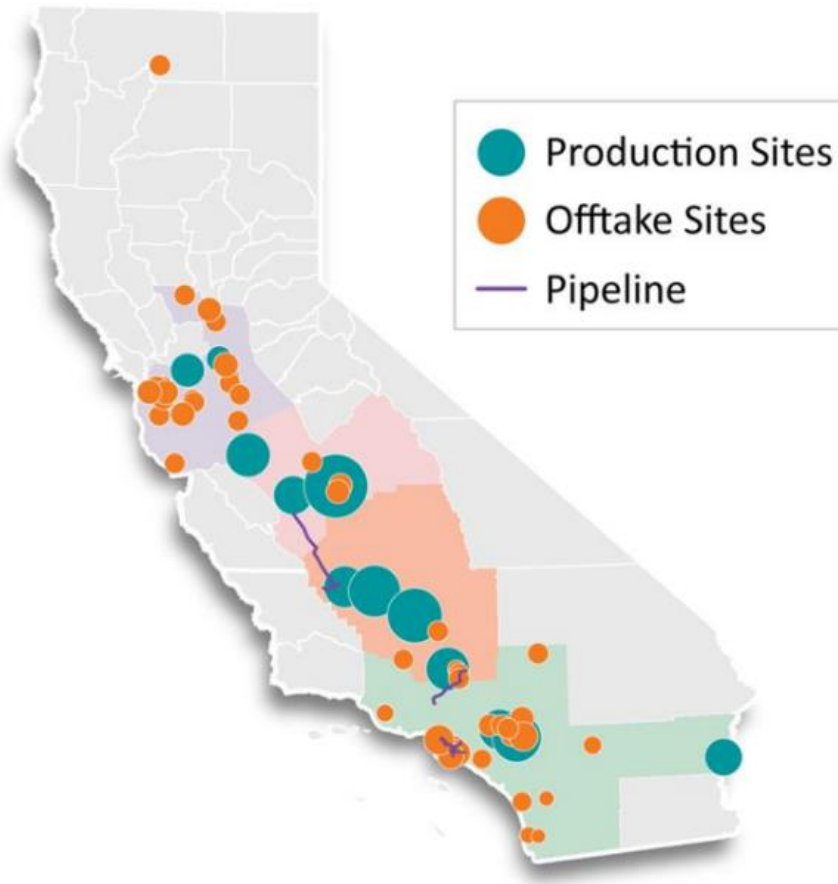


OCED
Office of Clean Energy Demonstrations

California Hydrogen Hub Details

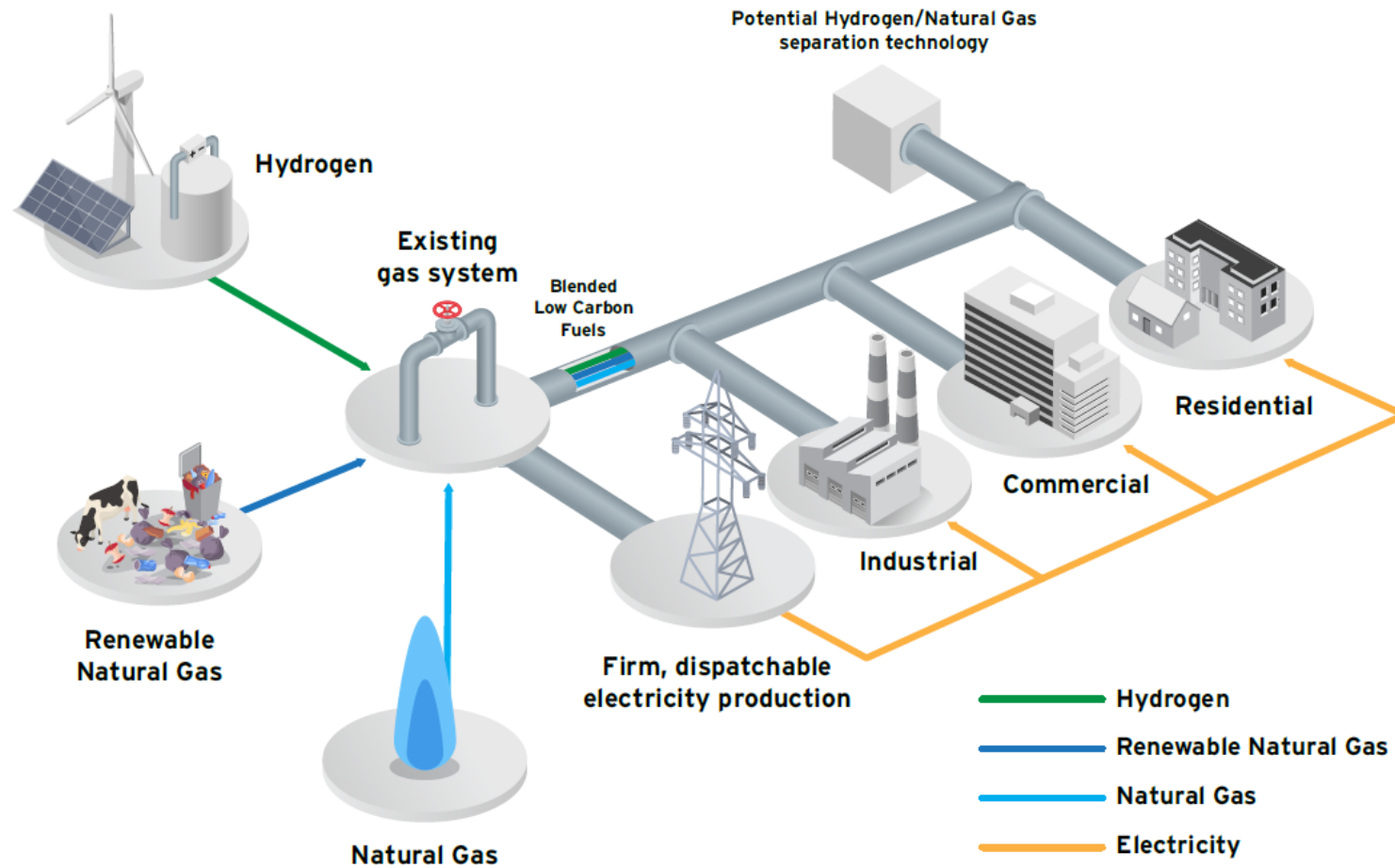


\$1.2 BN



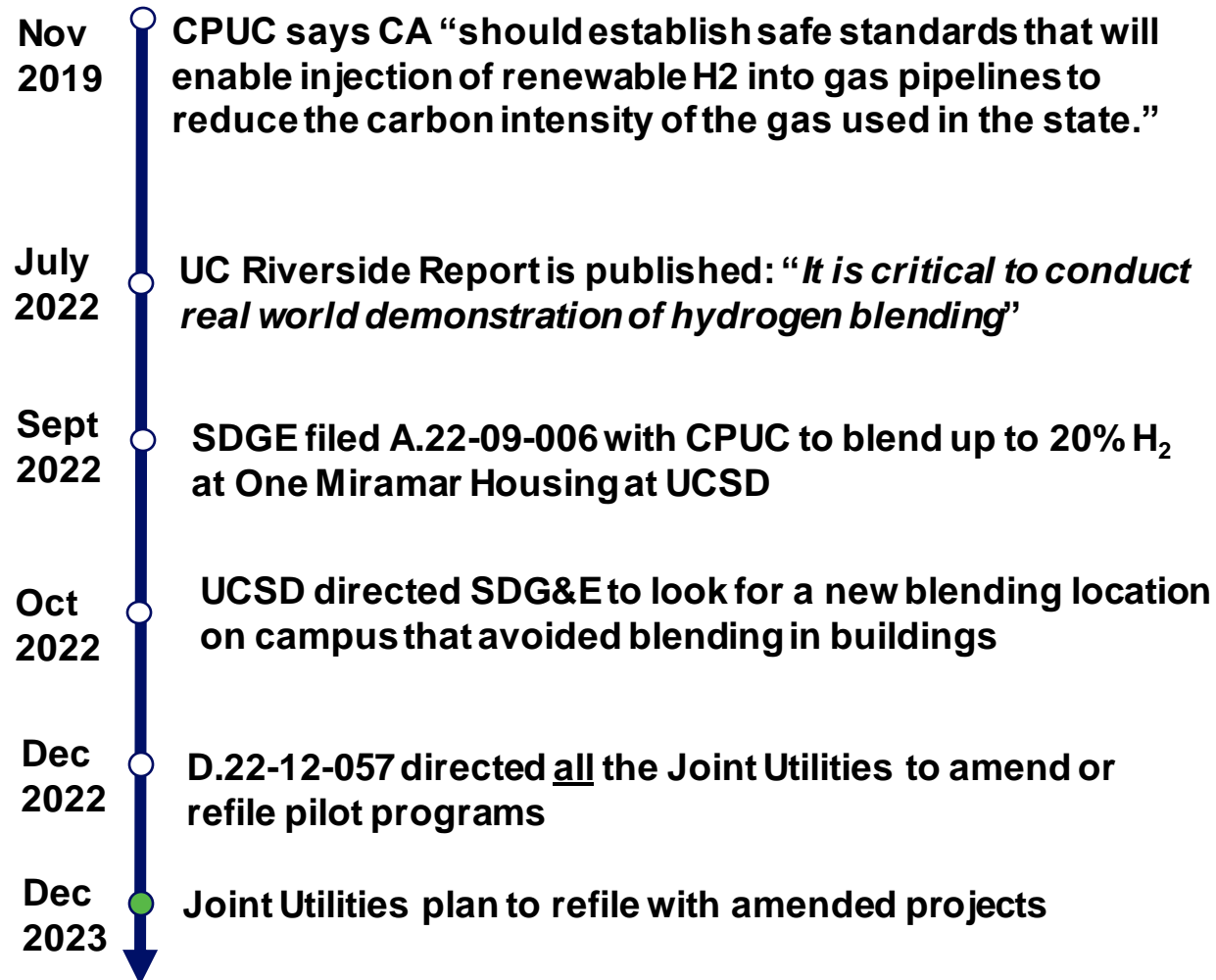
* Reduced premature death, asthma, cancer risk, missed work days

Hydrogen Blending for Gas System Decarbonization



Injecting hydrogen (H₂) in the natural gas system can lower the emissions of multiple sectors while supporting energy resiliency

CA Hydrogen Blending Timeline



Key SDG&E Campus Engagement

- March 2022: Met with select research faculty to discuss educational opportunities related to study
- August 19, 2022: Memorandum of Understanding (MOU) executed between UCSD and SDG&E
- December 2, 2022: SDG&E and the UCSD Fire Marshall and Facilities Management team performed site walk of potential new locations
- December 5, 2022: SDG&E participated on a UCSD Student Town Hall to discuss hydrogen blending
- June 13, 2023: SDG&E and the Applicants held a public Joint Utilities Stakeholder Workshop
- November 6, 2023: SDG&E and the Applicants held a public Joint Utilities Technical Workshop
- December 2023: We want to meet with you!

CPUC Rulemaking, D.22-12-057 for H₂ Blending Pilots

A. Ensures long-term safety of the California pipeline

B. Prevents H₂ from reaching natural gas storage areas

C. Avoids end user appliance malfunctions

D. Evaluates hydrogen blends between 0-5% and 5 to 20%

E. Project application must specify funding amounts

F. Consistent with directed courses of action

G. Testing protocols consistent with the UCR Study

H. Takes stakeholder input into account

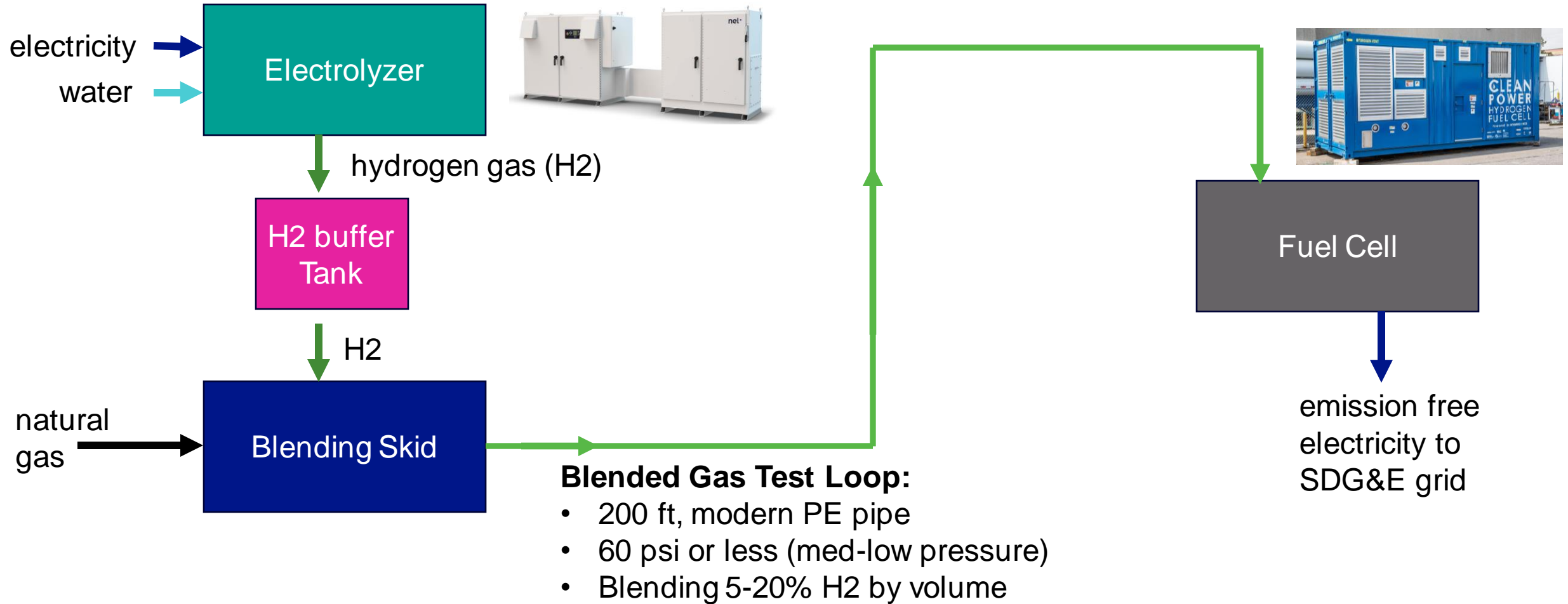
I. Propose Hydrogen Blending System Impact Analysis Methodology

J. Heating value considerations

K. Leakage detection, rigorous leak testing protocols

L. Independent research plan

Blending Project Details: Process Diagram with Key Equipment





Thank you!

Email us at hydrogen@sdge.com

Net Zero



Carl Salas
Founding Principal

Direct Carbon Reduction



Part 1: Metrics and you

Part 2: Where does it come from?

Part 3: Approach: how do we get there?

"...ranked the 6th best public university in the Nation"

"One on the top 15 research universities in the world"

Direct Carbon Reduction



Climate Change Metrics *and your footprint*

14.24

Annual per capita CO2 emissions, in metric tons (tonnes).

Direct Carbon Reduction and your carbon footprint

ELECTRIC **VS** ***GAS***

Miles per kWh 3.3
Cost per kWh \$0.37



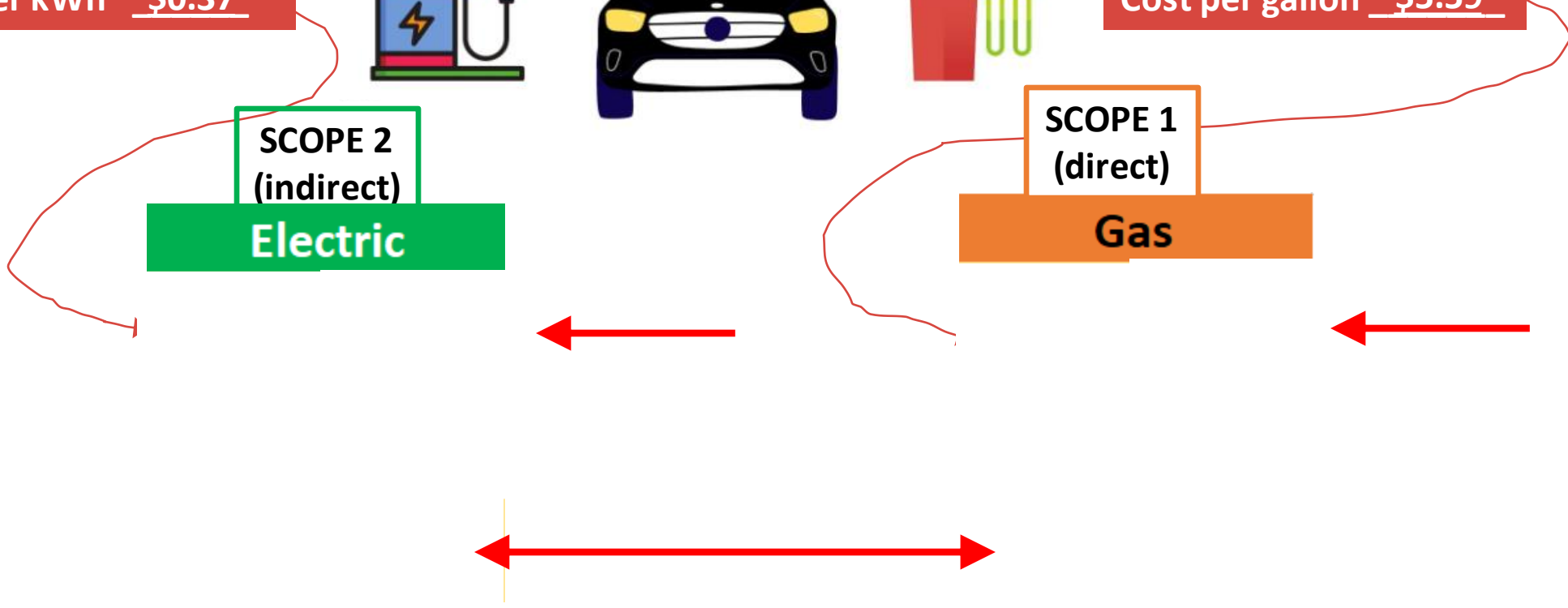
Mile per gallon 30
Cost per gallon \$5.59

SCOPE 2
(indirect)

Electric

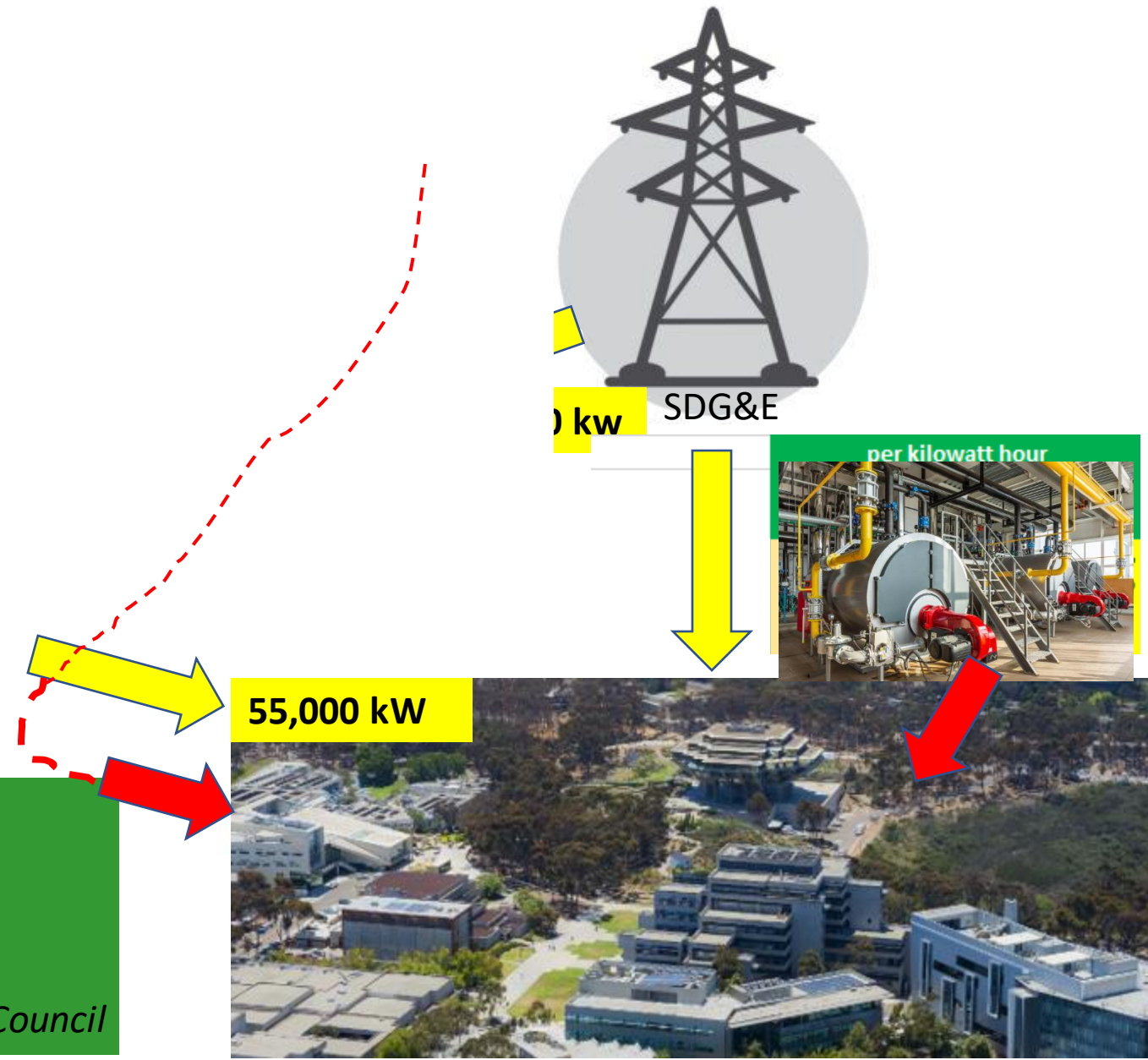
SCOPE 1
(direct)

Gas



Where does our power and energy come from (conventional)

Where does our power and energy come from (at UCSD)



UCSD has one of the world's most advanced microgrids

Roosevelt Strategic Council

Part 2: The Challenges

*The (UCSD) sustainability promise excludes the small fact that UCSD **emits 300,000 tonnes of carbon every year** through a **methane-burning cogeneration plant**.*

The UC San Diego Guardian

Direct Carbon Reduction strategies: similar approach to you

ELECTRIC **VS** ***GAS***



SCOPE 2

Electric

UCSD
\$1,667

SCOPE 1

Gas

UCSD
\$2,795



Direct Carbon Reduction and **the campus**

ELECTRIC VS **GAS**



SCOPE 2

Electric

UCSD

\$44,356,985

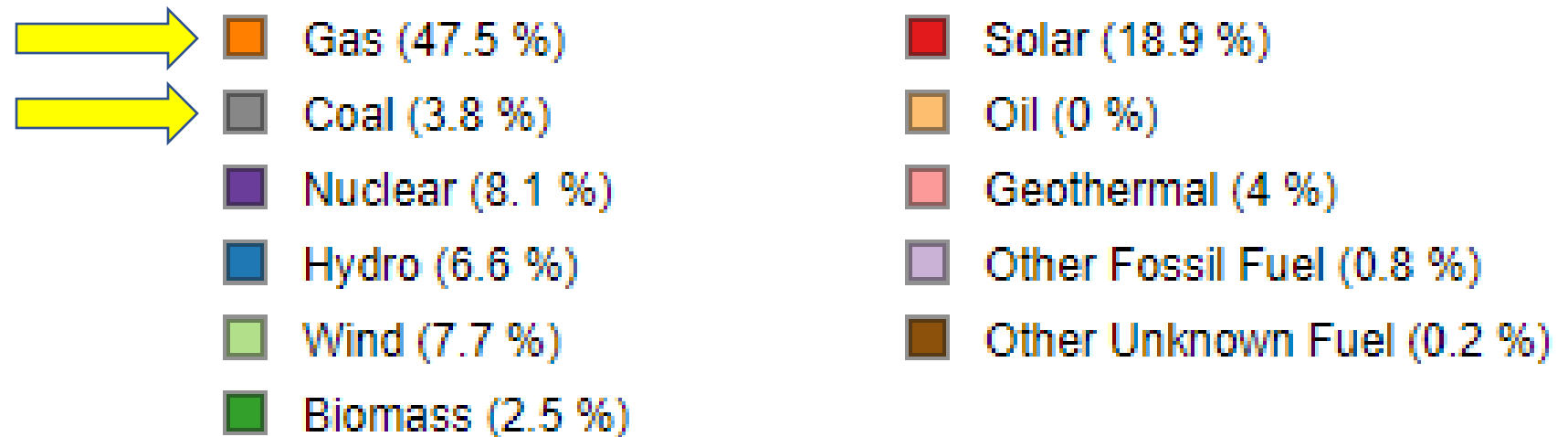
Where does the electricity come from ... *really*?



Power Profiler

Enter zip code: 92093

Fuel (CAMX Generation %)



Approach: We'll apply technology, metrics and analysis

ENVIRONMENT

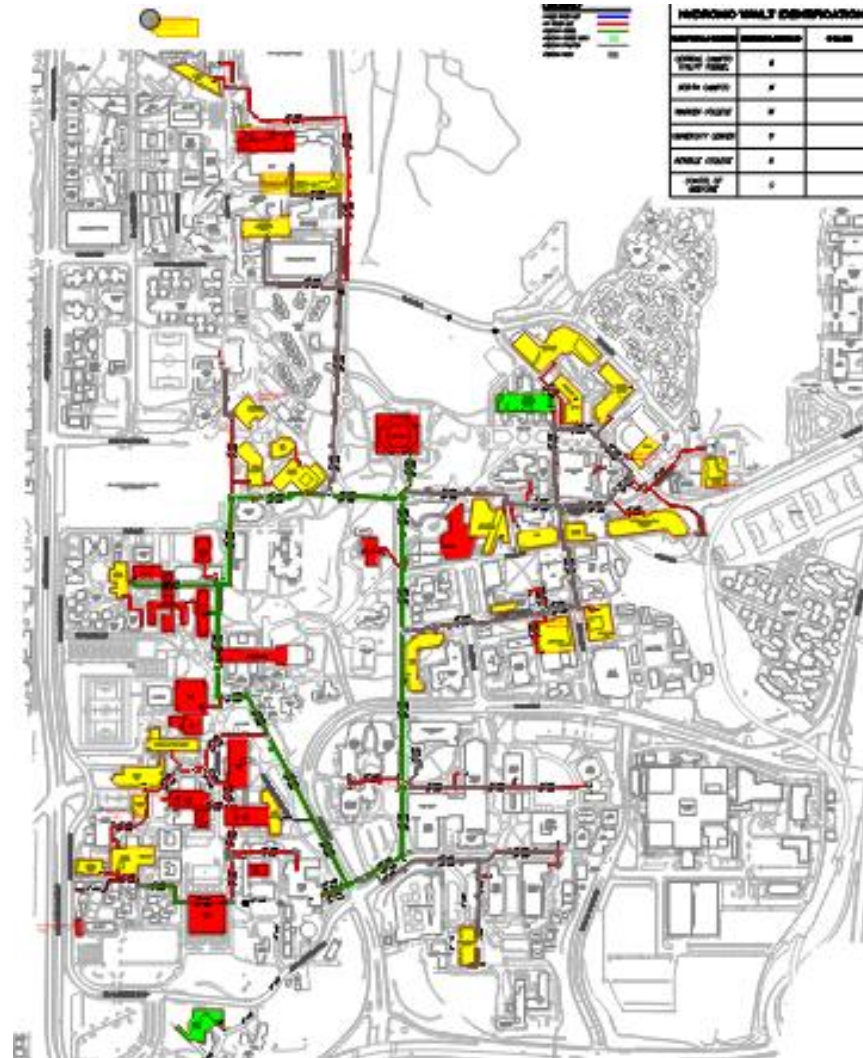
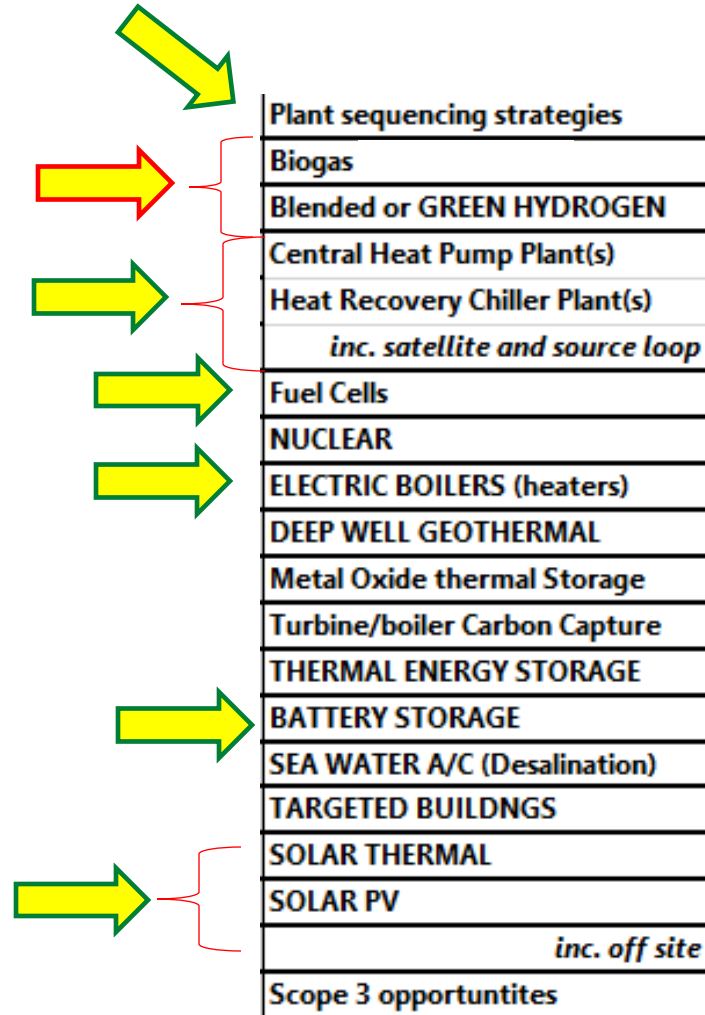
Newsom wants to export California's climate regulations to world on trip



“The technology breakthroughs that are coming in the next few years will blow past the paradigm of limited thinking we have today,”

SJ Mercury News 10.24.23

We get there with technology, metrics and analysis



Remember the metrics

*The (UCSD) sustainability promise excludes the small fact that UCSD emits **300,000 tonnes** of carbon every year through a methane-burning cogeneration plant.*

The UC San Diego Guardian

3.75 tonnes per capita

The Metrics, Challenges & Approach....

in moving to Direct Carbon Reduction

....to be continued

Q&A