South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765
(909) 396-2000, www.aqmd.gov

NOTICE OF SPECIAL MEETING OF THE GOVERNING BOARD
Governing Board Retreat

Day One
Thursday, May 9, 2024
1:00 p.m. to 5:30 p.m.
Day Two
Friday, May 10, 2024
9:00 a.m. to 12:00 p.m.
Westin Rancho Mirage
71333 Dinah Shore Drive, Rancho Mirage, California 92270
Governing Board Retreat will take place in the Oasis Ballroom (except as noted in the agenda)

Meeting will be a hybrid format
Members of the public may participate either in person or via Zoom or telephone.

A Special Meeting of the South Coast AQMD's Governing Board will be held at 1:00 p.m. on Thursday, May 9, 2024 and at 9:00 a.m. on Friday, May 10, 2024 through a hybrid format of in-person attendance in the Westin Rancho Mirage, located at 71333 Dinah Shore Drive, Rancho Mirage, California 92270 and/or virtual attendance via videoconferencing and by telephone. Please follow the instructions below to join the meeting remotely.

Please refer to South Coast AQMD's website for information regarding details on how to participate:
http://www.aqmd.gov/home/news-events/meeting-agendas-minutes

ELECTRONIC PARTICIPATION INFORMATION
(Instructions provided at bottom of the agenda)
Join Zoom Webinar Meeting - from PC or Laptop
https://scaqmd.zoom.us/j/93128605044
Zoom Webinar ID: 931 2860 5044 (applies to all)
Teleconference Dial In +1 669 900 6833 or +1 253 215 8782
One tap mobile +16699006833,,93128605044# or +12532158782, 93128605044#

Spanish Language Audience Zoom Meeting ID: 932 0955 9643
Teleconference Dial In +1 669 900 6833
One tap mobile +16699006833,,*93209559643#*

The audience will be allowed to provide public comment in person, through Zoom or telephone.
PUBLIC COMMENT WILL STILL BE TAKEN

Cleaning the air that we breathe...

AGENDA

Items may be taken in any order and/or may be heard on either day.

DAY ONE **Begins at 1:00 p.m.**	
1a. Welcome (15 minutes)	Chair Vanessa Delgado Vice Chair Michael Cacciotti South Coast AQMD Governing Board
1b. Setting the Stage (10 minutes) Overview of topics that will be discussed and their relationship to reducing emissions at the San Pedro Bay Port Complex.	Wayne Nastri South Coast AQMD Executive Officer
1c. Health Effects from Sources at Commercial Marine Ports (20 minutes) Summary overview of health effects of air quality from sources at the San Pedro Bay Port Complex.	Nichole Quick, M.D. South Coast AQMD Health Effects Consultant
1d. Zero-Emission Technology and Supporting Infrastructure Panel (1.5 hours) Panel discussion on zero emission technologies and supporting infrastructure for equipment used at the ports. Panelists will highlight potential technology pathways and challenges to full-scale implementation.	Aaron Katzenstein, Ph.D. (Moderator) South Coast AQMD Deputy Executive Officer *Technology Advancement Office* James Dumont Paul Manzi Crowley Maritime Corporation Philip Moslener Wabtec Corporation Vice-President Toru Sugiura Toyota Tsusho America, Inc. Senior Manager Craig Klaasmeyer Kaizen Clean Energy, Inc. Co-founder Paul Gioupis Zeem Founder and Chief Executive Officer
Break (15 minutes)	
1e. International Maritime Organization's Role in Shipping Emissions (45 minutes) Oceangoing vessels are one of the most challenging sources to address and regulate. This presentation will discuss the International Maritime Organization (IMO) and will provide insight into IMO's work to reduce emissions and challenges and limitations.	Galen Hon U.S. Department of Transportation Maritime Administration (MARAD)

DAY ONE (Continued)	
1f. Role of Hydrogen in the Road to Zero Emissions (45 Minutes) Overview of the role of hydrogen for transition to zero-emissions for sources at commercial marine ports, supply and distribution, and challenges.	Matt Miyasato, Ph.D. FirstElement Fuel, Inc. Chief Public Policy and Programs Officer
1g. Take Away Points and Day One Closing Thoughts (30 Minutes) Group discussion on key take away points and suggestions for reducing emissions at the San Pedro Bay Port Complex.	Chair Vanessa Delgado South Coast AQMD Governing Board

Closed Session

CONFERENCE WITH LEGAL COUNSEL – EXISTING LITIGATION

It is necessary for the Board to recess to closed session pursuant to Government Code sections 54956.9(a) and 54956.9(d)(1) to confer with its counsel regarding pending litigation which has been initiated formally and to which the South Coast AQMD is a party. The action is:

- South Coast Air Quality Management District v. EPA, U.S. District Court for the Central District of California, Case No. 2:23-cv-02646.

CONFERENCE WITH LEGAL COUNSEL – INITIATING LITIGATION

It is also necessary for the Board to recess to closed session pursuant to Government Code section 54956.9(a) and 54956.9(d)(4) to consider initiation of litigation (two cases).

CONFERENCE WITH LEGAL COUNSEL – ANTICIPATED LITIGATION

Also, it is necessary for the Board to recess to closed session pursuant to Government Code section 54956.9(d)(2) to confer with its counsel because there is a significant exposure to litigation against the South Coast AQMD (two cases).

DAY TWO **Begins at 9:00 a.m.**	
2a. Opening Remarks for Day 2 (5 minutes)	Wayne Nastri South Coast AQMD Executive Officer
2b. Induction Cooking Demonstration (30 minutes) **<u>Located in the Courtyard outside of Oasis Ballroom</u>** Southern California Edison will provide a cooking demonstration highlighting the benefits and unique attributes of electric induction cooktops.	Oliver Ta Brian Choi Southern California Edison Foodservice Technology Center
Transition to Oasis Ballroom for Remaining Items	
2c. South Coast AQMD's Proposed Pilot Program for Residential Incentives (30 Minutes) Overview of South Coast AQMD's proposed pilot program for residential incentives.	Michael Krause South Coast AQMD Assistant Deputy Executive Officer *Planning, Rule Development and Implementation*
2d. Update on the South Coast AQMD's Diversity, Equity, and Inclusion (DEI) Programs (45 Minutes) Overview of South Coast AQMD DEI program and elevating DEI with air districts statewide.	Anissa (Cessa) Heard-Johnson, Ph.D. South Coast AQMD Deputy Executive Officer *Diversity, Equity, and Inclusion Office with Community Air Programs*
2e. Climate Change Committee (10 Minutes) Summary comments about Climate Change Committee and key objectives.	Supervisor V. Manuel Perez South Coast AQMD Governing Board Member Chair of Climate Change Committee
2f. Climate Change and Air Quality (45 Minutes) General introduction to climate change and how our work to address air quality issues can complement and achieve co-benefits to help achieve climate change goals.	Sarah Rees, Ph.D. South Coast AQMD Deputy Executive Officer *Planning, Rule Development and Implementation*
2g. Closing Remarks	Chair Vanessa Delgado

<u>Closed Session</u>

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No General Public Comment Period at a Special Meeting

Members of the public may address this body concerning any agenda item before or during consideration of that item. (Government Code Section 54954.3(a)). If you wish to speak, raise your hand on Zoom or press Star 9 if participating by telephone or if in-person please provide a Request to Address the Board card to the Clerk of the Board if you wish to address the Board on an agenda item. Speakers may be limited to three (3) minutes total for all agenda items on each day of the retreat. At a special meeting, no other business may be considered, there is public comment only for items on the agenda, and there is no general public comment period. (Government Code Section 54956(a)). The agenda for this meeting is posted at South Coast AQMD Headquarters, 21865 Copley Drive, Diamond Bar, California and at the Westin Rancho Mirage, located at 71333 Dinah Shore Drive, Rancho Mirage, California 92270, California at least 24 hours in advance of the meeting.

ADJOURNMENT

Americans with Disabilities Act and Language Accessibility

Disability and language-related accommodations can be requested to allow participation in this Special Governing Board meeting. The agenda will be made available, upon request, in appropriate alternative formats to assist persons with a disability (Government Code Section 54954.2(a)). In addition, other documents may be requested in alternative formats and languages. Any disability or language related accommodation must be requested as soon as practicable. Requests will be accommodated unless providing the accommodation would result in a fundamental alteration or undue burden to the South Coast AQMD. Please contact Clerk of the Boards at 909-396-2500 from 7:00 a.m. to 5:30 p.m. Tuesday through Friday or send the request to cob@aqmd.gov.

INSTRUCTIONS FOR ELECTRONIC PARTICIPATION

Instructions for Participating in a Virtual Meeting as an Attendee

As an attendee, you will have the opportunity to virtually raise your hand and provide public comment.

Before joining the call, please silence your other communication devices such as your cell or desk phone. This will prevent any feedback or interruptions during the meeting.

Please note: During the meeting, all participants will be placed on Mute by the host. You will not be able to mute or unmute your lines manually.

After each agenda item, the Chair will announce public comment.

A countdown timer will be displayed on the screen for each public comment.

If interpretation is needed, more time will be allotted.

Once you raise your hand to provide public comment, your name will be added to the speaker list. Your name will be called when it is your turn to comment. The host will then unmute your line.

Directions for Video ZOOM on a DESKTOP/LAPTOP:

- If you would like to make a public comment, please click on the **"Raise Hand"** button on the bottom of the screen.
  This will signal to the host that you would like to provide a public comment and you will be added to the list.

Directions for Video Zoom on a SMARTPHONE:

- If you would like to make a public comment, please click on the **"Raise Hand"** button on the bottom of your screen.
- This will signal to the host that you would like to provide a public comment and you will be added to the list.

Directions for TELEPHONE line only:

- If you would like to make public comment, please **dial *9 to raise your hand** to signal that you would like to comment and **dial *6 to toggle mute and unmute**.

Agenda Item 1c. Health Effects from Sources at Commercial Marine Ports

Health Effects from Sources at Commercial Marine Ports

Nichole Quick, M.D.
Health Effects Consultant
South Coast AQMD Board Retreat
May 9, 2023

Nichole Quick, M.D.
South Coast AQMD

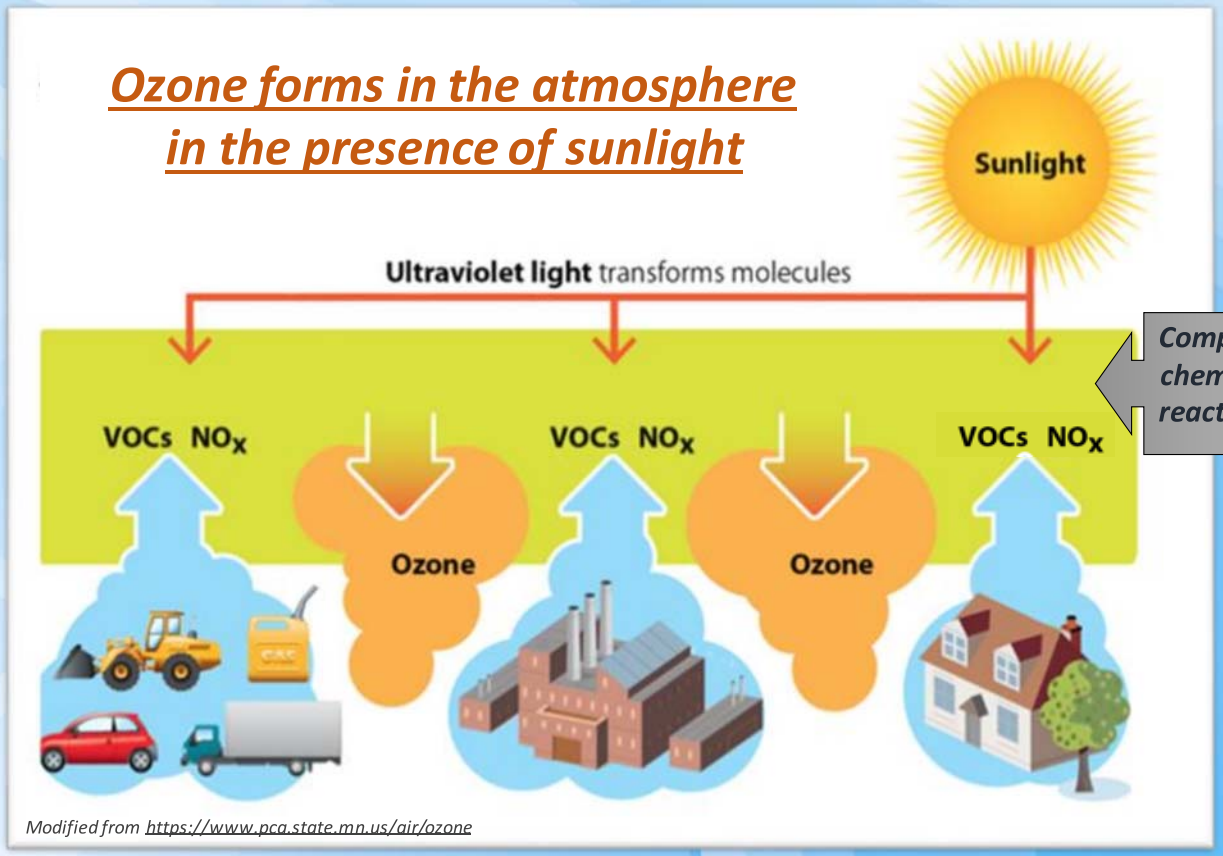
Nichole Quick, MD, MPH, serves as Health Effects Consultant to the South Coast Air Quality Management District, leveraging expertise gained through extensive experience in governmental public health service and healthcare leadership, as well as an MPH in environmental health. Dr Quick specializes in population health and is an advocate for underserved populations through outreach, education, and resource alignment within public and private sectors. She is board certified in Public Health & General Preventive Medicine and Addiction Medicine.

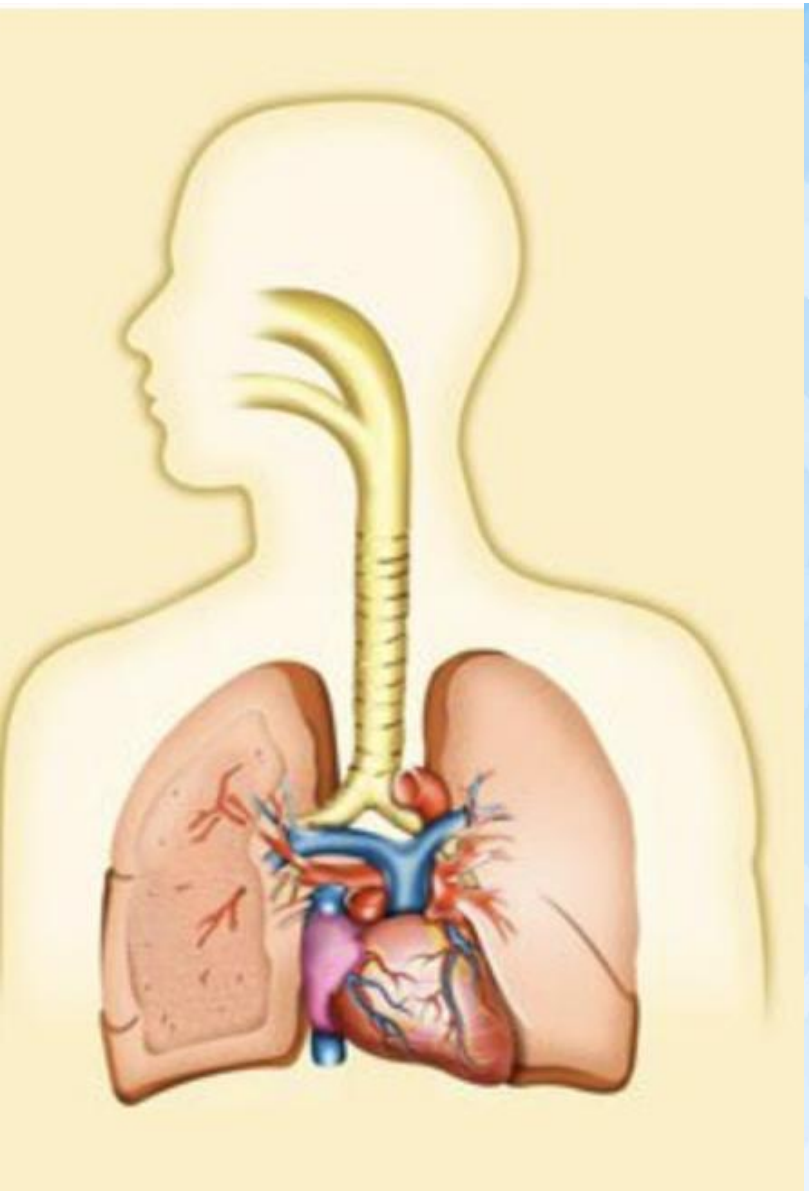
Criteria Pollutants

- Ozone, particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NOx), sulfur dioxide (SOx)
- Harmful to human health and the environment

Ozone

- Not emitted directly; created by chemical reactions between NOx and volatile organic compounds (VOC) in the presence of sunlight
- Pollutants emitted by heavy duty vehicles, ships, locomotives, cars, power plants, industrial boilers, refineries, chemical plants, and other sources
- Regional effect





Key Health Effects of Ozone

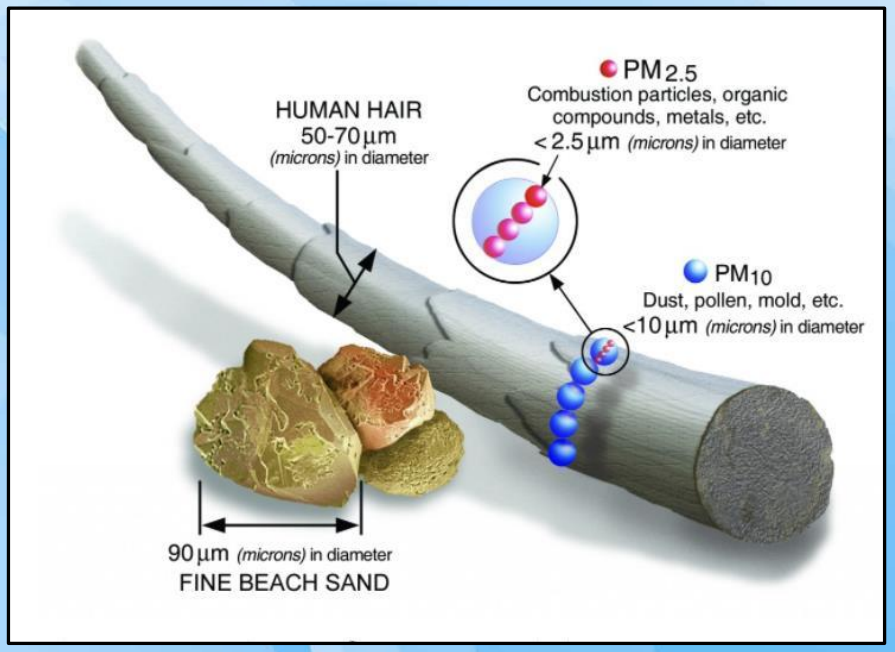
- Inflames and damages the airways
- Coughing, sore throat
- Makes lungs more susceptible to infection
- Aggravates lung diseases such as asthma, emphysema, and chronic bronchitis
- Increases the frequency of asthma attacks

Sources of Particulate Matter (PM)

- Emitted directly: construction sites, unpaved roads, smokestacks, fires, vehicle exhaust
  - Directly emitted PM from diesel vehicles has a local effect
- Most fine particles form in the atmosphere as a result of complex reactions of chemicals (SOx, NOx, etc.)
  - PM formed in the atmosphere has a regional effect

Health Effects of PM

- Premature death in people with heart or lung disease
- Heart attacks, irregular heartbeat
- Aggravated asthma, decreased lung function
- Increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing
- Ultrafine (<0.1 µm): not regulated but known health effects
- PM from diesel exhaust is a carcinogen



https://www.epa.gov/pm-pollution/particulate-matter-pm-basics

Diesel Exhaust

- Source of directly emitted PM
- Local effect
- Emission sources at ports:
  - Ships (container, cruise, etc.)
  - Harbor craft (like tugs, ferries, fishing vessels)
  - Trucks
  - Cargo Handling Equipment
  - Locomotives
- Congestion at ports increases emissions of PM and resulting health effects

Key Data Sources for Health Effects

- Local data
  - Academic studies
  - CARB – Health Risk Assessments
- Data compilations/tools
  - US EPA – Integrated Science Assessments
  - South Coast AQMD – Air Quality Management Plans and Multiple Air Toxics Exposure Studies
  - California EPA – CalEnviroScreen

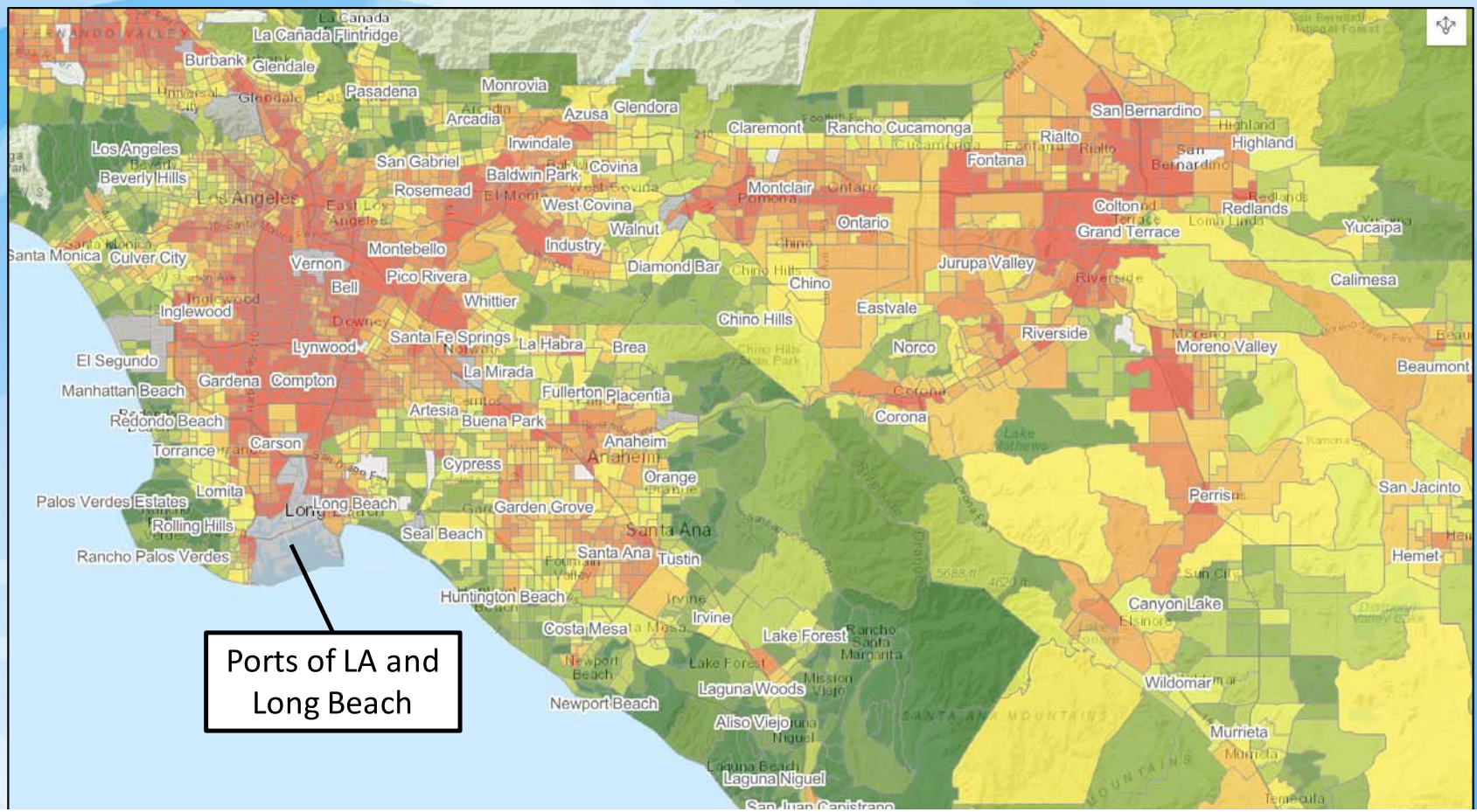
CalEnviroScreen

- Mapping tool that helps identify California communities that are most affected by many sources of pollution
- Uses environmental, health, and socioeconomic information to produce scores for every census tract in the state
- Scores are mapped so that different communities can be compared
- An area with a high score is one that experiences a much higher pollution burden than areas with low scores

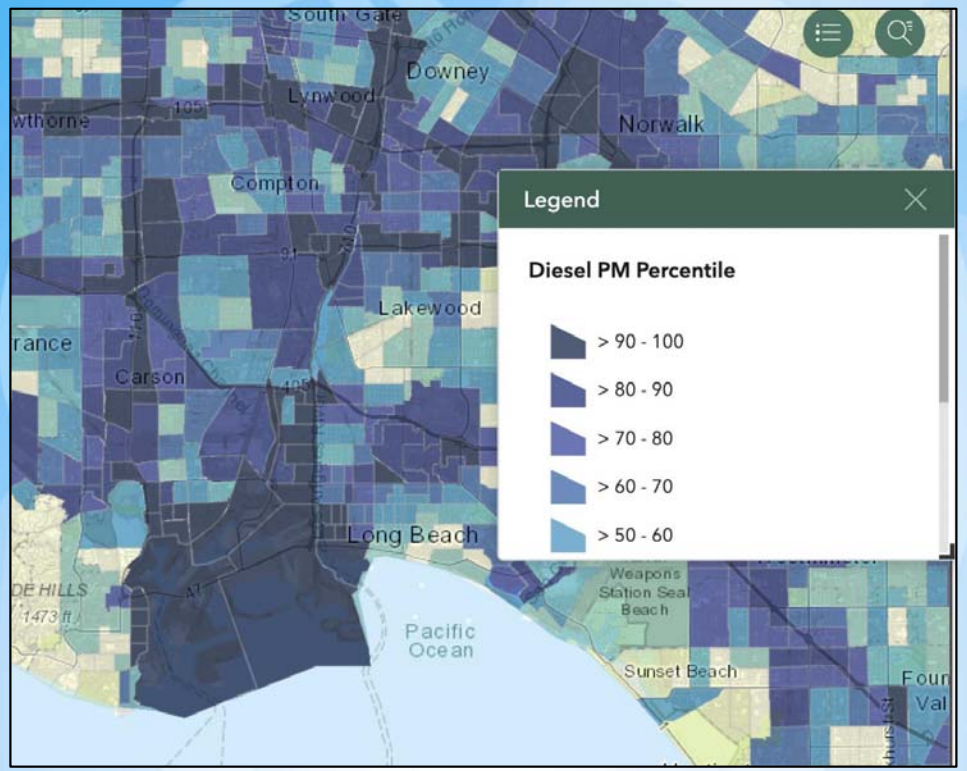
CalEnviroScreen (continued)

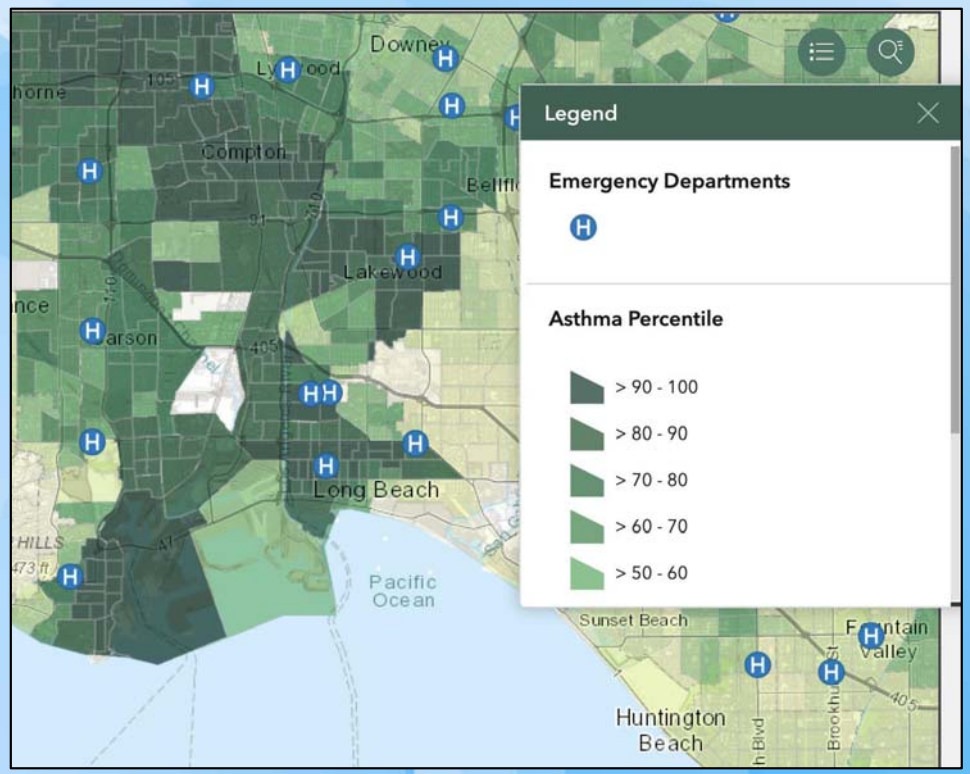
- Population characteristics:
  - Asthma
    - Spatially modeled, age-adjusted rate of emergency department (ED) visits for asthma per 10,000 people averaged over 2015-2017
  - Cardiovascular disease
    - Spatially modeled, age-adjusted rate of ED visits for heart attacks (acute myocardial infarctions) per 10,000 people averaged over 2015-2017
  - Low birth weight
    - Percent low birth weight averaged over 2009-2015

CalEnviroScreen (continued)



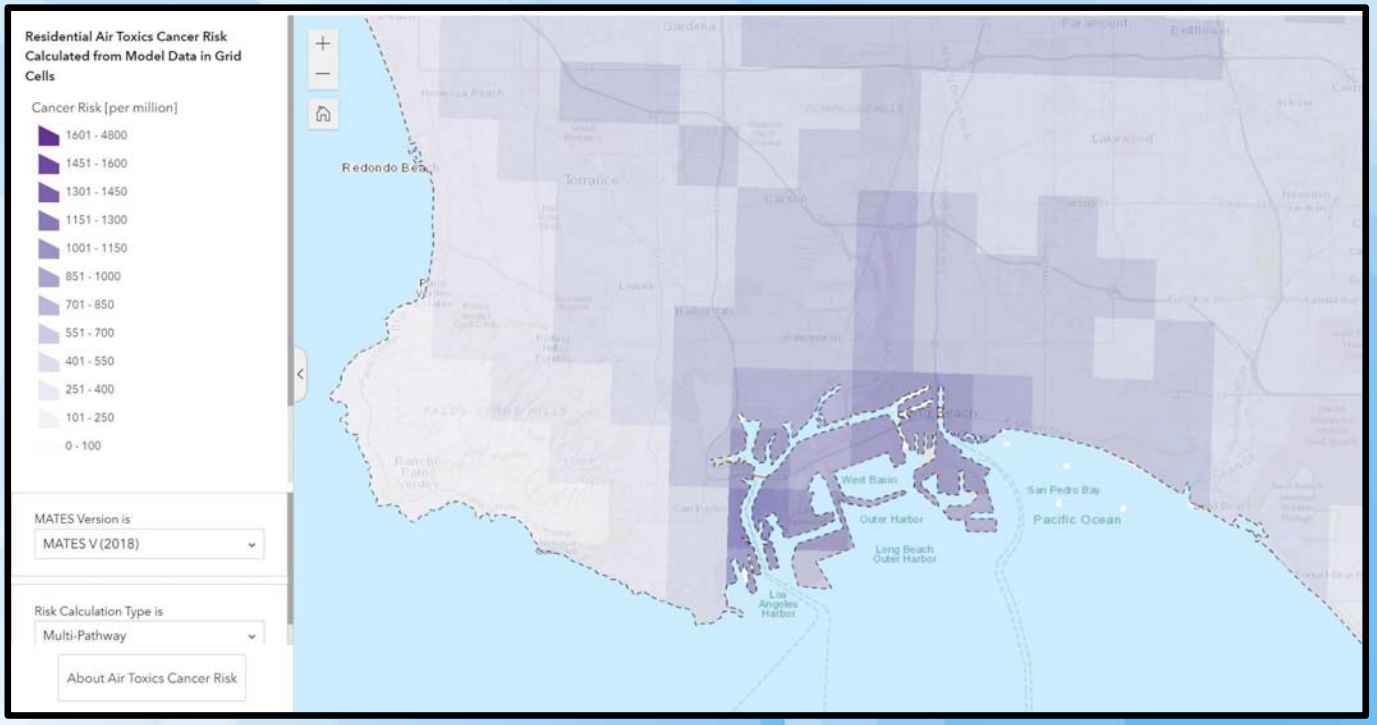
CalEnviroScreen (continued)
Diesel PM & Asthma Percentiles





South Coast AQMD MATES V

- MATES V includes a Health Risk Assessment of all emission sources throughout the region
- Clear pattern of increased cancer risk in the community near the port complex



AQMP Health Benefits

~2,500 fewer annual asthma-related emergency room visits

~700 fewer annual hospital admissions related to asthma, cardiovascular, or respiratory conditions

>200,000 fewer annual person-days of work and school absences

An annual average of 1,600 premature deaths avoided

Public health benefits estimated to be $173 billion cumulatively (2017-2031)

Conclusion

- Reducing Ozone and PM emissions decreases health risks and has economic benefits
  - Less exacerbation of respiratory conditions such as asthma and bronchitis
  - Decrease in cardiovascular risks
  - Decrease in cancer risk from exposure to diesel exhaust

Agenda Item 1d. Zero-Emission Technology Panel

Zero-Emission Technology Panel

Panel Discussion
Moderated by Dr. Aaron Katzenstein
South Coast AQMD Deputy Executive Officer
2024 South Coast AQMD Board Retreat
May 9, 2024

Aaron Katzenstein, Ph.D.
South Coast AQMD

Dr. Aaron Katzenstein is the Deputy Executive Officer of the Technology Advancement Office. The Technology Advancement Office oversees several mobile source incentive programs, technology review, and development and commercialization of clean air technologies.

He began his career at South Coast AQMD in 2003 where he worked in the laboratory prior to his role as the Climate and Energy Supervisor in Planning and Rules. He later became an Acting Planning Manager for Area Sources and most recently was the Laboratory and Source Test Manager. He has been heavily involved in numerous Multiple Air Toxics Exposure Studies, Air Quality Management Plans, policy development, research projects, air quality studies, and technology/infrastructure projects.

Dr. Katzenstein received his undergraduate degree in Chemistry with a minor in Physics from the University of Redlands. He graduated with a M.S. and Ph.D. in Chemistry with a focus on Atmospheric Chemistry from the University of California Irvine where he studied regional and global air quality.

Agenda

- Introduce Panel Members
- Presentations with Questions for Discussion

Zero-Emission Technology Panel

James Dumont
Crowley Maritime Corporation

Paul Manzi
Crowley Maritime Corporation

Philip Moslener
Wabtec Corporation

Toru Sugiura
Toyota Tsusho America, Inc.

Craig Klaasmeyer
Kaizen Clean Energy, Inc.

Paul Gioupis
Zeem

Paul Manzi
Crowley Maritime, Inc.

Paul is a maritime profession with more than 40 years of experience in the maritime industry, serving as a navigational watch officer, and various positions of increasing responsibility in marine operations and corporate safety, health, and environmental compliance and stewardship as well as serving the industry on technical committees and in leadership roles in trade organizations. In his current role he has responsibility Crowley Marine Services, Inc Ship Assist and Escort business as Vice President – General Manager. The business is focused on optimization, decarbonization and partnerships. Prior to joining Crowley, he served in a variety of health, safety and environmental roles, most recently with BP, including stints in shipping, major projects in the Middle East and drilling and exploration in North Africa. He is based in Bellingham, WA and enjoys the outdoor life that abounds in the Northwest and Puget Sound.

James Dumont
Crowley Maritime, Inc.

James is a leading expert in developing consortia and public-private partnership projects for deep decarbonization of the transportation sector with over nine years' experience designing flagship advanced energy and clean transportation technology development and demonstration projects, multinational public-private partnerships, and grant proposals awarded more than $900 million in discretionary grant funds. In his current role as Grants Director, he has responsibility for developing and implementing Crowley's grants and incentives strategy, advancing public-private partnerships and consortia, and coordinating with agency, regulatory, and nongovernmental organizations (NGOs) on decarbonization efforts. Prior to joining Crowley in March of 2023, James served as the Director of Ports and Fleets at Momentum and The Grant Farm in Sacramento, CA. James studied Global Studies and Maritime Affairs at CSU Maritime Academy in Vallejo, CA, and obtained a Juris Doctor from Tulane University Law School in New Orleans, LA, where he specialized in admiralty, maritime, and environmental law.

Paul Gioupis
Zeem

Paul Gioupis is a lifelong entrepreneur and seasoned executive with over 25 years of experience in corporate finance, capital markets and business management. He has notable experience in a wide range of investment sectors, including FinTech, RegTech, medical, real estate, clean and renewable technology with a strong appreciation of ESG and impact investing.

Paul Gioupis is Founder and CEO of Zeem Solutions, the leading provider of innovative contract-based EV charging and fleet management services. He launched the business in 2017 with a forward-thinking approach to the commercial fleet electrification in California and throughout the United States. Under his leadership the Company has successfully positioned in the dynamic and competitive arena of EV charging infrastructure services and committed to accelerating growth and operating performance to ensure its long-term success.

Mr. Gioupis runs the company and all his client relationships on a foundation of trust, ethics, and a steadfast belief that putting the client's needs first will yield the best possible results for all parties involved.

Philip Moslener
Wabtec Corporation

Mr. Moslener holds the position of Corporate Vice-President for Advanced Technologies at Wabtec. The mission of this team is to integrate new technologies within the company through R&D and value added projects. Namely, he is responsible for the Wabtec One cloud platform and product cyber security, as well as furthering developments in disruptive technologies such as Artificial Intelligence and Alternative Fuels. He has been active in the Railway industry for 25 years. Previous to Wabtec, he held various roles with General Electric Transportation and Bombardier Transportation in Canada, USA, China and Thailand, namely as Head of Engineering Asia Pacific region, Head of Functional Integration and Head of Mechanical Integration in North America. As a car-builder, he had the pleasure to contribute designs and/or project management to exciting rail projects such as the Zefiro-380 Very High Speed Train (China), Acela High Speed train (USA), New York Subway R-142 (USA), New Jersey Transit Commuter (USA), Via Rail Inter-City trains (Canada), Minneapolis Light Rail (USA), Toronto Transit Subway (Canada), Queensland Rail Commuter (Australia), to name a few.

Born in Montreal, Canada, Mr. Moslener graduated from Concordia University in Mechanical Engineering.

Craig Klaasmeyer
Kaizen Clean Energy

Craig Klaasmeyer is a co-Founder and Chief Financial Officer of Kaizen Clean Energy. Previously he was an investment banker for 30 years with Donaldson, Lufkin & Jenrette and Credit Suisse. His investment banking career spanned New York, London and Houston and roles included the head of European Leveraged Finance while in London and an energy banker and head of the Houston office during his Houston years.

Toru Sugiura
Toyota Tsusho America, Inc.

Toru Sugiura is a senior manager in Corporate Strategy & Sustainable Business Development Division at Toyota Tsusho America, Inc. (TAI)

His work focuses on hydrogen value chain eco system projects in mobility industry trying to create supply and demand synergy to accelerate its market expansion. He and his team are bringing Toyota Tsusho's experience of several environmental demonstration projects in Japan to the U.S to support establish a sustainable clean energy society.

He is currently involving a demonstration project on technology transition for fuel cell port equipment and hydrogen supply solution at Port of Los Angeles and Long Beach. His team and partner companies plan to develop sustainable green hydrogen supply scheme for the ports with biogas from dairy farm digesters from Central Valley in California.

Special Meeting of the South Coast Air Quality Management District Governing Board/Board Retreat

May 9, 2024
Rancho Mirage, California

Tugboats 101

WHAT ARE TUGS?

- Escort
- Ship Assist

WHO DETERMINES THE SERVICE?

- Pilots
- Harbor Safety Committee
- U.S. Coast Guard Maritime Transportation Safety
- Ship Owners/Operators
- Terminal Requirements

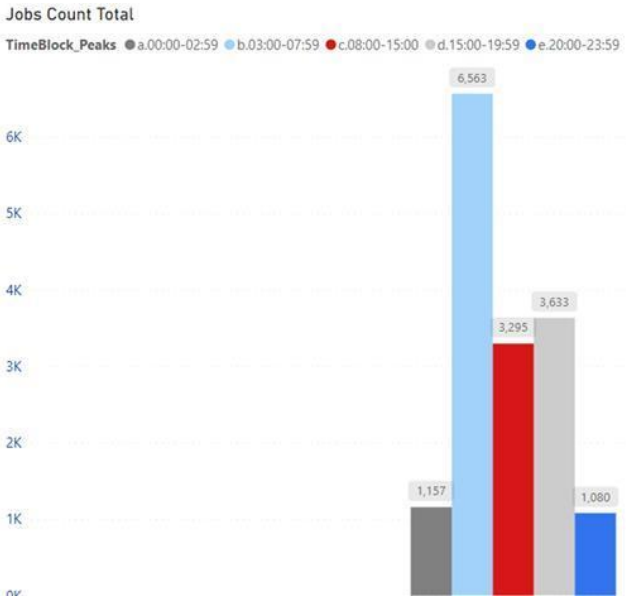
HOW MANY TUGS OPERATE IN SAN PEDRO BAY?

- Approximately 15-16

CROWLEY

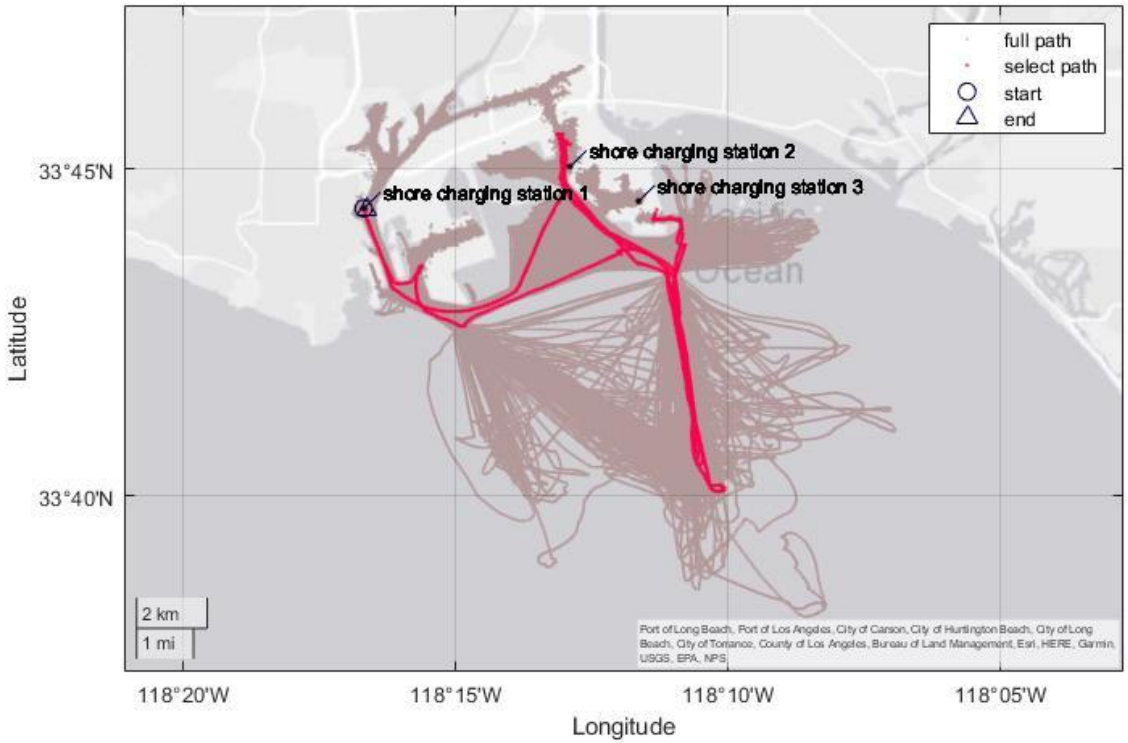
Tugboats are the Waterfront Workhorses

Tugboat Usage and Patterns



Annual Tug Activity
by Daily Time Blocks

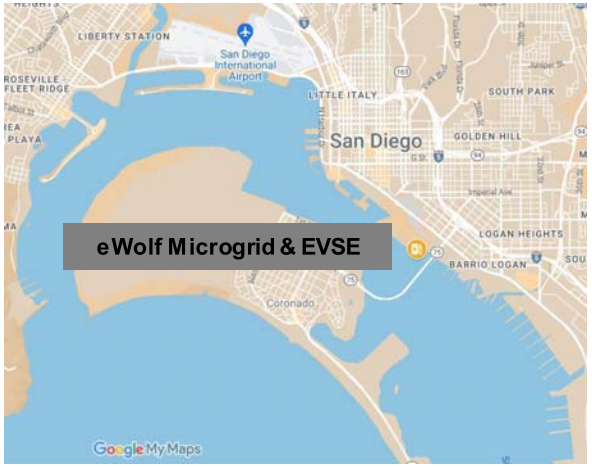
Mapped Tug Routes in San Pedro Bay

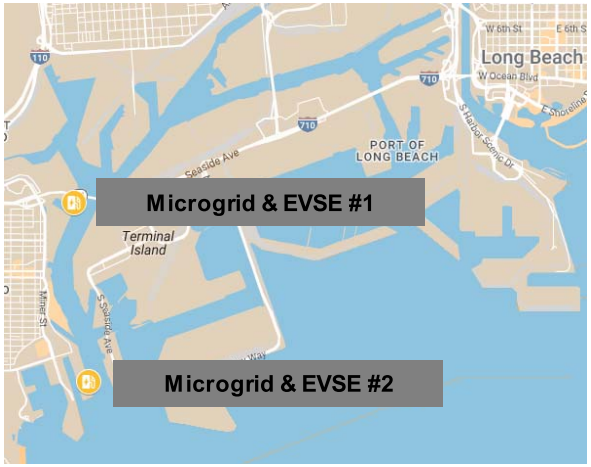


CROWLEY

Crowley's Zero-Emission and Hybrid Tug Efforts

- **EWOLF**
  - Development Began in 2019
  - Grant Offerings in 2020
  - Commissioning May 2024
  - Hurdles with Construction, Infrastructure
  - Hurdles to Operation
- **ETUG+ / HYBRID TUG**
  - Commissioned Design in 2021
  - Grant Offerings in 2022
  - Program Under Review 2024





CROWLEY

Commercial Challenges

- **UTILIZATION RATES**
- **STATIC RATES / LOW MARGIN BUSINESS**
- **SHIP VOLUMES**
  - Larger ships > reduced demand for Tugs
- **REGULATORY UNCERTAINTY**
- **LONG USEFUL LIFE OF THE ASSETS**
- **COSTS**
  - Capital Expenditures (CapEx) / Operational Expenditures (OpEx)

Infrastructure Challenges

- DESIGN AND PERMITTING
- EQUIPMENT SELECTION
- LOCATION / SITING
- PROPERTY VALUE
- COMPETING UTILIZATION AND NEEDS
- R&D AND TECHNICAL NEEDS
- GRID CAPACITY / DEMAND
- POWER QUALITY, RELIABILITY, SOURCE AND COST

Challenges with Vessel Design and Technology

- ASSET LIFE (40+ YEARS)
- DESIGN AND APPROVAL
- EQUIPMENT SELECTION AND VESSEL DESIGN
- OPERATING PROFILE / LOCATION
- COMPETING UTILIZATION AND NEEDS
- R&D / TECHNICAL AND FUTURE NEEDS
- RELIABILITY, SAFETY, AND PERFORMANCE
- COST OF CAPITAL, COST OF VESSEL
- COMMERCIAL RATES
- VESSEL REPLACEMENT REQUIREMENTS IN MANY GRANTS

	Horsepower	Diesel (gal/yr)
Class 8 Truck[1]	380-700	~35,000
50 BPT Tugboat	4,700	~100,000
90 BPT Tugboat	6,700	~120,000

Questions?

Paul Manzi
Paul.Manzi@crowley.com

May 9, 2024

Wabtec CORPORATION

May 9th, 2024

Freight Rail Decarbonization

WABTEC

Global leader in freight and transit rail technologies

Wabtec CORPORATION
Faiveley TRANSPORT
GE Transportation

Wabtec CORPORATION

+50 COUNTRIES

~29K EMPLOYEES

FREIGHT: 72%

TRANSIT: 28%

GEOGRAPHY

~55% NON–U.S. REVENUES

34% Services

18% Equipment

12% Components

8% Digital Intelligence

28% Transit

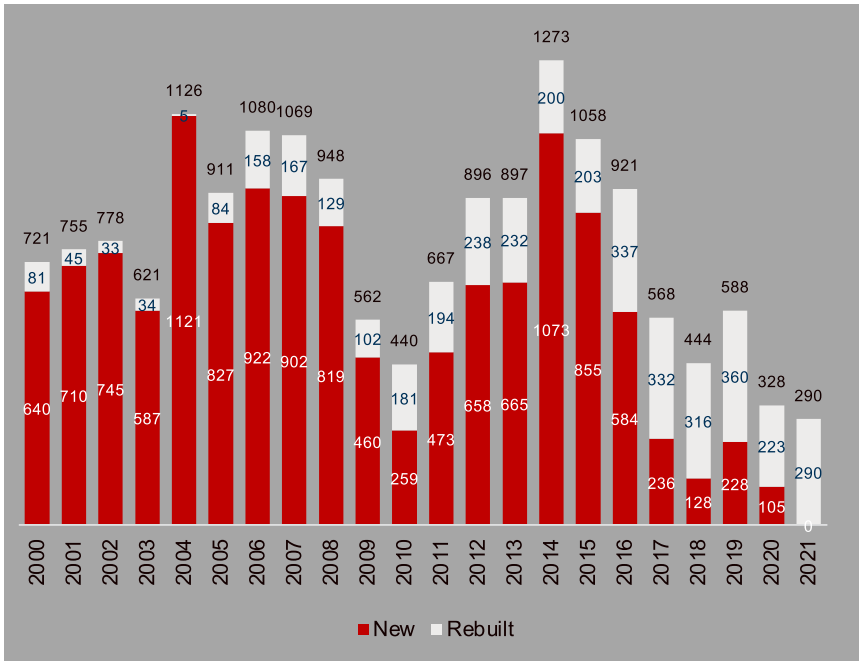
Leader in North American Freight Locomotives Mfg & Services

1 out of 5 rail shipments in the world are pulled by a Wabtec Locomotive

Freight Rail Quick facts

- Rail hauls **30%** of ton-miles in the US annually, yet contributes only to **8%** of CO_2 emissions from freight transportation
- Class 1 Railroads handle **92%** of rail freight volume. A single Class 1 mainline haul Locomotive consumes **250-300k** gal diesel/ year.
- The freight rail sector consumes nearly **4B** gal. diesel/year for a total of **35M** tonnes CO_2
- **~25k** locos are in operation in the US
- Average age of all locomotives is **~29** years
- Locomotive are known for operating up to **40-50** years.

N.American Locomotives delivered: New & Rebuilds

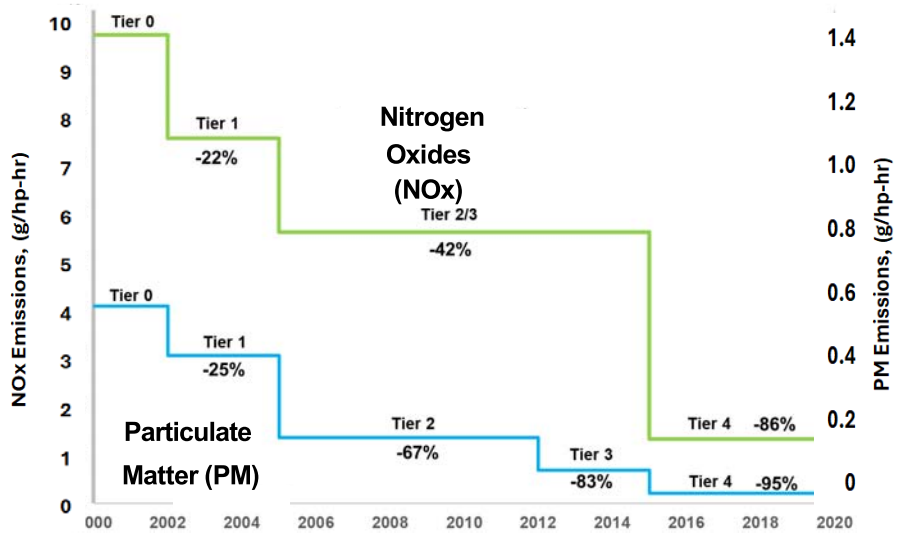


Sources:
www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions
AAR Statistics

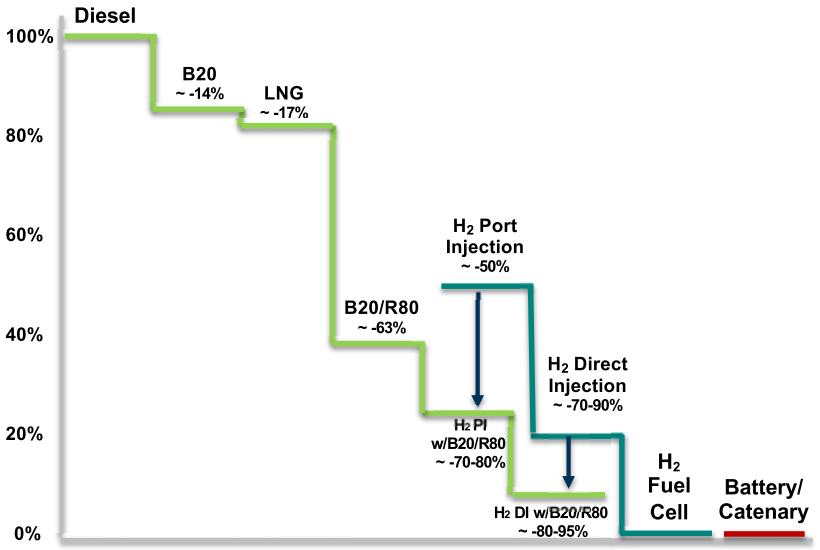
T0 – T4 Emissions History… Transitioning to a Carbon Focus

Engine Constituent Emissions Nitrogen Oxide (NO_x) & Particulate Matter (PM) were significantly reduced from Pre-Emissions <1998 through EPA Tier 4 (2015), while Wabtec was able to reduce engine fuel consumption by 10% during that time.

EPA EMISSIONS LEVELS (1998-2024)

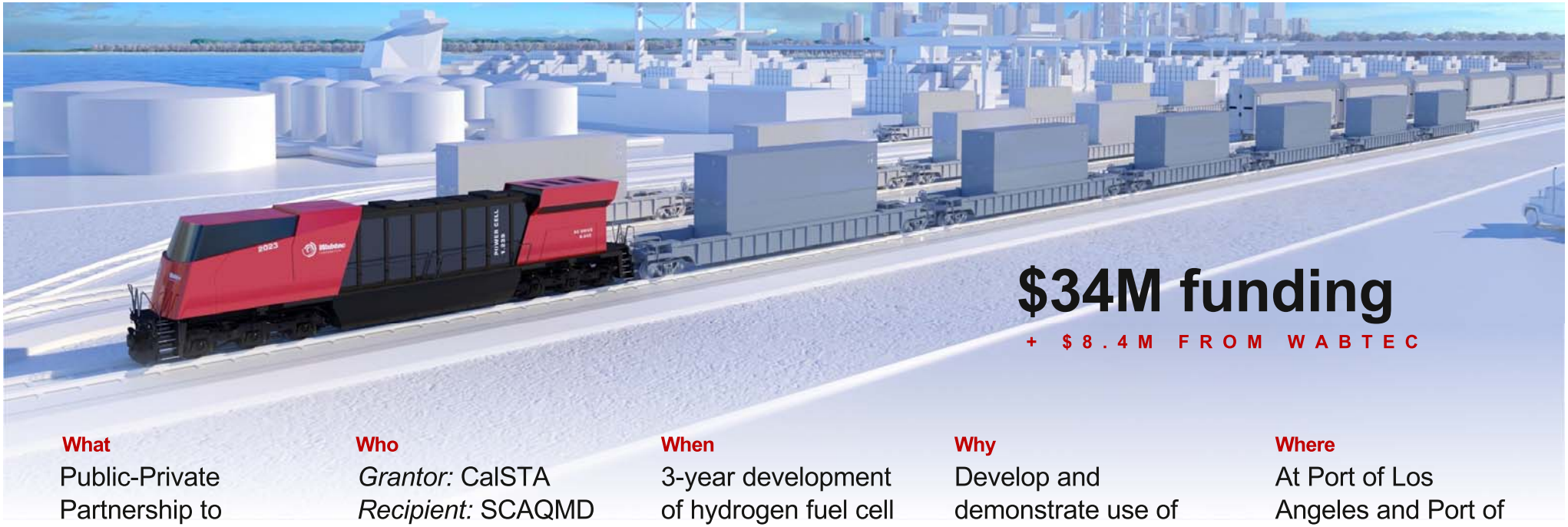


CO_2 REDUCTION TECHNOLOGIES



CALSTA PORT AND FREIGHT INFRASTRUCTURE GRANT

Grant overview



$34M funding

+ $8.4M FROM WABTEC

What
Public-Private Partnership to demonstrate Hydrogen Fuel Cell Locomotive

Who
Grantor: CalSTA
Recipient: SCAQMD
Sub-Recipient: Wabtec

When
3-year development of hydrogen fuel cell demo locomotive
1-year demo period

Why
Develop and demonstrate use of hydrogen fuel cell technology to deliver zero emissions solutions

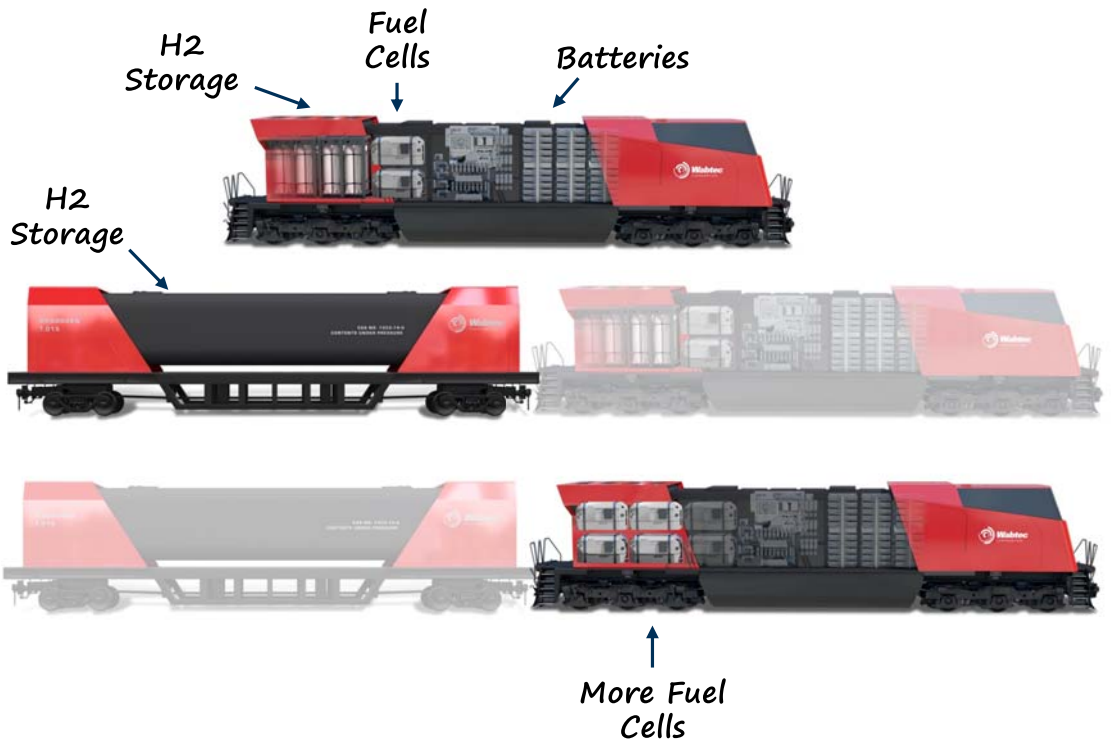
Where
At Port of Los Angeles and Port of Long Beach

H_2 Fuel Cell Technology Path

Phase 1: Low HP + Short Range
On-board Storage

Phase 2: Low HP + **Long** Range
Tender Car Storage

Phase 3: **High** HP + Long Range
Tender Car Storage



Hydrogen Power Technologies

H_2 Fuel Cells

Utilize hydrogen fuel to generate zero emission power. Provides traction power and energy to charge batteries.

100%
CO_2 Reduction

100%
PM & NOx Reduction

Fixed Fuel

Credit: Hyzon Motors

H_2 Engine

Substitution of diesel fuel with hydrogen. Can also be combined with bio-based fuels to further reduce CO_2.

50-90%
CO_2 Reduction

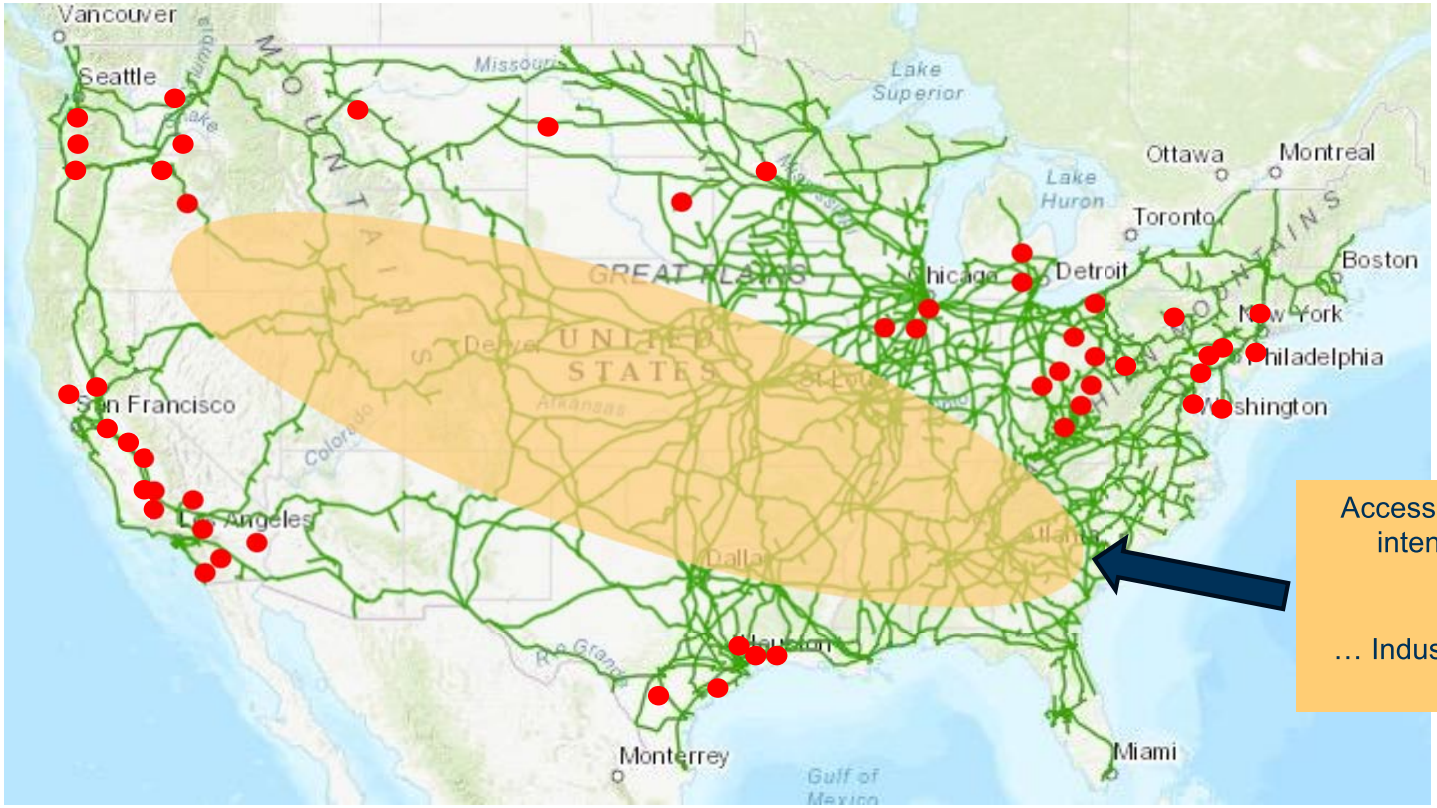
Partial PM Reduction
No NO_x Reduction

Flexible Fuel

Supported Platforms: T2/T3, T4 EVO

CO_2 reductions are tail-pipe

US Rail Map vs H_2 Hubs

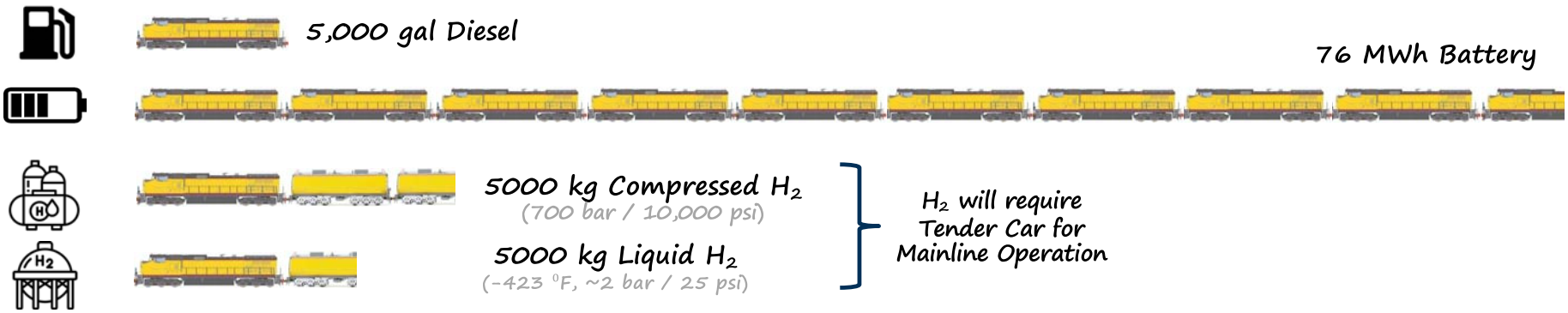


Access to low cost, low carbon intensity hydrogen will be incremental

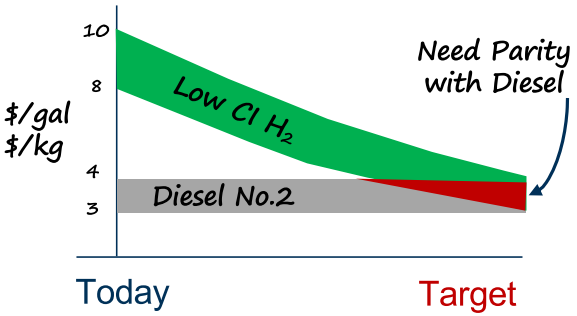
… Industry will require a flexible technology

H_2 & Battery Adoption Challenges

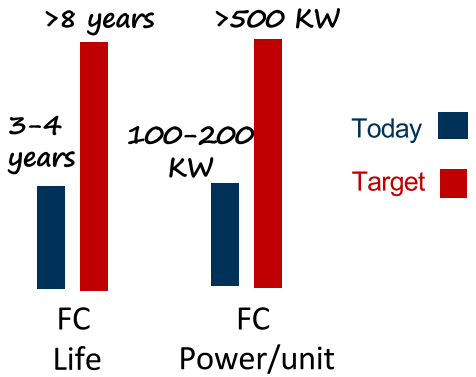
ENERGY DENSITY



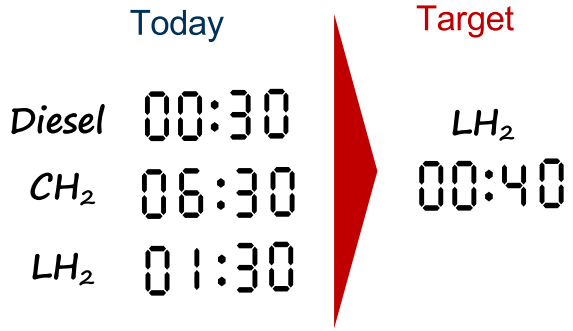
COST & AVAILABILITY OF H_2



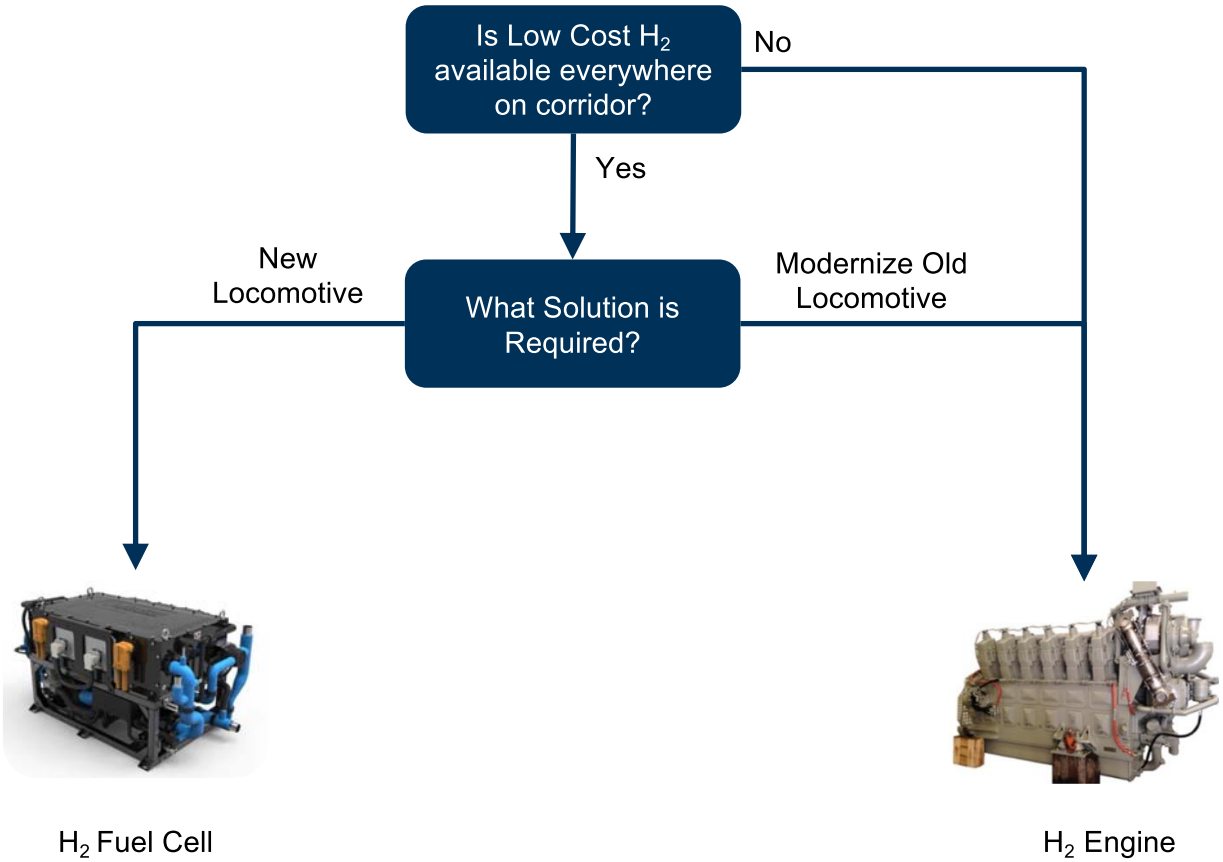
TECHNOLOGY MATURITY



H_2 REFUELING TIME



Conclusion: H_2 Solution Decision Flow Chart



Credit: Hyzon Motors

WabtecCorp.com

Be the Right ONE

Simultaneous Hydrogen Time-Fill Refueling Demonstration Project for Port Equipment

Meeting Material for SCAQMD

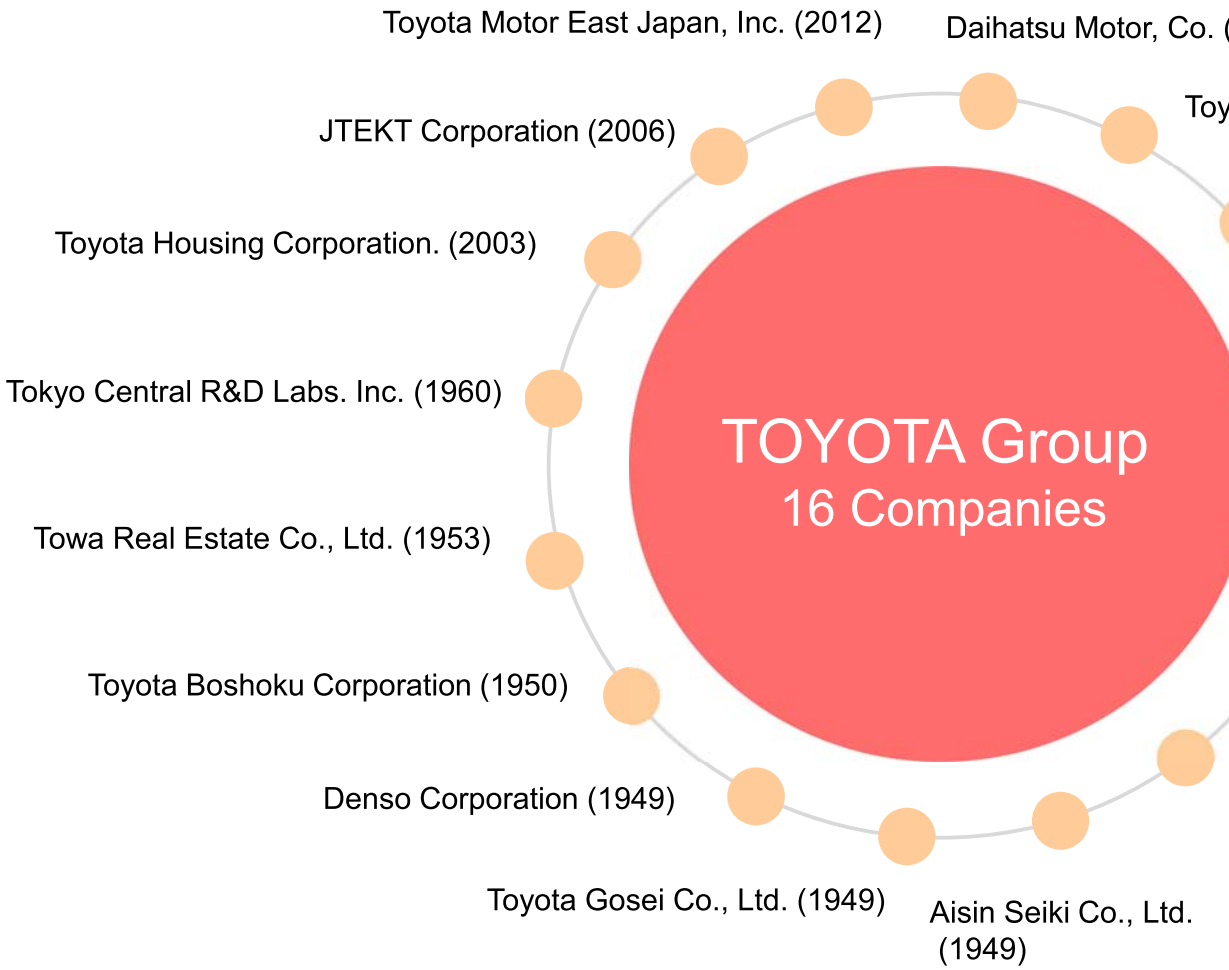
Toyota Tsusho America, Inc.
Sustainability Business Development Group

May 9, 2024

Be the Right ONE

Company Profile

About Toyota Tsusho



Toyota Tsusho Corporation/TTC (1948)

- Headquarters: Nagoya and Tokyo
- Number of Employees: 3,316 (Parent), 65,218 (Consolidated)
- Main Shareholders: Toyota Motor Corporation: 21.7%
  Toyota Industries Corporation 11.2%
- Chairman/President&CEO: Nobuhiko Murakami / Ichiro Kashitani
- Financial Highlights(Global) - FY2021 (Apr-Mar)
  Revenue: 61,750 million USD (8,208 billion yen)
- Global Network: Business Locations in around 120 countries.

Company Business:

- Trading arm with diverse sectors
- Supports Toyota Motor and other group companies in raw material supply, logistic service, business development, Financial Investment, etc.

Toyota Motor/Toyota Tsusho Hydrogen Commitment

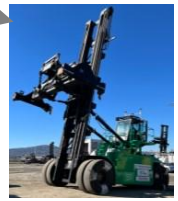
Toyota Motor

Toyota **"Mirai"** (Hydrogen Fuel Cell Vehicle)
- **15,000+** on-the-road in California -

Toyota **"Fuel Cell"**
–One of the most reliable fuel cell in market -

Class-8 Truck

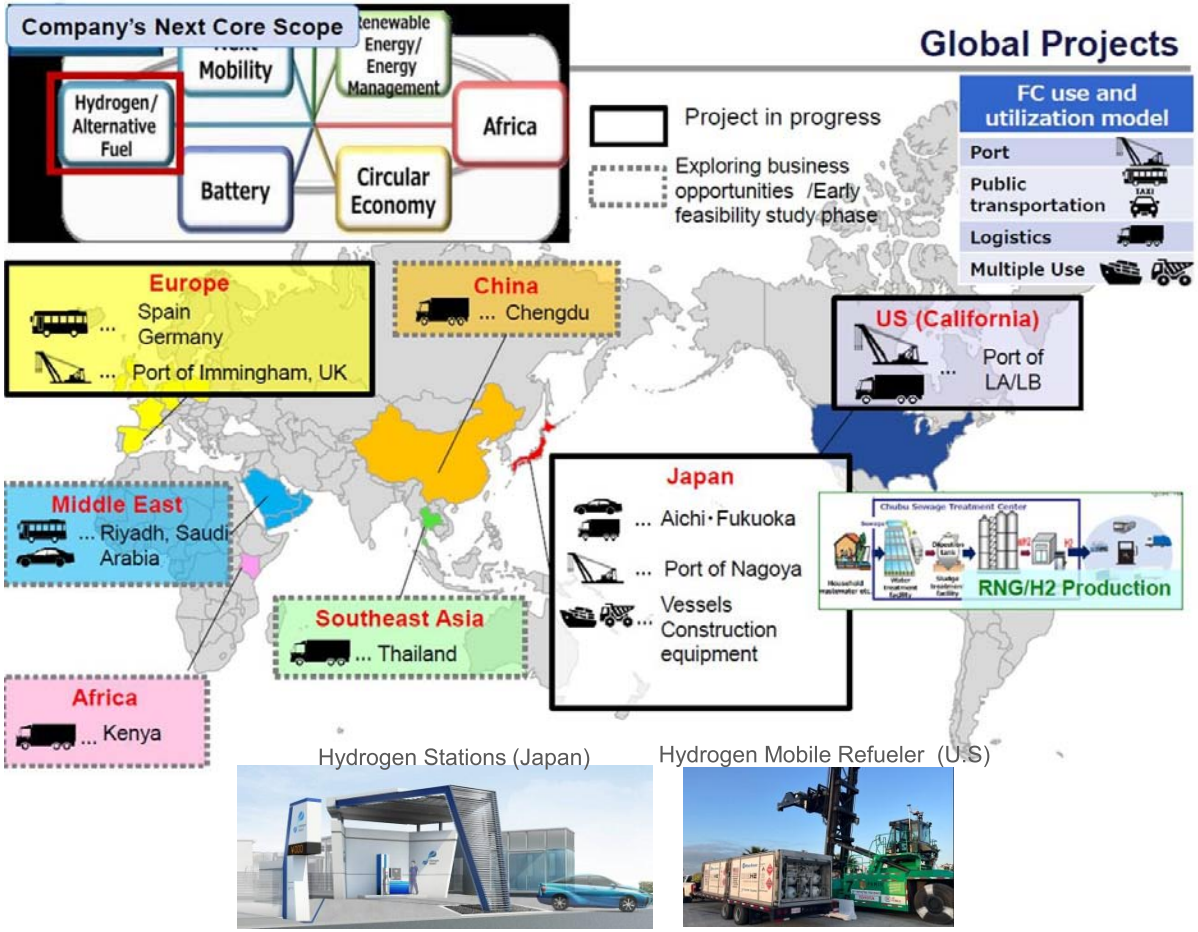
Power Generator



Port Equipment

Extend to More Hydrogen Applications

Toyota Tsusho



Hydrogen Stations (Japan)

Hydrogen Mobile Refueler (U.S)

Accumulated Hydrogen Experience

Continuous Commitment and Established Market Reliability in Hydrogen

Toyota Tsusho's Zero Emission Port Equipment Demonstration Project Overview

Surrounding Environment: POLA/POLB and Zero Emission Goal

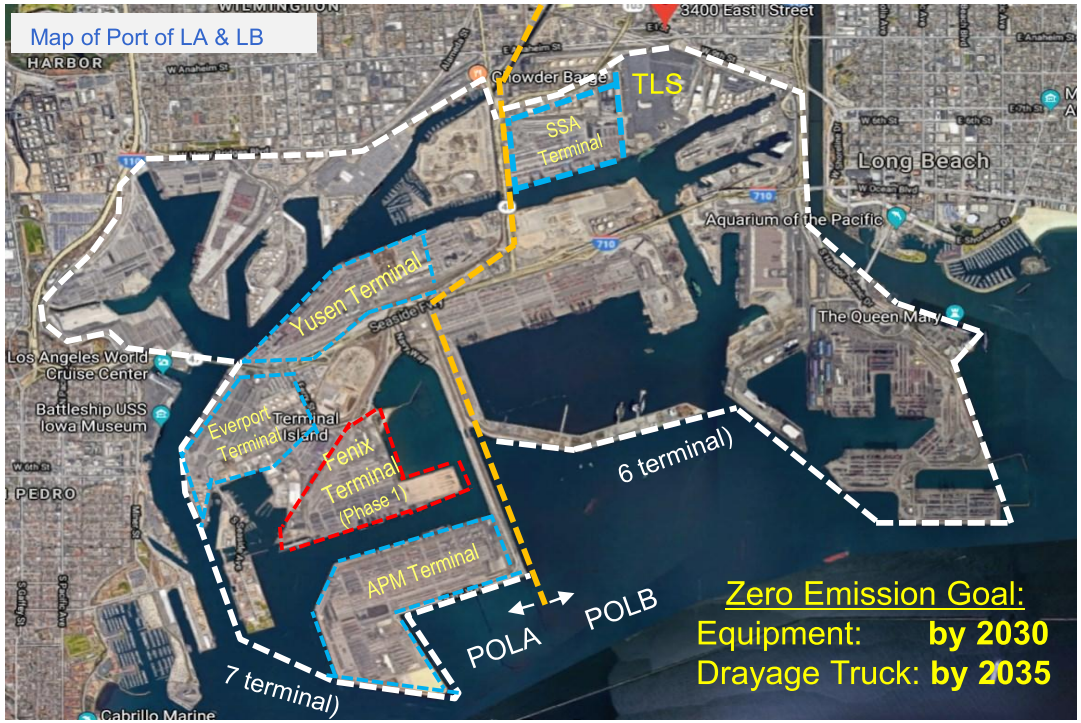
POLA Port Equipment List

Equipment	Engine Type	Count
Stacking crane	Electric	29
Bulldozer	Diesel	3
Cone Vehicle	Diesel	21
Crane	Diesel	8
Crane	Electric	3
Wharf crane	Electric	86
Excavator	Diesel	1
Forklift	Diesel	110
Forklift	Electric	11
Forklift	Gasoline	7
Forklift	Propane	355
Loader	Diesel	11
Loader	Electric	2
Man lift	Diesel	19
Man lift	Electric	5
Man lift	Gasoline	1
Material handler	Diesel	9
Miscellaneous	Diesel	1
Miscellaneous	Electric	2
Rail pusher	Diesel	1
Reach stacker	Diesel	1
☆ Hybrid RTG	Diesel	13
☆ RTG crane	Diesel	85
Side pick	Diesel	15
Skid steer loader	Diesel	4
Hybrid straddle carrier	Diesel	12
Straddle carrier	Diesel	28
Sweeper	Diesel	8
Sweeper	Gasoline	2
☆ Top handler	Diesel	198
Truck	Diesel	21
Truck	Propane	1
☆ Yard tractor	Diesel	790
☆ Yard tractor	LNG	17
☆ Yard tractor	Propane	158
Total count		**2,038**

POLB
Port Equipment List

Equipment	Engine Type	Count
Bulldozer	Diesel	1
Cone vehicle	Diesel	5
Crane	Diesel	2
Excavator	Diesel	2
Forklift	Diesel	98
☆ Hybrid RTG crane	Diesel	15
Loader	Diesel	11
Man Lift	Diesel	12
Material handler	Diesel	2
Miscellaneous	Diesel	2
Rail pusher	Diesel	3
☆ RTG crane	Diesel	39
Side handler	Diesel	7
Skid steer loader	Diesel	2
Sweeper	Diesel	12
☆ Top handler	Diesel	188
Tractor	Diesel	1
Truck	Diesel	12
☆ Yard tractor	Diesel	570
Forklift	Gasoline	24
Man Lift	Gasoline	2
☆ Yard tractor	Gasoline	134
Forklift	Propane	102
Sweeper	Propane	7
Tractor	Propane	5
☆ Yard tractor	Propane	2
Total		**1,260**

☆ Hydrogen Fuel Cell favored technologies due to high GHG emission, Long duty cycle (16+hrs/day), high power output, infra feasibility.



Targeted technology change from "diesel to hydrogen" at port area

Type	Drayage Truck	Top Handler	RTG	Yard Truck
Image				
Units	13,000+	386	152	1,671
Diesel Usage (Average)	30～40 gallon/day	60～80 gallon/day	80～100 gallon/day	30～40 gallon/day
H2 Usage (Estimate)	20～30 kg/day	40～50 kg/day	50～60 kg/day	20～30 kg/day

Over 90% of POLA/LB's GHG Emission from CHE

Be the Right ONE

Challenge of Port Electrification = Hydrogen as needed solution.

"Power Requirement for Electrification of California Ports"

Study Regions	Terminal Component	Required Power Demand (MW)			
		2035	2035	2040	2040
		On-Shift UTR Charging	Off-Shift UTR Charging	On-Shift UTR Charging	Off-Shift UTR Charging
	Buildings & Area Lighting	51.1	51.1	51.1	51.1
	eCHE	169.4	230.9	203.7	244.0
	Reefer Power	89.0	89.0	98.5	98.5
	Shore Power*	73.9	73.9	78.7	78.7
	Drayage Trucking	125.6	125.6	137.0	137.0
	Totals	**509.1**	**570.6**	**569.0**	**609.4**

Source: Technical Memorandum "Electrification of California Ports"(Moffat & Nichol), June 2021

To put this power requirement into some perspective.

- 1 MW can power between 400 and 900 U.S. households. Using an average of 650 households per MW, the 2040 study region power demand of approximately 600 MW could power about 390,000 households, or a U.S. population of about 1.0 million.
- Total power demand from the port regions in 2035 and 2040 would require 50% and 53%, respectively, of one reactor at the Diablo Canyon Nuclear Power Generating Station, which is scheduled for shut down by 2025,

Grid Power Capability = Not enough for port electrification.

Hydrogen must play an important role.

Toyota Tsusho's Hydrogen Port Equipment Demonstration

2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029

Phase 1

FENIX MARINE SERVICES

Preparation → Demonstration (1 yr)

In-Operation

Fuel Cell System

Top Handler (x1)

H2 Mobile Refueler (x1)

Funded by:
- POLA/LB (TAP-Technology Advance Program)
- **SCAQMD (Carl Moyer, Clean Fuel Program)**
- NEDO
  (New Energy and Industrial Technology Development Organization-Japan)

Phase 2

YTI YUSEN TERMINALS LLC

Preparation → **About to Start** → Demonstration (4 yrs)

TOYOTA

Fuel Cell System

RTG (x1)
May, 2024～

H2 Production SMR (x1)
Jun, 2024～

H2 Mobile Refueler (x2)
Jun, 2024～

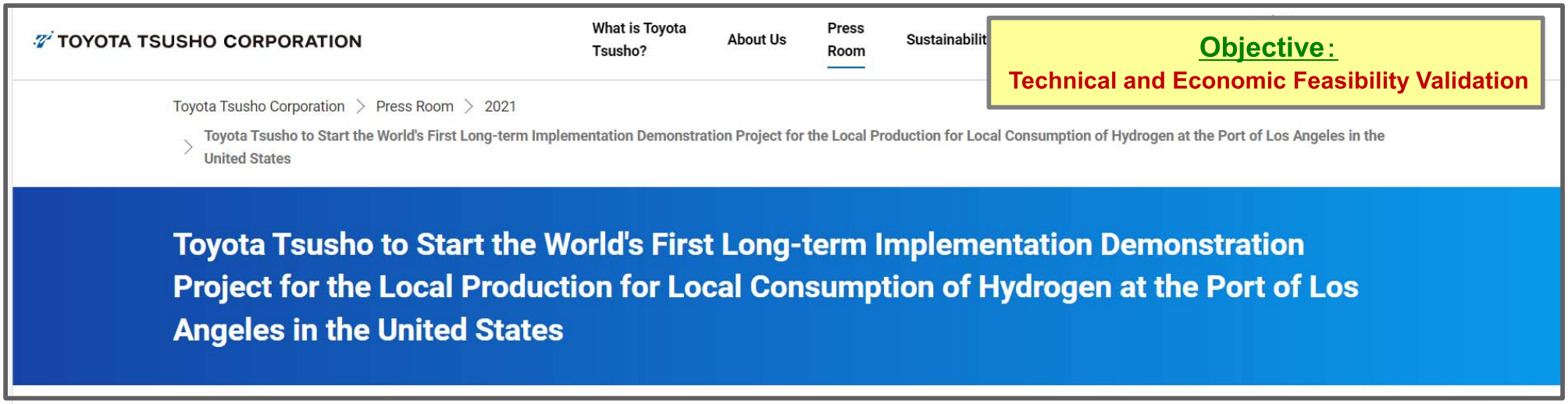
Yard Truck (x2)
Aug.2024～

Top Handler (x1)
Oct, 2024～

Class-8 Drayage Truck (x2)
Mar.2025～

Funded by:
- NEDO

Press Release(Dec. 2021)



TOYOTA TSUSHO CORPORATION

What is Toyota Tsusho? | About Us | Press Room | Sustainabilit

Toyota Tsusho Corporation > Press Room > 2021

Toyota Tsusho to Start the World's First Long-term Implementation Demonstration Project for the Local Production for Local Consumption of Hydrogen at the Port of Los Angeles in the United States

Toyota Tsusho to Start the World's First Long-term Implementation Demonstration Project for the Local Production for Local Consumption of Hydrogen at the Port of Los Angeles in the United States

Objective:
Technical and Economic Feasibility Validation

Hydrogen Demand Potential (Estimate) at Port of LA/LB

Equipment Type	Qty (Units)	Case 1 (H2 100%)	Case 2 (H2 50%)	Case 3 (H2 30%)
Yard Truck	1,614	18,012	9,006	5,404
Top Handler	390	5,686	2,843	1,706
RTG	159	2,576	1,288	773
Total (kg)		**26,274**	**13,137**	**7,883**

Unit=1,000kg The estimated demand is annual volume (360 days)

THE PORT OF LOS ANGELES

Port of LONG BEACH THE PORT OF CHOICE

H2 Usage Assumption * 31kg/day

45kg/day

40.5kg/day

* Source：DOE Hydrogen Fuel Cell Application in Ports

VS

H2 demand in California for Passenger Vehicle (FCV) (CARB Est. by 2030)

* CARB: California Air Resource Board

Key Points:

- **With assumption, H2 demand in port area is substantially large.**

  1) 100% shift: 26,274 ton/yr. (72 ton/day) **2) 50% shift: 13,137 ton/yr.** (36 ton/day) **3) 30% shift: 7,883 ton/yr.** (21 ton/day)

- **If includes H2 demand for Drayage Trucks, the demand gets even larger.**

  (Note: drayage trucks can refuel hydrogen not only near port area but other areas .)

  100%: 360 ton
  50%: 180 ton
  30%: 120 ton
  } Per day

Note: Toyota Tsusho as well as POLA/LB terminals also studies the potential and feasibility for BEV equipment. But for the 3 main equipment, we pursue H2 fuel cell demonstration as favorable option.

More H2 Demand => Lower H2 Cost => Accelerate Market Expansion

Repowered Hydrogen Fuel Cell Top Handler (First in the World)

Before Repower（Diesel）

Same Machine

After Repower（FC-Fuel Cell）

We can supply "Repowered" top handlers to terminal operators.

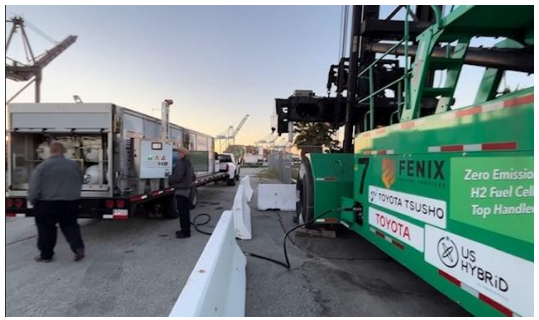
Hydrogen Refueling by Mobile Refueler

Diesel Refueling at LA port terminal (between 3am – 7 am)




We refuel hydrogen the same way as diesel refueling.

(Terminal and ILWU preferred method: No change in refueling labor work, very small footprint, agile and flexible)



Findings: Hydrogen vs battery in Port Equipment

(In case of Top Handler)

- **High Power Output**

  It requires over 1MWh in port operation (rail yard)

- **Long Duty Cycle（2 shift = 16 hours)**

  Refueling/charging hour 3am to 7am (4 hours)

  Terminal operators want one refueling / day.

- **Refueling/Charging Time**

  H2: 30 – 50 min (60kg/100kg)

  Battery: 4 hrs.(1MWh battery (@250kWh)

- **Battery Life**

  Fast charge (high voltage) everyday means

  =>degrade and shorten the life of battery.

- **Infrastructure for charging**

  If a terminal (ex Fenix Marine) has 50 top handlers

  Ex. 1MWh x 50 units = 50MWh ！

Port Equip = High Power & Long Duty Cycle = Hydrogen is a must ENERGY source.

Be the Right ONE

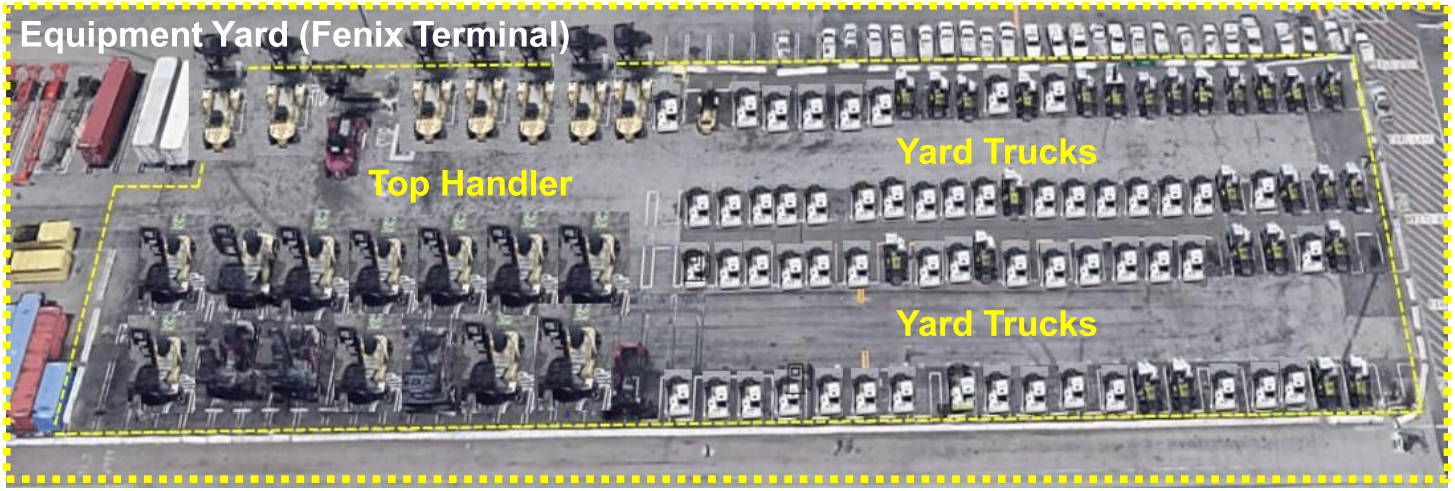
Simultaneous H2 Time-Fill Refueling System

We are seeking funding opportunity

Next Step: Hydrogen Refueling in Scale

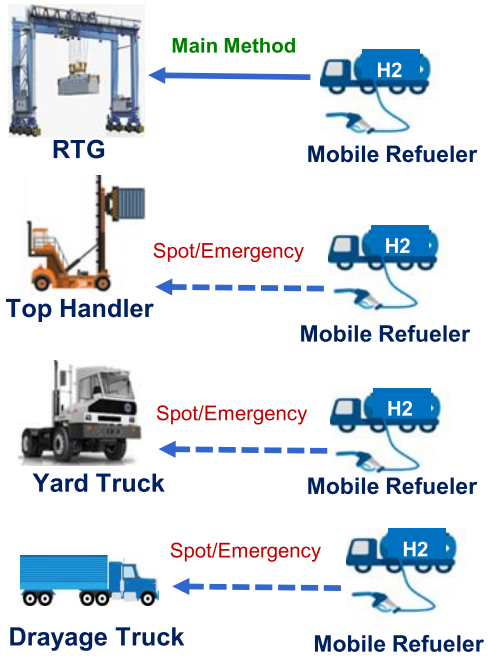
How to Refuel H2 to Port Equipment/Drayage Trucks when scale arrives ?

Below: View of Port Terminal and Drayage Truck yard



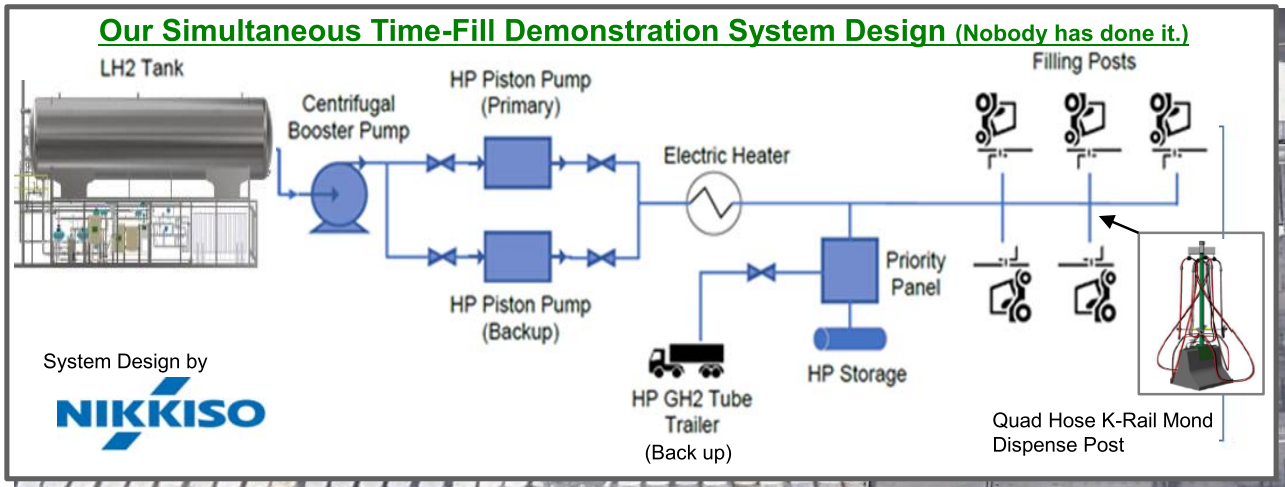
Use of Mobile Refueler (Once scale arrives)

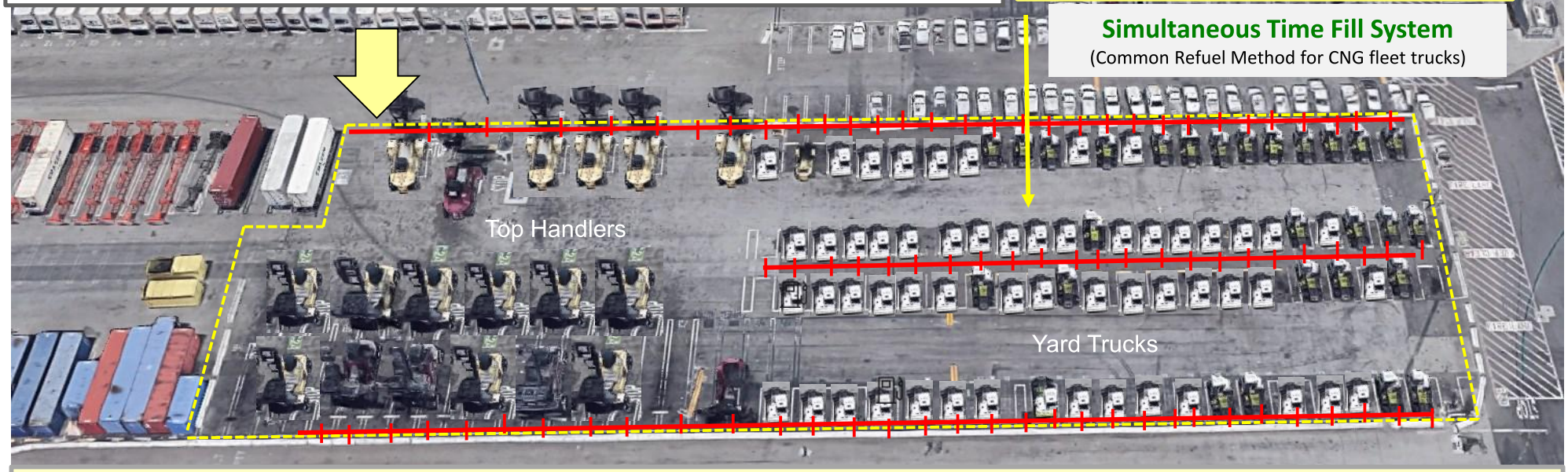
Challenges with Mobile Refueler:
- Many need for mass refueling.
- Many refueler operator need.
- Loading Capacity at H2 Load Hub



Next Solution for Mass Refueling ?

Simultaneous H2 Time-Fill Refueling, Future Concept





Advantages: 1) Simultaneous fill, 2) Established (Reliable)Technology, 2) Low in CAPEX/OPEX cost

We would like to do a demo project to verify "Technical", "Economic", "Operational" feasibility.

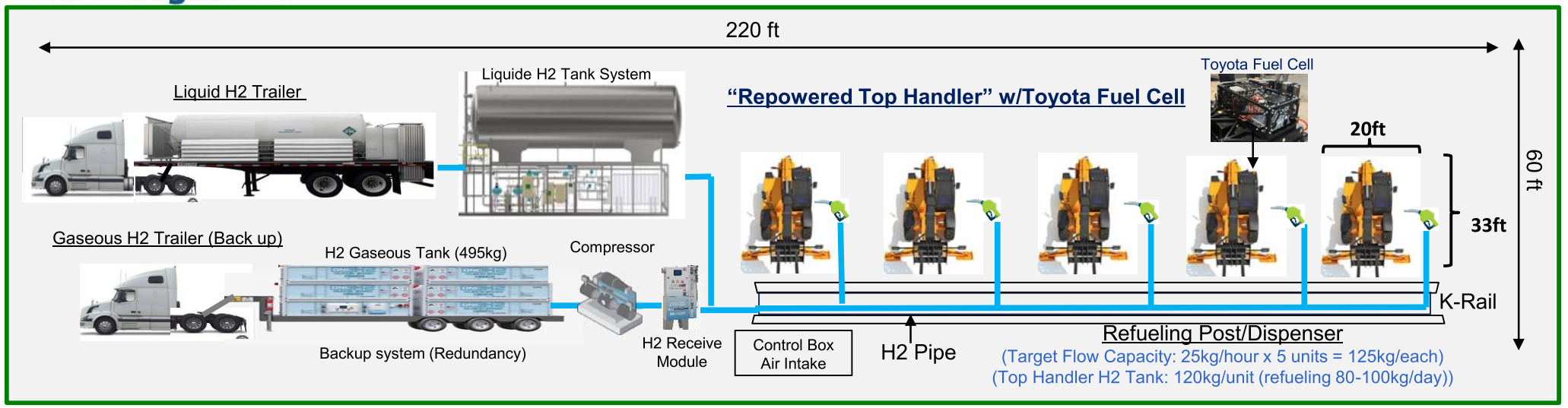
Same Concept for Drayage Trucks application

(Shippers Transport Express – Class 8 Drayage Truck Fleet Operator)

Another Application for Time-Fill H2 Refueling

Shippers Transport Express prefers hydrogen fuel cell class-8 trucks for zero emission solution for range coverage and for concerns of potential requirement for large investment grid upgrade (sub-station).

Simultaneous H2 Time-Fill Refueling, Demonstration Concept



Why Hydrogen "Simultaneous Time-Fill" Refueling System?

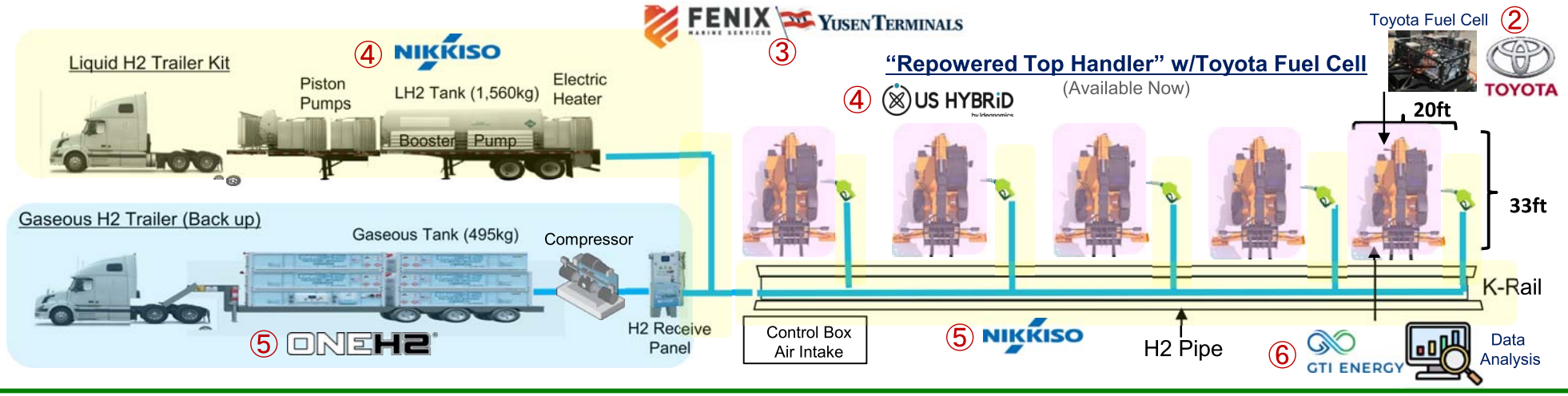
- **Simultaneous Fill** => No need for que up Equipment/Trucks Reliable like H2 station setup.
- **Established Technology** for CNG fleets => Reliable. (H2 needs temp & pressure control)
- **Cost Effective**: No high flow nozzle, Nearly automated, Low maintenance/repair.

We will validate thru this project for :

- **Technical and Economic feasibility.**
  (H2 temp & pressure control, H2 flow rate thru first to last unit, maintenance/repair cost)

Project Partners

① Project Leader: Toyota Tsusho America, Inc.



	Logo	Company Name	Company Role	Remarks
1	TOYOTA TSUSHO	**Toyota Tsusho America, Inc. (TAI)**	**Project Developer/Leader/H2 provider (LH2)**	・TAI is conducting 2 on-going demo projects at Fenix and Yusen Terminal ・Plans to collaborate with large industrial gas company for H2 production. (2027～)
2	TOYOTA	**Toyota Motor North America**	**Fuel Cell Provider**	・As known, Toyota's fuell cell is most used and reliable in mobility industry. ・Toyota fuel cells are used all of TAI's port demo at Fenix and Yusen.
3	FENIX or YUSEN TERMINALS	**Fenix or Yusen Terminal**	**Operation Host/Top Handler Provider**	・Both Fenix and Yusen are TAI's current 2 on-going port demo host partners. ・Both terminals wants to implement the time-fill system after successful demo.
4	US HYBRID	**US Hybrid**	**System Integrator (Repower)**	・System integrator (repower) for TAI's current demo project at Fenix and Yusen. ・One of the few integrator in the U.S wih fuel cell equipment expertise.
5	NIKKISO	**Nikkiso**	**LH2 Trailer Kit & Time-Fill refuel system**	・Over 75 years of experience in design, sales and service of cryogenic machinery, process systems and heat transfer equipment.
6	ONEH2	**OneH2**	**GH2 Tank Trailer/Compressor/H2 Provider**	・Current H2 provider/mobile refueler manufacture for TAI demo (Fenix and Yusen) ・They are the only company who manufactures 930 hydrogen mobile refueler.
7	GTI ENERGY	**GTI Energy**	**Project Management/Data Analysis**	・Current data-analysis partner for TAI's demo project at Fenix and Yusen Terminal. ・Project developer for FC-Yard Truck (Capacity) demo project at Trapac Terminal.

Be the Right ONE

Thank you!

For contact:

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Tomoaki Sakai
Project Manager, Sustainable Business Development
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E-mail: tomoaki_sakai@taiamerica.com


KAIZEN
Clean Energy

WHAT WE DO

On-site

- Power generation
- Hydrogen fueling

Location

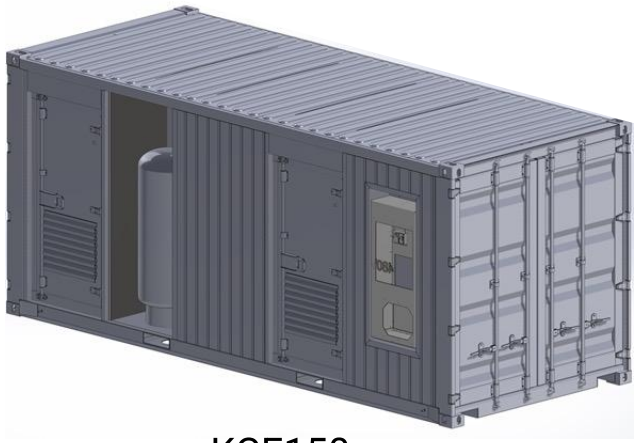
- Grid constrained
- Off-grid

Duration

- Temporary
- Permanent

KCE MICROGRID PRODUCTS

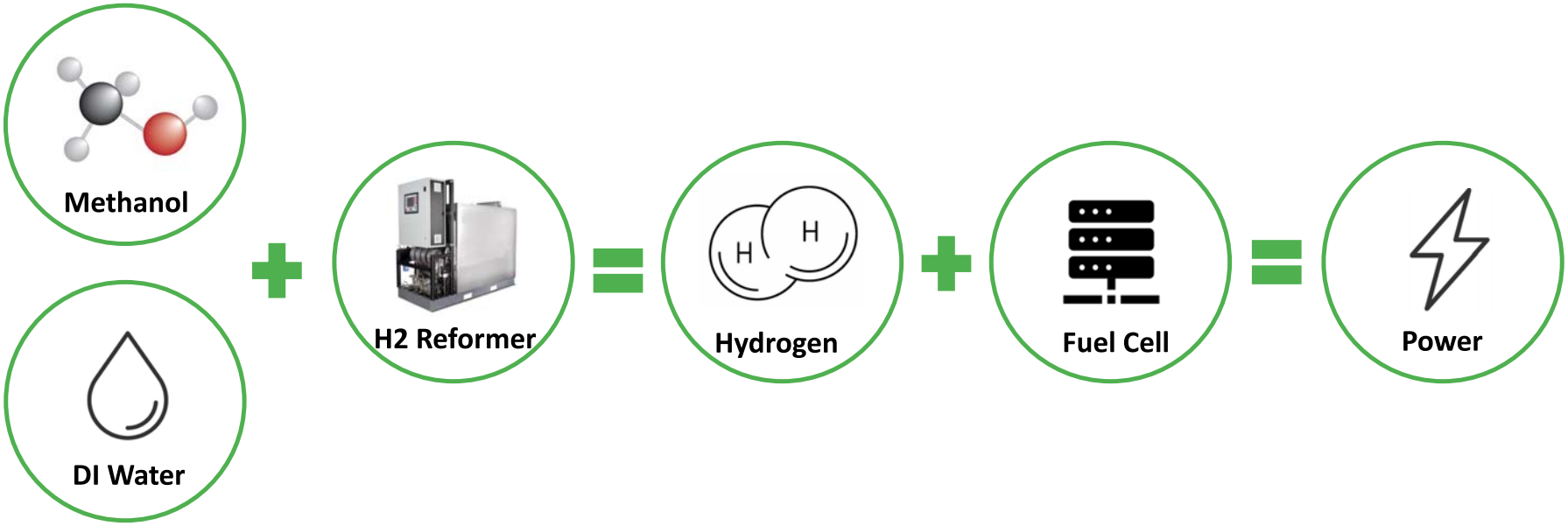
- **Hydrogen fuel cell-based power**
- **Methanol as a hydrogen carrier**
- **Containerized; transportable**
- **No permanent infrastructure**
- **Scalable to MWs**
- **Unmatched energy security**



KCE150

Power Output:
150kW Base
300kW Peak
Immediate Demand Response

HOW KAIZEN'S MICROGRIDS WORK



APPLICATIONS

Fleet EV Charging

Fleet Hydrogen Fueling

Diesel Generator Replacement

KCE150'S IN SERVICE

Element 1

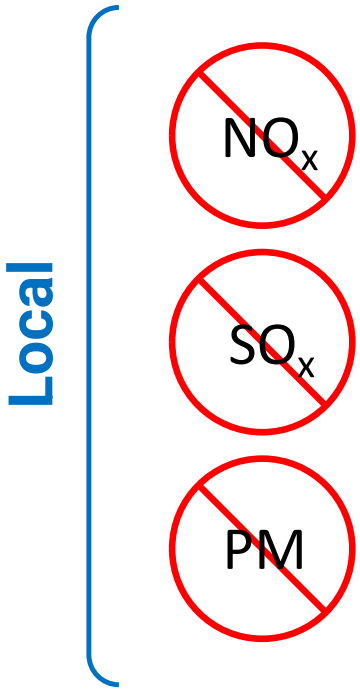
- 150kW EV charging unit
- On and off grid solution

Extreme E

- 150kW DC to DC microgrid
- 100% off-grid power generation system

Proven technology ready for deployment

KCE150 EMISSIONS



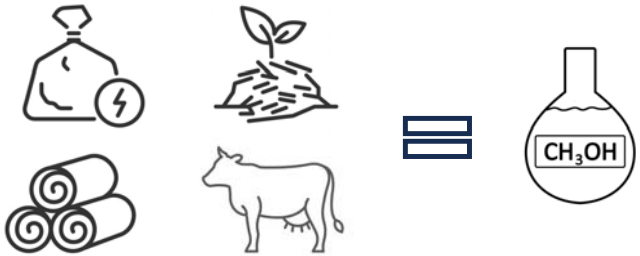
Grey Methanol

Green Methanol

- Bio-methanol
- e-Methanol

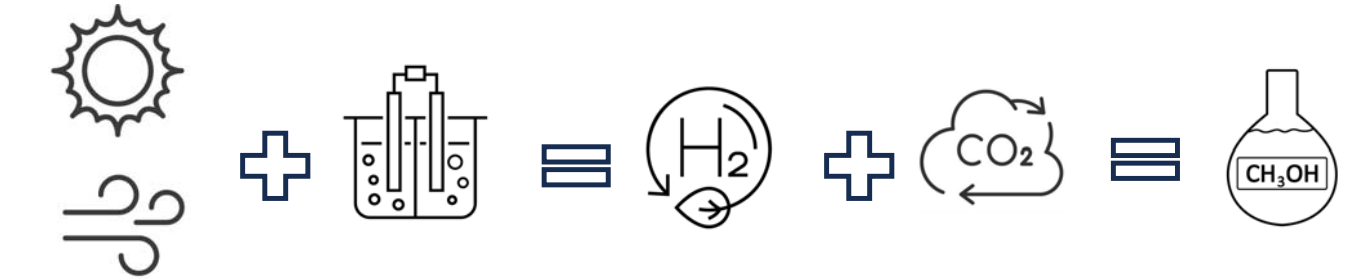
GREEN METHANOL SOURCES

Bio-methanol



RNG Sources — Bio-methanol

e-methanol



Renewable Energy — Electrolysis — Green Hydrogen — Biogenic CO2 — e-Methanol

WHY METHANOL

- Liquid
- Densest hydrogen carrier
- Lowest cost hydrogen carrier (per DOE)
- Safe
- Existing distribution network

EARLY ADOPTERS OF METHANOL

- Future fuel of choice in maritime industry
- 230 methanol dual fuel vessels on order

- 30,000 methanol cars
- 140 methanol fueling stations

- Multiple methanol-to-power start-ups
- Forefront of e-Methanol technology

SCAQMD Governing Board Retreat

What We Do

Zeem enables fleet electrification by providing EV charging infrastructure solutions for fleets through:

Standalone Depots	Co-Located Depots	In-Yard Infrastructure

Why We Do It

Zeem was founded to provide value-add solutions for fleets to seamlessly transition to electric by facilitating daily EV fleet operations management and removing the heavy CapEx burden required for infrastructure development

How We Do It

Zeem builds, develops and operates EV charging infrastructure, helping reduce operating costs while meeting sustainability goals and government mandates

1 Robust Site Deployment Process
Diligent Market Assessment

Paul to provide data for a 10-mile radius and confirm all numbers

- **Zeem has built a proprietary EV fleet database by making over 1.7 million calls to fleets across the country**

Outreach Process

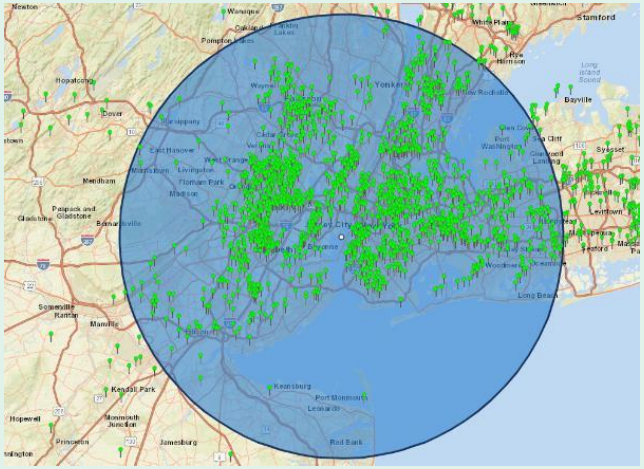
1. **Direct engagement with fleets** → Zeem has targeted discussions with fleet operators across the country based on data acquired from the Department of Transportation
2. **Collect direct fleet data** → Sites are scored based on the total number of vehicles and zero-emissions timeline of the fleet, in addition to data around vehicle composition and duty cycles
3. **Identify customer demand hotspots** → Focus on fleets near seaports, airports, distribution centers and high-volume corridors
4. **Make decision on services and site selection** → Locations are prioritized and decisions are made after utility engagement, policy analysis, site visits and financial modeling

Detailed fleet data such as plans to electrify, potential fleet size and daily routes can be used to inform site qualification and configuration

Current Database

- National database of over 15,500 qualified fleets totaling [700,000] Class 2b - Class 8 vehicles
- Database informs Zeem's pipeline of 7 high-priority sites, 15 medium-term sites and 10 long-term potential sites
- Serves as Zeem's customer acquisition resource which provides information for potential customers at a given location, informing revenue predictability and de-risking new site identification

Case Study NY/NJ Port District

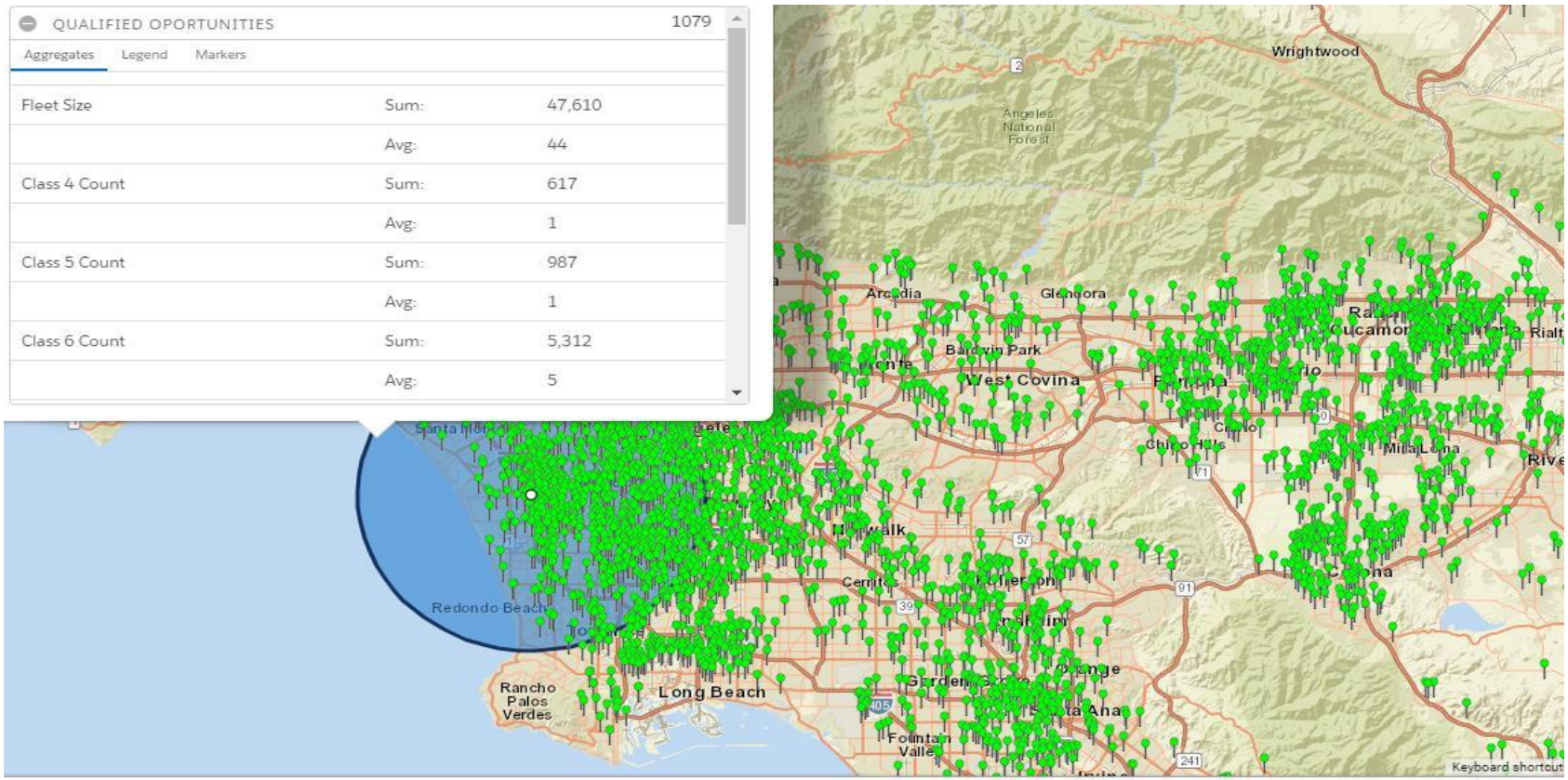


Class 2b – Class 8 Qualified Fleets

- Over **[1,980] qualified leads** in a 10-mile radius of the Statue of Liberty
- Approximately **[45,000] vehicles to electrify**, including [380] cargo vans, [3,110] shuttles, [610] Class 4, [3,480] Class 5, [4,650] Class 6, [7,400] Class 7, and [8,640] Class 8

Source: Company information.

Platform Internals



LAX Depot

- **Zeem holds a first-mover position with the largest operational commercial EV charging hub in the US**

Zeem's flagship LAX site is a multi-lot depot with several key attributes

- Operational since December 2021 and fully energized in February 2024
- Supports up to 550 third-party EVs with high-speed charging throughout the day
- Easy access to LAX, the I-405 and I-105 freeways with capacity for up to 170 electric medium and heavy-duty vehicles overnight
- Full-suite of depot services, including multiple maintenance bays at both sites and vehicle washing services

Key Stats:

78 Fast-Charging Ports	**53** Level 2 Chargers	**7.5 MW** Utility Interconnection
3.1 Acres Combined	**170** Depot Services Capacity	**550** Contract Charging Capacity

Leading Infrastructure Operator

Zeem Is Accelerating Electrification by Providing Customized Solutions for Fleets in the US

- ✓ 78 Direct Current Fast Charging (DCFC) and 53 Level 2 chargers in operation
- ✓ Over 7,700 vehicles served
- ✓ 26,000 charging sessions with 1 GWh delivered in 2023
- ✓ Over 680 Mt of CO_2e avoided
- ✓ 7 depots under active development
- ✓ Near-term pipeline representing >150 GWh dispensed annually

Real Operational Experience

Zeem's management team has substantial knowledge and insights into fleet EV demand and deployments, enabling Zeem to identify, select and build sites near demand hotspots

Unmatched Customer Understanding

Over the past 24+ months of delivering exceptional service to leading national fleets, Zeem has fine-tuned its business model to meet customers wherever they are on their electrification journey

Trusted Fleet Manager

Zeem supports customers throughout every stage of fleet electrification, from consulting on vehicle selection to engaging with utilities to handling significant aspects of infrastructure development and fleet operations

Reliable Services

A 24 / 7 / 365 focus on providing premium fleet charging services that enable an excellent customer experience, improved charger and vehicle uptime and site safety

The Zeem Solution

- **Zeem provides comprehensive charging solutions by developing shared depot and in-yard infrastructure for fleets**

Marketplace Challenges

Complex Fleet Electrification Process	Lengthy Utility Power Upgrade Timelines	Expensive Infrastructure	Poor Charging Infrastructure Operations

Zeem Solutions

EV Transition Planning

Identify priority routes for EV transition

Vehicle selection consulting

Identify financing solutions and incentives

Advise on depot, in-yard or mixed solutions

Optimized Infrastructure

Identify sites with optimal attributes and access to power

Site procurement, design and construction

Navigate real estate owners, utilities and regulators

Help customers reduce costs through co-located solutions

Reliable Operations

Comprehensive charging management

Service and preventative maintenance

Supervised overnight EV parking

Lounge and shared office with amenities

2023 Real-World Results

- **26,000+** Charging Sessions
- **7,700+** Vehicles Served
- **1,000+** MWh Delivered
- **680+** Mt of CO_2e Avoided

Source: Company information.

Infrastructure Challenge

- Utilities cannot move fast enough to provide power for new EV charging sites
- Zeem is working with vendors and suppliers to provide power for EV charging in advance of utility upgrades using containerized power, Hydrogen or Batteries
- Pairs of battery containers operate in tandem – one discharges at a depot to charge EVs while the other travels a short distance to a charging hub, is recharged, and is returned to the depot – then the cycle repeats every 3 to 4 hours
- A charging depot needs 1 MW to charge 30 Class 8 trucks overnight
- Zeem is developing sites with 10+ MW capacity to serve as charging hubs and building sites at power plants owned by Arclight
- An initial demo program is planned with LAWA at LAX to start this year

Description sample #1

Scalable

- 150kW scalable to MWs

Environmentally friendly

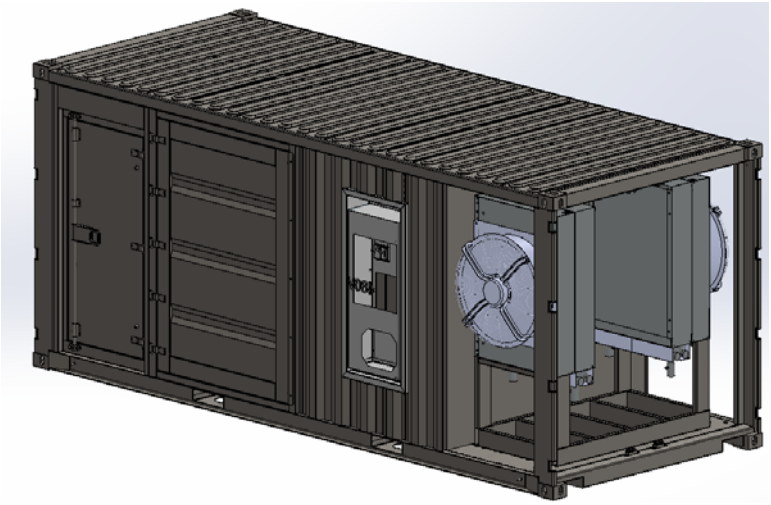
- No local emissions
- Carbon emissions of 0-95 gCO2e/MJ.

No permanent infrastructure

- Transportable containerized units

Unmatched energy density

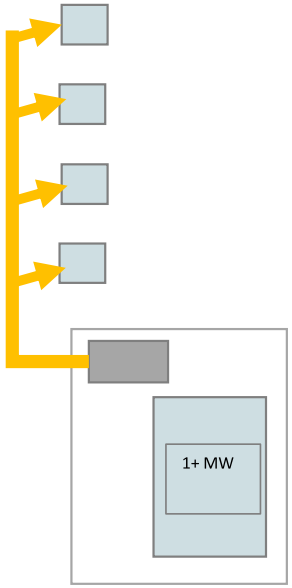
- 3.6MWh per day from 20’ container
- 48MWh stored in 9,000g fuel tank



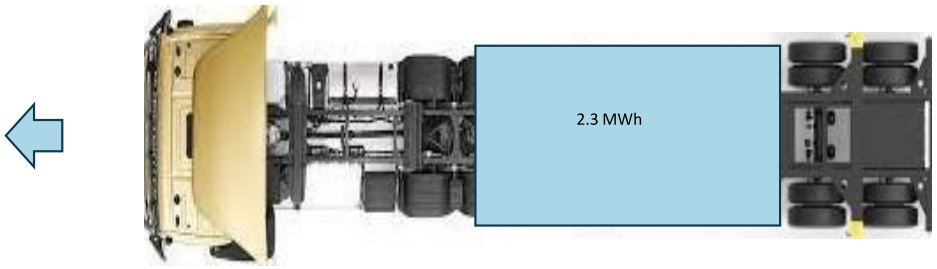
Performance	
Base Power Output	150kW
Peak Power Output	300kW
Output Voltage	AC 480v, 3-phase
Demand Response	Immediate
Operating Conditions	-40F to 120F

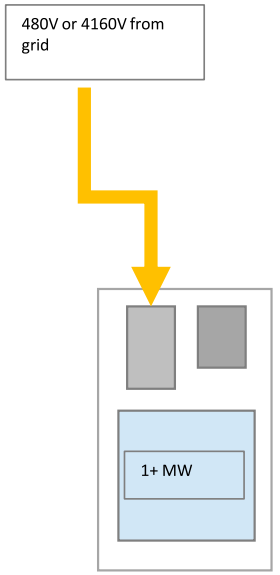
KCE150 – 150kW base load with 300kW peaking

ROLLING BATTERIES PROVIDE 1 MW FOR EV DEPOT WITHOUT GRID CONNECTION



EV Depot

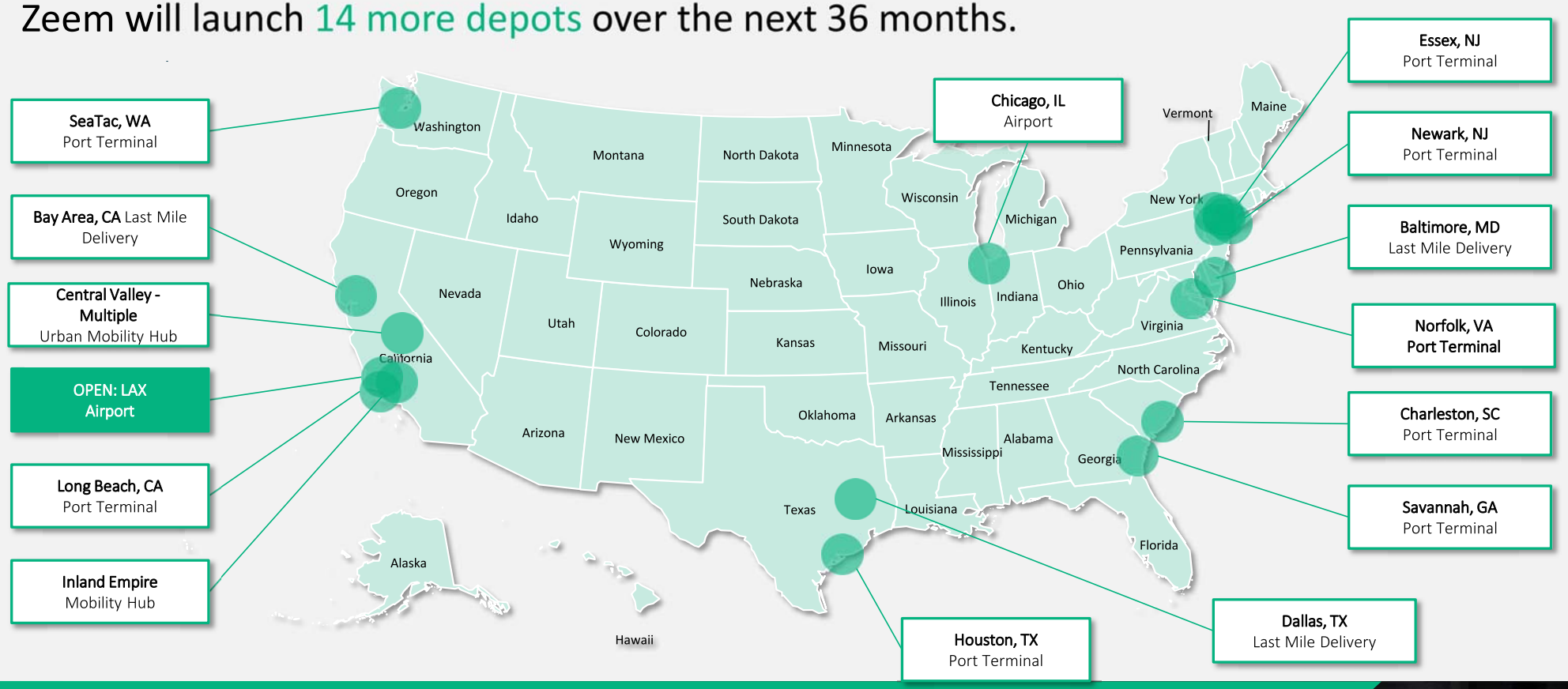




Power Hub

Taking Our Network Coast to Coast

Zeem will launch 14 more depots over the next 36 months.



Agenda Item 1e. International Maritime Organization's Role in Shipping Emissions

International Maritime Organization's Role in Shipping Emissions

Galen Hon
U.S. Department of Transportation Maritime Administration

2024 South Coast AQMD Board Retreat
May 9, 2024

Galen Hon
U.S. Department of Transportation Maritime Administration

Mr. Hon has 20 years of experience developing technically focused strategy and policy for the maritime sector spanning leadership and technical roles with NGOs, private industry, and government.

With the US DOT's Maritime Administration (MARAD), he develops and manages projects for the Maritime Environmental and Technical Assistance Program. His project portfolio focuses primarily on climate change, energy transition, and air quality and he serves as a subject matter expert on these issues for the Administration.

In addition to this work, Mr. Hon co-leads a US interagency team drafting a domestic maritime climate action plan and represents MARAD on the US delegation to the International Maritime Organization's (IMO) Marine Environmental Protection Committee. At the IMO, Mr. Hon is on a small team with the State Department developing and negotiating IMO's emerging greenhouse gas regulations.

Regulating Air and Climate Emissions at the International Maritime Organization (IMO)

SCAQMD Board Retreat

9 May, 2024

Galen Hon

Office of Environment and Innovation
United States Maritime Administration

1200 New Jersey Ave., SE | Washington, DC | 20590

marad.dot.gov

MARAD
U.S. MARITIME ADMINISTRATION

Introduction

MARAD

About me:

- 20+ years in ports and maritime
- Specialized in air quality, climate, and energy strategy and policy
- Led maritime programs for the Rocky Mountain Institute, and International Council on Clean Transportation (ICCT).
- 8 years as strategic and technical consultant for industry on air and climate
- 14 years at the IMO, representing ports, NGOs, industry, government
- Currently serving on the US delegation on behalf of DOT's MARAD

Presentation Overview

Regulating Emissions at the IMO:

- Introduction to MARAD and the IMO
- Overview of Vessels and Regulations
- History of IMO Emission Regulatory Activity
- Current Work on Emissions at the IMO
- Related Activities and Paths for Engagement

US DOT's Maritime Administration

MARAD

U.S. Department of Transportation

National Highway Traffic Safety Administration (NHTSA)

Federal Aviation Administration (FAA)

Federal Highway Administration (FHWA)

Pipeline and Hazardous Materials Safety Administration (PHMSA)

Federal Motor Carrier Safety Administration (FMCSA)

Federal Railroad Administration (FRA)

Federal Transit Administration (FTA)

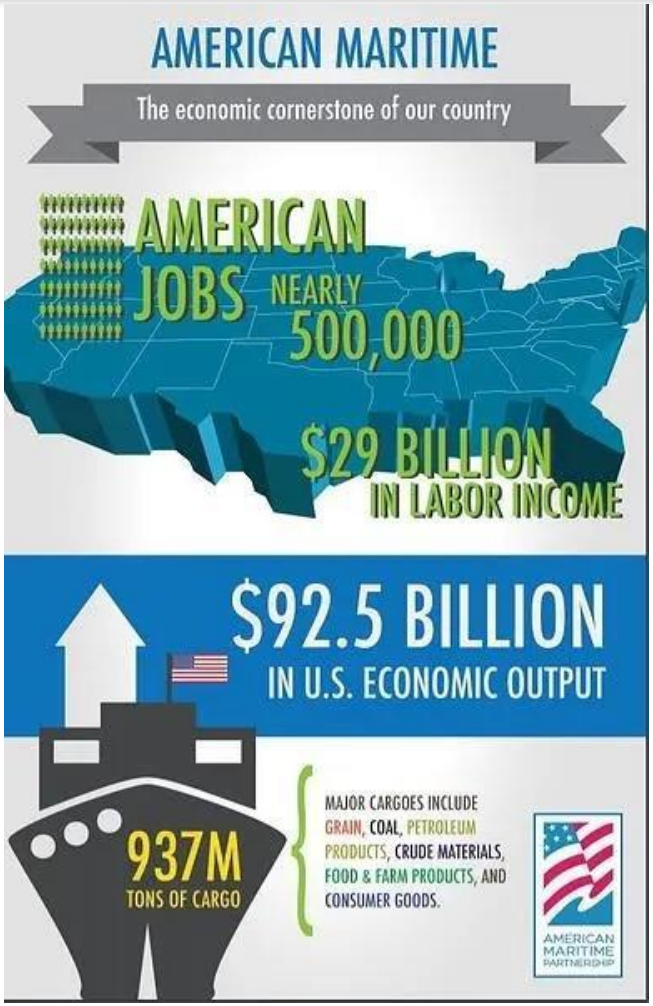
U.S. Department of Transportation
Maritime Administration

Established: 1950

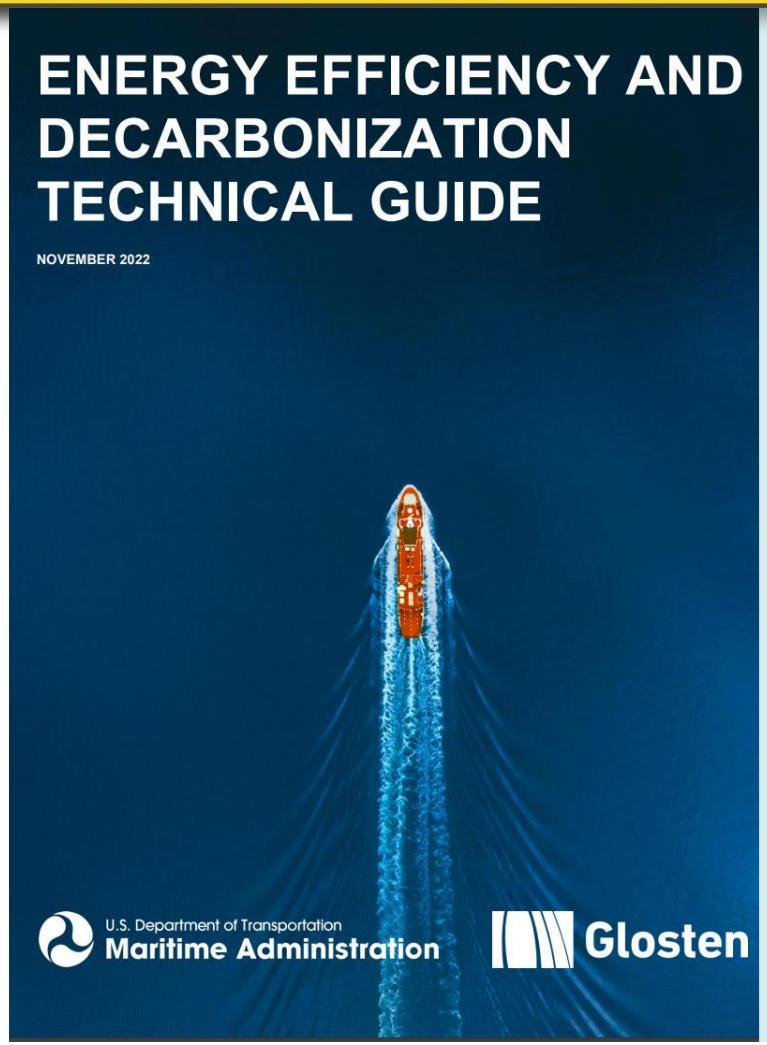
Mission: To foster, promote and develop the *maritime industry of the United States* to meet the nation's economic and security needs

The US Fleet: Smaller vessels, big impact

MARAD



MARAD: Office of Environment & Innovation



MARAD

Maritime Environmental Technical Assistance Program (META):

Maritime Energy Transition Collaborations

- **Vessel Energy Efficiency and Decarbonization Guide**
  - Completed 2022
- **Microgrid Demonstration**
  - Pasha Operations at POLA
- **Smartships GHG Emissions Calculator**
- **Global Routing Energy and Emission Network for Transportation (GREEN-T)**
- **Battery Electric Workboat Techno-economic Analysis**
- **Vessel Carbon Capture and Storage**
- **Future Energy Options Studies**
  - Great Lakes
  - California

IMO: Regulating the Global Fleet

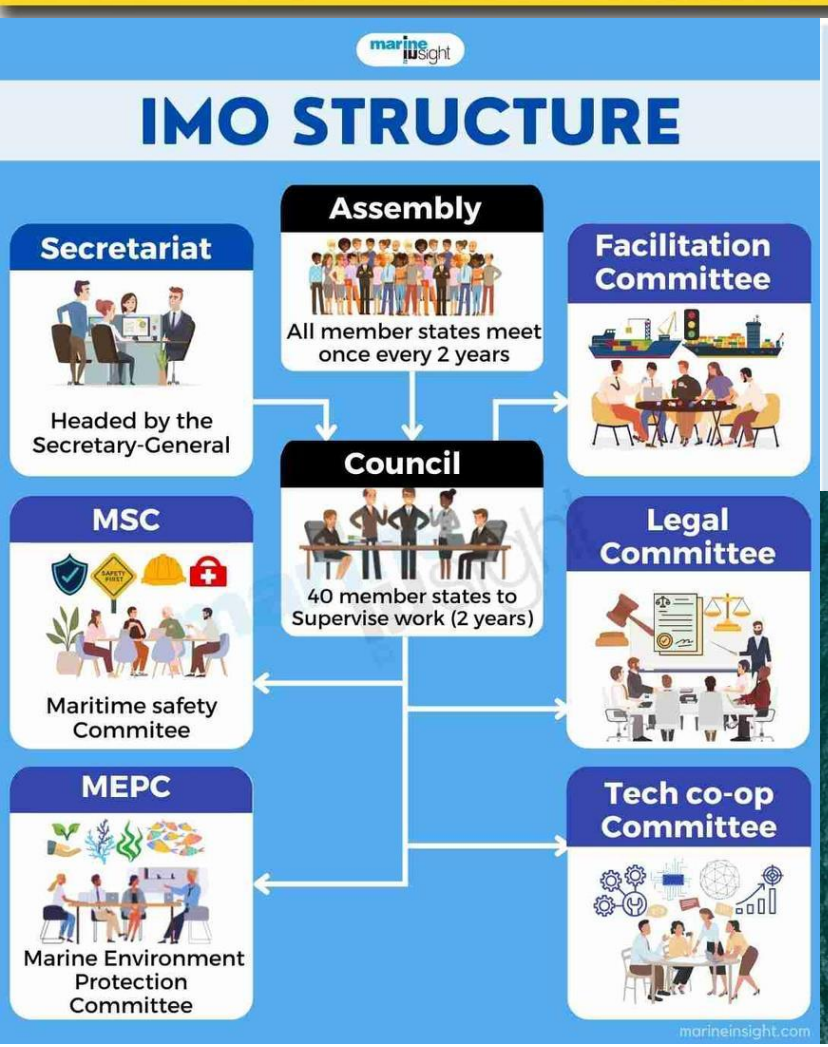
MARAD

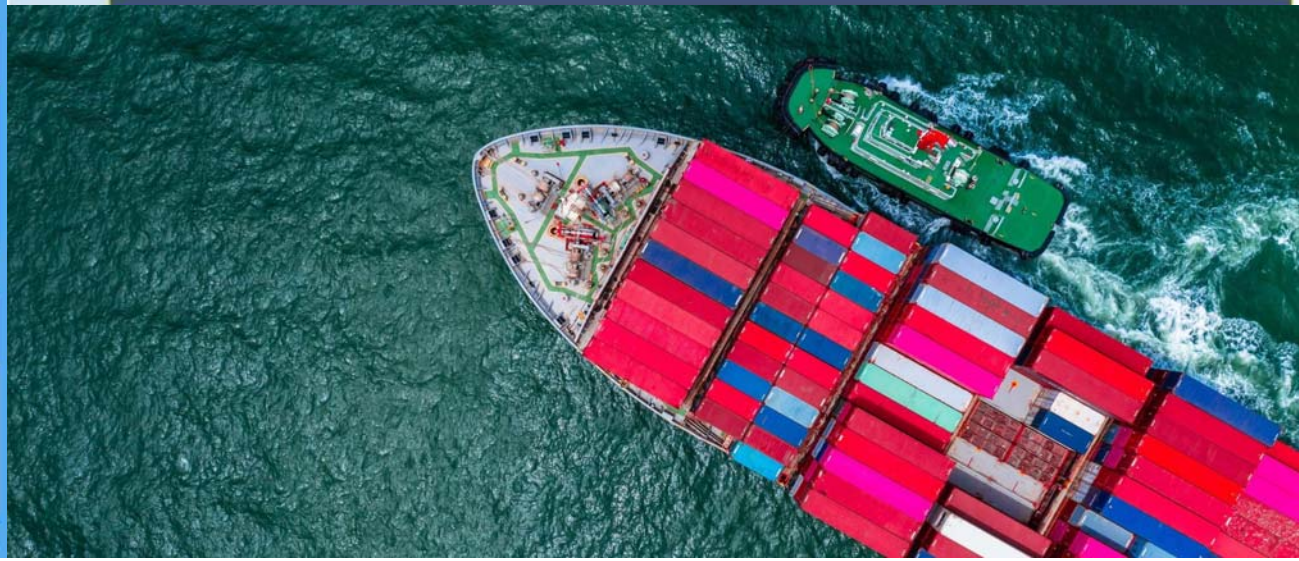
IMO

INTERNATIONAL MARITIME ORGANIZATION

IMO Organization, Governance and Outputs

MARAD



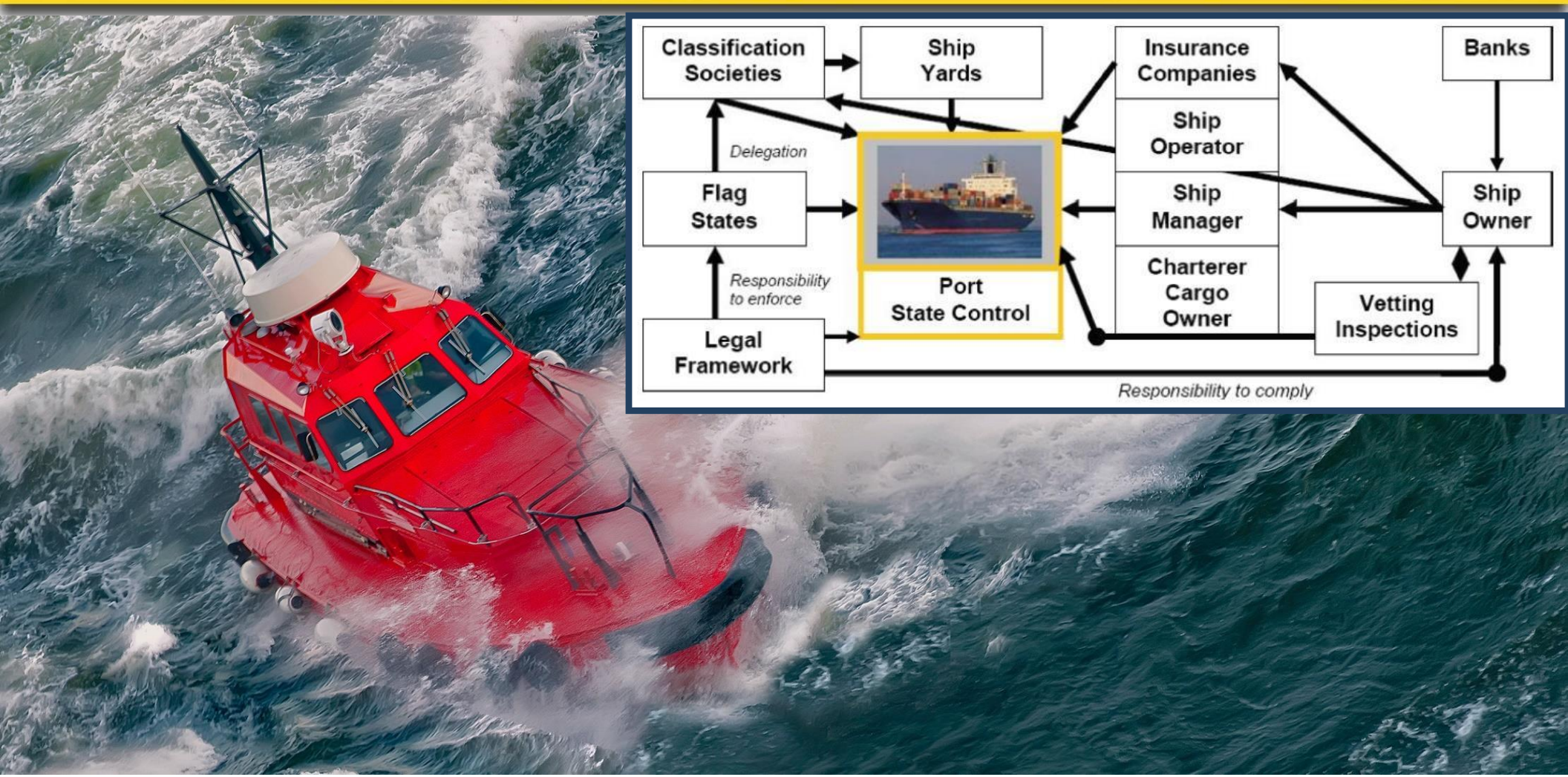


IMO: A Complex Organization for Complex Issues

MARAD

Layers of regulation and enforcement authorities

MARAD



IMO Regulations for *MAR*ine *POL*lution: "*MARPOL*"

MARAD

The International Convention for the Prevention of Pollution from Ships (MARPOL) contains six annexes:

OIL
ANNEX I
Prevention of Pollution by Oil (entered into force 2 October 1983)

SEWAGE
ANNEX IV
Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003)

NOXIOUS LIQUID SUBSTANCES
ANNEX II
Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983)

GARBAGE
ANNEX V
Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988)

HARMFUL SUBSTANCES
ANNEX III
Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992)

AIR
ANNEX VI
Prevention of Air Pollution from Ships (entered into force 19 May 2005)

- IMO was founded in 1948, but its **first effort on environmental regulation started in 1973,** targeting discharges of oil
- Subsequent regulations address other types of pollution to water.
- **Air pollution regulation came later, starting in 1997**, which would begin to address **SOx, NOx, and PM emissions,** leading to ANNEX VI of MARPOL
- Subsequent amendments to MARPOL Annex VI have strengthened these protections.

US Engagement at IMO

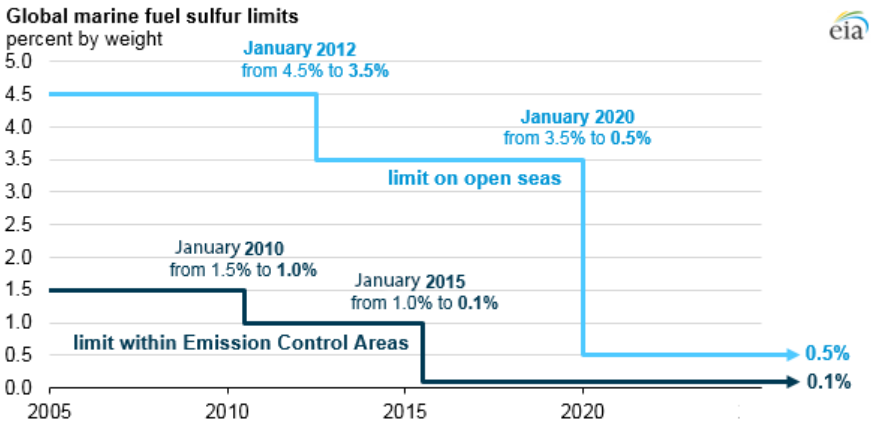
MARAD

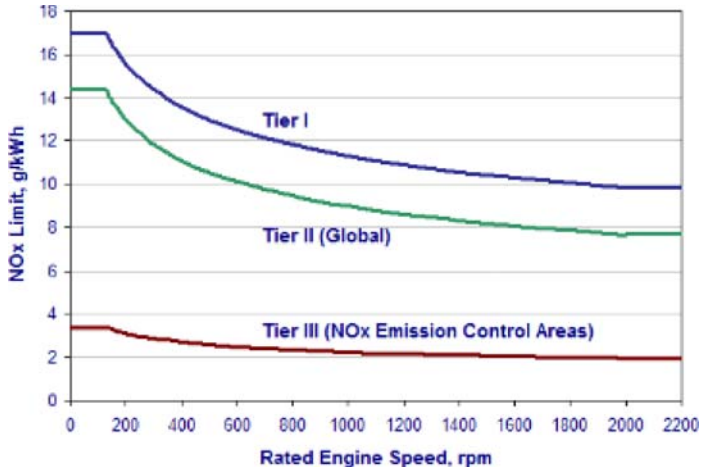
- 176 “Member States” at the IMO, like the United States, are comprised of delegations that contribute specialized knowledge to policy and technical committees and working groups to address specific issues.
- The US delegation is led by the USCG and, for environmental regulations, supported primarily by NOAA, EPA, and MARAD.
- Any Member States can raise concerns and weigh in substantively on potential ways to address those concerns.

Limits of IMO Authority

- **IMO regulations only apply to:**
  - Large vessels
  - Internationally trading vessels
  - Vessels owned by and operating among signatories to the MARPOL convention
- Individual countries **can pass MORE stringent regulations** for international vessels that are **registered in that country**. Most countries do not because it is a major competitive disadvantage.
- Countries can also have more or less stringent regulations for domestic vessels that are not covered by

Air Quality Regulation at IMO

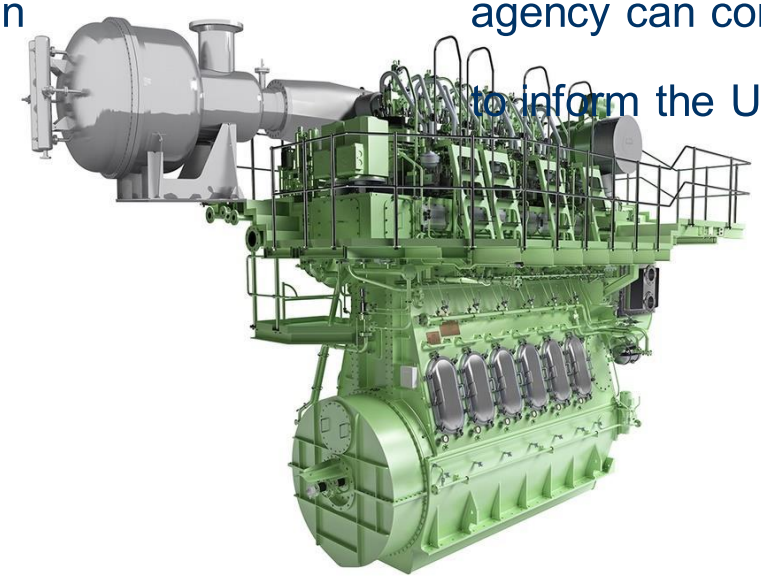




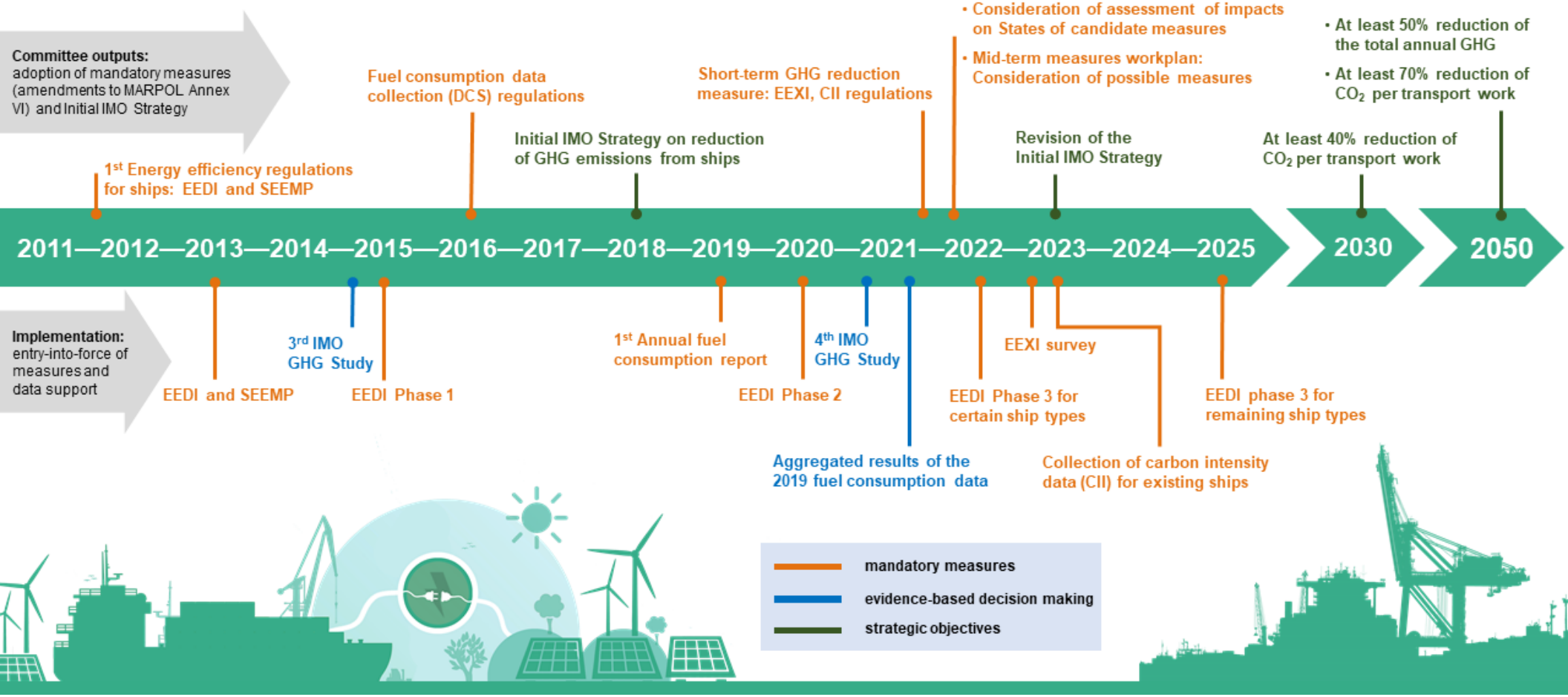
- Regulations for **Sulfur Oxides (SOx)** are addressed through fuels standards or exhaust treatment (scrubbers).
- Apply to **ALL vessels**, with more stringent standards for Emissions Controls Areas (ECAs) like in the US
- Regulations for **Nitrogen Oxides (NOx)** are addressed with engine modifications and/or exhaust treatment technologies
- NOx standards apply ONLY to **new ships** built after a certain date (2016 for highest standards) and are more stringent in ECA areas.
- In general, major new environmental regulation at the IMO **takes 8-10 years** to fully enter into force IF everyone is generally supportive.

IMO Regulations - Beyond Implementation Dates

- Even with the long development and phase-in for regulations, the complexity of technologies, regulatory language, and the industry overall requires continual work and adjustment to the regulation
- With NOx Tier III regulations, IMO is actively working to solve new issues, such as emissions at low speed
- While EPA leads the US work on these issues, any agency can contribute research and suggestions to inform the US position through EPA.

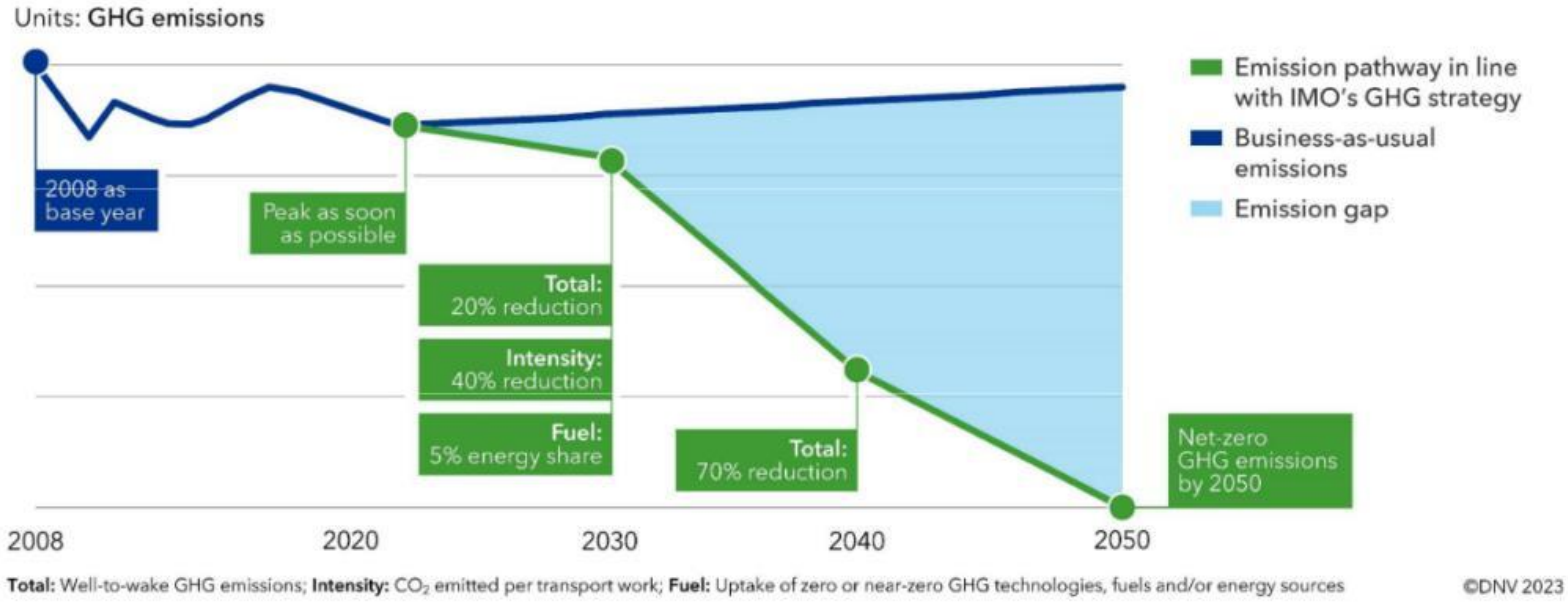


Climate Regulation at the IMO



IMO's 2023 "Revised Strategy" for GHGs

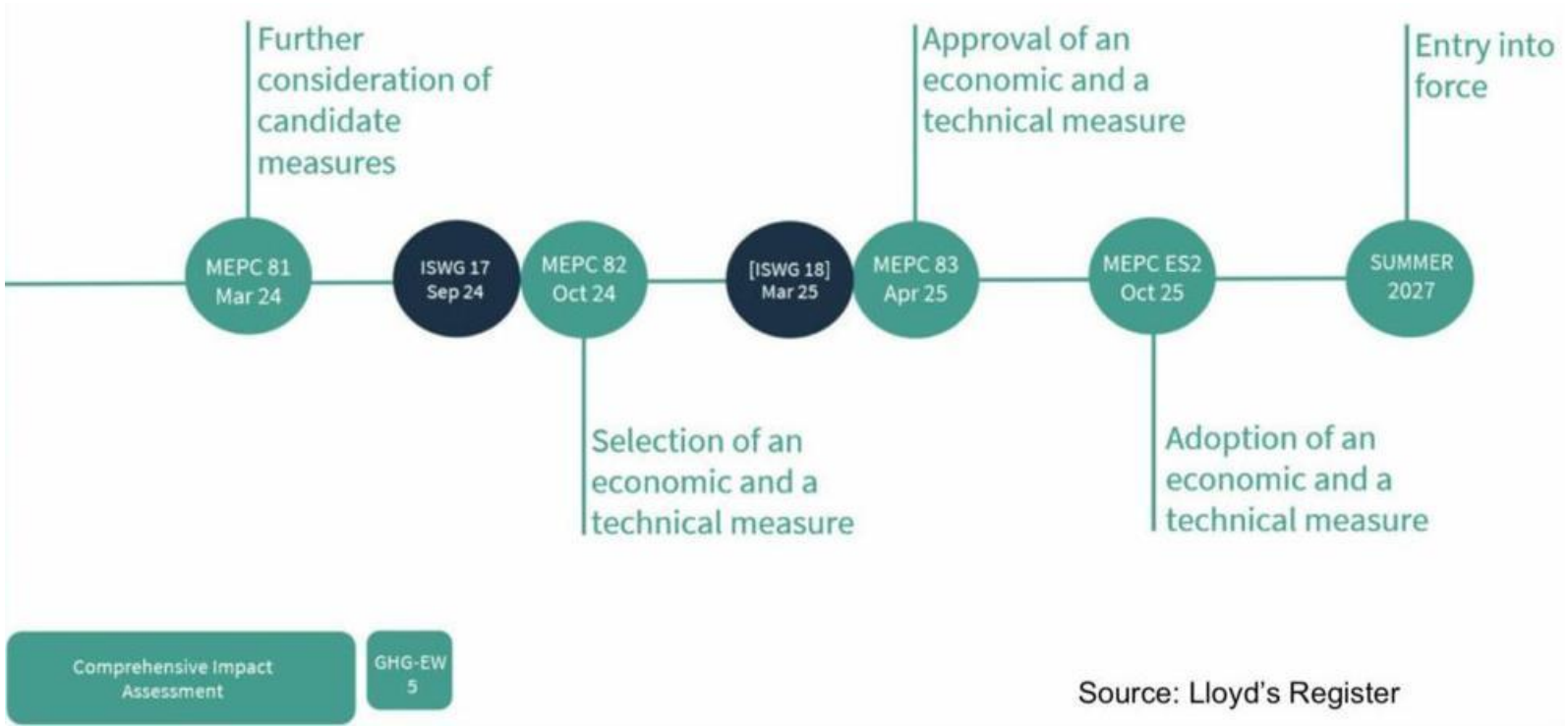
- US and IMO aligned with goal to achieve net zero by 2050.
- IMO 2023 Revised GHG Strategy: decarbonization with interim "checkpoints"



Beyond Regulation at IMO

- Beyond regulation, IMO is a significant **convening body** for maritime issues.
- These are climate-related initiatives, but there are many more for safety, security, and other topic areas.

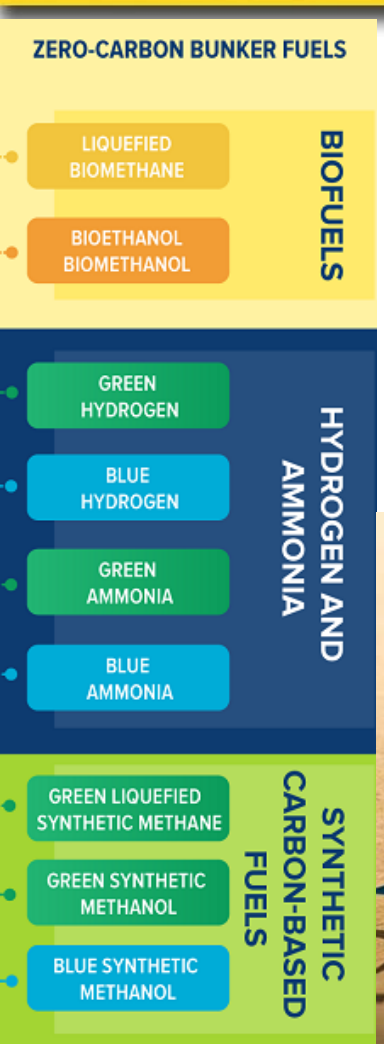
Timeline and Key Elements of IMO GHG Regulation



Source: Lloyd's Register

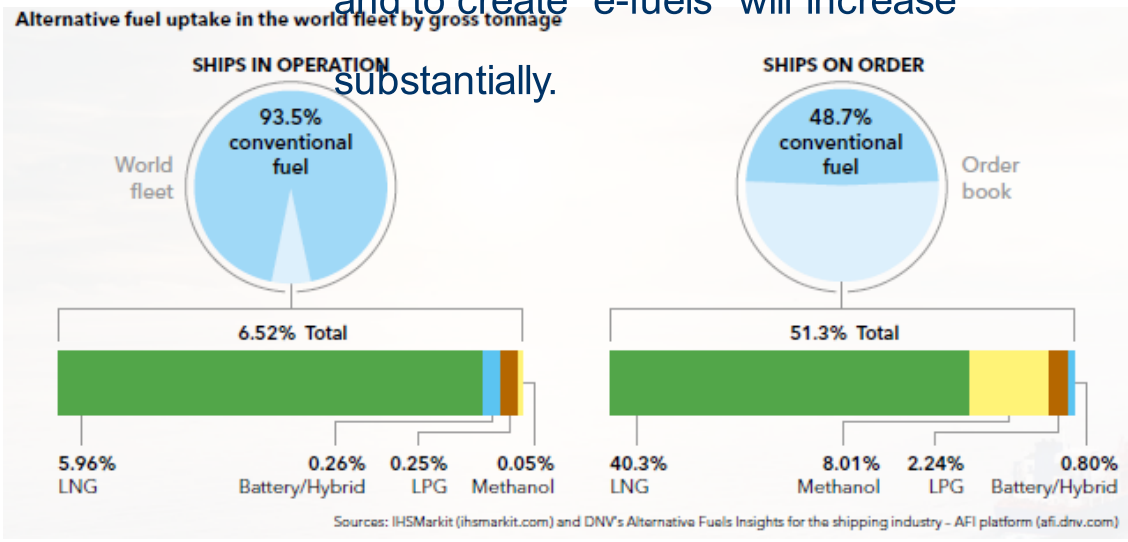
IMO GHG Regulations: Implications for the U.S.

MARAD



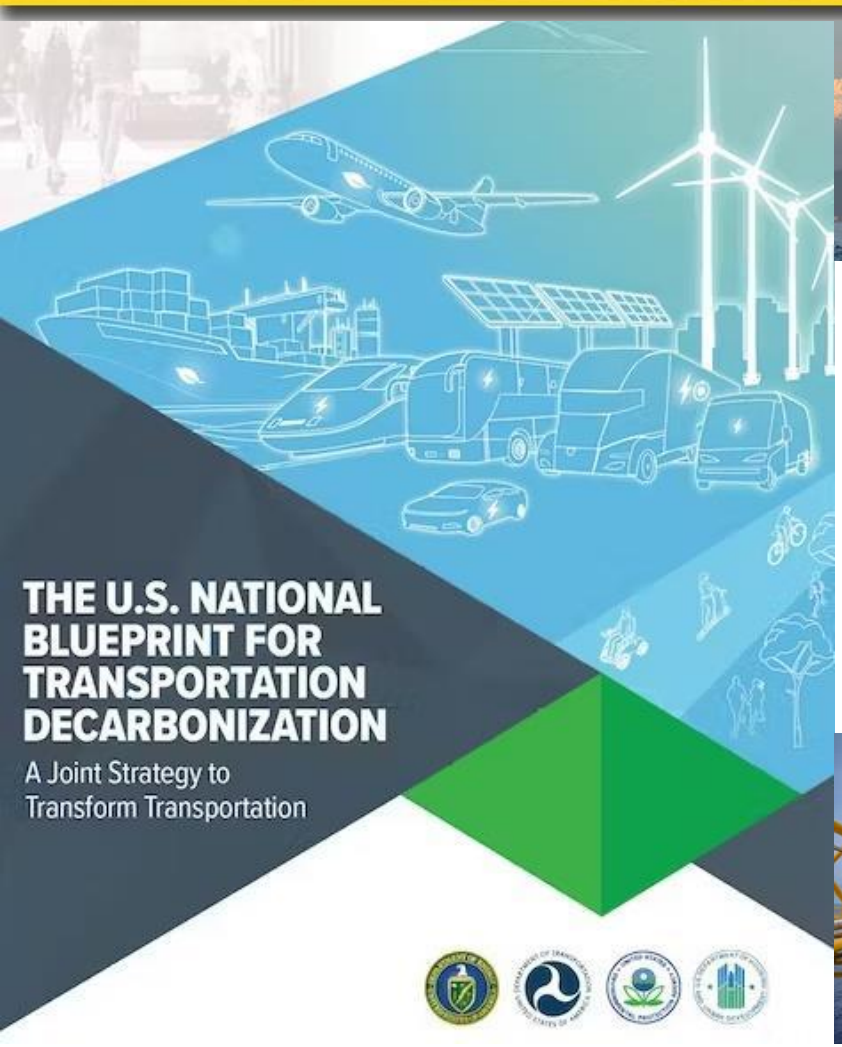
- New fuel types will develop and deploy quickly to supply international vessels
- A "de-facto" **carbon price** will make these fuels much less expensive for the international market

- **Rising volumes and price reduction** will affect supply and uptake for domestic maritime fleets - and potentially for on-road vehicles.
- **Demand for electricity**, for charging and to create "e-fuels" will increase substantially.



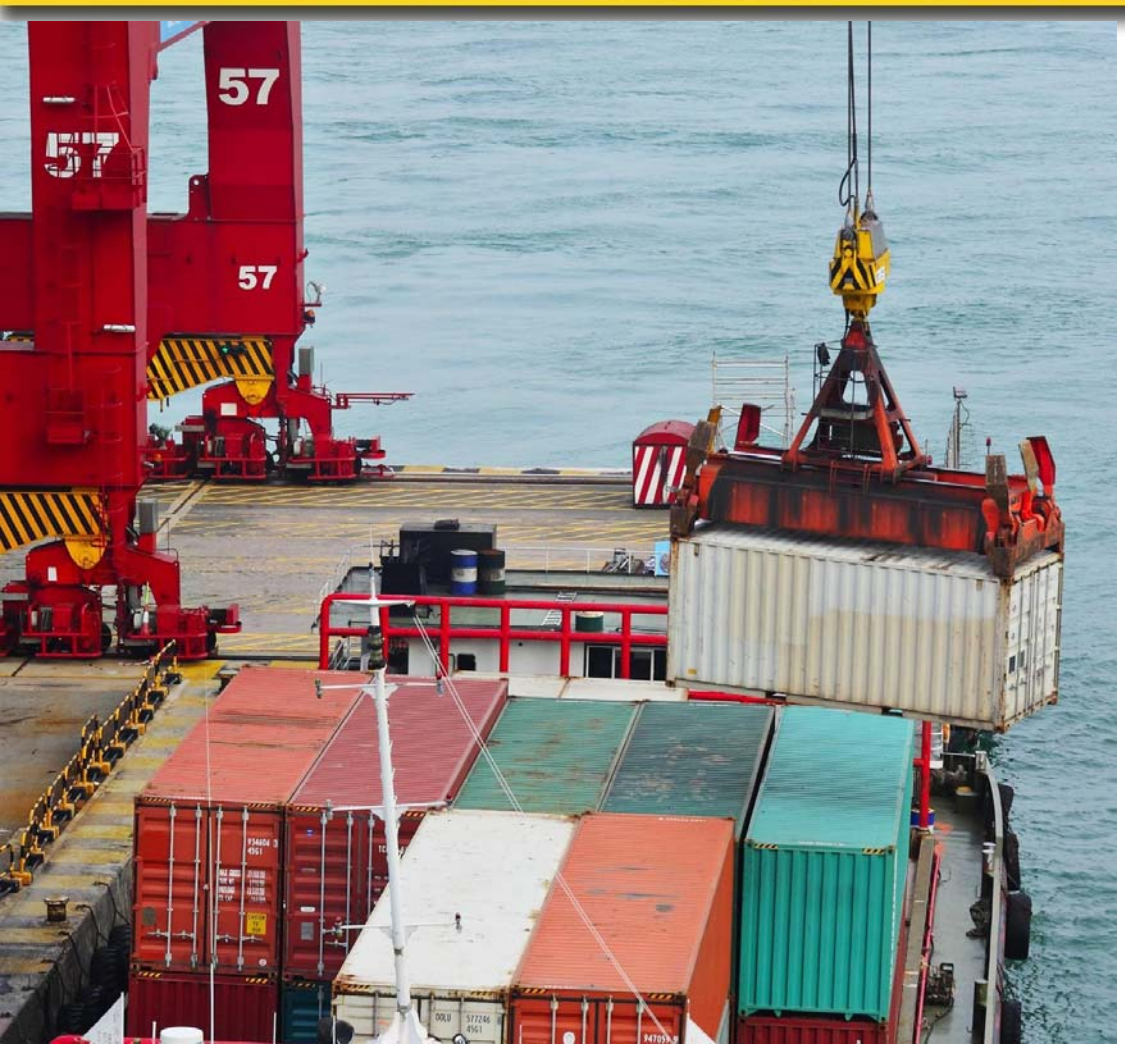
US Interagency “Maritime Action Plan”

MARAD



- Building on the “US National Blueprint for Transportation Decarbonization” an interagency team is creating a plan with **specific actions and milestones** needed to achieve national goal of “net-zero GHG emissions by 2050.”
- Plan will be released late-August, 2024

Summary



- IMO is a **complicated but effective** governing body for *international shipping*
- The IMO regulatory process is necessarily **complex and time consuming**, but produces **robust and practicable** outcomes
- Air quality and climate regulations at IMO continue to **evolve with changing needs**, demonstrates that IMO can manage both technical and highly political issues
- The **US continues to play a central role** in developing environmental regulation that is

Thank You

MARAD

Galen Hon

Office of Environment and Innovation

United States Maritime Administration

galen.hon@dot.gov

Agenda Item 1f. Role of Hydrogen in the Road to Zero Emissions

Role of Hydrogen in the Road to Zero Emissions

Matt Miyasato
FirstElement Fuel

2024 South Coast AQMD Board Retreat
May 9, 2024

Matt Miyasato, Ph.D.
FirstElement Fuel

Dr. Matt Miyasato is the Chief Public Policy & Programs Officer for FirstElement Fuel and leads the government affairs activities, interfacing with public agencies on strategic hydrogen policies, as well as directly managing grant and incentive opportunities. In this role, Dr. Miyasato is helping to implement the state's aggressive hydrogen and fuel cell policies, deploy hydrogen stations with local air agencies, and expand FirstElement Fuel's presence into other regions. Dr. Miyasato also represents FirstElement Fuel at industry organizations, conferences and with the public.

Prior to joining FirstElement Fuel, Dr. Miyasato served as the Chief Technologist at the South Coast Air Quality Management District, the largest local air district in the United States. In that capacity, Dr. Miyasato led the research, development, demonstration and deployment program and initiated many large programs for early hydrogen refueling and zero-emission vehicles. Dr. Miyasato served as the District's representative on the EPA's Mobile Source Technical Review Subcommittee, the Hydrogen Fuel Cell Partnership, the California Stationary Fuel Cell Collaborative, Veloz, the Natural Gas Vehicle Partnership, the Ports Supply Chain Technical Working Group, CalStart, as well as many other ad hoc advisory groups.

Dr. Miyasato earned his Bachelors, Masters and Ph.D. from UC Irvine in Mechanical Engineering. He also previously worked at Southern California Edison, UC Irvine and General Electric.

Hydrogen in Marine Port Applications

South Coast AQMD Board Retreat
May 9, 2024

FIRST ELEMENT FUEL

Matt Miyasato, Ph.D.
Chief Public Policy & Programs Officer

FirstElement Fuel: Who We Are

We are Driven...

To foster the widespread adoption of hydrogen across all energy sectors.

To improve the economics of fuel and energy consumption and reduce its footprint on our planet. To change the energy industry.

And with it, the world.

Funding Partners

MITSUI & CO. · JBIC · MUFG · JII · NIKKISO · Air Liquide · TOYOTA · HONDA · South Coast AQMD · Bay Area Air Quality Management District

- Founded in California in 2013 to build & operate a hydrogen station network with a focus on the customer.
- Initial financing from OEMs (Toyota and Honda) and California Agencies. Private financing has grown to over $340M.
- 130 Employees.
- Launched our True Zero brand, which represents the largest hydrogen network in the world, greater than 80% market share in California.
- Created world-leading proprietary hydrogen station designs and SOPs to improve performance and increase scale
- Developed and currently owns assets of more than $25 Million in upstream supply
- Operates the True Zero Hydrogen Innovation Center to conduct R&D and in-house fabrication

FIRST ELEMENT FUEL

Driving Innovation in the Hydrogen Refueling System

Over the past 10 years FirstElement has driven innovation to develop a commercially viable system for hydrogen supply and refueling, after quickly discovering that none existed.

First Generation Retail HRS
Equipment Supplier Design
200 kilograms per day
1 Dispenser
Supplied by gaseous hydrogen

Hydrogen Station Systems that were available at the time were not commercially viable as cars began to enter the marketplace.

High Capacity Retail HRS
FEF Proprietary Design
1,600 kg/day capacity
4 Dispensers
Supplied by liquid hydrogen

To enable suitable performance, scaling, and repeatability, FEF developed the first commercially viable network of liquid hydrogen, cryopump-based stations. Fast fills, simultaneous refueling, higher volume overall.

Commercial Vehicle HRS
FEF Proprietary Design
18,000 kg/day capacity
2 HD Truck Dispensers + 4 MD/LD Dispensers
Supplied by liquid hydrogen

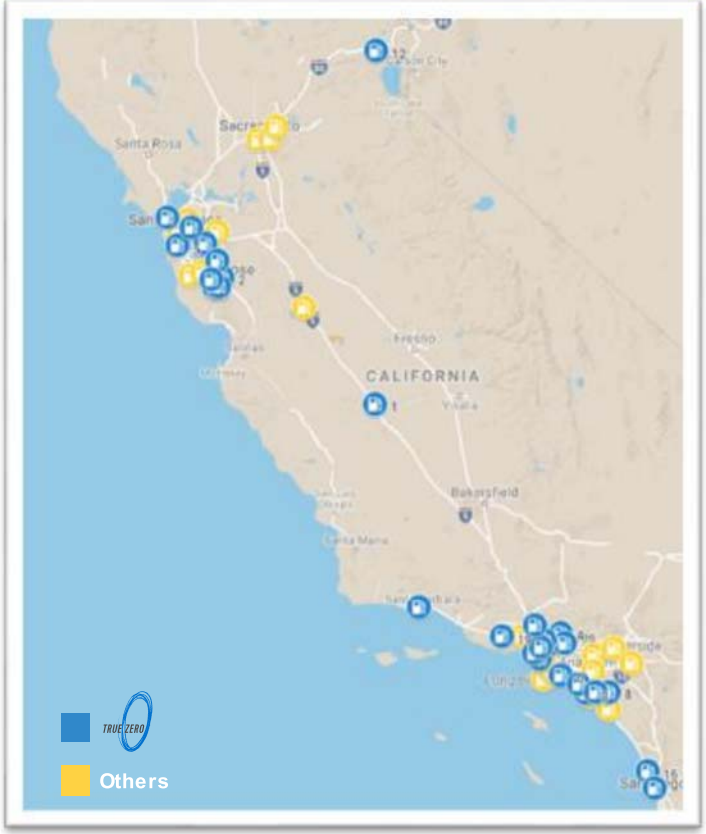
Technology developed by FEF to achieve scale and performance has enabled the development of commercial-scale hydrogen truck stop.

Implementation of the FEF Hydrogen Refueling System

FEF has been putting our hydrogen refueling system into practice.

- 41 retail station locations with 92 dispensers in operation supporting over 16,000 fuel cell vehicles
- 1 Truck Stop near opening, 2 Truck Stops in development, and 12 more Truck Stops in Development
- All trucks stops are planned to have a fueling island for light duty/commercial vehicles as well

Network Spans Key Markets in CA



Records Set by FEF to Date

*Zero Emission Vehicle

Hydrogen Dispensed	6.8 Million kilograms
Vehicle Fills	2.49 Million
ZEV* Miles Driven from FirstElement's Stations	442 Million
Single Day Record at one station	857 kilograms 317 fills
Single Day Record across FirstElement's Network	6,112 kilograms 2,226 fills
Monthly Record across FirstElement's Network	162,850 kilograms 62,245 fills

Heavy Duty:

More than 200 demonstration fills on HD Trucks

Over 50 fills and more than 2000 kgs dispensed on HD trucks during past 30 days while commissioning FEF's first HD Truck Station

FIRST ELEMENT FUEL

Port of Oakland Hydrogen Station

FEF is opening the world's first Commercial Hydrogen Truck Stop at the Port of Oakland, CA

(1) 700 bar fills; (2) capable of simultaneous fast fills, back-to-back; (3) up to 200 trucks per day

- FirstElement Fuel Proprietary design including patented technologies
- Developed under the NorCal Zero project, in partnership with Hyundai, and funded by the CARB and CEC
- 18,000 kilogram per day pumping capacity: achieves simultaneous, back-to-back fast fills and supports up to 200 trucks per day;
- First Commercial Installation of High-Flow Truck Dispensers by Tatsuno: <10 min fills of up to 80 kilograms per fill;
- 2 HD Truck fueling positions and 4 MD/LD fueling positions;
- Commitment of 30 Hyundai trucks + refueling agreement signed with Nikola for a committed volume helps overcome the chicken-or-the-egg challenge

FUEL

Marine Port Applications

- Why Hydrogen?
  - Heavy payload
  - Fast refueling requirements
  - Range or duty-cycle

- Potential applications
  - RTGs
  - Top picks
  - “Wet hosing”

FIRST ELEMENT FUEL

FUEL CELLS OFFER MORE PAYLOAD & RANGE

Missions


Local-Haul


Yard Trucks / On-Site


Ports & Drayage


Regional Middle-Mile


Long-Haul

ZEV Truck Weight Capacity to Travel Different Distances

	FCEV			BEV			
	Pounds						
200 Miles	23k	2k	55k	53k	4k	23k	80k
250 Miles	23k	2k	55k	51k	5k	23k	80k
300 Miles	23k	2k	55k	50k	7k	23k	80k
350 Miles	23k	2k	55k	49k	8k	23k	80k
400 Miles	23k	3k	54k	47k	9k	23k	80k
500 Miles	23k	5k	52k	43k	14k	23k	80k
625 Miles	23k	5k	52k	39k	17k	23k	80k
750 Miles	23k	6k	51k	36k	21k	23k	80k
875 Miles	23k	6k	51k	32k	24k	23k	80k
1000 Miles	23k	7k	50k	29k	28k	23k	80k

Chassis Powertrain Payload

Fuel cells have higher payload capacity than BEVs, particularly for longer distances

Sources: KPMG Analysis; NREL

Courtesy of Hyundai

FIRST ELEMENT FUEL

FUEL CELLS NEED MUCH LESS SPACE TO REFUEL

Missions

Local-Haul

Yard Trucks / On-Site

Ports & Drayage

Regional Middle-Mile

Long-Haul

Estimated Size of Fueling Stations based on Technology (Port of LA/LB)

	FCEV	BEV
Square Acreage of Respective Sites Imposed over Port of Long Beach Terminal		
Hours in a Day	24	24
Time to Refuel (hrs.)	÷0.50	÷2.23
# of Trucks/Bay	48.0	10.4
# of Daily Trucks	6,511	6,511
# of Trucks/Bay	÷48	÷11
# of Chargers Needed	136	624
Total SQFT/Bay[1]	x 31,050	X 31,050
SQFT Required	**4.2M** *(97 Acres)*	**19.4M** *(445 Acres)*

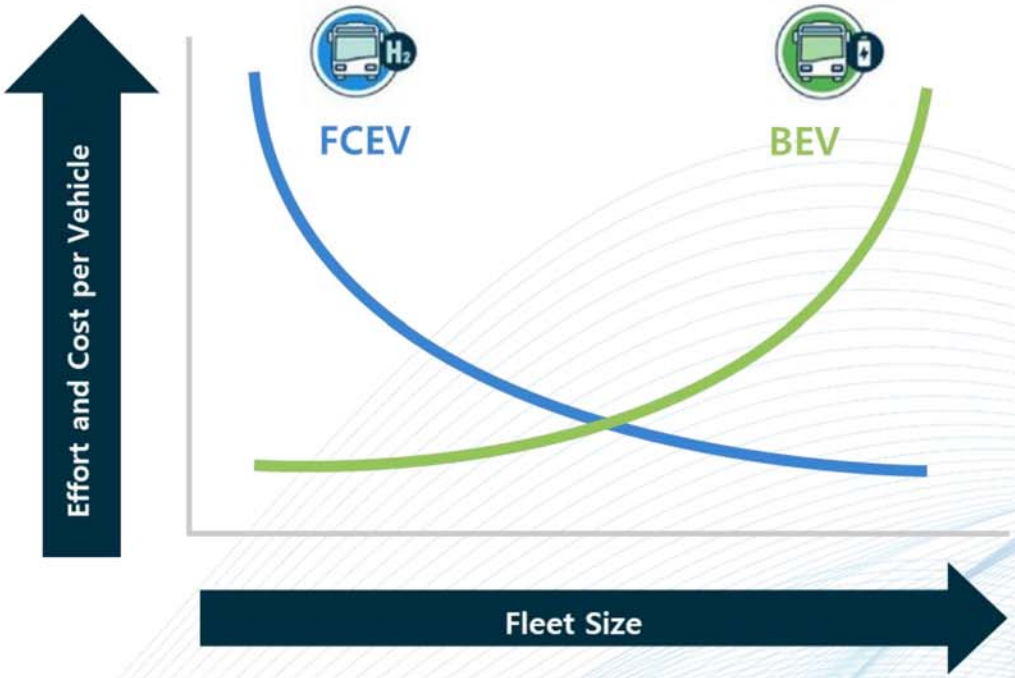
FCEV requires roughly 22% of space required by BEV to refuel vehicles

Notes: (1) Includes sq.ft per truck (655 sq ft) + sq. ft for egress, ingress, and parking space for waiting or dormant trucks (30,395 sq. ft)
Sources: KPMG Analysis; NREL (Port of New York and New Jersey Drayage Electrification Analysis)

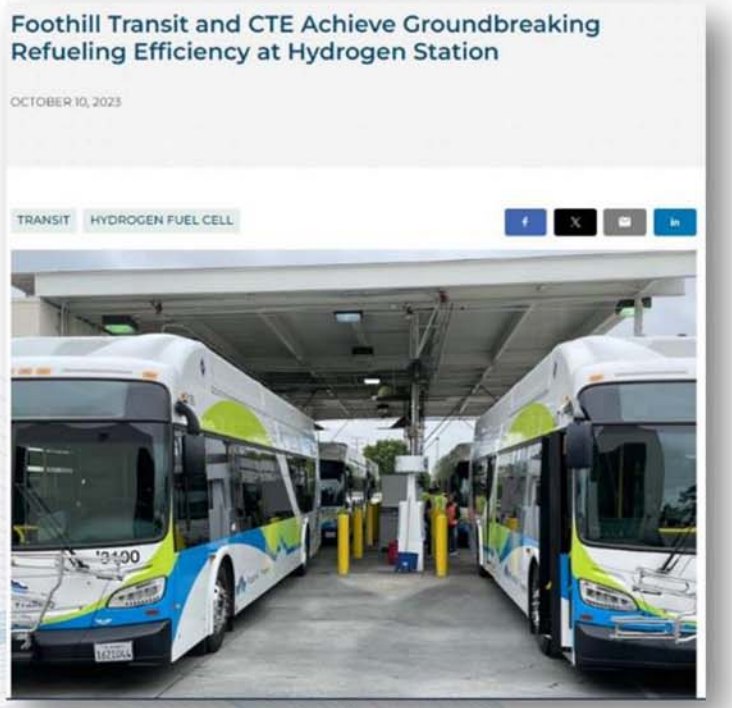
Courtesy of Hyundai

FIRST ELEMENT FUEL

FUEL CELL INFRASTRUCTURE PAYS OFF WITH SCALE



Source: CTE



Foothill Transit and CTE Achieve Groundbreaking Refueling Efficiency at Hydrogen Station

OCTOBER 10, 2023

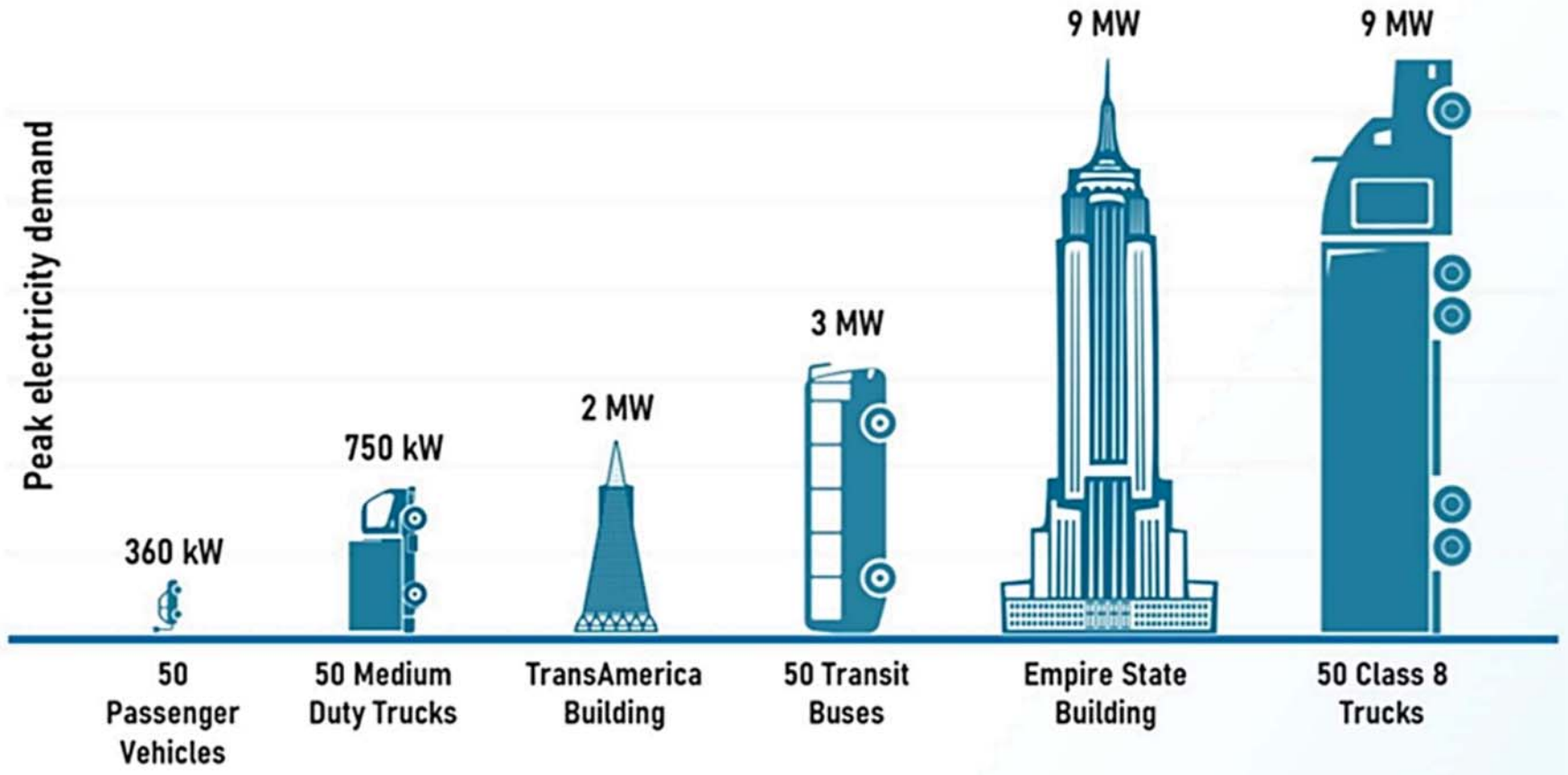
TRANSIT HYDROGEN FUEL CELL

During a recent performance test conducted by station developer Clean Energy (with technology support and design services from Messer), Foothill Transit successfully refueled 18 fuel cell buses back-to-back in a 90-minute timeframe. This was accomplished by utilizing two dispensers simultaneously, showcasing the station's efficiency and its commitment to seamless refueling operations. Using data from the performance test, CTE's models predict that Foothill will be able to achieve its standard fill of 19.1 kg of hydrogen in approximately 6.5 minutes.

Courtesy of Hyundai

FIRST ELEMENT FUEL

EV CHARGING IS A MAJOR CHALLENGE FOR HEAVY DUTY APPLICATIONS



~ 7,000 homes

Courtesy of Hyundai

FIRST ELEMENT FUEL

Hyster Fuel Cell Top Pick

- Fenix Marine at POLA
- 2 x 45 kW Nuvera fuel cells

Courtesty CTE

- CARB Climate Investment grant in 2018
- CTE submitted proposal to DOE for ”wet hose” concept

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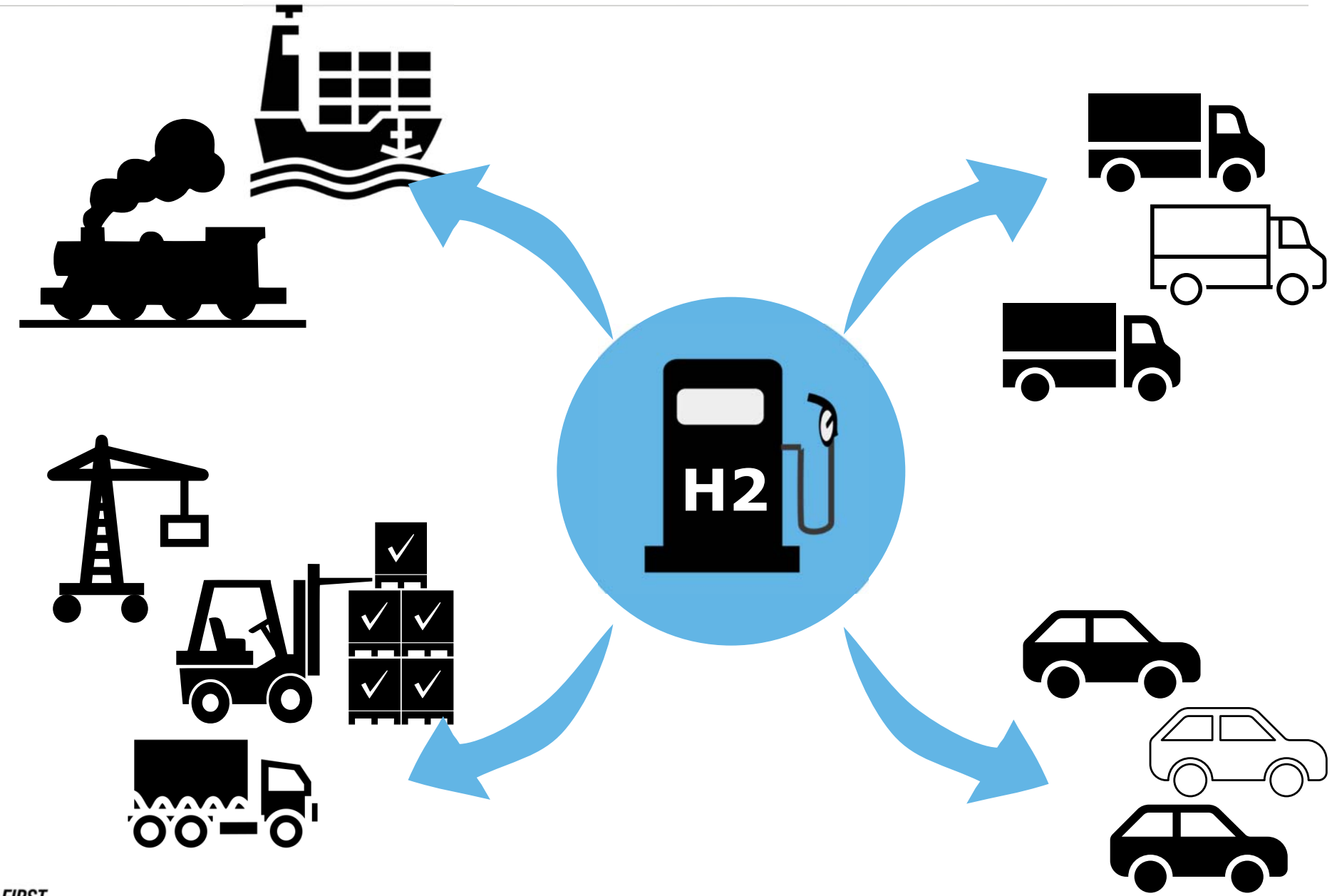
Port Hydrogen Refueling Hub Concept



FIRST ELEMENT FUEL

Challenges

- Sources of H2
- Distribution
- Footprint
- Cost
- Demand – commercial products
- Supply chain
- Incentives

FIRST ELEMENT FUEL

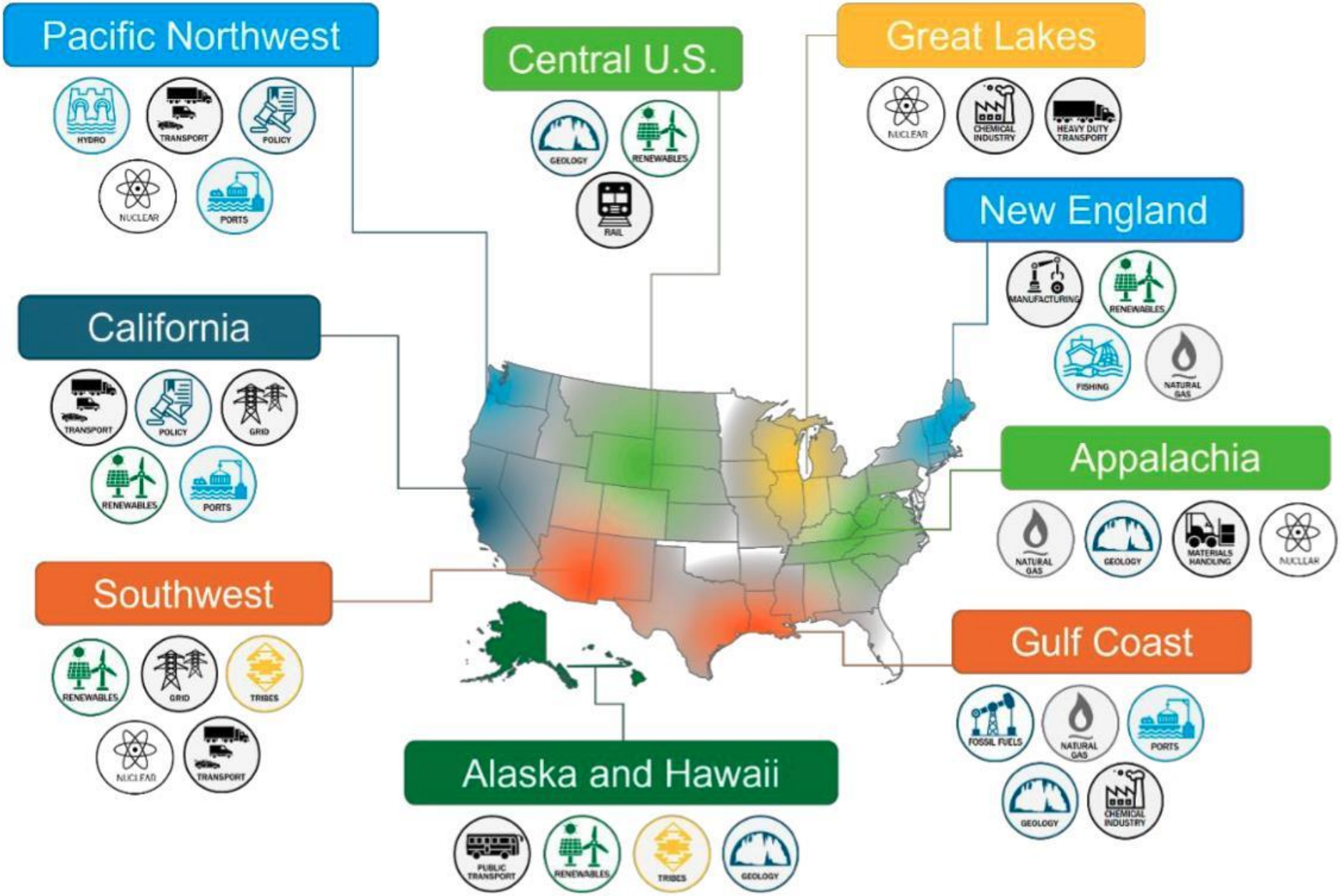
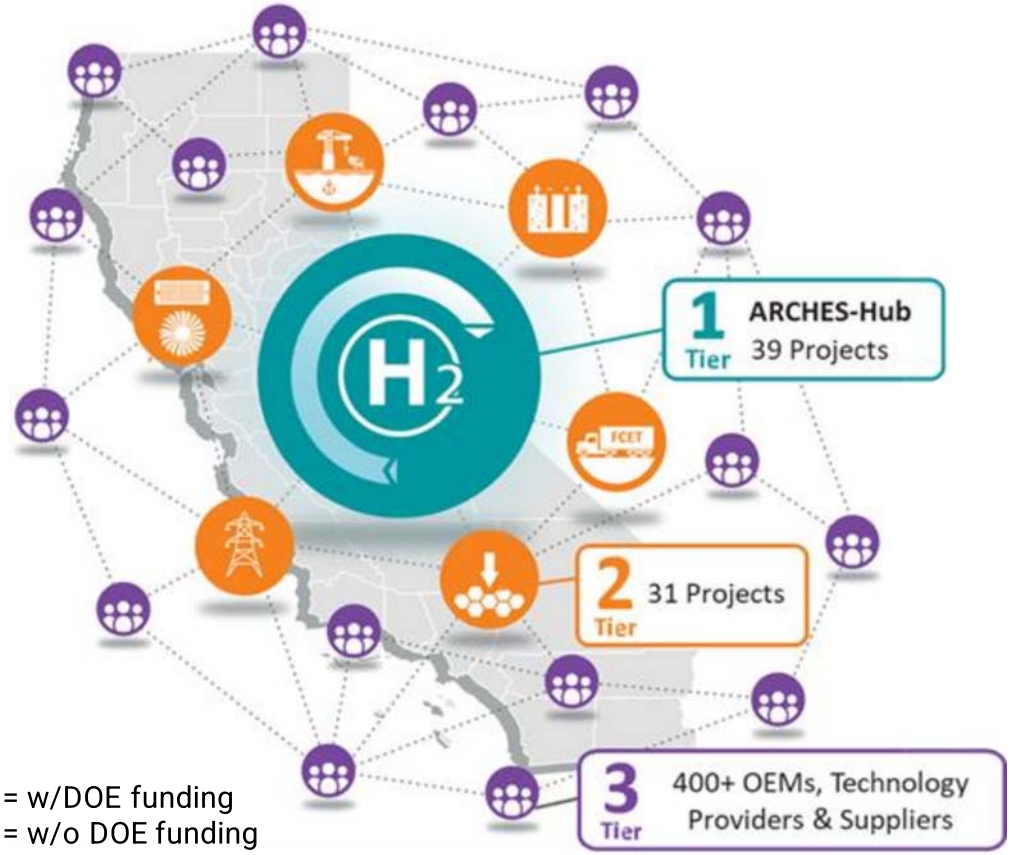


Figure 27: Examples of regions identified by responses to the Hydrogen Shot Request for Information (RFI).

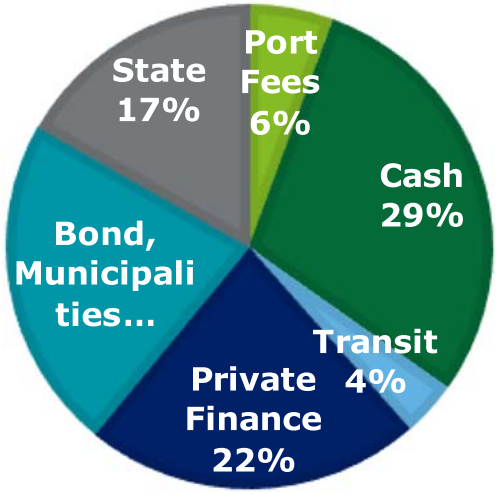
FIRST ELEMENT FUEL

ARCHES Projects: A Resilient Hydrogen Ecosystem for California

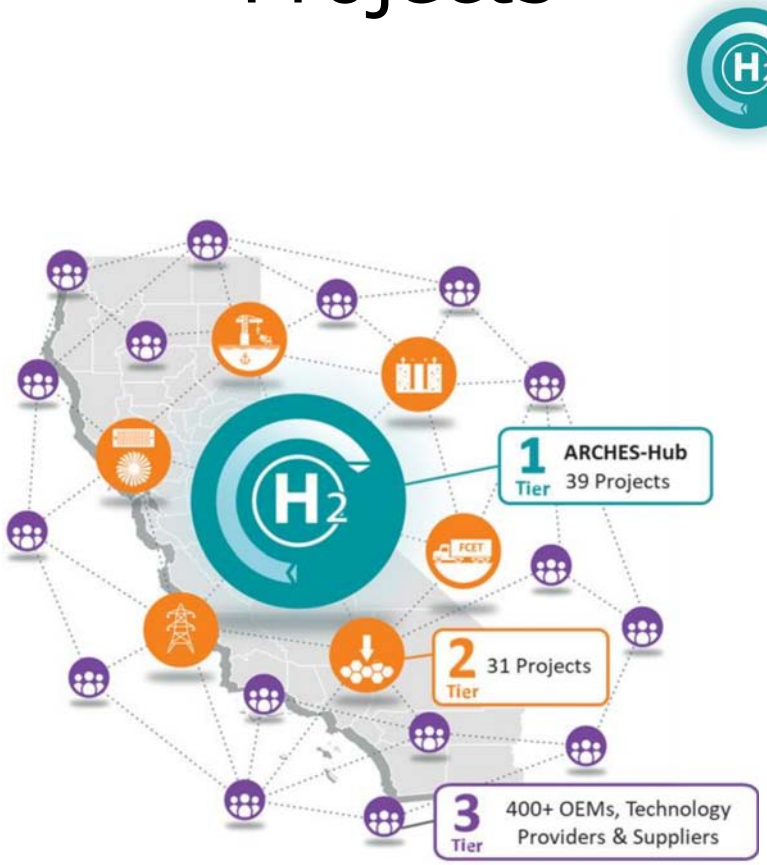


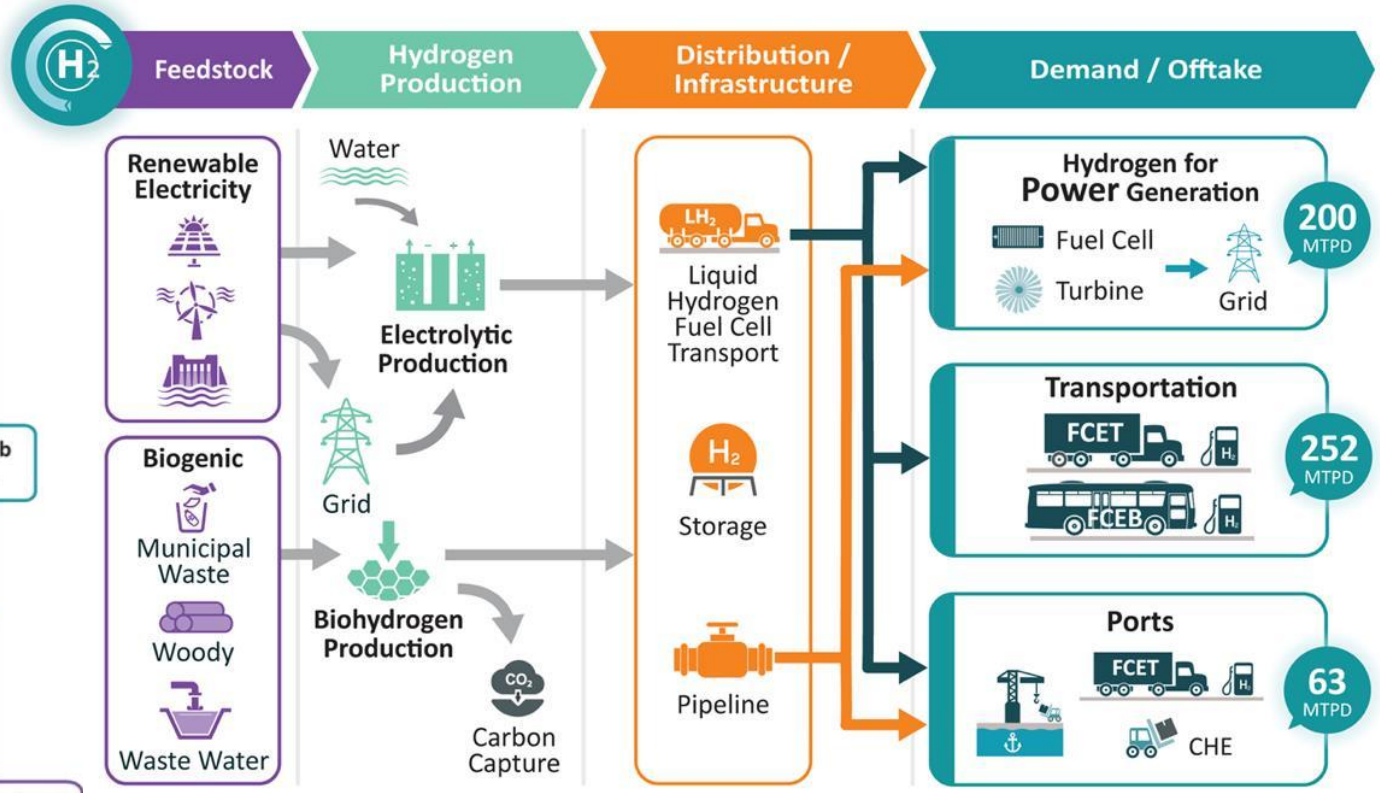
Tier 1 = w/DOE funding
Tier 2 = w/o DOE funding

$1.2B DOE funds unlocks **$11.7B in matching funds**



ARCHES Projects

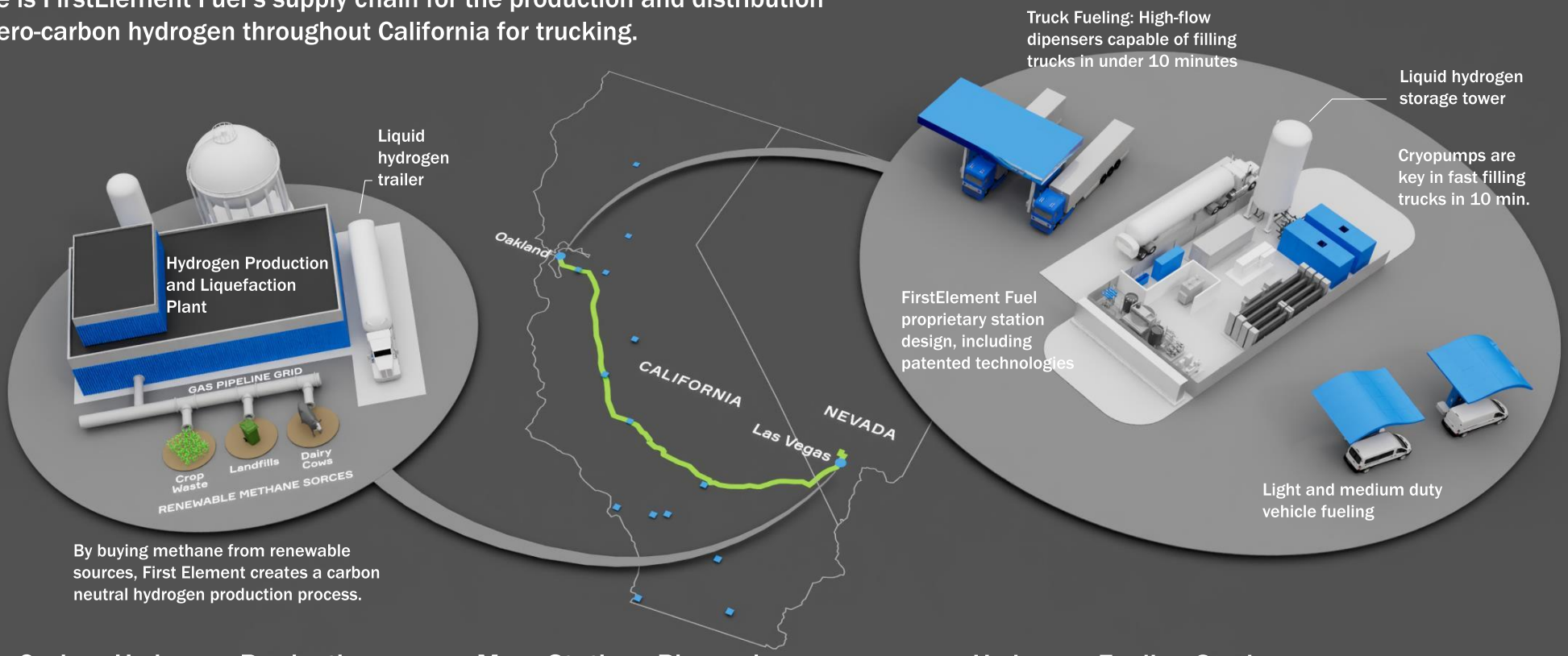




Tier 1 = w/DOE funding
Tier 2 = w/o DOE funding

The Start of Zero-Carbon Hydrogen

Here is FirstElement Fuel's supply chain for the production and distribution of zero-carbon hydrogen throughout California for trucking.



By buying methane from renewable sources, First Element creates a carbon neutral hydrogen production process.

Zero-Carbon Hydrogen Production

FirstElement Fuel's hydrogen supplier, Air Liquide, generates and supplies stations across California with liquid hydrogen from its facility located north of Las Vegas.

More Stations Planned

FirstElement Fuel is developing a hydrogen refueling network for long haul trucking in California and later the US

■ Planned FirstElement hydrogen stations

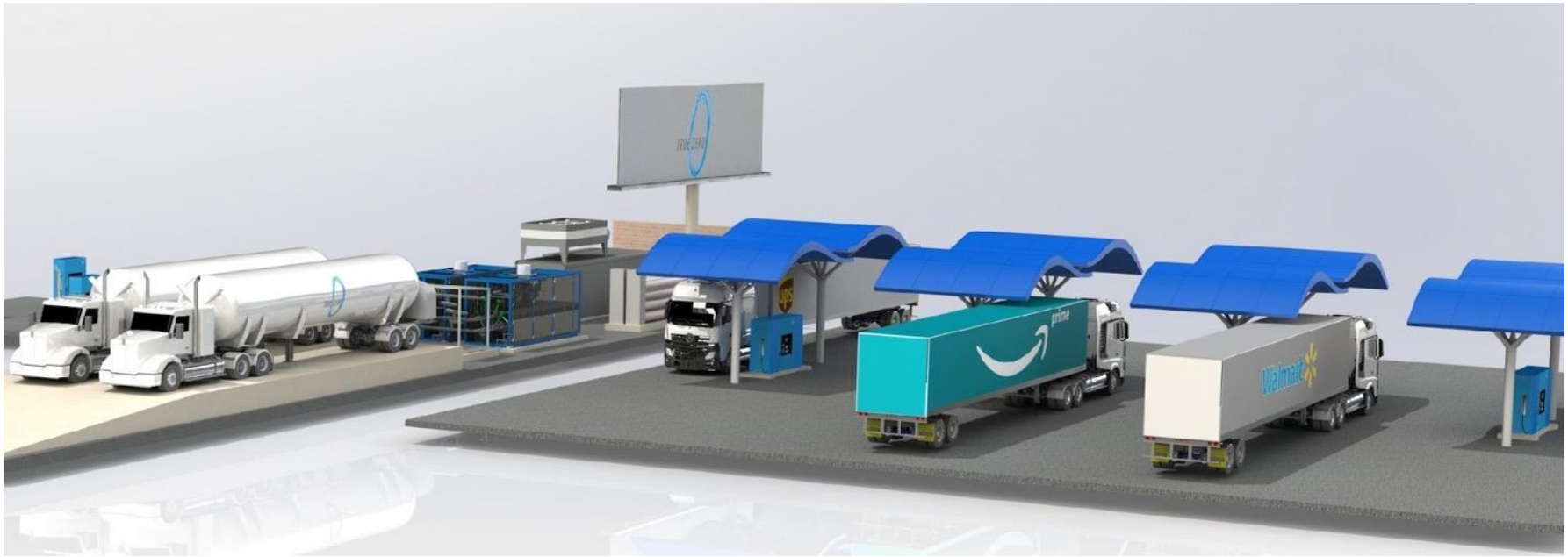
Hydrogen Fueling Stations

The Port of Oakland hydrogen station will be capable of serving up to 200 commercial trucks every day and will be on pace to move 1 million kilograms of zero-carbon hydrogen annually when fully operational later this year.

Source: FirstElement

Heavy-Duty Hydrogen Station Size and Cost

- Approx 2 acres for existing sites
- Maybe larger for future sites for more dispensers & transfill
- Initial station costs ?



FIRST ELEMENT FUEL

Available, Announced and Potential Products

- Only light-duty vehicles in production
- Limited heavy-duty trucks - Nikola and Hyundai
- Demonstrations of many different applications
  - Top picks, marine ferries, yard hoslters, locomotives
- Work trucks
  - Stellantis
  - Ford – SuperTruck 3
  - GM – SuperTruck 3

Cryopump Technology is a Critical Enabler of Hydrogen Refueling at Scale

Cryopump enables scale, efficiency, and commercial viability of hydrogen refueling stations

Why? Because to deliver fast, 700 bar fills the hydrogen needs to be cold, and high density (900 bar pressure)

Liquid hydrogen is cold and dense, and the cryopump takes advantage of those properties

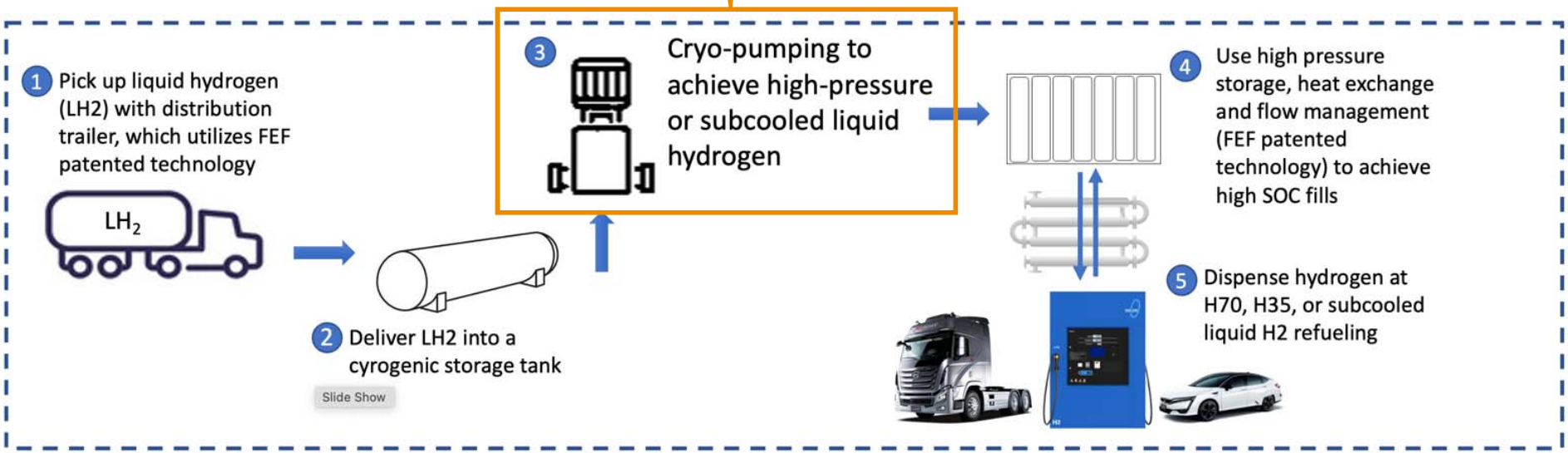
Overview:

A cryopump converts liquid hydrogen into cold, compressed hydrogen in one step.

Takes advantage of the energy put in to liquefy the hydrogen centrally

Advantages:

- Higher efficiency: 1/5 the energy consumption of a compressor
- Reduced footprint: higher capacity in 1/30 the amount of space
- Greater and more efficient storage density with liquid hydrogen
- Puts complexity upstream, simplifies downstream



FIRST ELEMENT FUEL

Incentives

- There is a critical need to ensure there are sufficient incentives for both vehicles/equipment and infrastructure
- Sends a market signal to manufacturers and end-users of viability
- Infrastructure can provide benefits to both on-road and off-road/port equipment

FIRST ELEMENT FUEL

Concluding Thoughts

Lessons learned from passenger vehicle infrastructure

- "Go big" if you want to achieve scale (throughput and economics)
- Liquid H2 is most suited for distribution… currently
- Leverage existing commercial products – incentive to expand the supply chain – passenger vehicles

The market is too nascent to overly constrain

- Significant GHG and PM2.5 benefits with just replacing diesel with H2
- DOE H2 Hub should help with supply but likely > 5 years away
- Scale and scope too large for electricity alone

Local air agencies can have much greater and earlier impact

- Moyer infrastructure funding
- AB 617
- Collaborating with others, e.g. MSRC, Ports, COGs, Metro, etc.

FIRST ELEMENT FUEL

2024 (today)

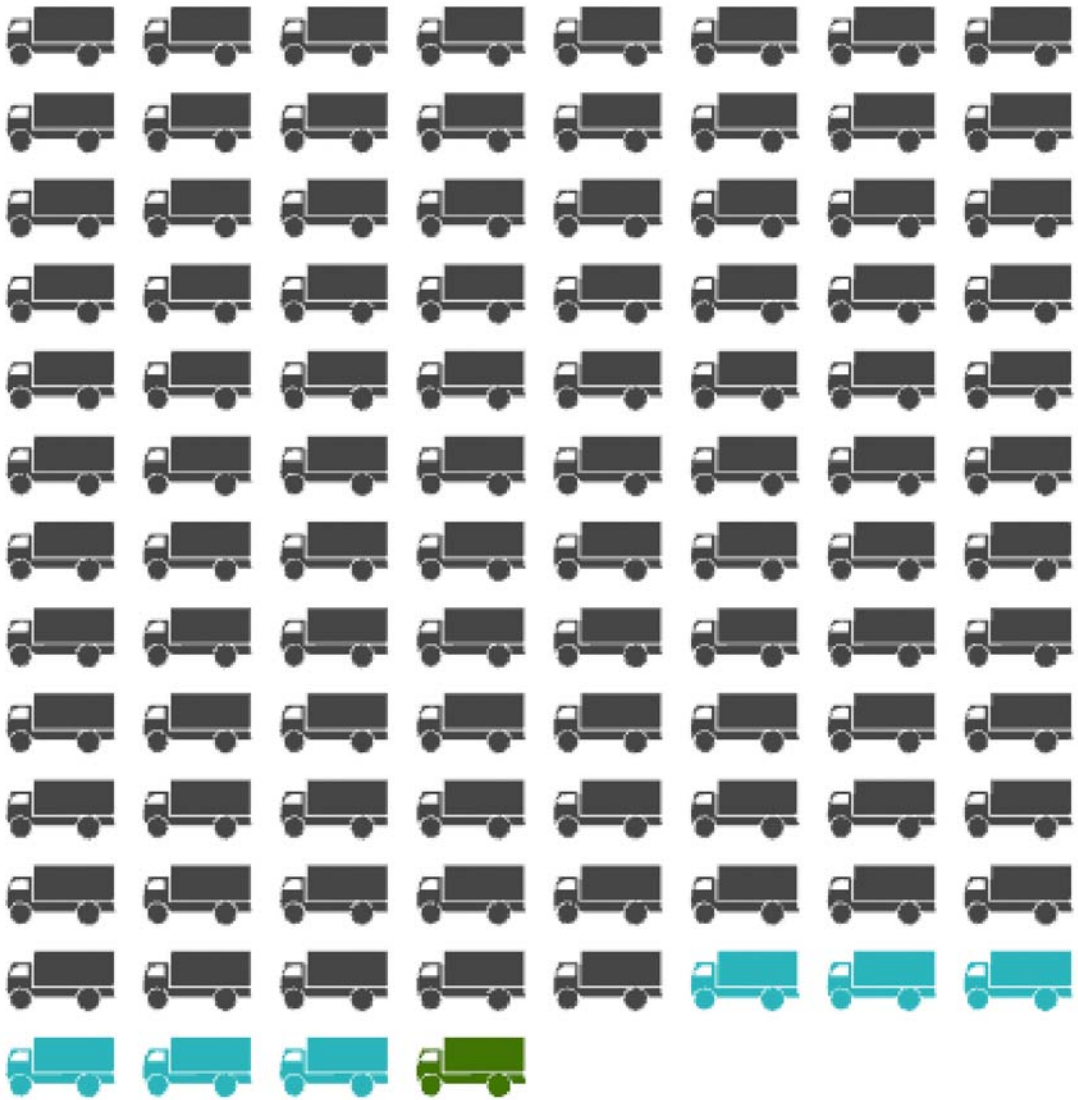
Passenger Vehicle Sales

16 Million

ZEVs
282,492

FCVs
2,707

Drayage Trucks



205,000

ZEVs
135

FCVs
30

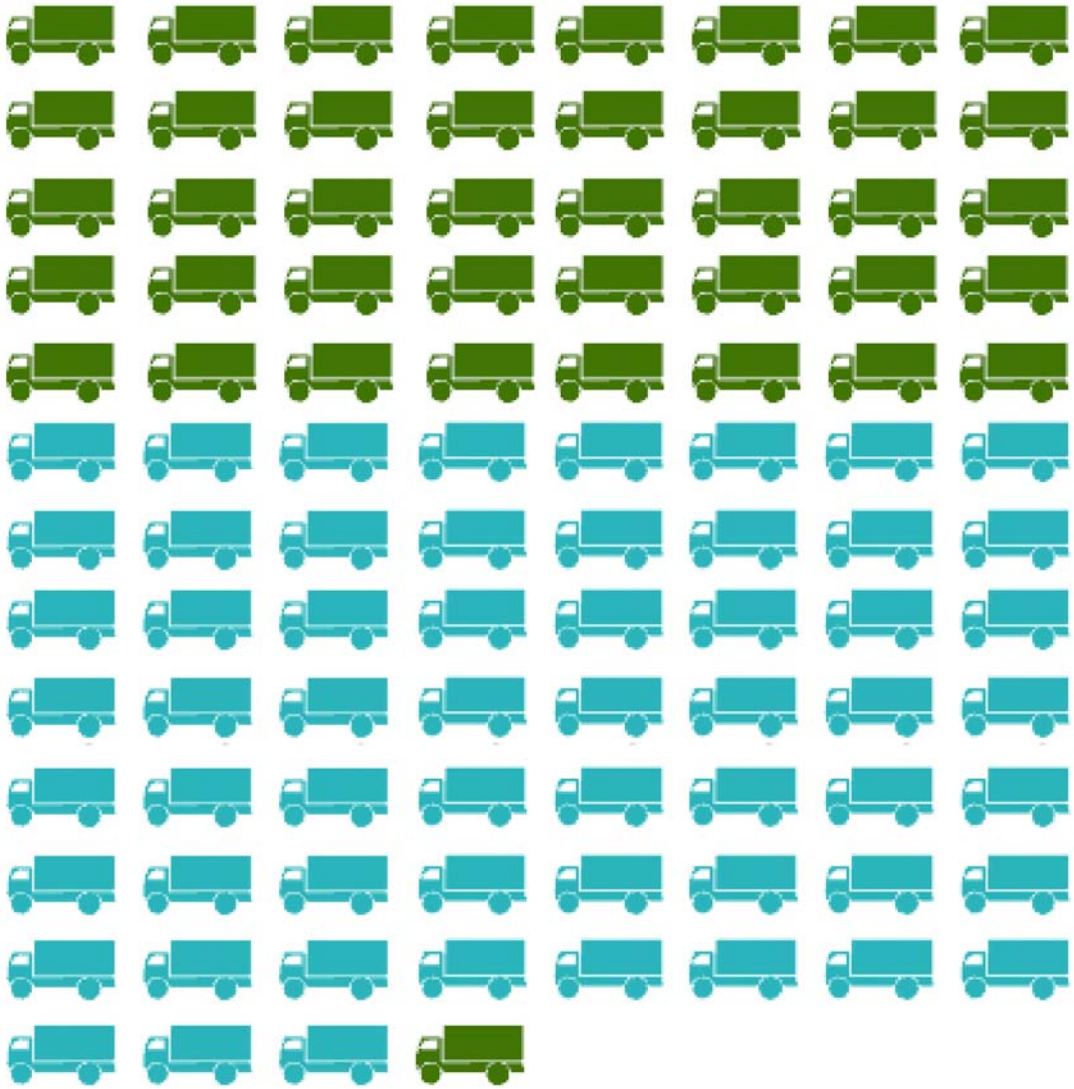
FIRST ELEMENT FUEL

2035 (11 years)

Passenger Vehicle Sales

16 Million ZEVs FCVs

Drayage Trucks

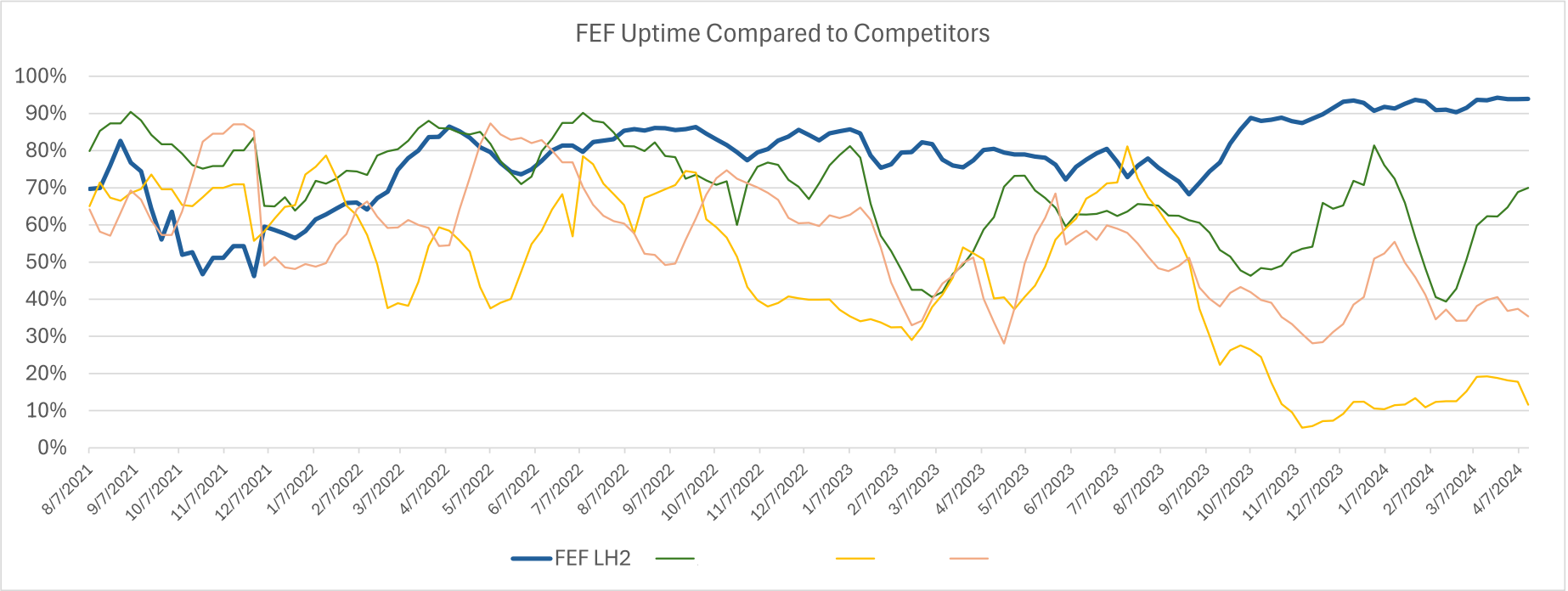


205,000 ZEVs FCVs

Backup Slides

FIRST ELEMENT FUEL

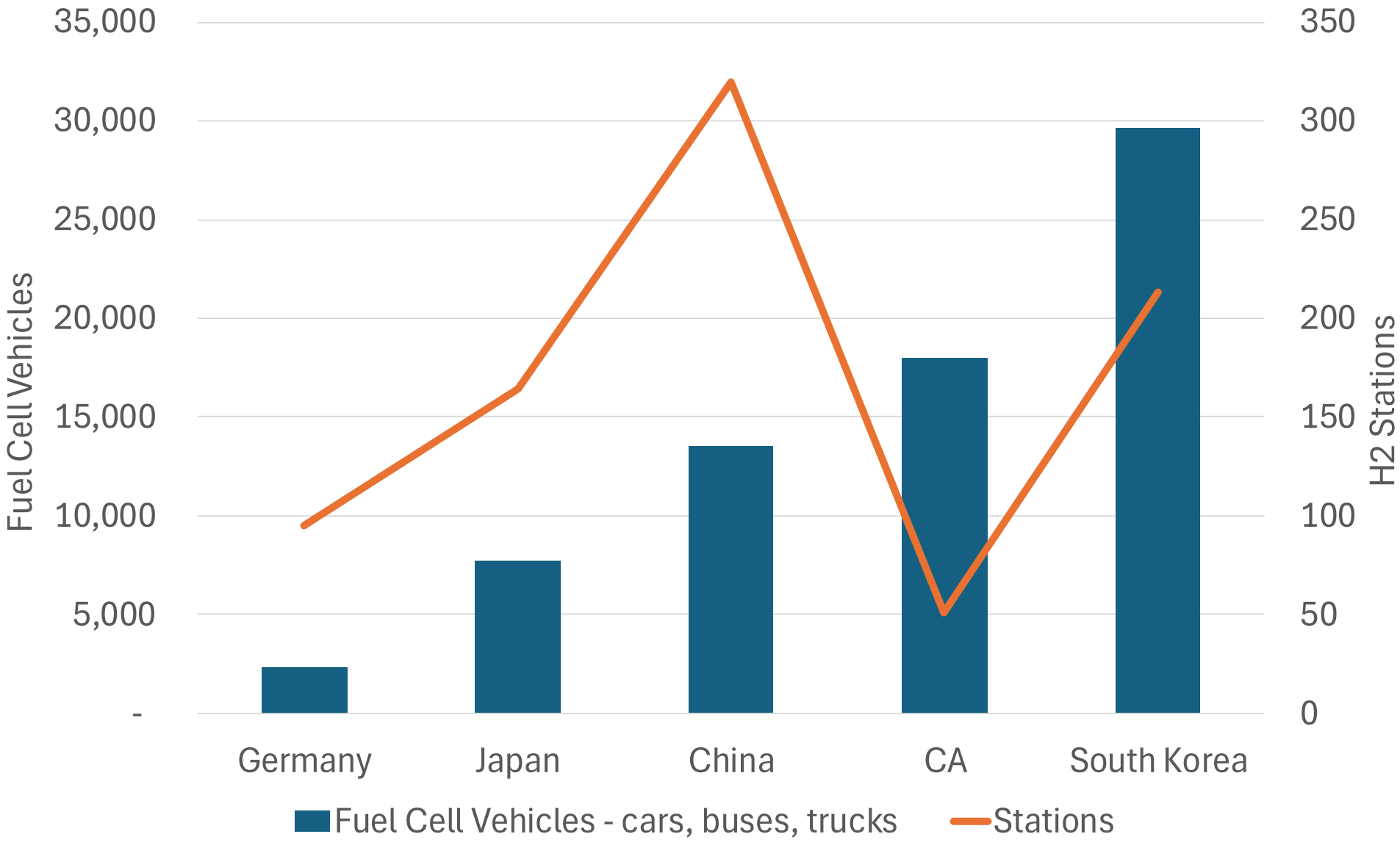
Best-in-class reliability through proprietary technology



- Unrivaled hydrogen expertise
- Vertically integrated up the value chain
- Custom made components
- Proprietary technology

- Pioneered the move to liquid hydrogen
- World class H2 technicians
- H2 distribution expertise

FIRST ELEMENT FUEL



https://www.energy.ca.gov/sites/default/files/2023-12/CEC-600-2023-069.pdf

Agenda Item 2c. South Coast AQMD's Proposed Pilot Program for Residential Incentives

South Coast AQMD's Proposed Pilot Program for Residential Incentives

Michael Krause
South Coast AQMD
Assistant Deputy Executive Officer
2024 South Coast AQMD Board Retreat
May 10, 2024

Michael Krause
South Coast AQMD

Michael Krause is Assistant Deputy Executive Officer in Planning, Rule Development and Implementation. In this role he oversees stationary source rule development for toxics, and criteria pollutant rules, CEQA, and AB617 efforts. Michael started his career at the South Coast AQMD in 1991 as an Assistant Air Quality Engineer in permitting working on a variety of air polluting sources, then progressively promoted to his current position.

Over his 31 years he oversaw a number of rule projects, including regulation of refinery equipment, continuous emissions monitoring systems (CEMS), flares, fenceline monitoring, combustion equipment, toxics, coatings, and adhesives, and upgrades to the Flare Event Notification System (FENS). Michael as the lead for area source control measures for the 2022 AQMP and was instrumental in the development of the 2012 and 2016 AQMPs. Earlier in Michael's career, he wrote dozens of CEQA environmental assessments, as well as leading the effort to create the California Emission Estimator Model used statewide.

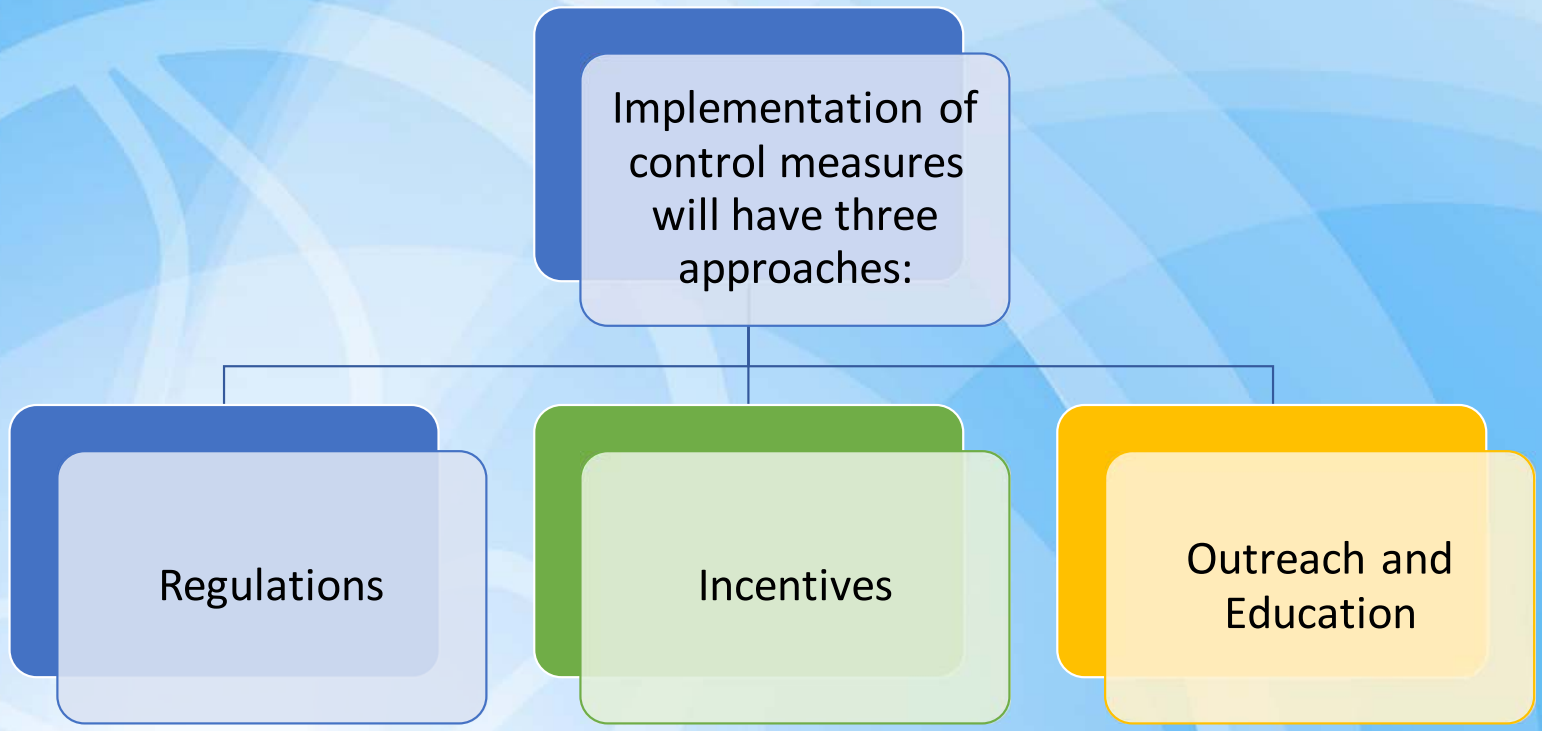
Introduction

- Staff is proposing a rebate program to help offset costs to replace NOx-emitting appliances with zero-emission units
  - Expected program launch in fourth quarter 2024
  - Funded by Rule 1111 and Rule 1121 mitigation fees
  - Considering allocating 75 percent of the funding to overburdened communities
- Needed for implementing 2022 AQMP control measures and building appliances rules

2022 Air Quality Management Plan (AQMP)

- Includes seven control measures seeking zero-emission or near-zero-emission technologies across all sectors
- Emission reductions needed to meet National Ambient Air Quality Standards for ozone
- Strong focus on zero-emission standards for building appliances
- AQMP Resolution directed staff to:
  - Develop a program to incentivize the installation and operation of zero-emission technologies
  - Deploy funding to overburdened communities
    - Aligns with Chair's priority to direct funding to underserved communities

Control Measure Implementation



Zero-Emission Technologies

Electric Resistance

- Uses heating coils to generate heat (similar to toaster oven)

Solar

- Uses energy from the sun to heat water

Fuel cells

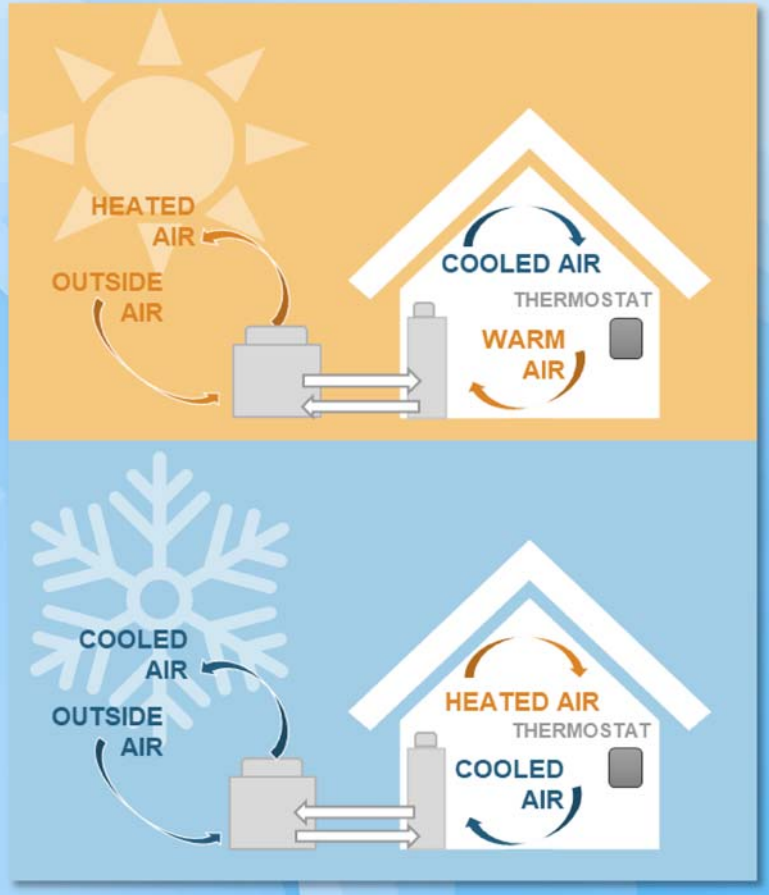
- Uses chemical energy to generate electricity that can be used for heat

Heat pumps

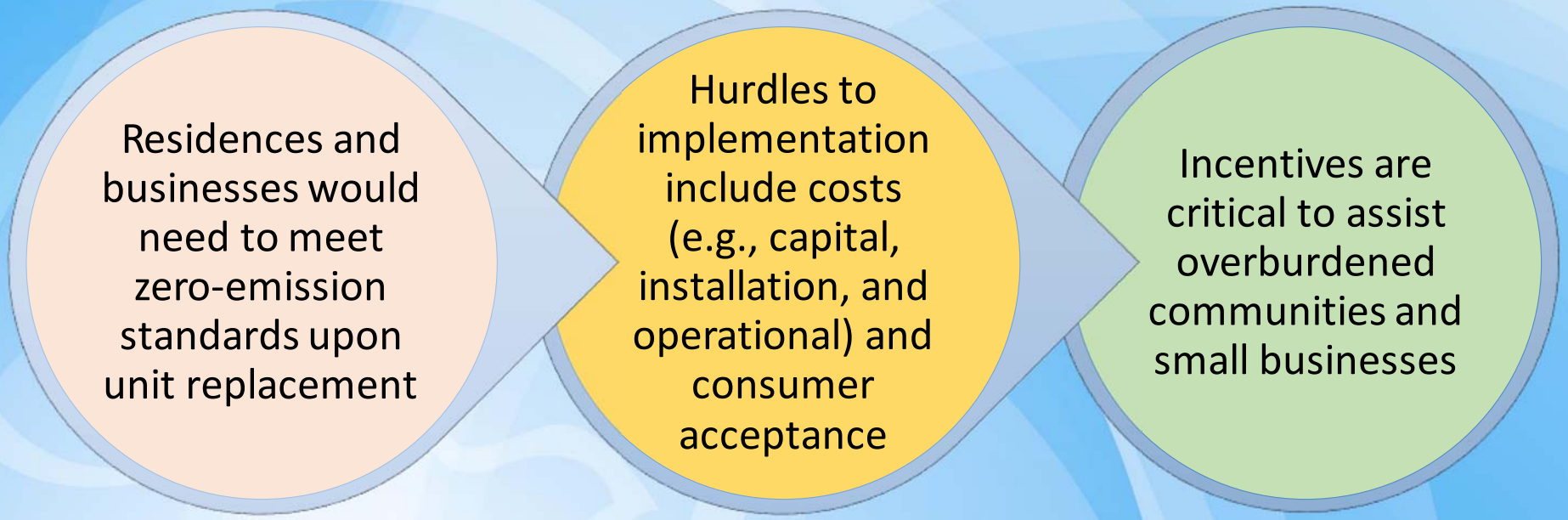
- Collects heat from air, water, or ground source (similar to an air conditioner)

Space and Water Heater Heat Pumps

- Heat pumps have highest market penetration due to efficiency
  - Can be 3 – 5 times more efficient than conventional unit
  - Results in lower operating costs
- Can provide hot water (heat pump water heaters)



Incentive Programs Are Needed



South Coast AQMD's CLEANair Furnace Rebate Program

The CLEANair Furnace Rebate Program was previously developed to incentivize early adoption of clean furnaces

- $6.5 million allocated, 25% of funding reserved for overburdened areas
  - **Phase 1** (2018-2019) incentivized low NOx furnaces
  - **Phase 2** (2020-2023) incentivized zero-emission furnaces
- $1,500 rebate per unit
- Successful program resulted in the installation of 2,500 zero-emission units

Proposed New Appliance Rebate Program

- Incorporate lessons learned from the Clean Air Furnace Program
- Expand to incentivize both space and water heating appliances
- Help address cost concerns to implementing zero-emission standards
- Implemented in phases to allow for program adjustments
  - Pilot phase will focus on single family, multifamily, and small businesses

Objectives of the Appliances Rebate Program

Dedicate significant percentage of funds to overburdened communities to increase zero-emission technology adoption

Maximize funding through collaborating with local, state, and utility programs

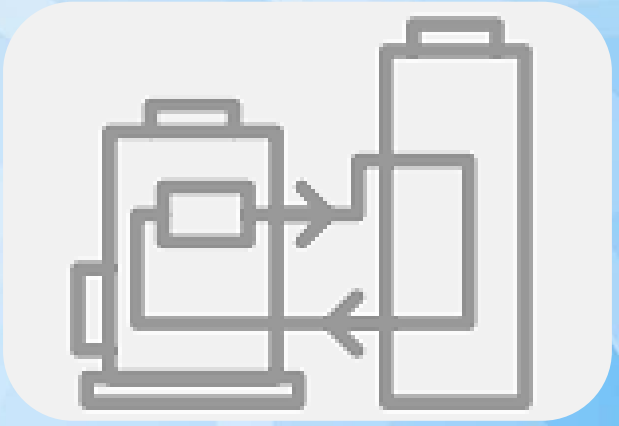
Incentivize consumers to replace NOx-emitting appliances with zero-emission appliances

Promote outreach to end users

Explore opportunities to partner with other organizations to facilitate workforce training

Implementation Approach

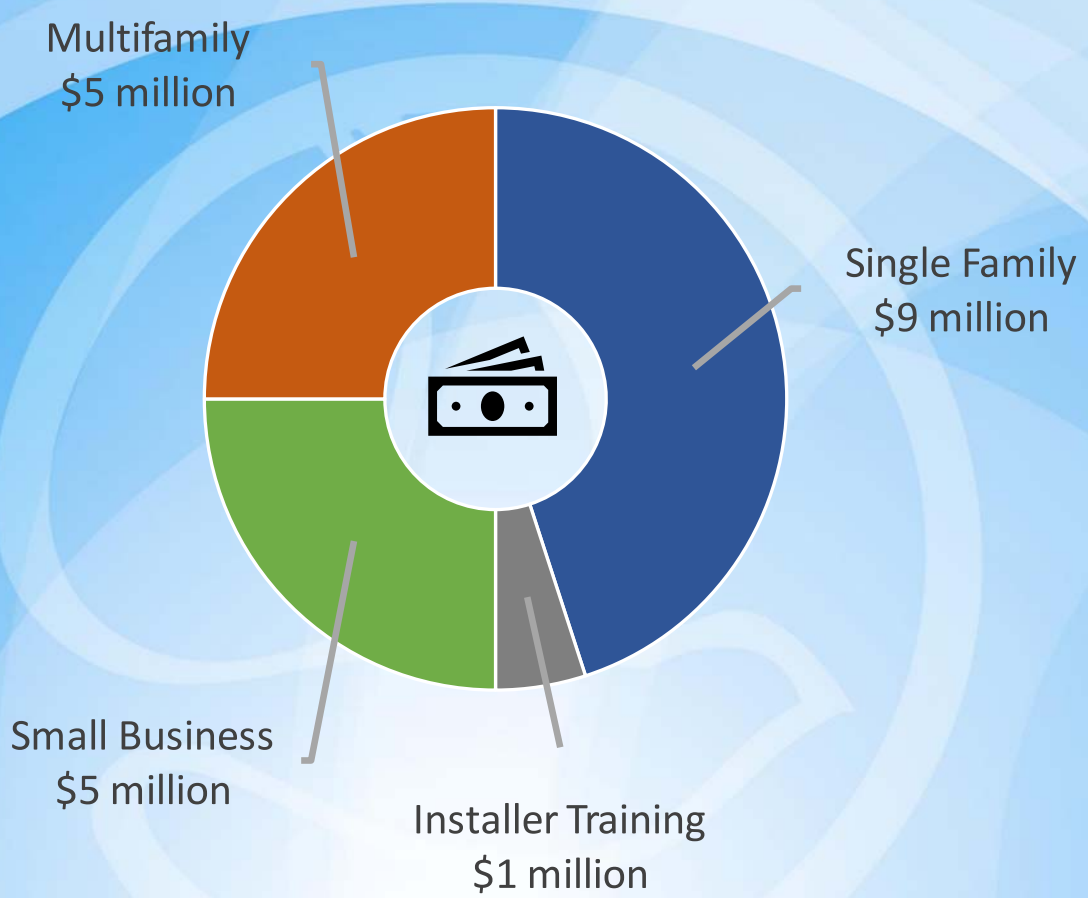
Public meetings to gain stakeholder feedback on program details



Initial phase focused on all-electric heat pumps for space and water heating

Third-party contractor will administer the program

Pilot Rebate Program Funding



Initial proposal to fund program with $20 million

- Three times more funding than previous Clean Air Furnace Program
- Funded by Rule 1111 and Rule 1121 mitigation fees
- Includes third-party contractor administration and outreach costs

Funds to be distributed on a first-come, first-served basis

75% of funding for overburdened communities (identified by CalEnviroScreen)

Suggested Program Features

Monitor implementation in overburdened communities (e.g., feedback on technology) – help to enhance future program phases

Focus on ease of use for applicants – stacking other rebates, address language barriers, outreach, and application assistance efforts

Collaborate with funding institutions to provide funding upfront

Rebate Program Summary

Rebate Program will focus on three areas:

- Single Family Residential
- Multifamily Residential
- Small Businesses

Incentives doubled for overburdened communities

Additional incentive for high efficiency equipment

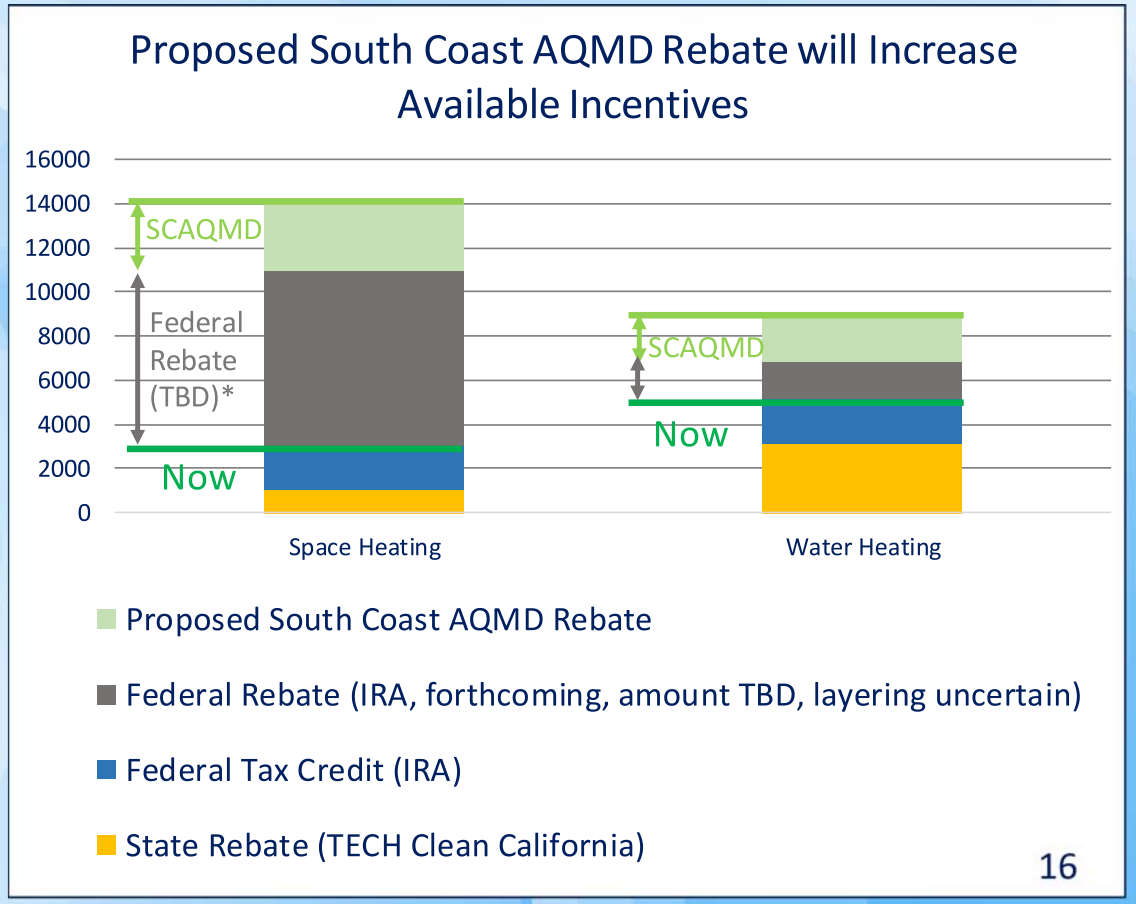
Training program to familiarize installers with heat pump technology

Residents Could Stack Federal and State Incentives with South Coast AQMD Rebates

- Federal Tax Credits – Available Through 2032
- Federal Rebates – Forthcoming mid-2024
- State Rebates – Available Now
- State GoGreen Financing/loans for heat pumps in low-income communities
- Utility electricity discounts for low-income residents

Layering rebates will help residents adopt zero-emission technology earlier:

- Up to $14,000 for space heating
- Over $8,000 for water heating



Next Steps (subject to change)

- Stationary Source Committee – June 2024
- Request approval and release Request For Proposal – August 2024
- Present contractor selection to Stationary Source Committee – October 2024
- Request approval for contractor to implement program – November 2024
- Program Launch – First Quarter 2025

Update on the South Coast AQMD's Diversity, Equity, and Inclusion (D.E.I.) Programs

Dr. Anissa "Cessa" Heard-Johnson
Deputy Executive Officer
D.E.I. with Community Air Programs
South Coast AQMD Board Retreat
May 9-10, 2024

Anissa “Cessa” Heard-Johnson, Ph.D.
South Coast AQMD

Dr. Anissa “Cessa” Heard-Johnson is the Deputy Executive Officer of Diversity, Equity, and Inclusion. In her role, she focuses on creating and implementing equity-based programming, training, and policy and procedure review.

Cessa has over twenty years of experience in fostering inclusive environments, supervising diversity practitioners, and creating equity-based programing, training in business, social service agencies, and educational organizations. Prior to joining the South Coast AQMD Cessa was an adjunct professor at UC Santa Cruz and Oregon State University, teaching women’s studies and diversity/social justice. She founded cultural and LGBTQIA+ centers and developed equity initiatives for Racial and Ethnic-based communities, Foster Youth, Gender Equity, Food and Housing Insecure, Promise Scholarship Recipients, Re-Entry, and Undocumented students and Veterans.

Cessa obtained her BA in elementary education with a minor in African American studies at San Diego State University, earned her MS in higher education policy and management at the University of Oregon, and graduated with her Doctorate Degree in Educational Leadership from Seattle University in August 2021.

Fabulous Female Friday

Elizabeth C. Yeampierre

Civil Rights and Environmental Activist

- Executive Director of UPROSE, Brooklyn's oldest Puerto Rican community-based organization
- Co-Chair of the national alliance Climate Justice Alliance
- Co-founder of #OurPowerPRnyc (a grassroots initiative of the Puerto Rican diaspora guided by the Jemez Principles of Democratic Organizing)
- Advocates for just, sustainable development, environmental justice, and community-led climate adaptation
- Featured speaker at numerous local, national, and international forums and media outlets
- Played major role in organizing the People's Climate March Mobilization in 2014, Proposed adoption of Jemez principles for democratic organizing

VIDEO LINK

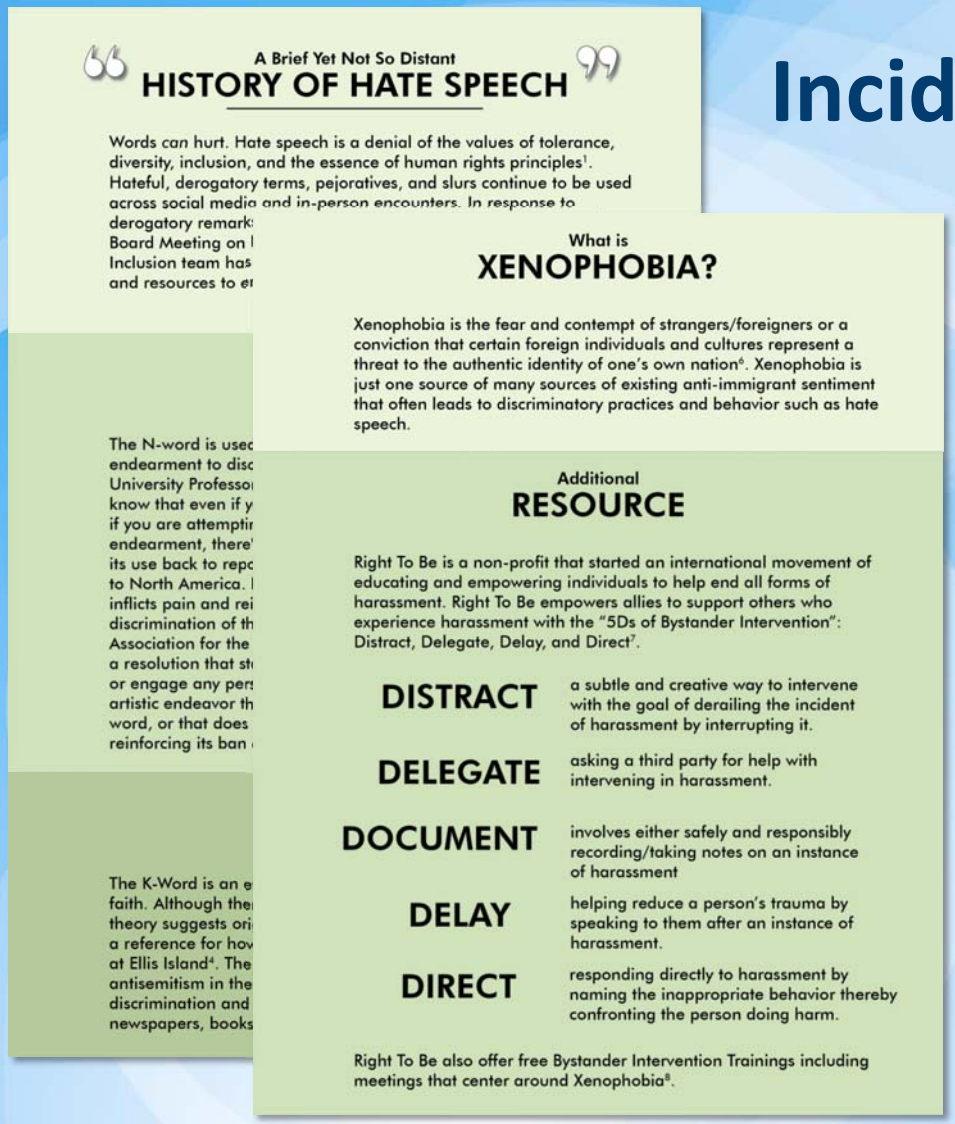
Presentation Overview

- Overall Goals and Priorities Update
  - Incident Response and Support
  - Events
  - Fabulous Female Fridays
  - Displays
  - Infographics
  - J.E.D.I. Think Tanks
  - J.E.D.I. Book Clubs
- Employee Resource Groups (ERG)
- Young Leaders Advisory Council (YLAC)
- Critical Community Conversations for Purposeful Outreach (C3PO)
- Statewide DEI Efforts
- Upcoming and Ongoing DEI Initiatives

D.E.I. Goals and Priorities 2023-2024

	Equity Related Staff Resources	Employee Resource Groups Initiatives	Staff Training and Development
FY 23-24 Annual Goals	**24**	**42**	**16**
FY 23-24 Year to Date	**23**	**31**	**10**
FY 24-25 Annual Goals (modified for the upcoming year)	**24** DEI events	**64** including meetings, events and initiatives	**14** Including agency-wide trainings, J.E.D.I Think Tanks and J.E.D.I. Book Clubs

- YTD: On target to meet goals for this year
- Can attribute these metrics to ongoing engagement with employee resource groups and community groups
- NEW: Critical Community Conversations for Purposeful Outreach is serving as community engagement focused training
- Modified the goals and indicators for success for the upcoming fiscal year



A Brief Yet Not So Distant
HISTORY OF HATE SPEECH

Words can hurt. Hate speech is a denial of the values of tolerance, diversity, inclusion, and the essence of human rights principles[1]. Hateful, derogatory terms, pejoratives, and slurs continue to be used across social media and in-person encounters. In response to derogatory remarks Board Meeting on I Inclusion team has and resources to e

The N-word is used endearment to disc University Professo know that even if y if you are attempti endearment, there its use back to repo to North America. inflicts pain and rei discrimination of th Association for the a resolution that st or engage any per artistic endeavor th word, or that does reinforcing its ban

The K-Word is an e faith. Although the theory suggests ori a reference for hov at Ellis Island[4]. The antisemitism in the discrimination and newspapers, books

What is
XENOPHOBIA?

Xenophobia is the fear and contempt of strangers/foreigners or a conviction that certain foreign individuals and cultures represent a threat to the authentic identity of one's own nation[6]. Xenophobia is just one source of many sources of existing anti-immigrant sentiment that often leads to discriminatory practices and behavior such as hate speech.

Additional
RESOURCE

Right To Be is a non-profit that started an international movement of educating and empowering individuals to help end all forms of harassment. Right To Be empowers allies to support others who experience harassment with the "5Ds of Bystander Intervention": Distract, Delegate, Delay, and Direct[7].

DISTRACT	a subtle and creative way to intervene with the goal of derailing the incident of harassment by interrupting it.
DELEGATE	asking a third party for help with intervening in harassment.
DOCUMENT	involves either safely and responsibly recording/taking notes on an instance of harassment
DELAY	helping reduce a person's trauma by speaking to them after an instance of harassment.
DIRECT	responding directly to harassment by naming the inappropriate behavior thereby confronting the person doing harm.

Right To Be also offer free Bystander Intervention Trainings including meetings that center around Xenophobia[8].

Incident Response and Support

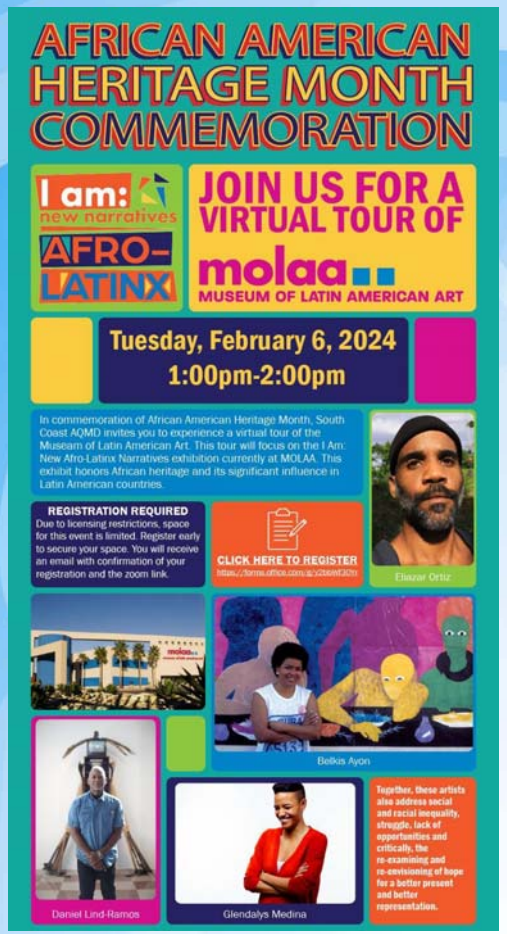
Education and Awareness: Providing ongoing training and resources to increase awareness and understanding of diversity issues, including the impact of hate speech.

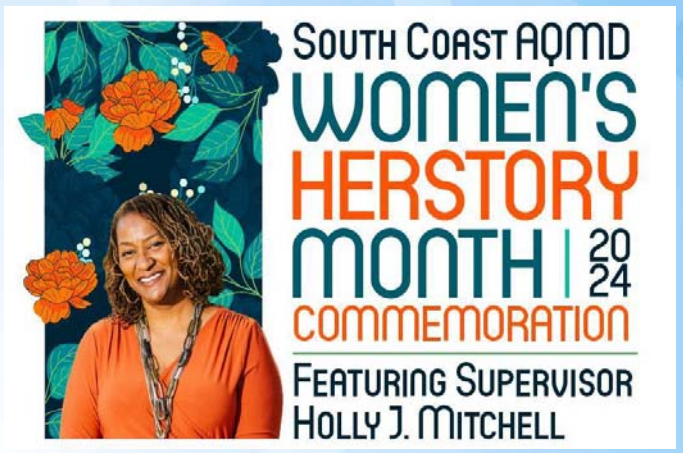
Protocol Review: Regularly reviewing and recommending updates to our policies and procedures to ensure they reflect our commitment to diversity, equity, and inclusion, including clear guidelines for addressing hate speech and incidents of injustice.

Support and Resources: Offering support and resources to those affected by hate speech, including access to counseling services and avenues for reporting incidents.

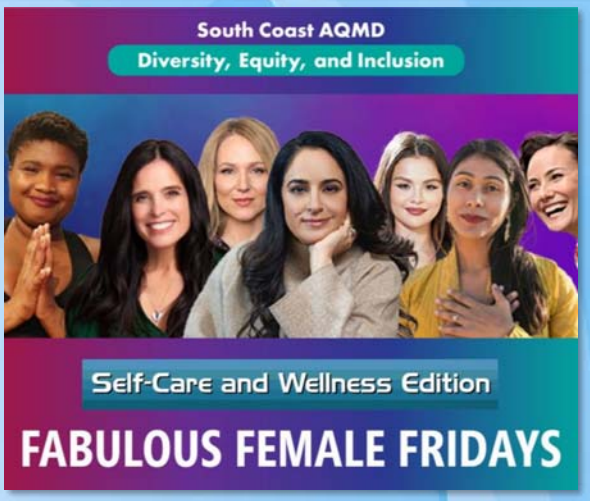
Click Here to View Full Infographic

D.E.I. Events 2023-2024





Fabulous Female Fridays 2023-2024



D.E.I. Infographics

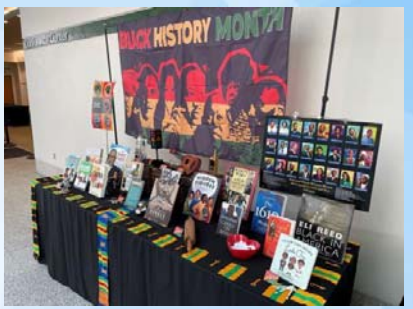
Pride Month
Loving Day
Memorial Day
Juneteenth
Hispanic Heritage Month
Mid Autumn Festival
Mehregan

Filipino American History Month
Indigenous People's Day
National Coming Out Day
Dia de los Muertos
Diwali
Veterans Day
Transgender Day of Remembrance

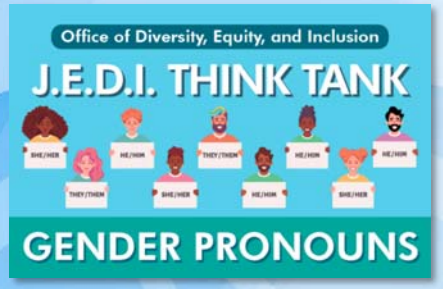
Multicultural Observances
Dr. Martin Luther King Jr. Day
African American Heritage Month
Rosa Parks Day
Lunar New Year
Japanese Internment Remembrance Day
Women's Herstory Month

Nowruz
Holi
National Farmworker Awareness Week
Cesar Chavez Day
Day of Silence

D.E.I. Displays 2023-2024



J.E.D.I. Think Tanks 2023-2024



Aug.
- Gender Pronouns

Sept.
- Communicating Science

Feb.
- Race and Racism

"I have family and friends that are nonbinary. Seeing this topic discussed at work was touching. It's also so relevant for our work. We can't do this work without connection with our residents and acknowledging identities plays a critical role in that."

"I see how valuable engagement is in creating connections with community and I like that the method for communication presented is fun and can help open dialogues between our agency and community members. I hope our agency does more of a story approach, especially in social media."

"Often times, I am uncomfortable, so I tend to approach discussions [about racism] on the defensive end. This gave me strategies to work through that."

J.E.D.I. Book Club 2023-2024

Event Highlights:

- Expanding staff's knowledge of community activism within AB 617 communities
- DEI and Environmental Justice victories can be small and impactful (offering translations)

"This event was eye opening about the issues our communities face and how important our persistent presence is. This work is necessary and this glimpse into how our communities advocate is invaluable."

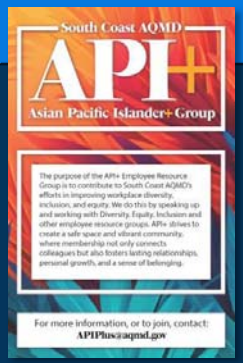
"I appreciate events like this. The way Dr. Kim shared her insight into the community perspective was inspiring and invigorating. I can be a part of the small victories that create impactful change."





Employee Resource Groups

Allies and Advocates

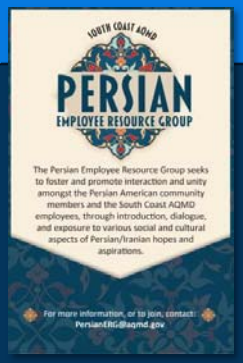


Asian and Pacific Islander+

Black Employees Resource of Change

Hispanic and Latinx Organization for Success

Lesbian, Gay, Bisexual, Queer/Questioning, Intersex & Asexual+

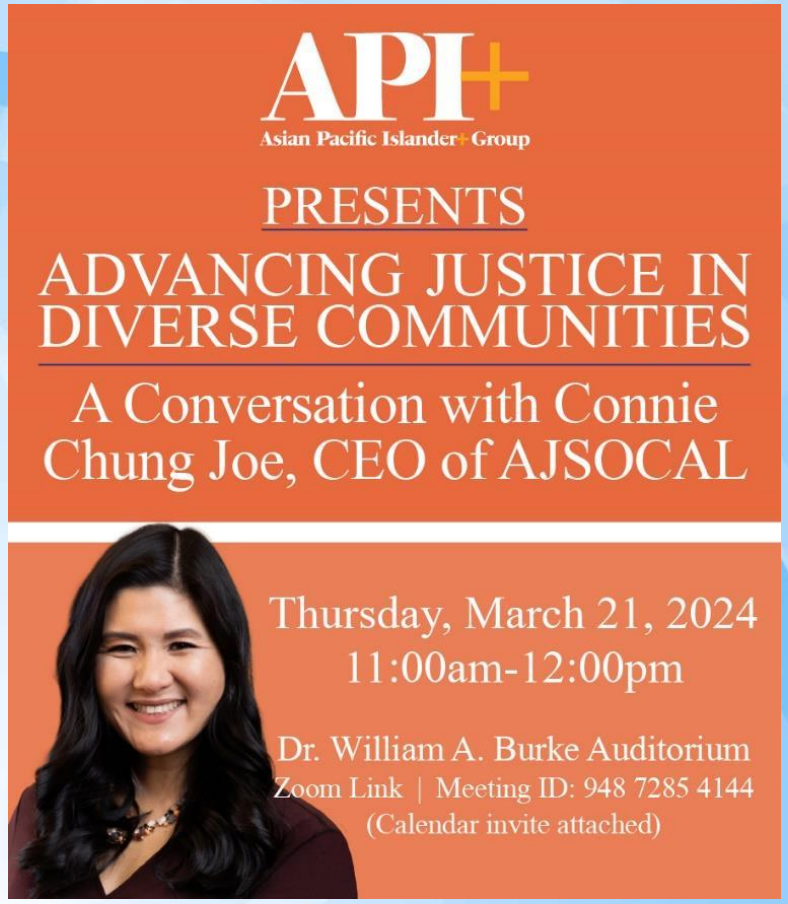


Persian

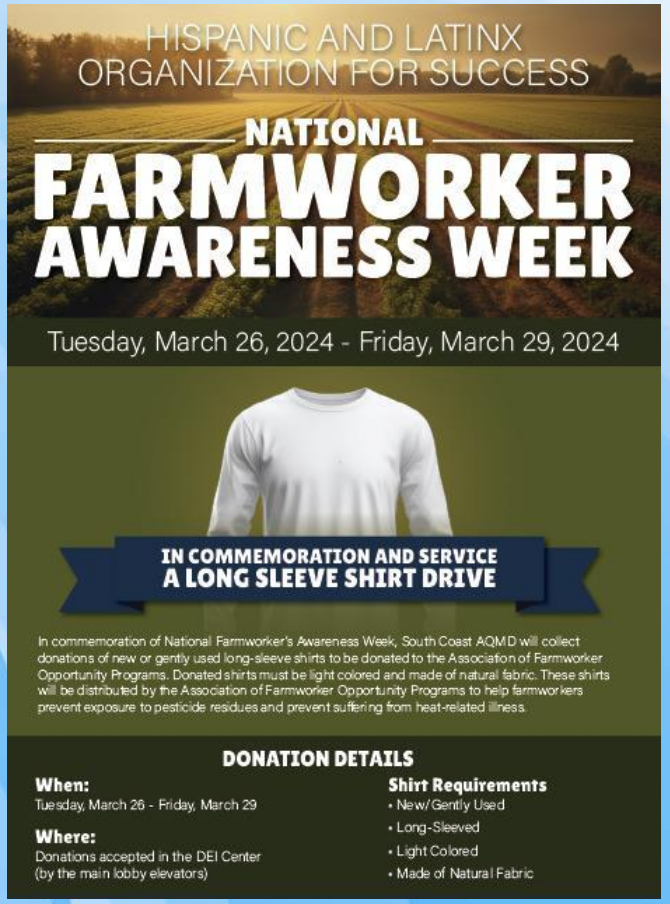
Veterans and Active-Duty Military Family

Employee Resource Group Initiatives

Allies and Advocates



Asian and Pacific Islander+



Hispanic & Latinx Organization for Success

Young Leaders Advisory Council

Facilitation of the YLAC committee has been transferred to Diversity Equity and Inclusion with Community Air Programs as of January 2024

Represents a continuation of engaging community members through a DEI lens

Provides an opportunity for South Coast AQMD to increase our knowledge and awareness of issues at the intersection of youth and environmental injustice

Los Angeles County Members

- Gabriela Ballesteros
- Emanuel De Jesús Cruz
- Mai Nguyen Do
- Aditi Gajurel
- Matthew Patara Hui
- Yifan Li
- Vanessa Melesio
- Michael Lyle Schumer
- Linh Tran
- Celina Vargas

Orange County Members

- Marc Anthony Flores

Riverside County Members

- M. Andres Coronel
- Ryan Drover
- Norah Kyassa
- Ciara Christina Thrower

San Bernardino County Members

- Roxana Marina Barrera
- Yolanda Aguilar Candelario
- Angel Delgado Lira
- Joshua Scheel

Critical Community Conversations for Purposeful Outreach (C3PO)

Goals

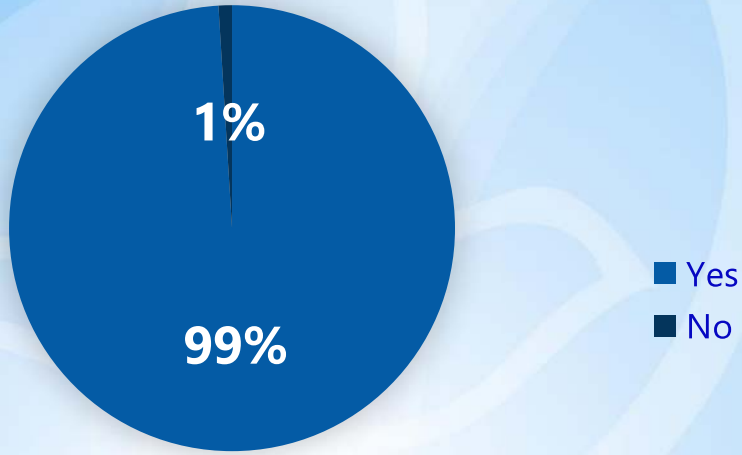
- Engage in purposeful and meaningful connections within each of our CSC communities
- Increase staff's understanding of intersectional issues impacting our communities

C3PO Survey

Survey Goals: To measure the effectiveness of DEI initiatives in increasing staff cultural competency

- 9 question survey was conducted at the end of each C3PO event
- 85% response rate (103 responses of 120 possible)

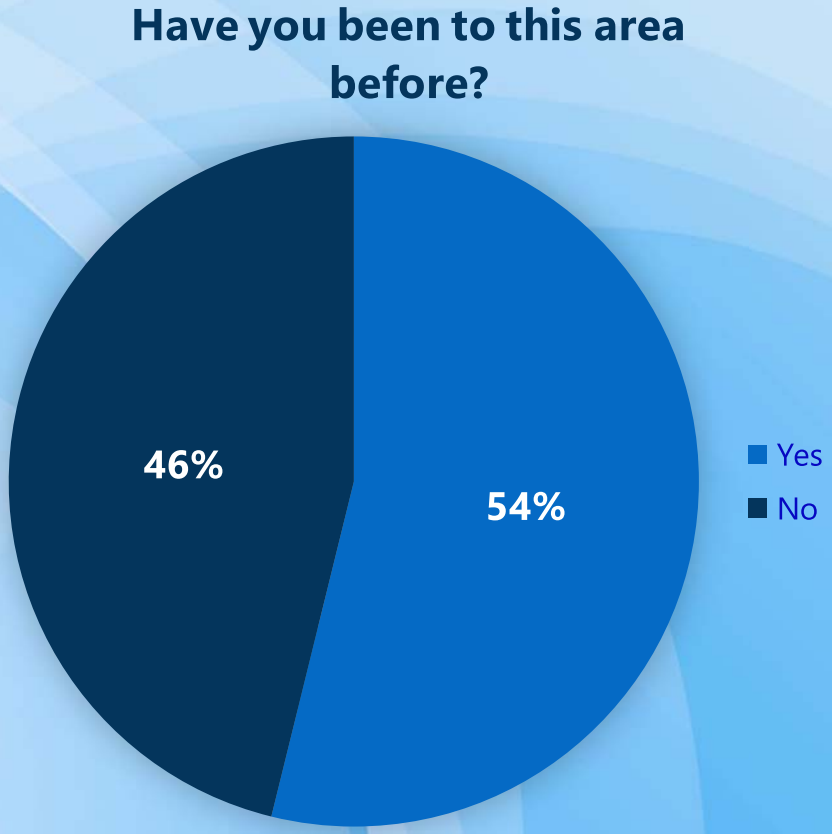
Did this C3PO event achieve its goals?



SCHEDULE FY 23/24

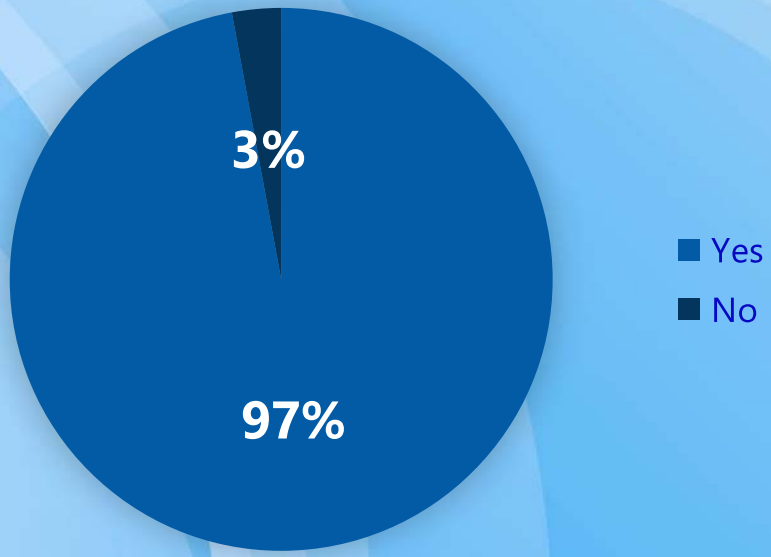
- June – South Los Angeles (SLA)
- August – Southeast Los Angeles (SELA)
- September – Wilmington, Carson, West Long Beach (WCWLB)
- January – San Bernadino, Muscoy (SBM)
- February – East Los Angeles, Boyle Heights, West Commerce (ELABHWC)
- March – CARB Headquarters, Riverside

C3PO Survey



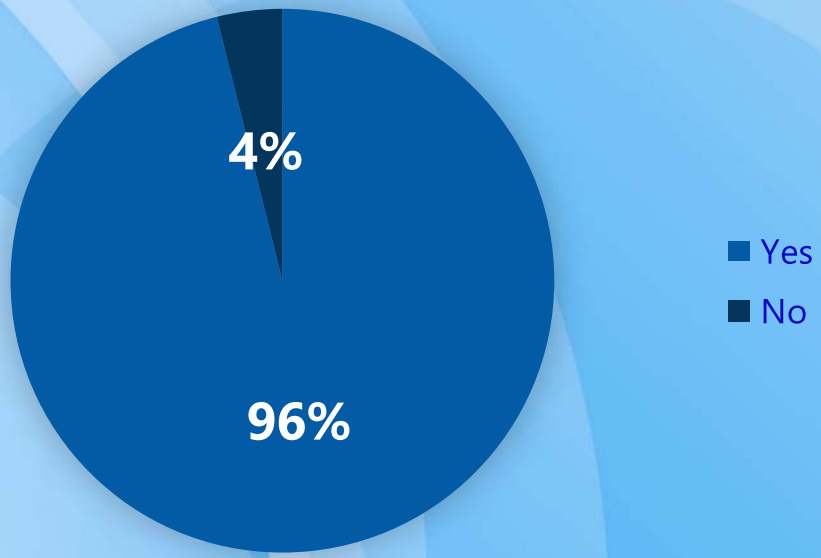
C3PO Survey

Do you think this experience broadened your perspective on issues within this community?



C3PO Survey

Did this C3PO reinvigorate your connection to the South Coast AQMD mission and/or inspire you to pursue environmental and social solutions that are equitable, just, and inclusive?



C3PO Survey

What new ideas/strategies did you gain from this C3PO?

- I learned how community members felt more engaged and have buy-in with government community development projects when they are entrusted with program management and/or have a role in decision-making processes.
- It renewed my belief that it is vital for our staff to get out into the communities they serve and hear directly from the folks our rules/regulations are affecting.

What are action items that come to mind based on your experience with this C3PO?

- I see why green spaces are so important to so many CSC members.
- I see why they are so tired of all the heavy-duty diesel trucks. They are everywhere in this area.
- I would like to see this program rolled out wider to EC, our Board, and eventually all staff. I think every employee should attend one of these events to put their work in perspective.

Statewide DEI

Purpose

To increase understanding of statewide diversity, equity and inclusion issues and concerns relevant to Air Quality

To apply critical thinking approaches to DEI problem solving and develop best practices

To develop standards of statewide DEI goals and priorities, benchmarks, and indicators

To mobilize DEI professionals across multiple contexts to address growing diversity related issues and concerns

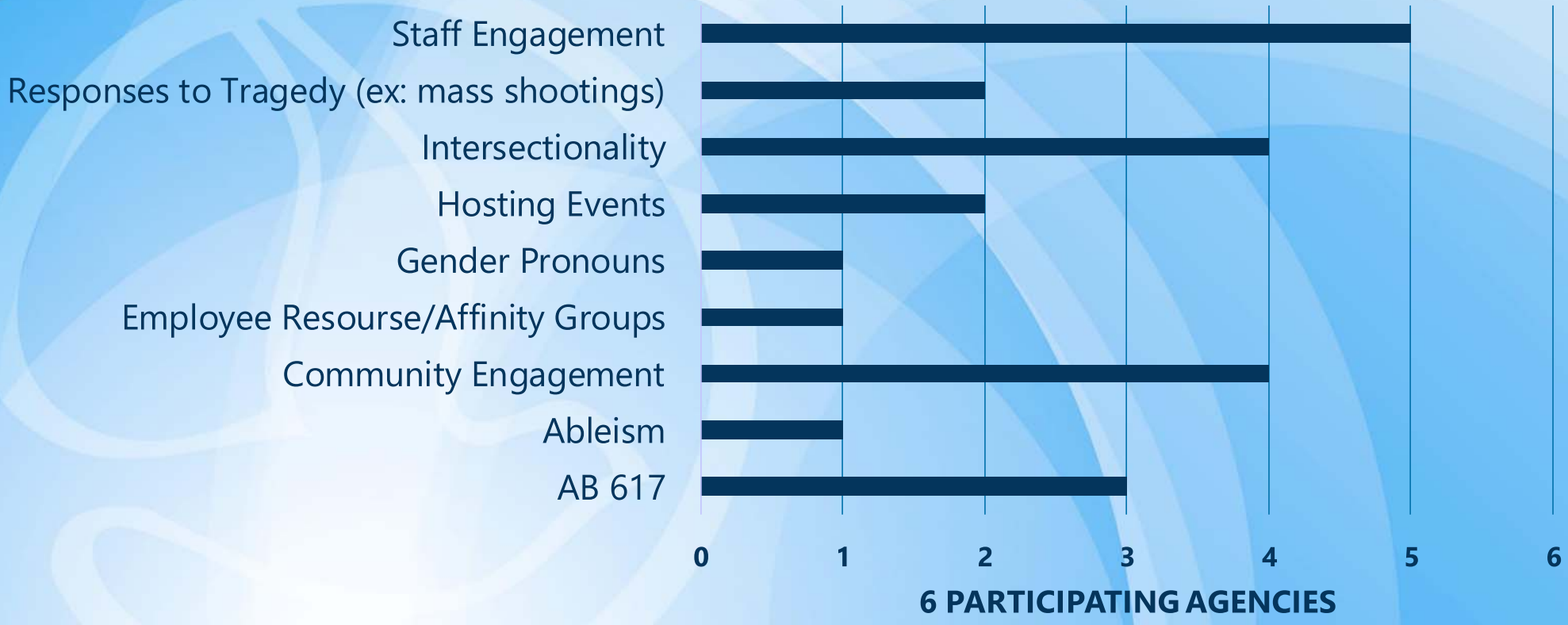
Initiatives

- Development of repository of DEI Resources
- CAPCOA DEI/.Environmental Justice Working Group
- Subject matter experts to advance the intellectual diversity agenda of agencies

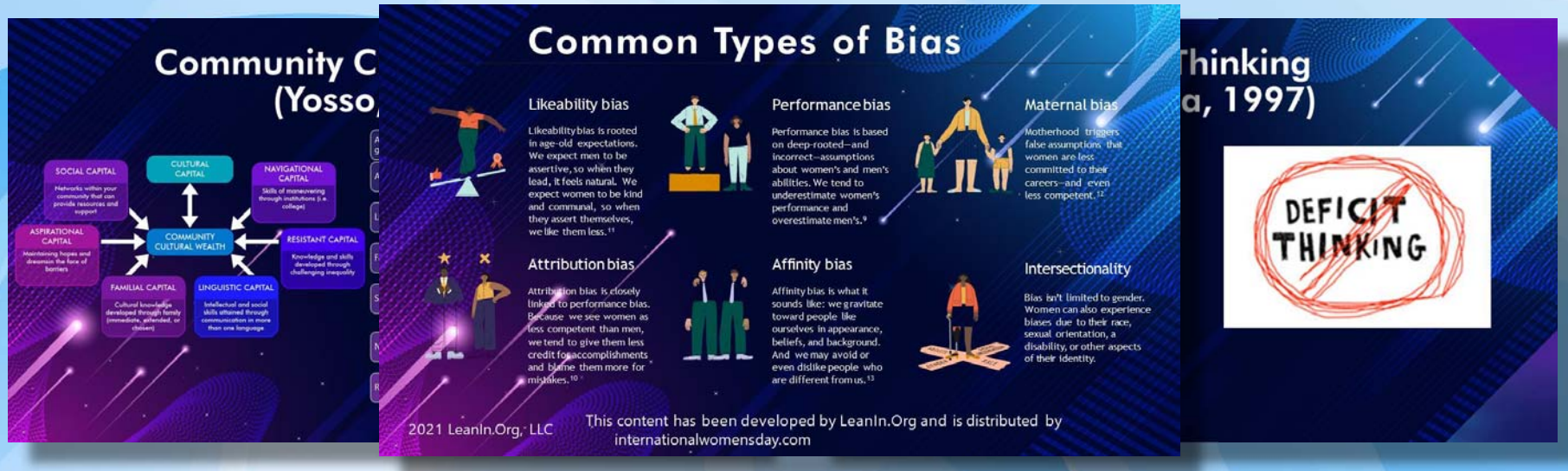
Monthly meetings with representatives from 6 Air Districts and CARB

Statewide DEI

2023/2024 Subject Matter Prioritization Survey



CAPCOA DEI/EJ Working Group



South Coast AQMD Presentation - May 2023

- Increased awareness of terminology, resources and theoretical foundations that ground DEI
- Increased awareness of DEI initiatives at South Coast AQMD
- Equip attendees with resources to identify the increasing complex DEI issues and incorporate into individual district work

Ongoing DEI Initiatives

Continuation of Support for Employee Resource Groups

- Expansion of ERG repository of resources

Continuation of Community Engagement

- Critical Community Conversations for Purposeful Outreach (C3PO)
- Young Leaders Advisory Council

Equity Center

- Expansion of DEI Library and Resources
- Work with AHR to provide DEI Trauma responsive training for employees

Statewide DEI

- Creation of Community of Practice Networks for DEI/EJ
- Creation of DEI/EJ Repository of Resources

Agenda Item 2f. Climate Change and Air Quality

Climate Change and Air Quality

Sarah Rees, Ph.D.
South Coast AQMD
Deputy Executive Officer

2024 South Coast AQMD Board Retreat
May 9, 2024

Sarah Rees, Ph.D.
South Coast AQMD

Dr. Sarah Rees is the Deputy Executive Officer in the Planning, Rule Development and Implementation Division at the South Coast AQMD. In her role she oversees all activities of the Division, including development of State Implementation Plans and the Air Quality Management Plan, strategies and rules for air pollution control, meteorology and forecasting, air quality evaluation, air toxics risk assessment, emissions inventories, and transportation programs, Prior to her current position she served as Assistant Deputy Executive Office focusing on the implementation of transportation and mobile source programs, as well as development of the Air Quality Management Plan.

Sarah has more than twenty years of experience in air quality and climate change matters at the state and federal level. Prior to joining South Coast AQMD, Sarah directed the Office of Regulatory Policy and Management in EPA's Office of Policy where she oversaw the Agency's regulatory agenda and advised senior Agency management on the development of high-profile regulations. Previously, she served several roles within Washington State's Department of Ecology, including directing programs to address climate change, and leading the planning and rules section within Ecology's Air Quality Program.

Trained as a chemical engineer, Sarah received her law degree from Rutgers Law School and practiced environmental law for several years before obtaining a Ph.D. in Engineering and Public Policy from Carnegie Mellon University.

Summary

- There is a critical need to act on climate change
- As a local air quality agency, our focus is on addressing criteria pollutants
- Current AQMP strategies to address Ozone and PM will also reduce GHG emissions

Outline

- Background on climate change and greenhouse gases (GHGs)
- GHG emission trends and sources
- Current status and impacts
- International, national and state policies and regulations
- Role of local air districts & limitations on authority

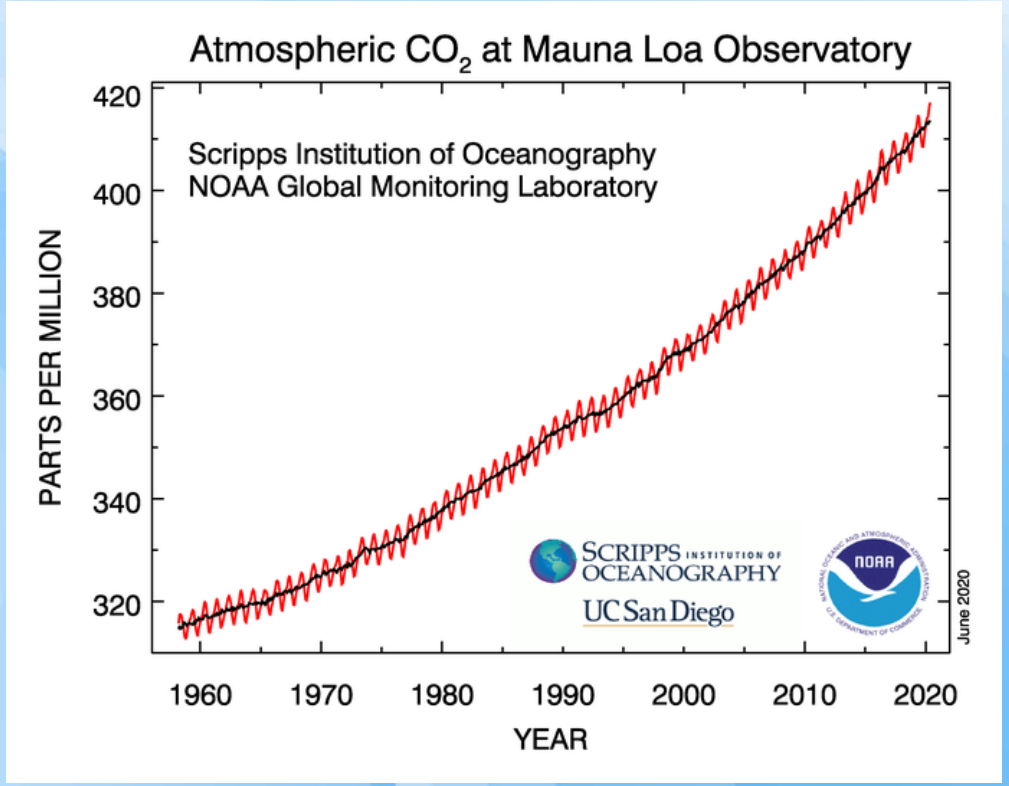
What is Climate Change?

- Long-term shifts in global temperature and weather patterns
  - Measured over hundreds of years
  - Different from shorter term weather patterns
  - Signs of climate change
    - Higher temperatures, but also
      - Change in rainfall patterns
      - Sea level rise
      - Warming ocean temperatures
      - More frequent and intense extreme weather events
- Can be naturally-occurring or man-made
  - For the past ~200 years changes in climate caused mostly by human activities

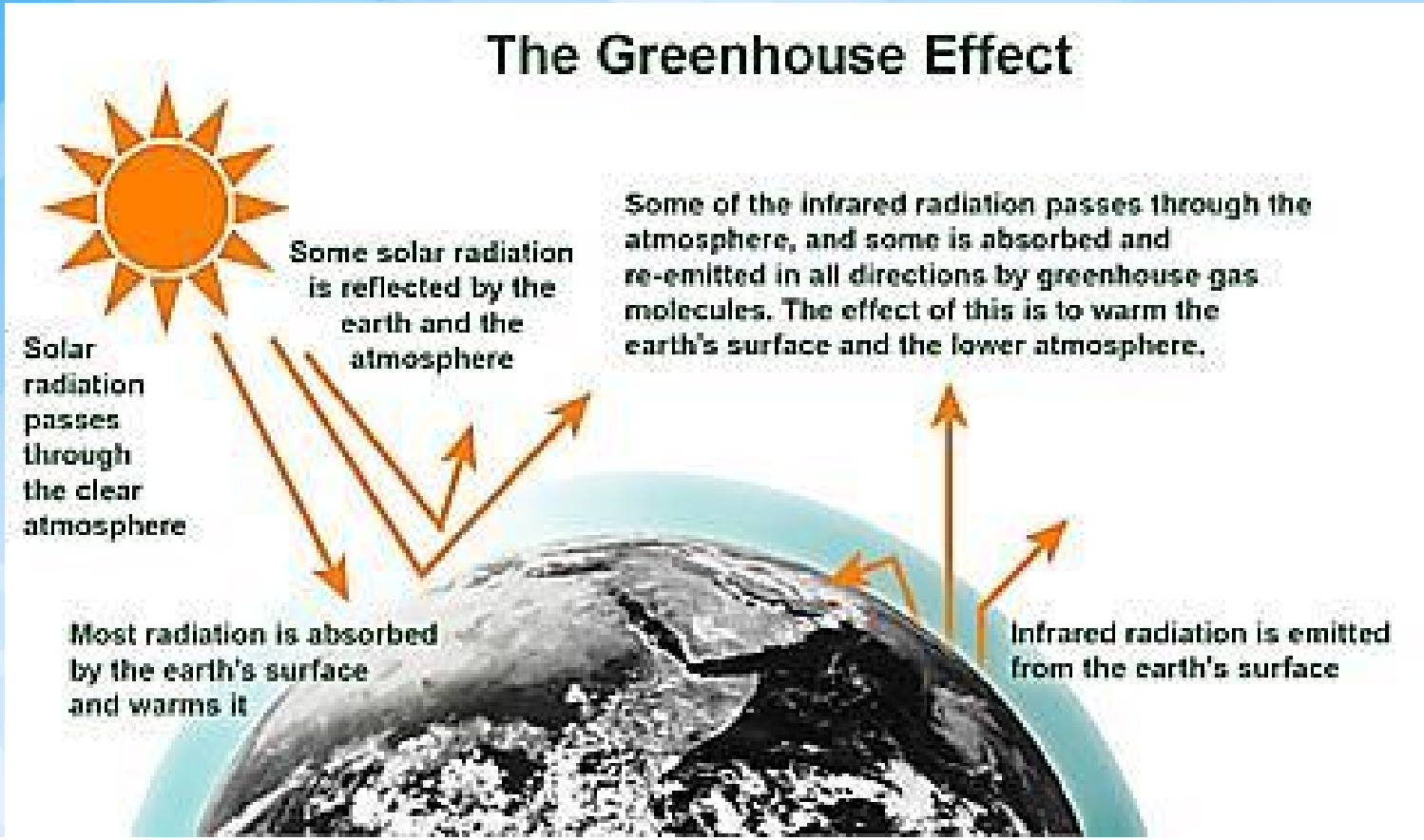
What Caused the Current Climate Change Patterns?

- Elevated levels of Greenhouse Gases (GHGs) trap heat from the sun in our atmosphere (Greenhouse Effect)
  - Aerosols can also cause climate change by cooling the atmosphere
- Since the industrial revolution the burning of fossil fuels has resulted in very high levels of GHGs

Current CO2 levels are >400 ppm, levels that the atmosphere hasn't experienced in several million years

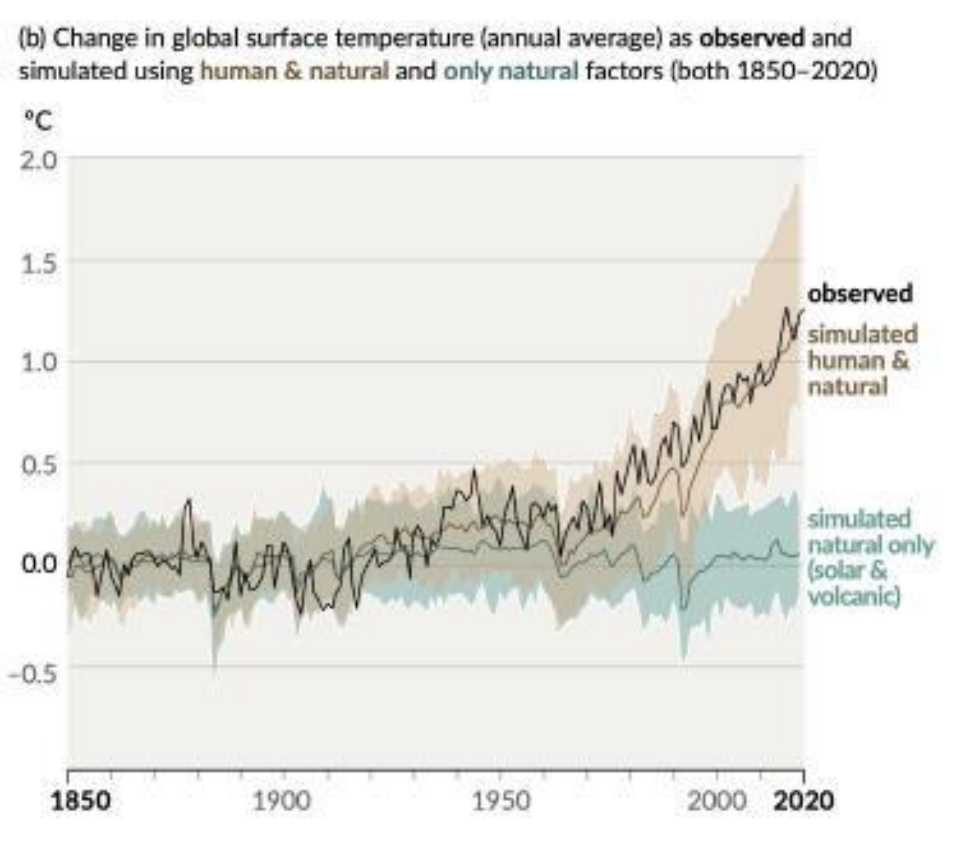


The Greenhouse Effect Causes Warming Trends



Source: EPA The Effect of Climate Change on Water Resources and Programs | Watershed Academy Web | US EPA

How do we know climate change is caused by humans?



Observed temperatures deviated consistently above what would be expected from natural factors since ~1950

Types of GHGs

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Fluorinated gases (e.g., HCFCs, SF_6, etc)

Other Important GHGs

Global Warming Potential (GWP)

- Different GHGs have different potential to warm the atmosphere
  - CO2 is the reference: GWP=1
  - Other gases, particularly fluorinated gases, are more potent
- GHGs are therefore usually expressed as CO2 equivalents (CO2e)
- Of total GHG emissions ~80% due to CO2

GHG	GWP
CO2	1
CH4	28-36
N2O	273
SF6	23,500

These are global warming potentials over 100 year time span

Sources of GHGs

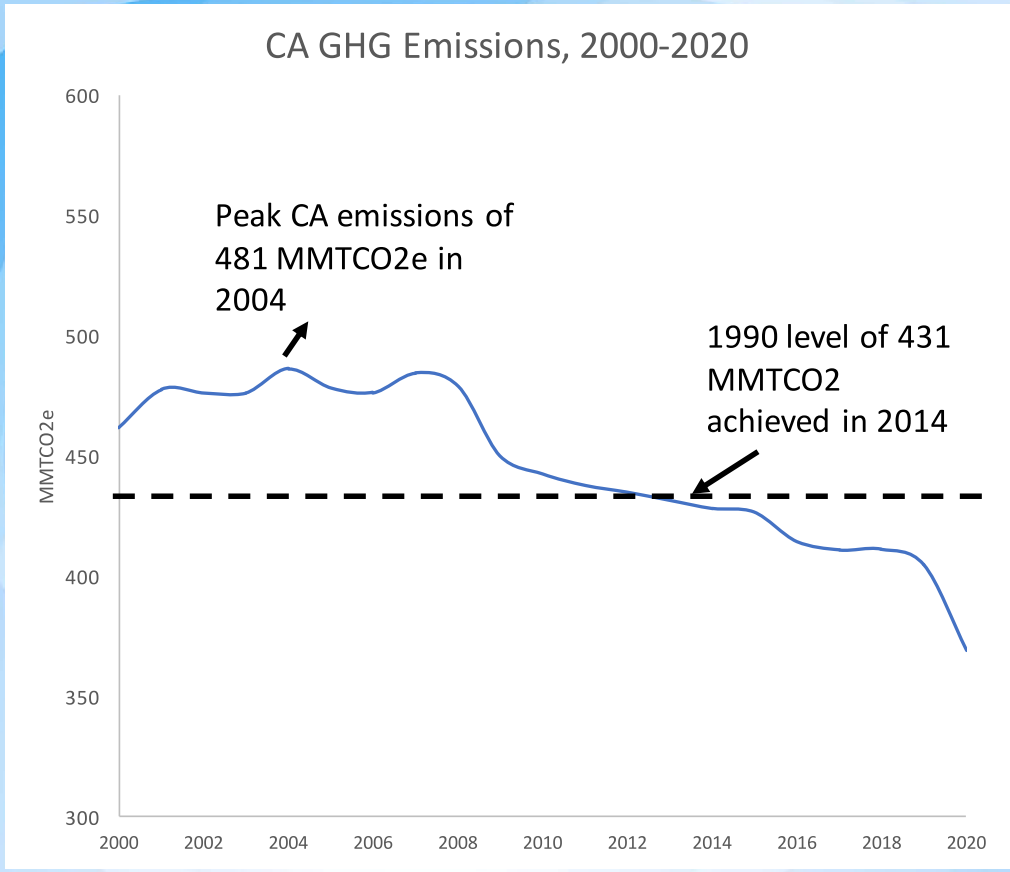
CO2: Burning of fossil fuels

CH4: Biological processes/oil and gas

N2O: Biological processes/combustion

SF6: Industrial Gas

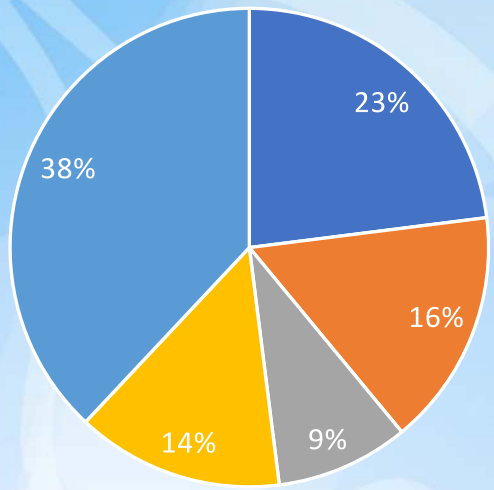
CA GHG Trends and Targets



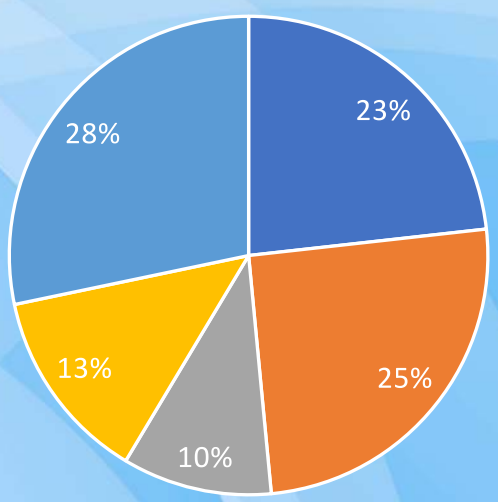
- 2022 Scoping Plan Targets
  - Reduce GHG emissions:
    - 48% from 1990 levels by 2030
    - 85% from 1990 levels by 2045
  - Achieve carbon neutrality by 2045

GHG Emission Sources in CA v US

CA 2020 GHG Emissions, 369 MMTCO2e



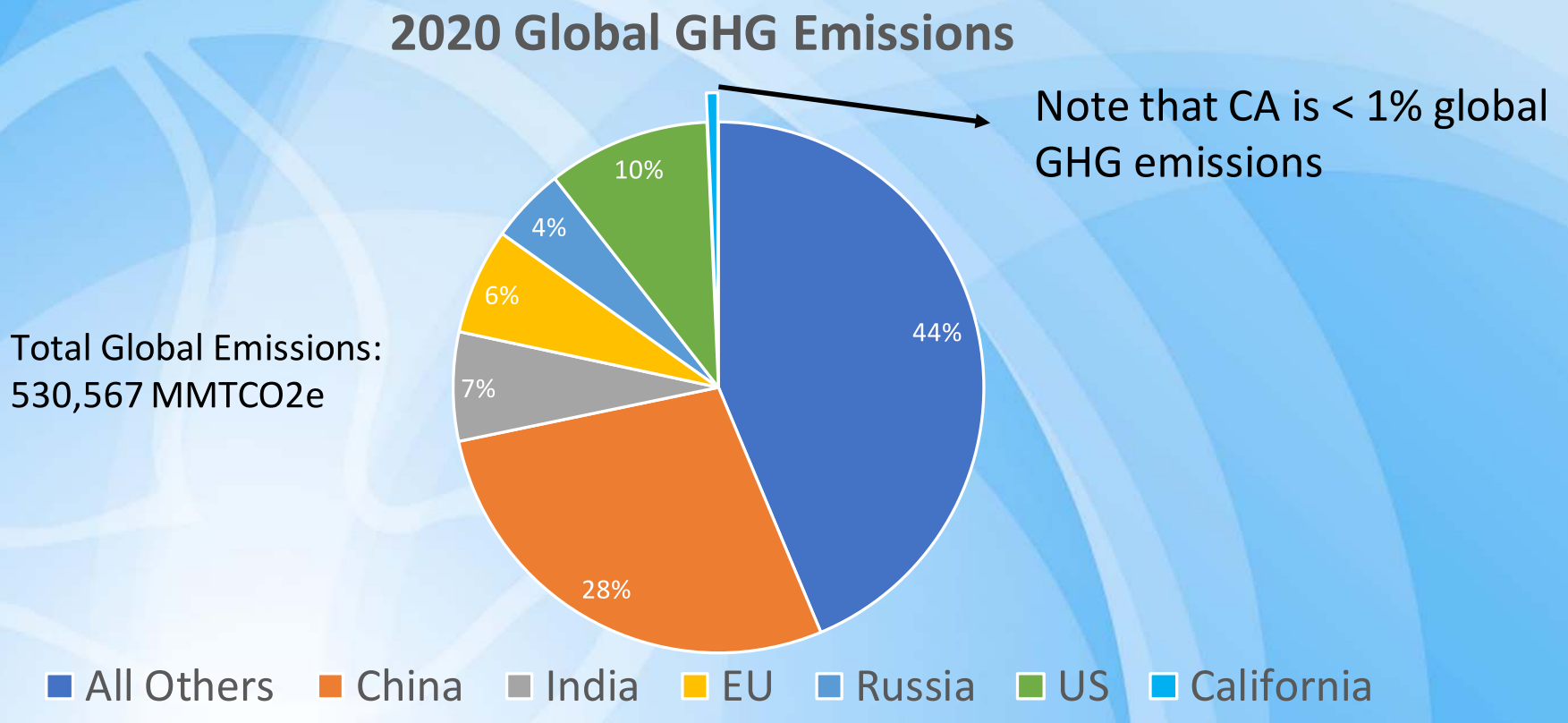
US 2020 GHG Emissions, 6,340 MMTCO2e



Industrial | Electricity | Ag & Forestry | Residential & Commercial | Transportation

Transportation is the largest source of GHGs for CA; transportation, electricity and industrial sources are approximately evenly split in the US

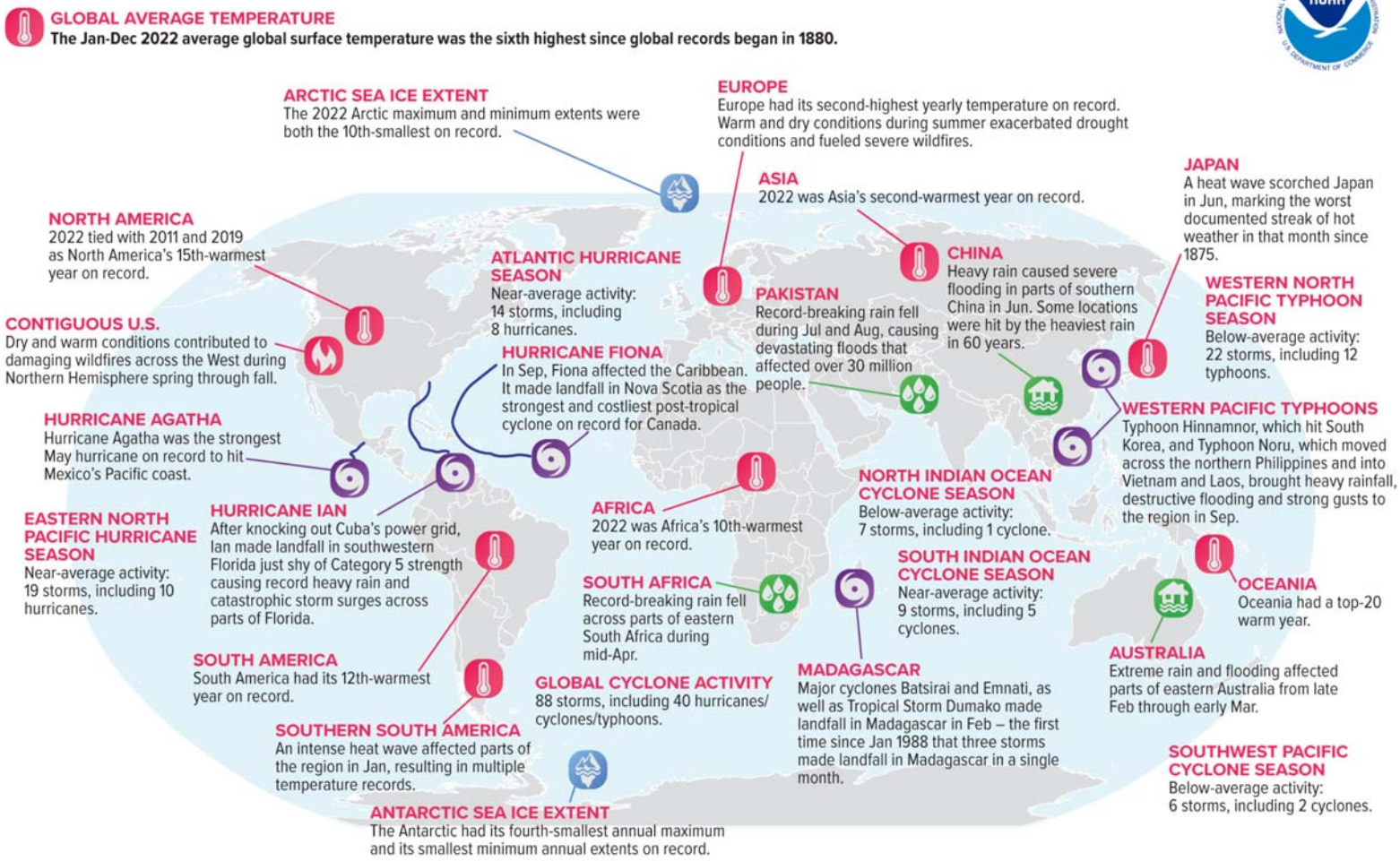
CA GHG Emissions are a Fraction of Global Emissions



Current Status and Projections

- Global average surface temperature has increased 2°F since pre-industrial times
- 2023 was the warmest year on record
- 11 warmest years have all occurred since 2010
- There is a 1 in 3 chance that 2024 will be warmer;
  99% chance that it will rank in the top 5
- The rate of warming is almost twice as fast 1981-current v. 1880-1980

Selected Significant Climate Anomalies and Events in 2022



Source: NOAA, Assessing the Global Climate in 2022 | News | National Centers for Environmental Information (NCEI) (noaa.gov)

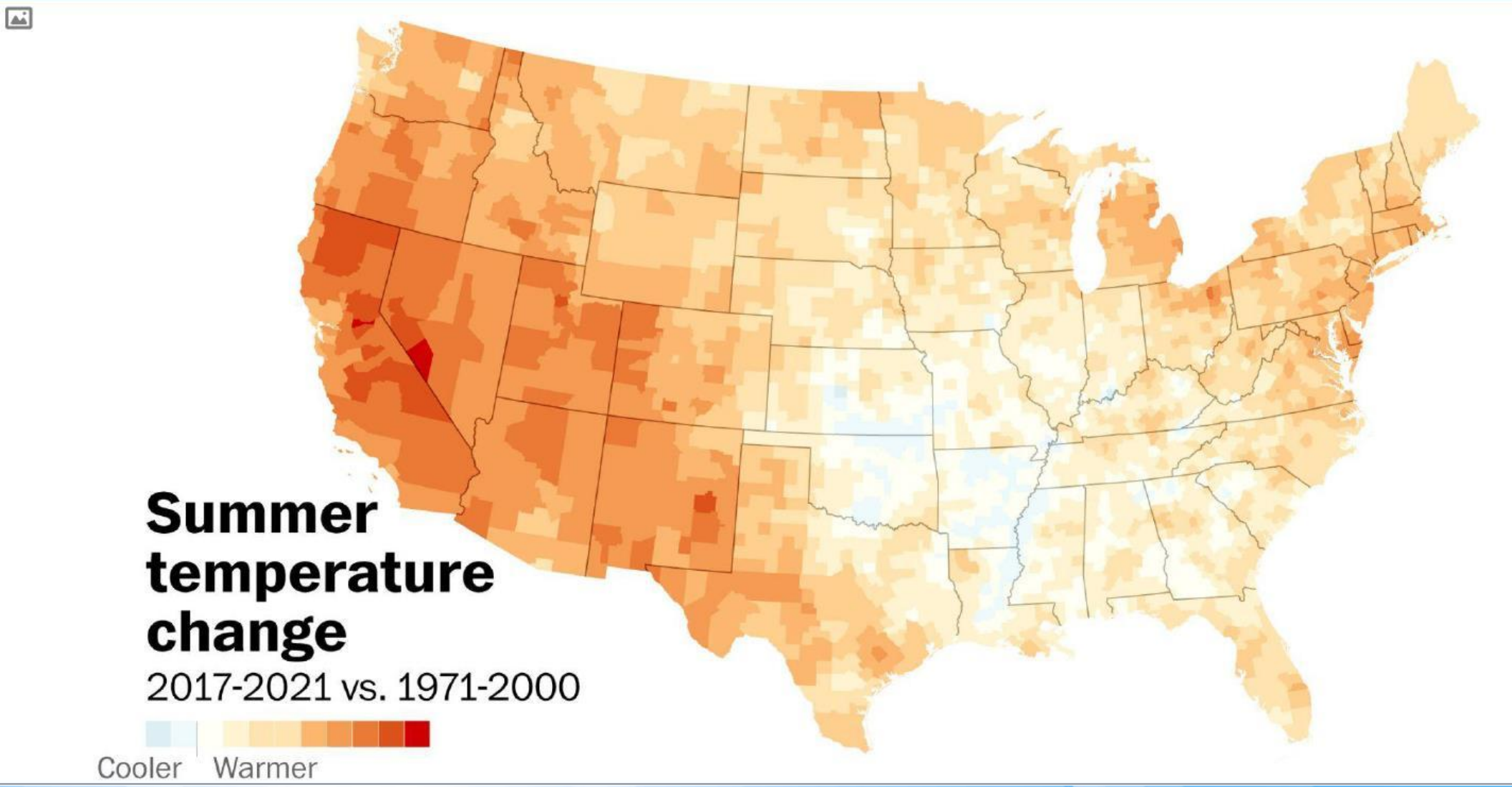
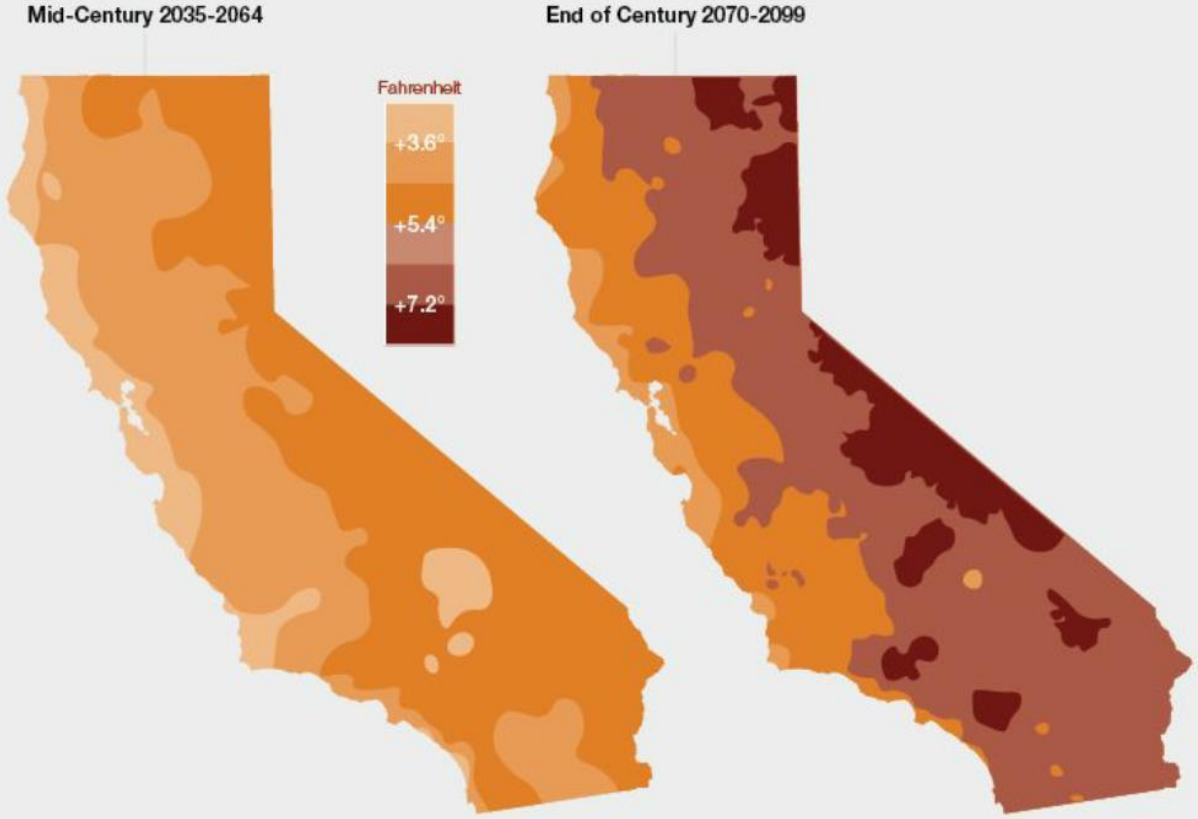

Summer temperature change
2017-2021 vs. 1971-2000
Cooler
Warmer

Figure 1

Projected Increases in Average Maximum Temperatures Are Greatest in Inland and Southern California



Reflects changes from historical baseline 30-year average maximum temperatures (1961-1990). These estimates assume the moderate climate change scenario of "RCP 4.5," in which international practices result in the rate of worldwide greenhouse gas emissions slowly declining in the coming decades.

Data from www.Cal-Adapt.org

LAO

California's Future Maximum Temperatures

Consequences of Increasing Temperatures

Air Quality

Wildfires

Drought

Measures to Address Climate Change

- **Mitigation** – reducing GHG emissions to reduce the magnitude and rate of future climate change
  - Cap and trade programs
  - Implementation of emission and fuels standards
  - Pivot to zero emission technologies

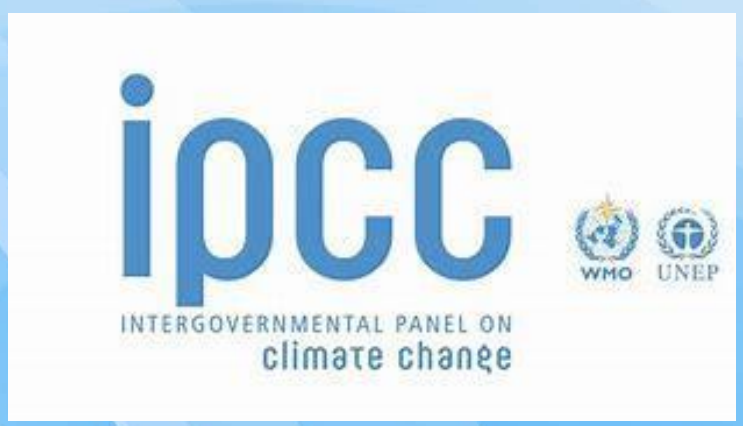
- **Adaptation** – actions to prepare for and adjust to the impacts associated with current and future climate change
  - Defenses for flooding/sea level rise
  - Strategies to reduce wildfires and promote forest management
  - Reducing urban heat island effect

Need to have both types of actions in place

International Framework to Address Climate Change (IPCC)

Intergovernmental Panel on Climate Change (IPCC)

- UN body responsible for assessing the state of science regarding climate change
- Informs the development of strategies under UNFCCC



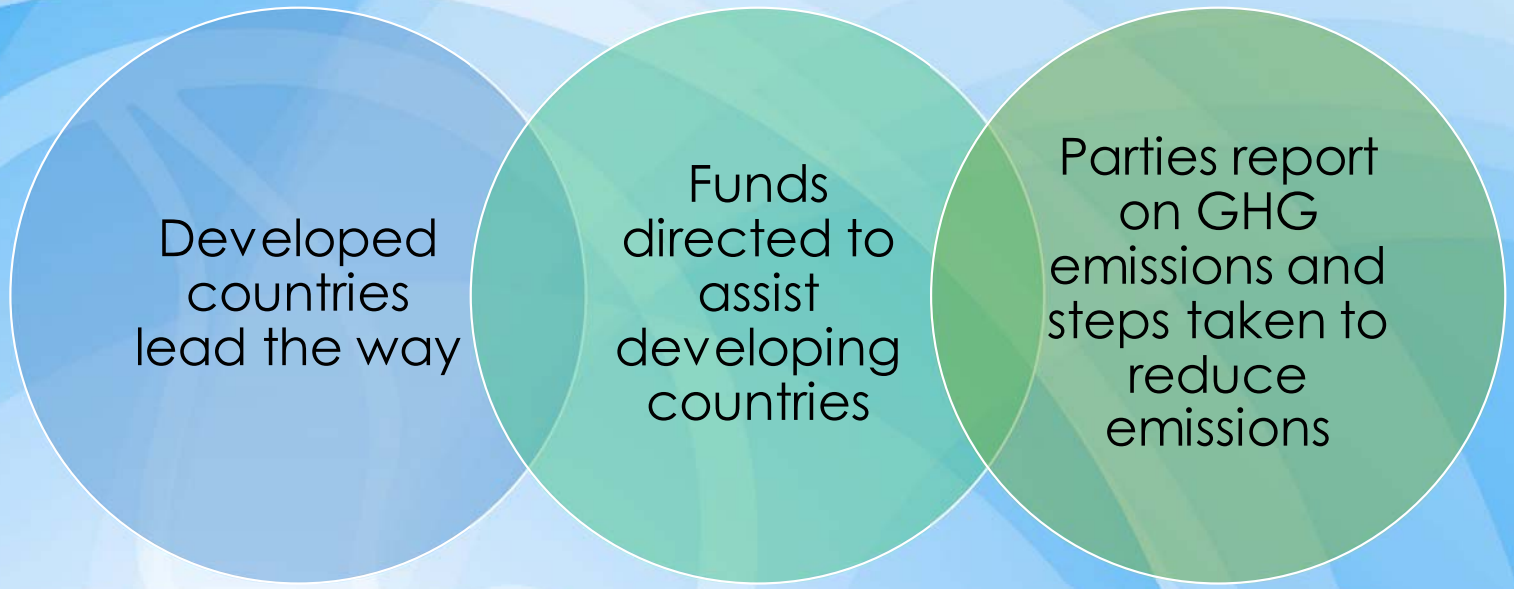
IPCC Observations

- *Human activities*, principally through emissions of greenhouse gases, *have unequivocally caused global warming*, with global surface temperature reaching 1°C above 1850–1900 in 2011–2020
- Global GHG emissions in 2030 implied by nationally determined contributions (NDCs) announced by October 2021 make it likely that warming will exceed 1.5°C during the 21st century and make it harder to limit warming below 2°C

UN Framework Convention on Climate Change (UNFCC)

- In effect March 1994 – current
- Currently ratified by 198 countries – these are the "parties to the convention"
- "Conference of parties" (COP) held annually – decision-making body of the UNFCCC
- US participation led by Department of State
- Designed to stabilize global GHG concentrations
  - "At a level that would prevent dangerous anthropogenic (human induced) interference with the climate system"
  - Within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner

UNFCC Approach



Paris Agreement (2015)

Hold global warming to within 2°C of pre-industrial levels

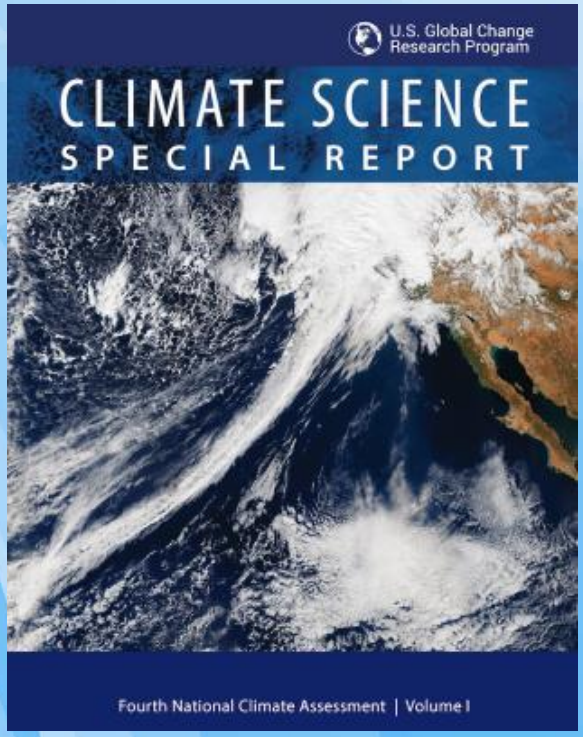
Try to limit to less than 1.5°C

National Efforts to Address Climate Change

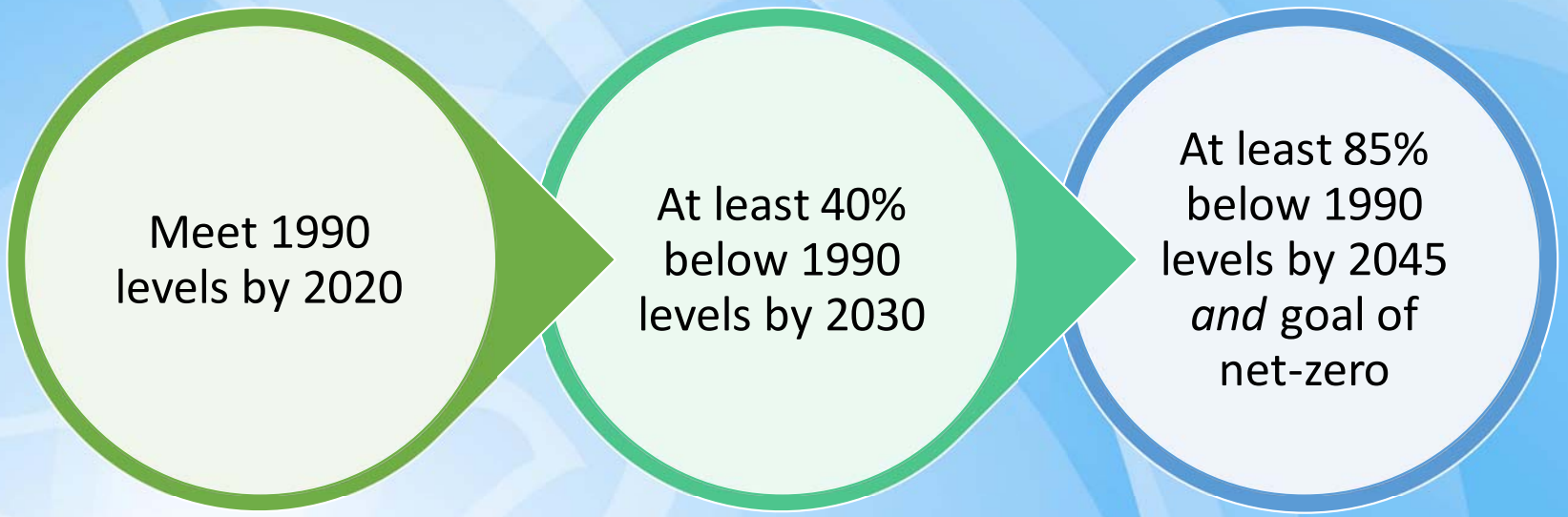
- Regulations
  - Emissions standards new light and heavy-duty vehicles
  - GHG standards for aircraft
  - Renewable Fuel Standard
  - Rules for power plants, oil and gas, and landfills
  - GHG emissions reporting
- Funding
  - Climate Pollution Reduction Grant Program (CPRG)
- Plans
  - Blueprint for Transportation Decarbonization
  - Zero Emissions Freight Corridor Strategy

US Global Change Research Program (USGCRP)

- Congressionally-mandated group with 14 member agencies to coordinate US climate research
- National Climate Assessment Report – peer-reviewed by National Academies of Sciences
  - 5th National Climate Assessment issued 2023



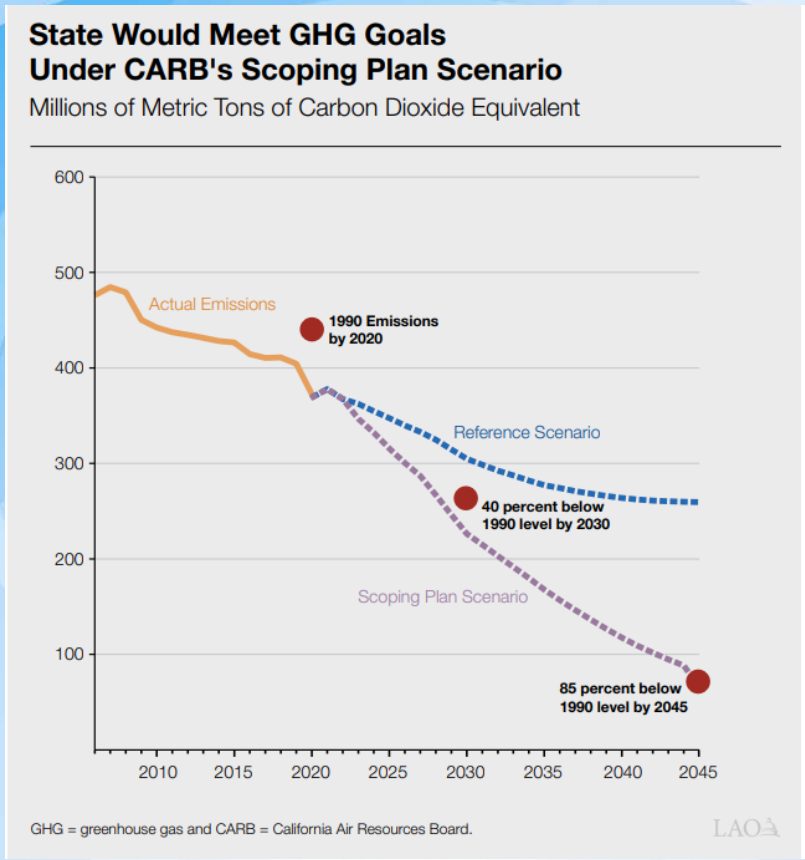
California Statutory Emission Reduction Targets



California's Efforts to Address Climate Change

- 2022 Scoping Plan
- Cap and Trade Program
- Vehicle Emission Standards
  - Advanced Clean Cars
  - Advanced Clean Fleets
  - Omnibus Rule
- Low Carbon Fuel Standard
- Renewable Portfolio Standard
- Green Building Standard
- Greenhouse Gas Reduction Fund

Challenges Meeting California's GHG Goals



- 2020 target met by 2014
- Sharp dip in emissions in 2020 due to the pandemic; expected to rebound
- CARB's Scoping Plan shows path to meet 2030 and 2045 targets
- Strategies in CARB's pathway require widespread transformation to a zero-emissions economy at a rapid pace

Limitations on Air District's Authority to Regulate GHGs

- AB 398 (Garcia, 2017) - **SEC. 12.**
- Section 38594 of the Health and Safety Code amended:

38594.

(a) Except as provided in subdivision (b), nothing in this division shall limit or expand the existing authority of any district.

(b) A district shall not adopt or implement an emission reduction rule for carbon dioxide from stationary sources that are also subject to a market-based compliance mechanism adopted by the state board pursuant to subdivision (c) of Section 38562.

Limits the ability of local air districts to regulate major sources of GHGs that are subject to CARB's cap and trade program ~80% of statewide emissions

Strategies Needed to Meet Air Quality Standards will Also Reduce GHGs

Combustion Equipment
(engines, boilers, heaters)

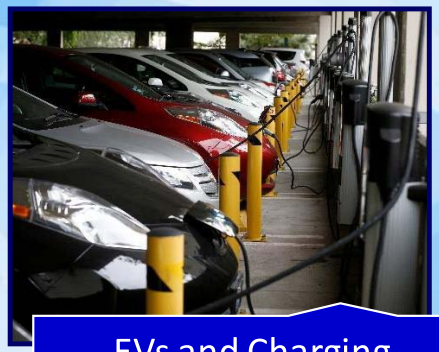
NOx

CO_2

Control measures that incorporate zero emission technologies will reduce NOx *and* CO2 emissions

Battery/Fuel Cell Technologies and Alternative Fuels for Mobile Sources

Hydrogen Fueling and FCHV



EVs and Charging Infrastructure

Electric Fleets

Shore Power and Electric Equipment at Ports

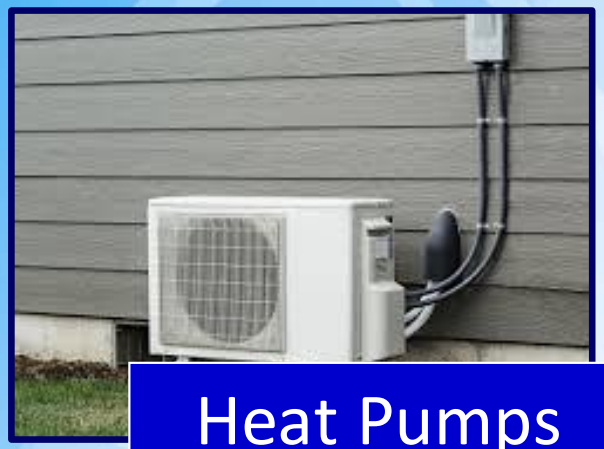
Battery EV and Fuel Cell Trucks at the Port

Battery EV

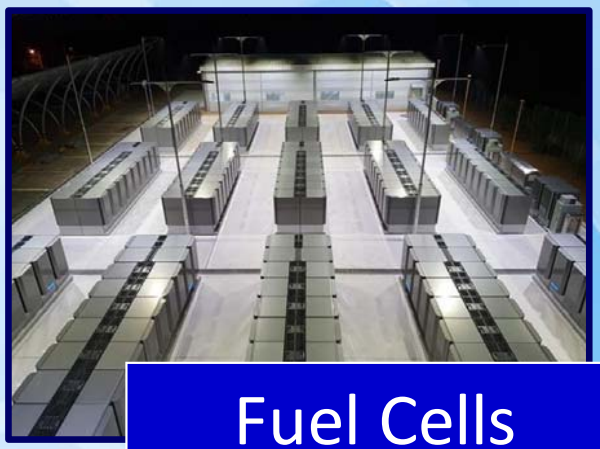
ZE Switchers

Electric Equipment at Airports

Heat Pumps, Fuel Cells, and Battery Storage for Stationary Sources



Heat Pumps



Fuel Cells

Battery Storage

Concluding Remarks

- Local governments can use their authority and resources to reduce greenhouse gases and climate change impacts within this overarching framework
- South Coast AQMD must continue to work to achieve National Ambient Air Quality Standards
- South Coast AQMD's strategies to achieve federal air quality standards will also help meet climate goals