



CLEAN FUELS PROGRAM ADVISORY GROUP AGENDA
JANUARY 17, 2019, 9:00 AM – 3:30 PM
Conference Room GB
21865 Copley Drive
Diamond Bar, CA 91765

Welcome & Overview - 9:00 – 9:30 AM

- (a) Welcome & Introductions Matt Miyasato, Deputy Executive Officer
- (b) Goals for the day Naveen Berry, Assistant Deputy Executive Officer
- (d) Feedback and Discussion All

Areas of SCAQMD Focus

1. Heavy-Duty Technologies - 9:30 AM – 12:00 PM

- (a) Near Zero Emission Beta Engine Rollout
Staff will provide update on 12L NG engine project Phil Barroca, Program Supervisor
- (b) Heavy Duty Low NOx Diesel Update
Staff will provide update on Low NOx technology Joseph Lopat, Air Quality Specialist
- (c) Heavy Duty Electric Truck Project Updates
Staff will provide update on Daimler & Volvo projects Joseph Impullitti, Technology Demonstration Manager
- (d) Medium & Heavy Duty Truck Projects Update
Staff will present on airport shuttle & heavy duty truck projects Seungbum Ha, Air Quality Specialist
- (e) Hydrogen Fuel Cell Bus Project
Staff will provide update on OCTA FCB project Patricia Kwon, Air Quality Specialist
- (f) Feedback and Discussion All

Lunch 12:00 - 1:00 PM

2. Light-Duty Technologies/Infrastructure - 1:00 – 2:45 PM

- (a) Hydrogen Stations & Zero Emission Vehicles Update
Staff will provide an Update of heavy & light-duty hydrogen stations & new fuel cell and battery electric cars Lisa Mirisola, Program Supervisor

Incentives and Regulations

- (a) Incentive Programs Update Vicki White, Technology Implementation Manager
- (b) 2016 AQMP – Indirect Source Measures Ian Macmillan, Planning & Rules Manager
- (c) Feedback and Discussion All

Break 2:45 – 3:00 PM

3. Wrap-up – 3:00 PM – 3:30 PM

- (a) Discussion & Wrap-up Naveen Berry
- (b) Advisor and Expert Comments All

Other Business

Any member of the committee, or its staff, on his or her own initiative or in response to questions posed by the public, may ask a question for clarification; may make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter, or may take action to direct staff to place a matter of business on a future agenda. (Government Code Section 54954.2)

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Document Availability

All documents (i) constituting non-exempt public records; (ii) relating to an item on the agenda for a regular meeting; and (iii) having been distributed to at least a majority of the Advisory Group after the agenda is posted, are available prior to the meeting for public review at the South Coast Air Quality Management District Public Information Center, 21865 Copley Drive, Diamond Bar, CA 91765.

Americans with Disabilities Act

The agenda and documents in the agenda packet will be made available, upon request, in appropriate alternative formats to assist persons with a disability. Disability-related accommodations will also be made available to allow participation in the meeting. Any accommodations must be requested as soon as practicable. Requests will be accommodated to the extent feasible. Please contact Donna Vernon at 909-396-3097 from 7:00 a.m. to 5:30 p.m., Tuesday through Friday, or send the request to dvernon@aqmd.gov.



South Coast
Air Quality
Management District

March 2019

CLEAN FUELS PROGRAM

2018 Annual Report and 2019 Plan Update

Technology Advancement Office

Leading the way to zero and near-zero emission technologies



Background

- 2018 Annual Report and 2019 Plan Update
 - Annual Report on Clean Fuels Program (HSC 40448.5.1)
 - Technology Advancement Plan (Update) (HSC 40448.5)
 - Draft 2019 Plan Update submitted to Technology Committee October 19, 2018
 - Annual public hearing to approve Annual Report and adopt final Plan Update
 - Submit to Legislature by March 31 every year

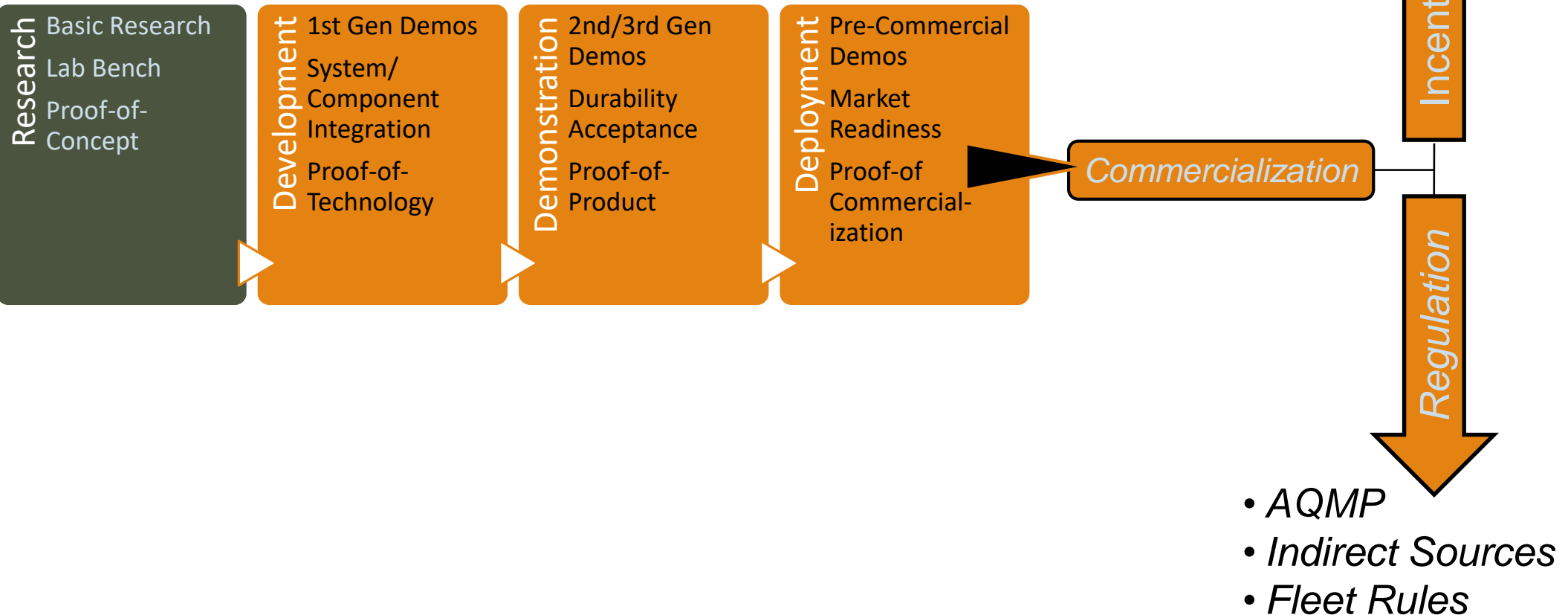
Input and Feedback

- Advisory group meetings
 - September 2018 and January 2019
 - Technology Advancement Advisory Group
 - Clean Fuels Advisory Group
 - Invited technical experts
- Meetings with agencies, industry groups, technology providers and other stakeholders
- Participation in symposiums and conferences
 - ACT Expo (April 2018)
 - 2018 Air Sensors Conference-UC Davis (Sept 2018)
 - Electrification 2018 Int'l Conference (Aug 2018)
 - Calstart Symposium (Nov 2018)
- Participation in clean tech partnerships
 - Transportation Electrification Partnership (ZE 2028 Roadmap)
 - California Fuel Cell Partnership



Clean Fuels Fund Overview

- *Carl Moyer*
- *Prop 1B, etc.*



Heavy-Duty Truck Usage National Data

Table 2-1 Weight of Shipments by Transportation Mode: 2012, 2015, and 2045
(millions of tons)

1.4% per year

Millions of tons	2012				2015				2045			
	Total	Domestic	Exports ¹	Imports ¹	Total	Domestic	Exports ¹	Imports ¹	Total	Domestic	Exports ¹	Imports ¹
Total	16,896	14,901	864	1,130	17,978	15,983	920	1,075	25,346	20,940	2,202	2,204
Truck	10,092	9,899	105	89	10,776	10,568	108	100	14,829	14,235	290	305
Rail	1,616	1,481	53	82	1,602	1,459	55	89	1,918	1,588	109	221
Water	884	502	68	313	884	544	95	246	1,100	609	190	301
Air, air & truck	10	2	4	4	10	2	4	5	37	4	16	18
Multiple modes & mail	1,311	309	596	406	1,346	324	615	407	2,962	431	1,521	1,010
Pipeline	2,942	2,672	37	233	3,326	3,056	43	226	4,468	4,058	73	338
Other & unknown	41	37	1	3	33	29	1	3	31	16	4	11

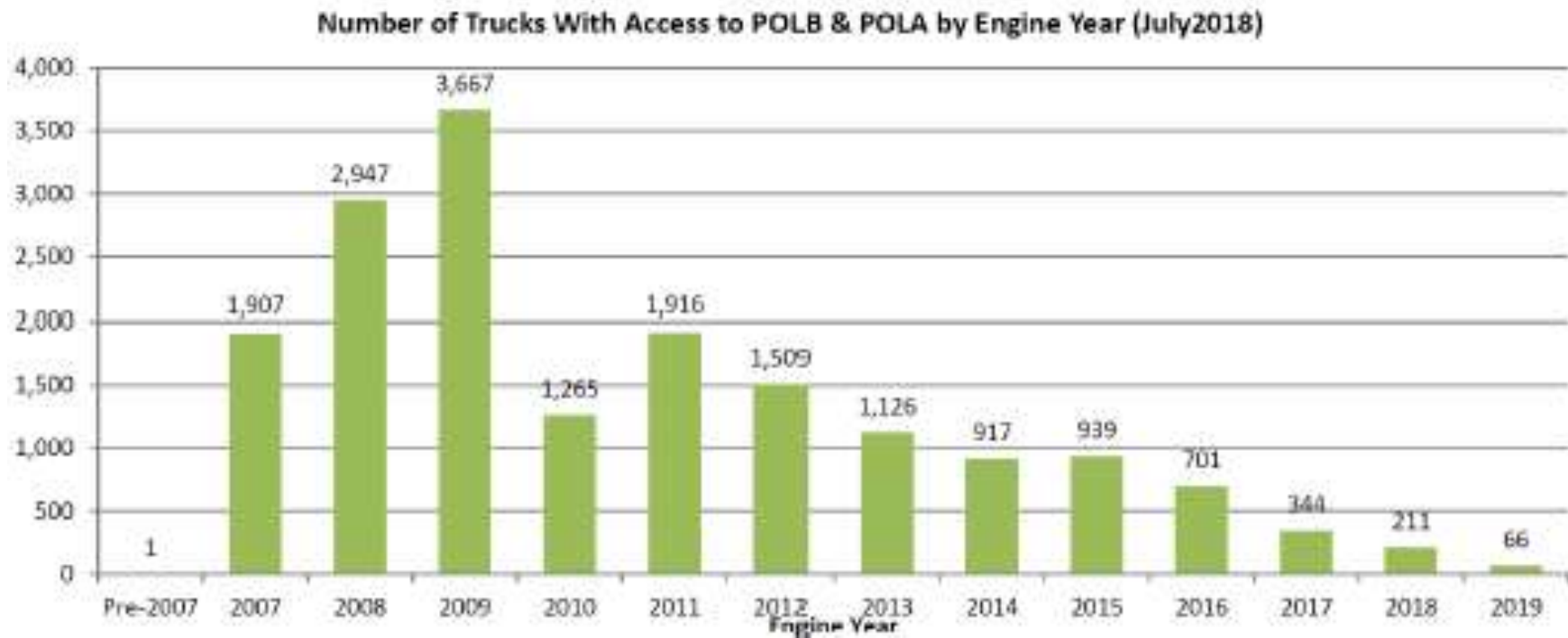
¹ Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode.

NOTES: Numbers may not add to totals due to rounding. The 2015 data are provisional estimates that are based on selected modal and economic trend data. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes & mail to avoid double counting. Multiple modes and mail also includes some air movements. As a consequence, some totals in this table are less than other published sources.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, Version 4.3.1, 2017.

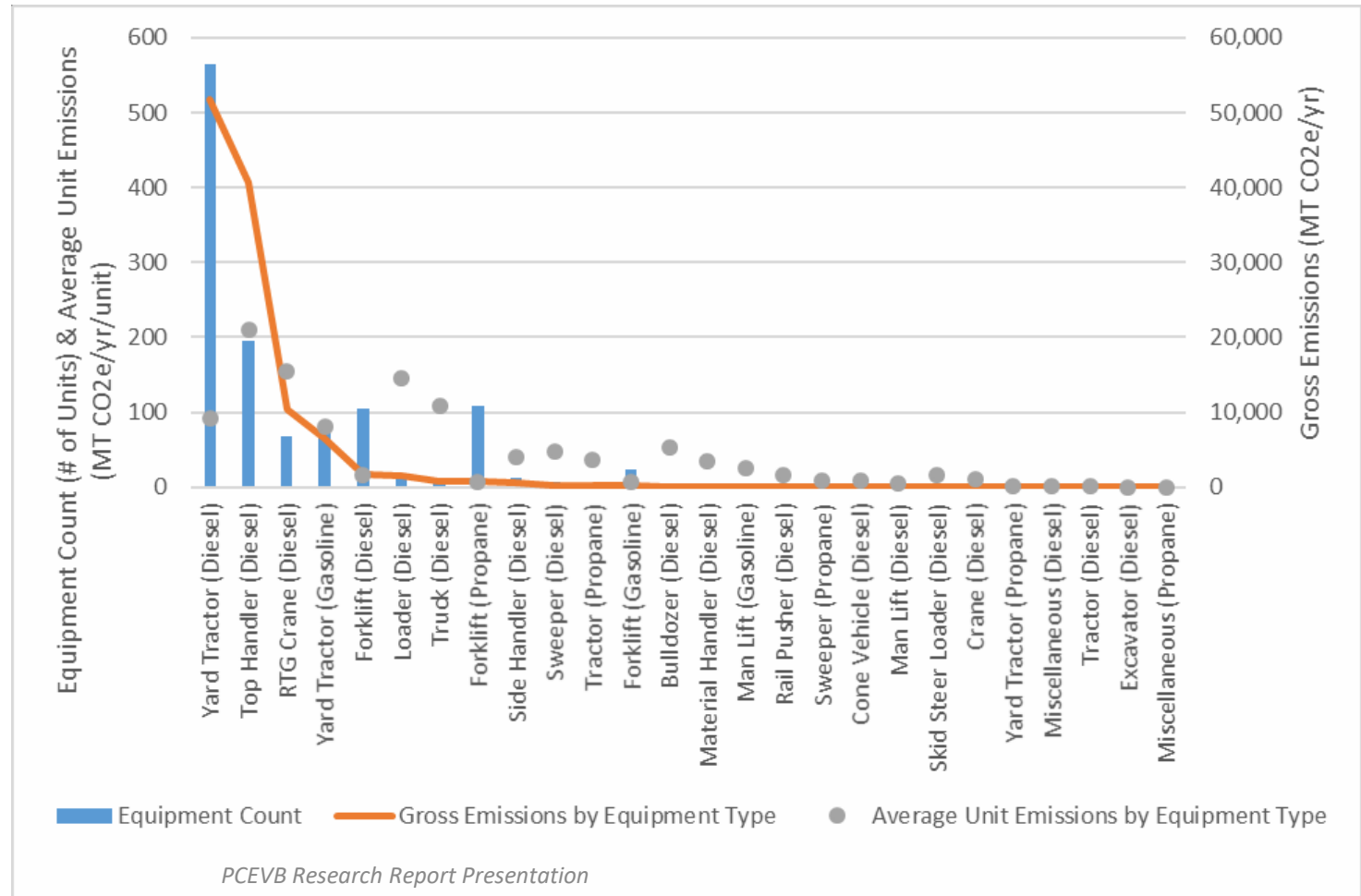
Port Drayage Trucks at a Glance

- 48.6% of the fleet (POLB & POLA) are 2009 or older

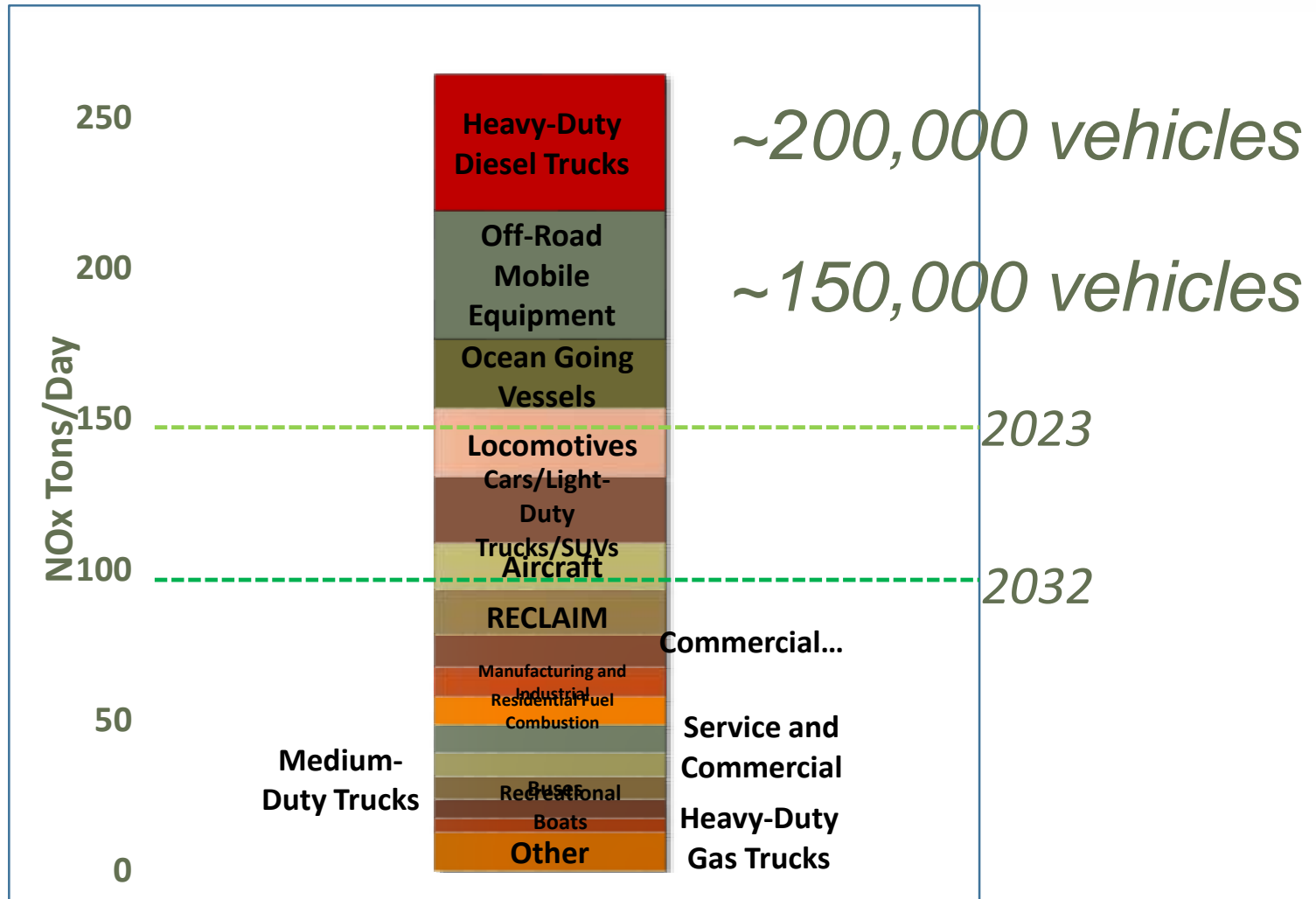


Port Equipment at a Glance

- *Yard Tractors, RTGs, and Top Handlers = 73% of the CHE inventory*
- *And = 94.5% of the CHE emissions*
- *90% of all CHE are located at container terminals*



Top NOx Sources 2023



Clean Fuels Program-Core Technologies

- Hydrogen/Fuel Cell Technologies and Infrastructure
- Electric/Hybrid Technologies and Infrastructure
- Engine Systems/Technologies (ultra-low emission NG HDVs)
- Fueling Infrastructure and Deployment (NG/RNG)
- Fuels/Emissions Studies
- Stationary Clean Fuel Technologies
- Emission Control Technologies
- Health Impacts Studies
- Technology Assessment/Transfer and Outreach



2018 – Key Funding Partners

Total = \$66.5M



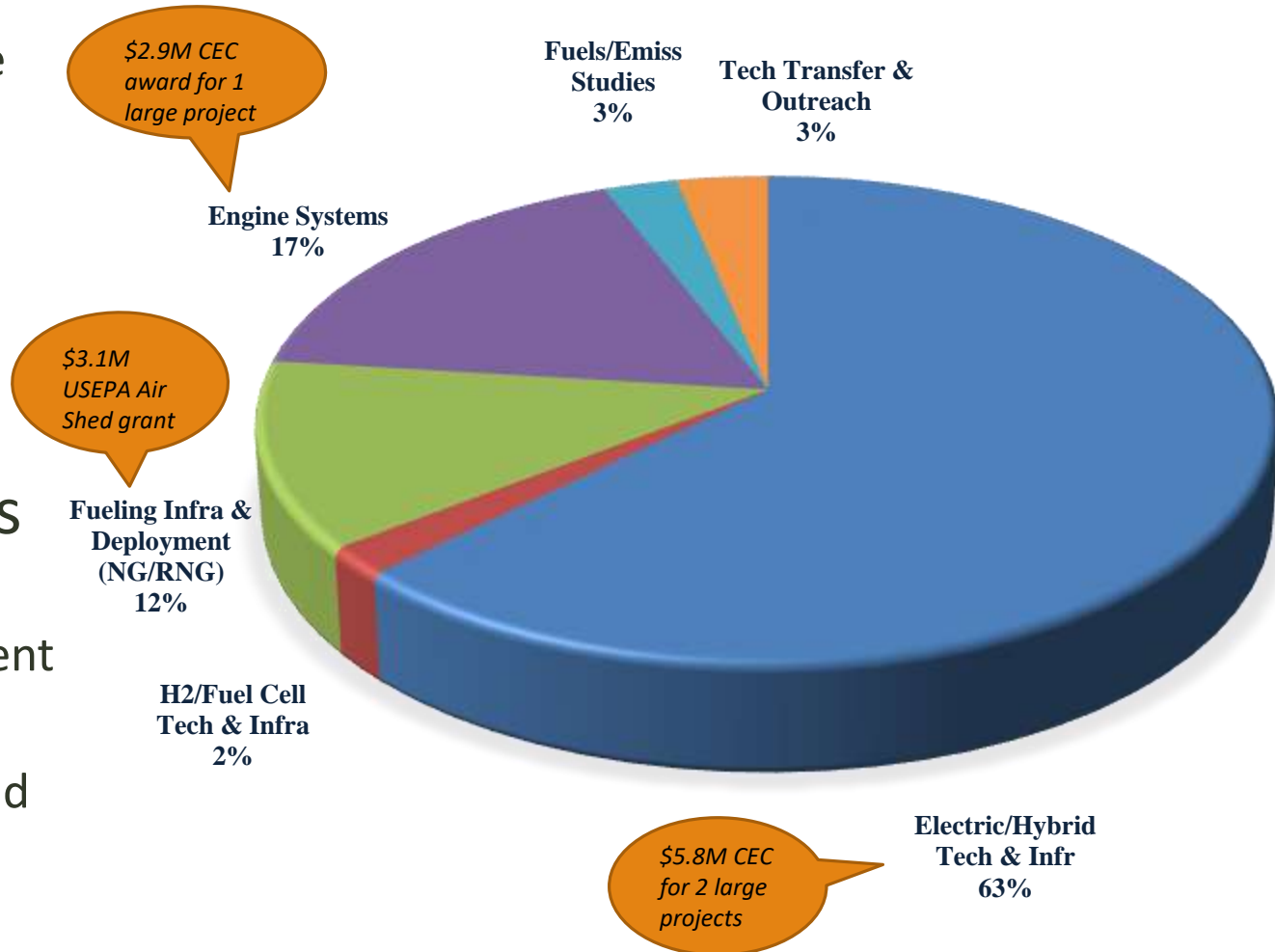
Targeted Air Shed - CATI



CY 2018 Accomplishments

- 73 – Contracts executed
 - \$25.5M – total contract value
 - \$12.3M revenue recognized into Clean Fuels Fund for executed contracts
 - \$70.2M – total project costs
 - \$1:\$5+ leveraging (typical)
- 48 - Completed projects
 - 18 research, development, demonstration and deployment projects
 - 30 technology assessment and transfer/outreach projects

Distribution of Executed Contracts



2018 Key Contracts Executed

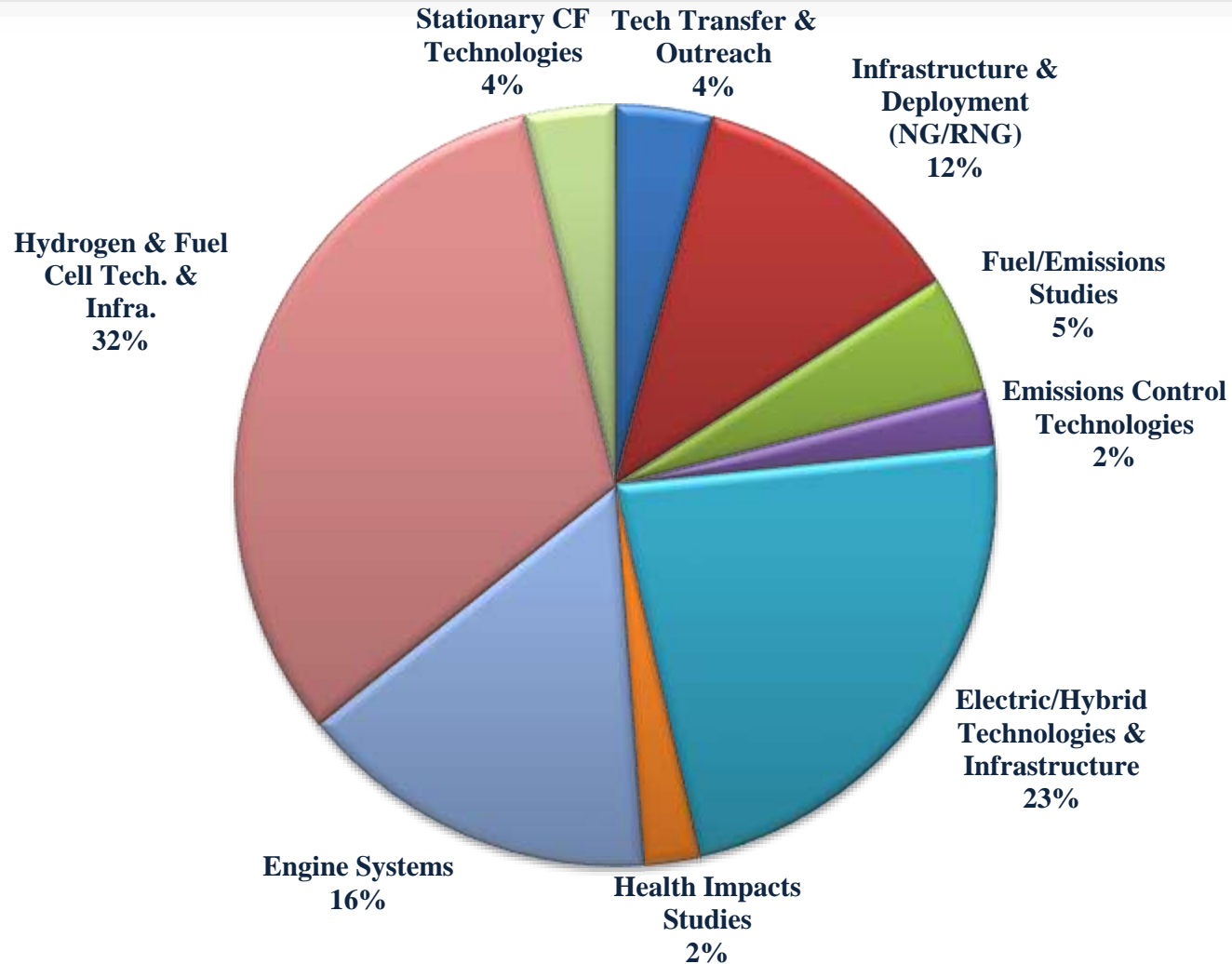
- Daimler Zero Emission Trucks and EV Infrastructure Project
- Develop & demonstrate zero and near-zero emissions technologies for drayage and cargo handling applications
 - SoCal trucking demonstration of near-zero ISX12-G engines
 - Electric top-pick development, integration and demonstration
 - SoCal advanced sustainable freight demonstration
- Ultra-low emissions diesel engine for on-road HDVs
- Develop & demonstrate battery electric switcher locomotive
- Develop & evaluate aftertreatment systems for large displacement diesel engines
- Assess air quality and GHG impacts of microgrid-based electricity

2018 Key Projects Completed

- Hydrogen technologies/infrastructure
 - Hydrogen station site evaluations for commercial sale certification
- Engine systems
 - Ultra-low emissions natural gas engine for on-road MDVs
 - Ultra-low emissions 12L NG engines for on-road HDVs
- Fuels/Emissions Studies
 - Evaluation of SOA formation potential from LDVs
- Electric/hybrid technologies
 - Develop & demonstrate Class 8 LNG plug-in hybrid electric drayage trucks (ZECT I)
 - Develop & demonstrate warehouse rooftop solar system with storage and EV charging
 - Electric & CNG hybrid trucks for zero emission truck and electric catenary highway



Draft 2019 Plan Update



\$16.9M

Proposed 2019 Plan Distribution

Core Technologies	2018 Plan	Draft 2019 Plan
H2/Fuel Cells Technologies & Infra.	30%	↑ 32%
Electric/Hybrids Technologies & Infra.	18%	↑ 23%
Engine Systems/Technologies	22%	16% ↓
Fueling Infra. & Deployment (NG/RNG)	10%	↑ 12%
Fuels & Emissions Studies	6%	5% ↓
Stationary Clean Fuel Technologies	4%	4% ↓
Emissions Control Technologies	3%	2% ↓
Health Impacts Studies	2%	2%
Tech Assessment/Transfer & Outreach	5%	4% ↓
	100%	100%

Development Schedule

- Technology Committee October 19, 2018
(Draft 2019 Plan Update)
- Advisory Group Review September 12, 2018
January 17, 2019
- Technology Committee February 15, 2019
- Board Approval March 1, 2019
- Due to State Legislature March 31, 2019

Fleet Demonstration of Cummins-Westport ISX12N

Clean Fuels Advisory Meeting

**South Coast Air Quality Management District
January 17, 2019**

Phil Barroca
Program Supervisor, Technology Demonstration
Technology Advancement Office



Purpose

- ▶ Demonstrate new near-zero emission (NZE) engine technology
- ▶ Need to replace older, more polluting trucks operating in the Ports and adjacent impacted communities
- ▶ Meet objectives of CARB, AQMP, CAAP to reduce Port truck emissions
- ▶ Address apprehensions of fleet operators with bad experiences associated with prior generation HD NGVs

Project Funding

- ▶ CEC ARV 16-025 - Sustainable Freight Transportation Projects
- ▶ SCAQMD awarded for three project proposal
 - ▶ Beta demonstration of CWI's ISX12N with local fleet operators
 - ▶ Demonstration of 1 HD EV and 3 HD NG PHEVs
 - ▶ Demonstration of 1 EV Top Handler and Wireless Charging
- ▶ Total Project Cost: \$14.1 million
- ▶ CEC Award: \$8.4 million
- ▶ Total Match Share: \$5.7 million, includes \$600,000 SCAQMD

Beta engine demonstration with local fleet operators

- ▶ Contractor – Clean Energy
- ▶ Subcontractors
 - ▶ Cummins Westport
 - ▶ Agility Fuel Solutions
 - ▶ Fleet Operators: TTSI, 4 Gen, Pac 9, NFI, CR&R, Orange Ave.
- ▶ Total Project Cost: \$6 million
- ▶ CEC contribution: \$2.845
- ▶ Total Match Share: \$3.150 million includes \$600,000 SCAQMD



Project Description

- ▶ Acquire 20 existing HDNGVs with CWIs 11.9L ISX12-G
- ▶ Retrofit existing HDNGVs with Beta version of CWI's ISX12N to produce fleet of demonstration vehicles
- ▶ Deploy the demonstration vehicles to multiple Goods Movement fleet operators in the South Coast Air Basin
- ▶ Provide training and support to Fleet operators
- ▶ Monitor and record vehicle activity, e.g. fuel usage, miles travelled, all maintenance and repair issues, survey of vehicle operators
- ▶ Provide final disposition of vehicles to local fleets with the intention that these vehicles will attain CARB OLNS certification and continue operations within SCAB.



Demonstration Vehicles



NFI



4 Gen Logistics



CR&R



Pac 9 Transportation



Dynamometer Test
TSI (LNG) Truck



Beta Engine & Engine Plate

Training



Agility Fuel System
new CNG tanks



Training at
Orange Avenue



Training at CR&R

Training at NFI



Fueling



Clean Energy Fueling Cards specific to each truck



Refueling at Clean Energy Station

Project Metrics

- ▶ 20 Vehicles deployed
- ▶ Seven Fleet operators participating
- ▶ First three vehicles deployed in Q4 2017, pre-CEC agreement
- ▶ Remaining 17 vehicles deployed in Q1 and Q2 2018, post CEC agreement
- ▶ One year demonstration/vehicle



Demonstration Performances

10

Fleet Name	No. Vehicles	Vehicle-Months	Sum of Miles	Sum of DGE	Average MPG	Average % Operation
CR&R	1	7	22,088	3,792	5.83	100.00%
NFI	4	24	51,702	10,647	4.82	60.17%
Orange Ave.	3	21	9,155	2,711	3.84	86.17%
TTSI	4	48	84,113	23,014	4.07	86.85%
4 Gen	4	32	44,651	9,063	4.78	67.48%
Pac 9	4	40	42,778	9,055	4.54	55.92%
Green Fleet	1	1	2,154	466	4.62	70.00%
Grand Totals	21	173	256,641	58,747	4.50	70.85%

Survey - Vehicle Operators

- ▶ Conducted on all Fleets in Q3-2018
- ▶ 21 Respondents; 11 Scored Questions
- ▶ Scoring Scale: from 1 (low) to 3 (high)
- ▶ Questions structured on “First Impressions vs Current Impressions”
- ▶ Overall response:
 - ▶ 47.5% scored current impressions > first impressions
 - ▶ 28.5% had no change in impressions
 - ▶ 19% inconclusive
- ▶ Range of respondent's scores for all questions (averaged): 2.07 – 2.85
- ▶ Engine responses improved 10% from 2.32 to 2.55

Survey Questions

TRUCK



Previous brand of truck and engine?

How comfortable is the truck?

Do you like the truck brand?

Manual or automatic transmission?

How well does the engine pull loads?

How is the acceleration?

Is the engine quiet?

How well do you like the clean air engine?

How do you like LNG fuel?

How do you like CNG fuel?

How easy is it to fuel the truck?

How reliable are the refueling stations?

ENGINE



FUEL



Next Steps

- ▶ Demonstrations scheduled to conclude Q3 2019
- ▶ First three trucks have completed one year demonstration and are being transferred to Fleet operator and engines upgraded to CARB's OLNS
- ▶ Remaining 17 trucks continue one year demonstrations.
- ▶ All trucks will be transferred to local fleet operators and engines upgraded to CARB compliant OLNS
- ▶ Fleet Operators expected to continue operating trucks for remainder of useful life

Takeaways

- ▶ Overall positive experience with beta engines
- ▶ Commercial vehicle acquisitions started in May 2018 with AJR Trucking - Kenworth trucks
- ▶ Additional incentives to purchase and deploy from CEC, POLA/POLB, SCAQMD

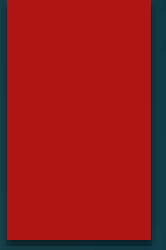




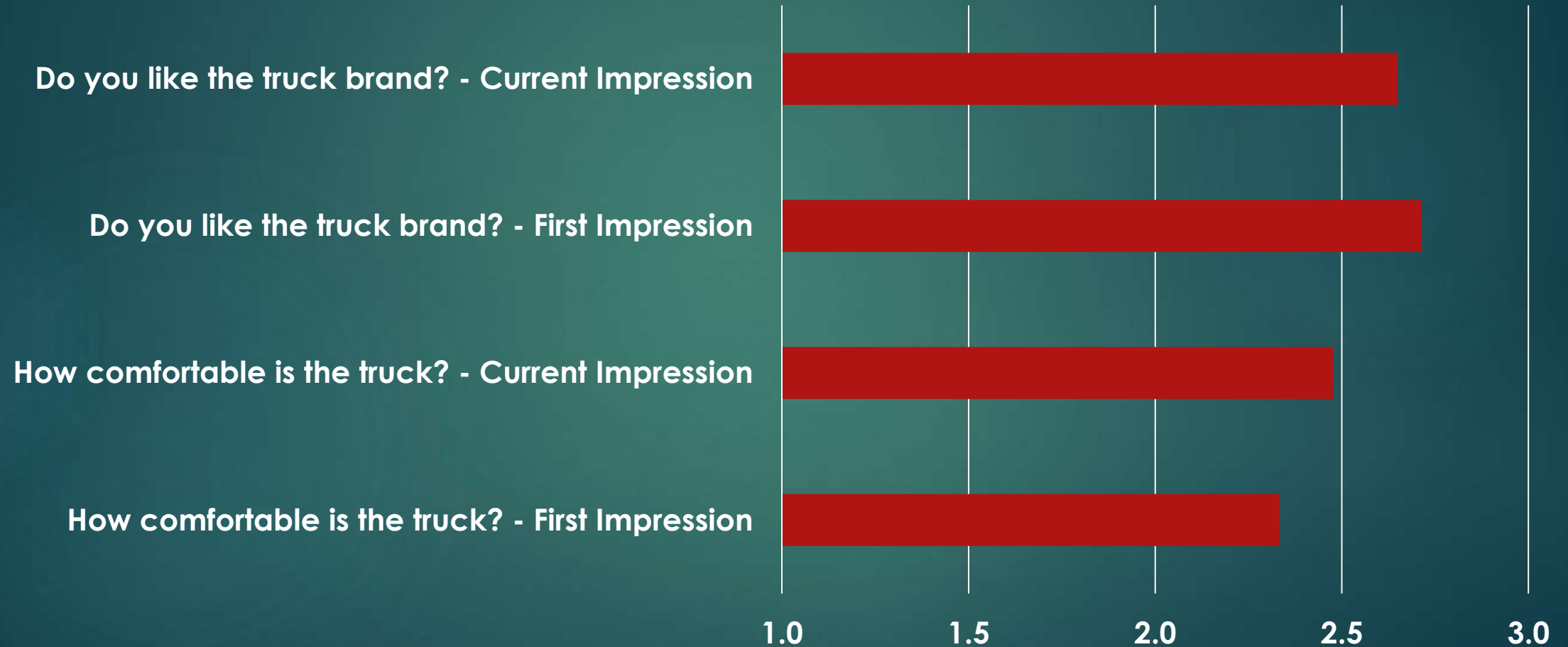
Thank You

Questions?

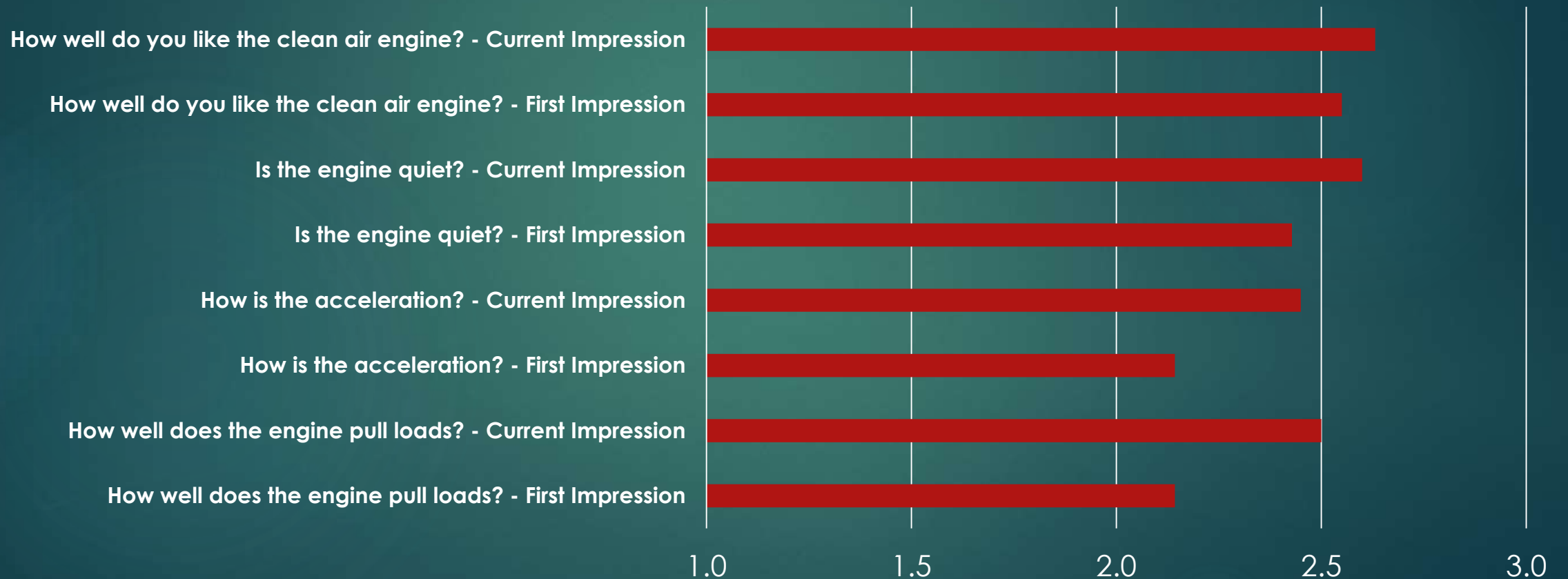
Back-up Slides



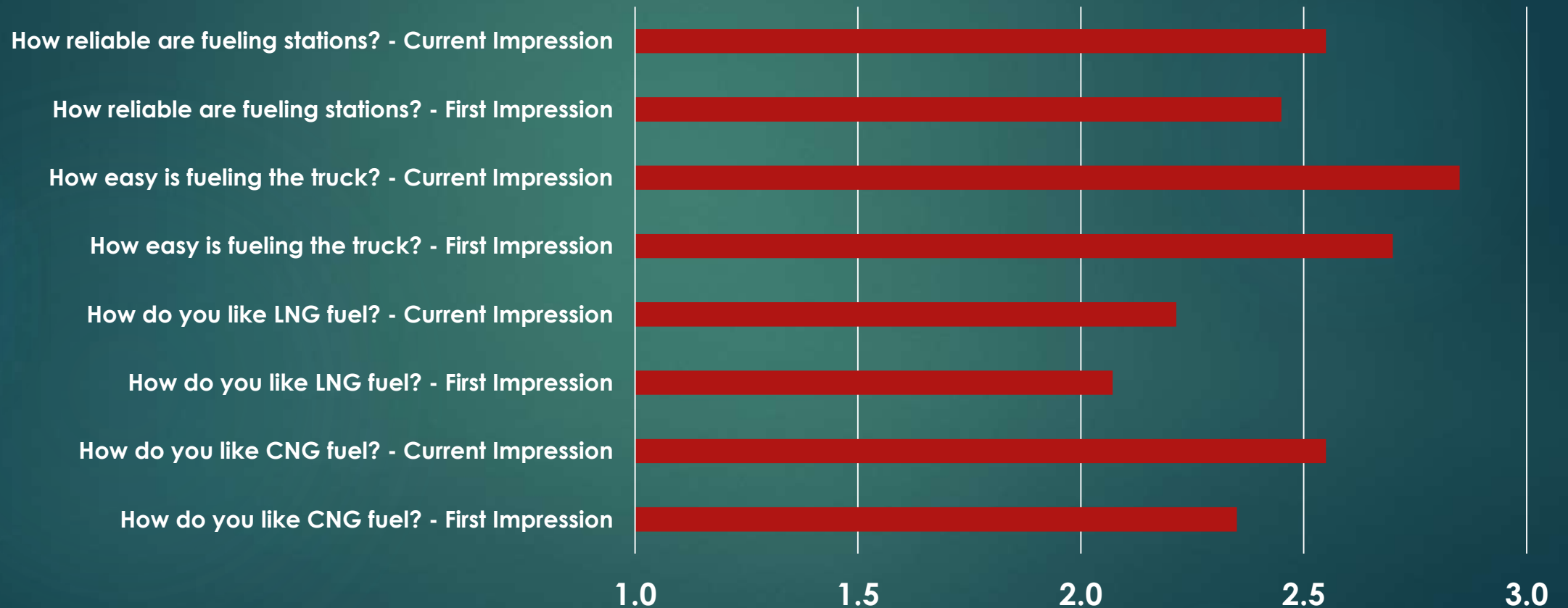
Truck Questions



Engine Questions



Fuel Questions



NEAR-ZERO EMISSION HEAVY-DUTY ENGINE TECHNOLOGY UPDATE



Joseph Lopat

CLEAN FUELS

The pathway to emissions reductions from Heavy-duty engines 0.02 g/bhp-hr

Alternative Liquid fuels

- ▶ Renewable Diesel and NOx mitigated biodiesel study
- ▶ potential 13% NOx reduction and 30% less PM



Potential CNG Projects

- ▶ Ford 7.3 Liter
- ▶ Achates OP CNG engine for Heavy- Duty Trucks
- ▶ CNG technology efficiency upgrades



GRANT SOLICITATION UPDATE

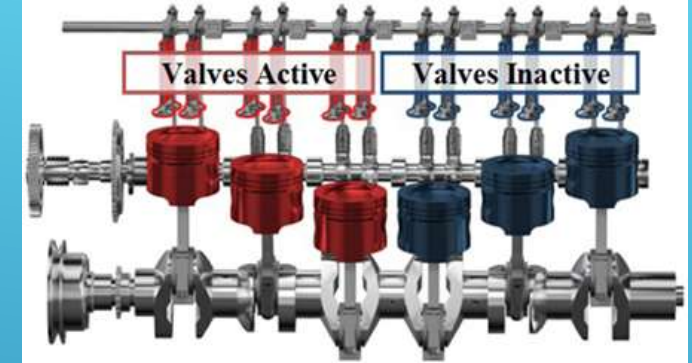
NREL Solicitation

- ▶ 8-12 Projects Selected
- ▶ Near-Zero NOx Technologies
- ▶ Higher Efficiency Engines
- ▶ Hybrid Vehicles

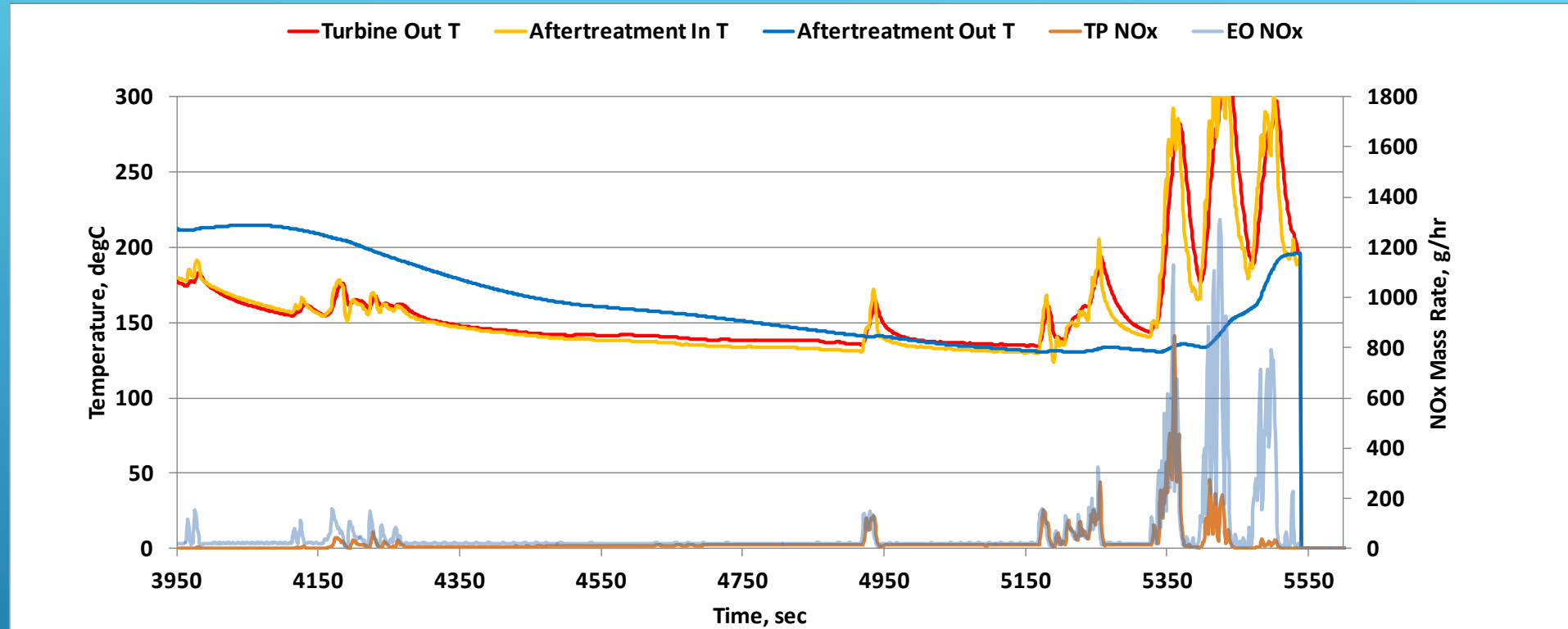
DOE	13 million
CEC	3.5 million
AQMD	1.5 million
Participant Cost Share	18 million
Total Project Budget	36 million

HEAVY-DUTY ENGINE DEVELOPMENT

- Southwest Research developed controls
- Cylinder Deactivation West Virginia University and SwRI in combination with RD the lowest NOx
- New AT formulations fabricated
- Close couple catalyst successful
- SwRI final test cycles selected
- Critical cycle emissions points discovered



ENGINE E EXTENDED IDLE SEGMENT



- ▶ Idle rate = 22 g/hr , 4250 to 5150 secs
20 g/hr at end of idle (4950 to 5150 secs)
- ▶ Cycle Segment = 1.9 g/kgCO₂ (61% conversion)
- ▶ 95% conversion needed to get to 0.1g NOx per BHP-Hr

Engine Class Opposed Piston 8 Demonstration

Program Update 1/7/2019



- Assembly Complete
- Integration with Peterbilt
- Demonstration in Basin

- ▶ Lessons learned
 - ▶ Technology pathway to Near-Zero NOx diesel engine showing promise
 - ▶ Engine cycles more understood and better tuning is possible
 - ▶ CNG sales gaining nationally
- ▶ Future Goals
 - ▶ Demonstration in the basin of a class 8 diesel truck capable of 0.02 g/bhp-hr NOx throughout the engine duty cycle and useful life of the engine
 - ▶ Development and demonstration leading to certification 0.02 g/bhp-hr NOx of smaller (5L-7L) and larger > 13-liter gaseous and liquid fueled engines



Battery Electric Trucks

Clean Fuels Advisory Committee Presentation

Joseph Impullitti

Manager Technology Demonstration

Technology Advancement Office



Agenda

- Daimler Battery Electric Truck and EV Infrastructure Project Summary and Update
- Volvo Battery Electric Truck Project Summary and Update



DAIMLER

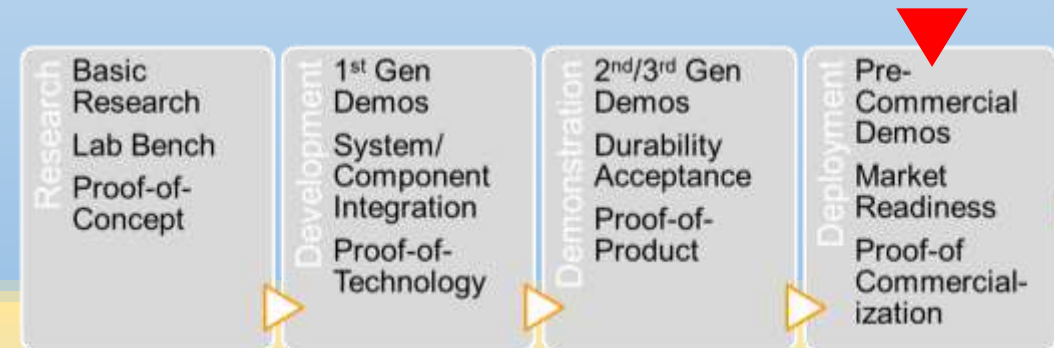


Battery Electric Trucks and EV Infrastructure Project



Project Summary & Overview

- Daimler Trucks North America (DTNA) is the largest truck OEM in North America
- DTNA will develop 20 battery-electric heavy-duty Freightliner trucks
 - Demonstrate the electric trucks in real-world commercial fleet operations in the South Coast Air Basin.
 - Five (5) Class 6 eM2 trucks (GVWR 26,000 lbs)
 - Fifteen (15) Class 8 eCascadia trucks (GVWR 80,000 lbs)
- The project will include appropriate charging infrastructure and energy storage for heavy-duty trucks



Freightliner eM2

- Class 6 straight truck
- 220 horsepower
- 4x2 axle configuration
- 106-inch wheelbase
- Day cab configuration
- 26,000 lbs GVWR
- 150-200 miles of service range
- 225-325 kWh battery packs
- Charging via CCA T1
- Applications: municipal, utility, pick up & delivery, food & beverage, etc.



Freightliner eCascadia

- Class 8 tractor
- 455 horsepower
- 6x4 axle configuration
- 116-inch wheelbase
- Day cab configuration
- 80,000 lbs GVWR
- 150-200 miles of service range
- 400-600 kWh battery packs
- Applications: regional hauling, port drayage, distribution, etc.



Q4 2018 Project Update

- First Freightliner eM2 delivered by DTNA to Penske (Dec. 20, 2018)



Q1 2019 Project Update: Trucks

- Planned delivery of additional Freightliner eM2 unit to Penske
- Expected to complete build of first two (2) Freightliner eCascadia test trucks
- Will begin testing of two eCascadia trucks
- Freightliner will complete first “ground up” designed heavy-duty truck battery pack



Q1 2019 Project Update: Infrastructure

PENSKE:

- 5 fleet site locations in SCAQMD to get EV charging infrastructure and/or energy storage (Chino, La Mirada, Anaheim, Ontario, Carson)
- Three sites (Chino, Carson & La Mirada) to be commissioned with EV charging equipment by end of Q1 2019
 - Total of 6 cabinets and 12 charging positions across the sites

NFI:

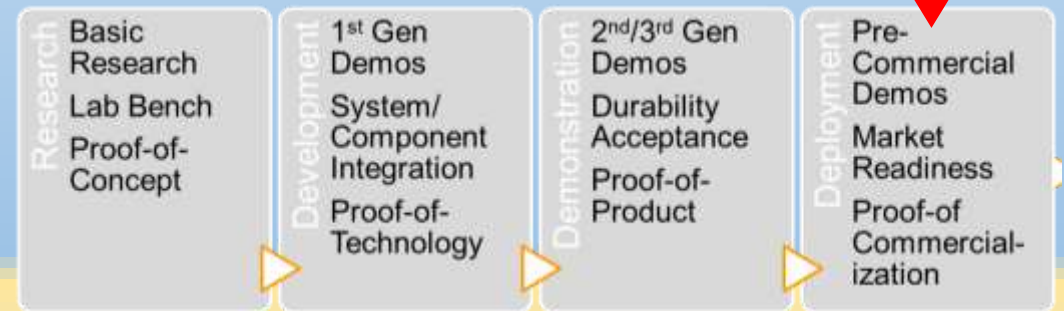
- Single site in Chino: 5 chargers / 10 trucks
- EV charger equipment selected
- Final design, engineering and permitting in Q1 2109
- Start up expected in Q2



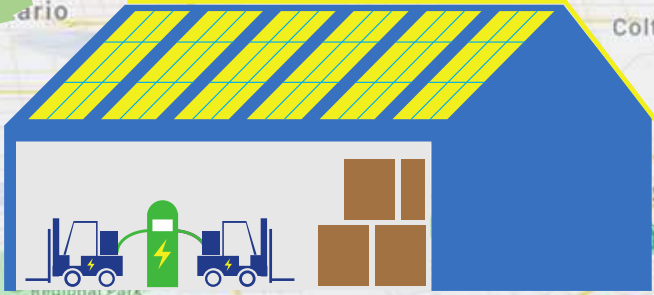
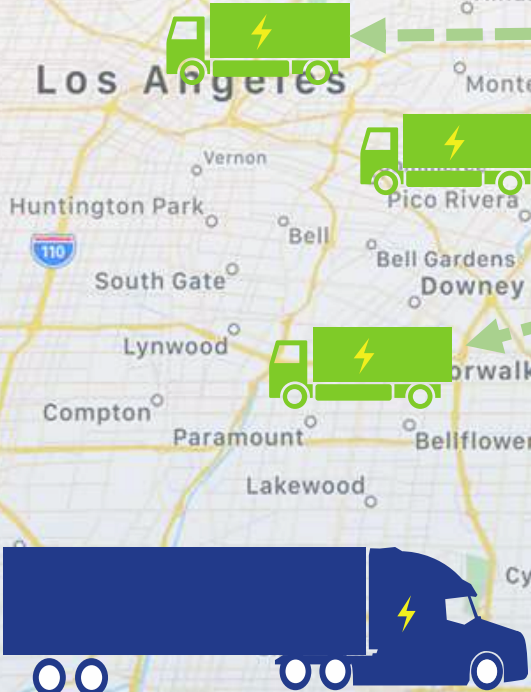


Volvo LIGHTS

- Volvo LIGHTS (Low Impact Green Heavy Transport Solution)
 - Funded with \$44.8M from CCI, \$4M SCAQMD \$41.6M from Partners
- Showcases zero-emission freight movement in support of CA's clean air goals
- The scope of Volvo LIGHTS encompasses the development of Class 8 demonstration units, production of Class 8 commercial units, facility improvements, installation of the charging infrastructure, public outreach, and data collection and reporting.



The Volvo LIGHTS Project



INLAND EMPIRE





Volvo LIGHTS



- Demonstrate zero-emission freight movement solutions within communities severely impacted by air quality
- Roll out an entire support system to enable zero-emission operations in at least 3 freight distribution facilities
- Reduce environmental footprint by integrating zero-emission equipment, renewable solar energy, and battery storage technologies into the freight mobility network
- The commercial Introduction of class 8 HDBEV trucks

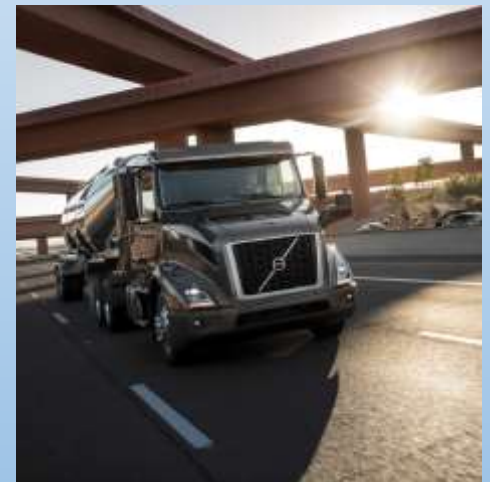




Volvo LIGHTS



- Truck Rollout Plan:
- Three chassis configurations for 8 demo and 15 commercial & pre-commercial trucks
- Freight Haul Demonstration:
 - Distribution
 - Short Regional Haul
 - Drayage
 - From Ports to Inland Empire warehouse locations





Project Update

- Engineering Study: Prototype truck build to validate packaging and design
- Prototype build taking place at the Greensboro NC Engineering Center
- Electronic control module includes inverter, charger and system control unit being lowered into VNR 300 Chassis

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Project Update

- Components and systems were adapted from Volvo's FE Electric Trucks being deployed in Europe
- Volvo management decided to use the VNR 300 a US Chassis for their American BEV debut



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Project Update

- First project trucks will be assembled in Greensboro
- Plan is to use other Volvo plants for sub assembly of system components
- Vehicle final assembly slated for Volvo's New River VA Assembly Plant

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Project Update

- Completion of contracts with detailed statement of work
 - Including subcontracts with partners / suppliers
- 5 Vehicles ordered for special production (to be sent to GSO)
 - Components ordered separately and delivered to Greensboro Technical Center
 - Final assembly operations planned for Q2
- Project work plans created with partners
 - Charging stations and facility upgrades timed with truck deliveries
- Kick off meeting planned mid-March



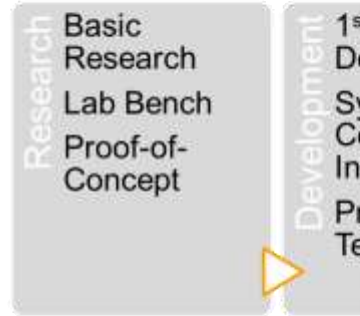
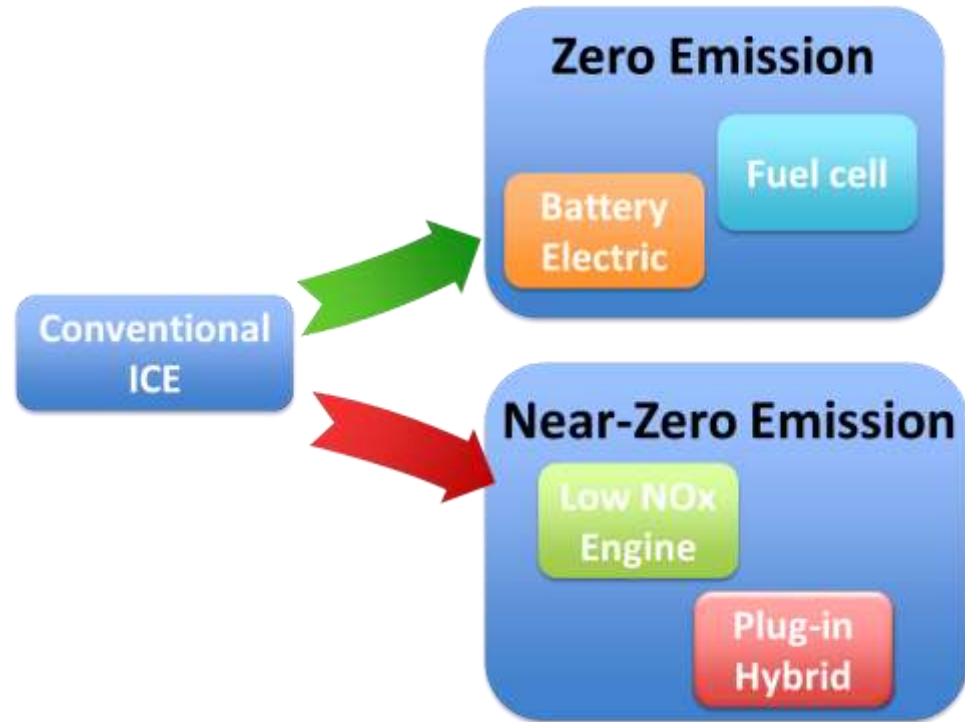


Technology Development for Medium and Heavy Duty Zero and Near-zero Emission Vehicle

Technology Advancement Office
Air Quality Specialist

Seungbum Ha

Pathway to ZE/ NZE Vehicles



Truck Type	Class	Description	Example	Applications
Light Commercial Vehicles (LCV)	3	One- and two-axle, four-tire trucks	heavy duty pick-up, walk-in van, minibus, box truck	local pick-up and delivery; heavy duty pickup truck, vans, minibuses
Medium Commercial Vehicles (MCV)	4	Two- and three-axle buses	large walk-in van, city delivery truck	parcel delivery, short distance
	5	Two-axle, six-tire, single-unit trucks	bucket truck, large walk-in van, city delivery truck	
Heavy Commercial Vehicles (HCV)	6	Three-axle single-unit trucks	beverage truck, school bus, rack truck	long haul truckload or less than truckload cargo (containers)
	7	Four or more axles single-unit trucks	refuse, city transit bus, medium semi-tractor, tow truck	
	8	Four or fewer axle single-trailer trucks	cement mixer, heavy semi-tractor, dump truck, sleeper cab, firetruck, refrigerator van, tour bus	
	9	Five-axle single-trailer trucks	2 units: heavy semi-tractor with trailer	
	10	Six or more axle single-trailer trucks	2 units: heavy semi-tractor with trailer	
	11	Five or fewer axle multi-trailer Trucks	3 units: heavy semi-tractor with 2 trailers	
	12	Six-axle multi-trailer trucks	3 units: heavy semi-tractor with 2 trailers	
	13	Seven or more axle multi-trailer trucks	3 units: heavy semi-tractor with 2 trailers	



“Developing Markets for Zero-Emission Vehicles in Goods Movement”, *National Center for Sustainable Transportation and Metrans Transportation Club*

1. Medium-Duty Zero Emission Vehicle

- Battery Electric Airport Shuttle Transportation**

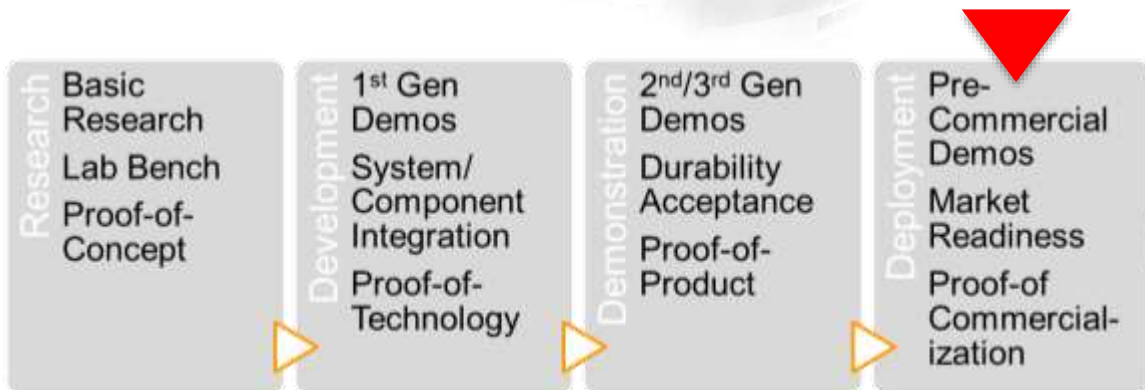
2. Heavy-Duty Zero and Near-zero Emission Truck

- ZECT I**
- ZECT II**
- GGRF**
- Future project**

Battery Electric Airport Shuttle Replacement



- Funding from the Environmental Protection Agency (EPA) 2017 Targeted Airshed Grant and HVIP for the Shuttle Bus Replacement Project.



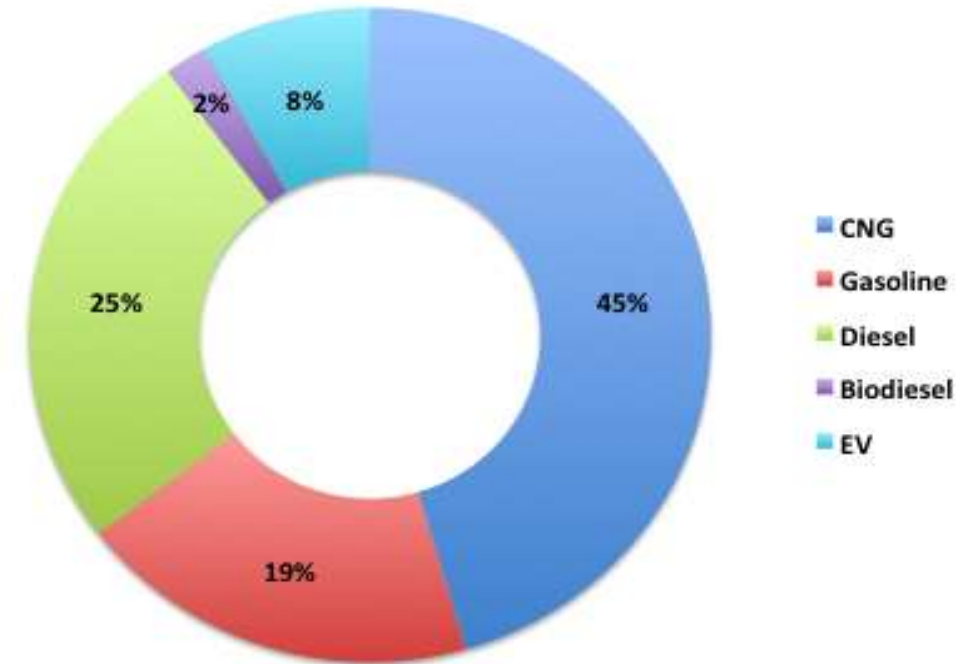
- Electric shuttle buses will be developed and deployed at four key airports across Southern California to replace existing gas and diesel shuttle buses.

Battery Electric Airport Shuttle Replacement

Airport Shuttles – Estimated Population in California

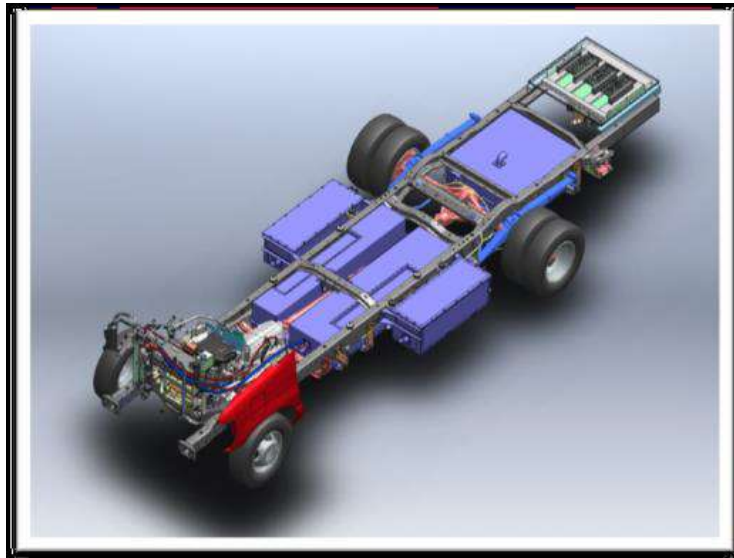
Vehicle Weight Class	Vehicle Type	Annual Mileage	Number of Vehicles		
			Part I: On-Airport	Part II: Off-Airport	Part I + Part II
Class 2b-3	Van/Cutaway	10,000-68,000	3	277	280
Class 4-5	Cutaway	10,000-54,000	82	409	491
Class 7-8	32'-40' Low-Floor Bus	17,500-65,000	156	0	156
Class 8	60' Articulated Bus	4,700	21	0	21
Total			262	686	948

Share of Airport Shuttles by Fuel Type



Performance Specifications

Operator	WallyPark	Joe's Parking
Duration	24 mins	19 mins
Distance	4 miles	2.50 miles
Average Speed	14.5 mph	10.6 mph



Parameter	Specification
Chassis & Body	Ford E450 Superduty Chassis
Seating Configuration	14 passenger, perimeter seating
Motor	Permanent magnet motor, High-Power Inverter
Battery	105 kWh Nickel, Manganese, Cobalt (NMC) battery
Range	Up to 110 Miles All Electric Range
Charge Time	Level II: 8 hrs / Level III: 3 – 4 hrs
Max Speed	65 mph (limited)
Acceleration	0-50 mph under 16 seconds

Fleet Outreach

Targeted Airports

- Los Angeles Airport
- Hollywood-Burbank Airport
- Santa Ana Airport
- Ontario International Airport

Key Fleet Segments

- Airport Parking Operators
- Car Rental Agencies
- Hotel Shuttle Operators
- Airport Employee Shuttles

Fleet Details	No. of Buses
WallyPark Experess Location: LAX Type of Operation: Airport Parking Shuttle	6
Global Trans Solutions Location: LAX Type of Operation: Airport Parking Shuttle	6
Standard Parking – 105 Location: LAX Type of Operation: Airport Parking Shuttle	2
Holiday Inn Express Location: LAX Type of Operation: Hotel Shuttle	1
VSP Parking Location: BUR Type of Operation: Airport Parking Shuttle	6
Hyatt Irvine Location: SNA Type of Operation: Hotel Shuttle	2

- 1. Medium-Duty Zero Emission Vehicle**
 - Battery Electric Airport Shuttle Transportation**

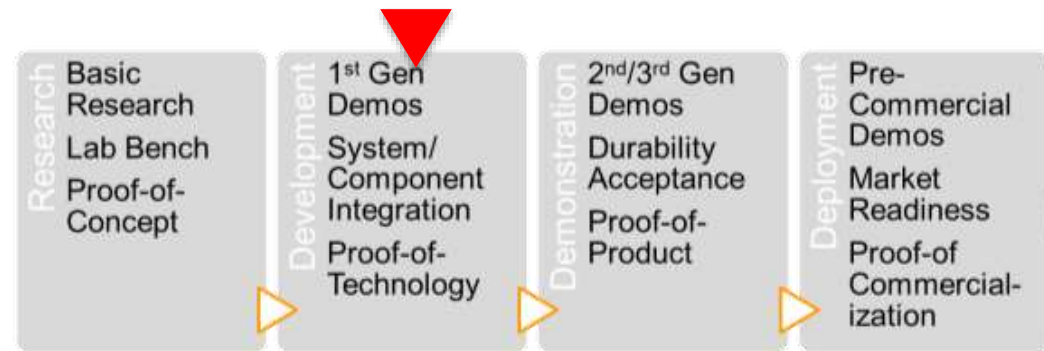
- 2. Heavy-Duty Zero and Near-zero Emission Truck**
 - ZECT I**
 - ZECT II**
 - GGRF**
 - Future project**

DOE ZECT Projects - Overview

- **Objective** - Develop and demonstrate zero and near-zero emission technologies for Class 8 goods movement trucks operating in the South Coast Air Basin, primarily between the Ports and near-dock rail yards
- **ZECT 1 – Awarded: 2012; Kickoff: 2012**
 - Two technologies: Battery Electric and Plug-in Hybrid Electric Trucks
 - Two technology integrators: TransPower and U.S. Hybrid
 - Data Analysis: NREL
 - Fleet participation: drayage fleets
 - Funding: DOE: \$4,169,000; Match Share: \$5,205,641; Total Cost: \$9,374,641
- **ZECT 2 – Awarded: 2014; Kickoff: 2015**
 - Three Technologies: Fuel Cell, Battery Electric with Fuel Cell, Battery Electric with CNG ICE
 - Four technology integrators: TransPower, U.S. Hybrid, Hydrogenics, BAE/Kenworth
 - Data Analysis: NREL
 - Fleet Participation: Drayage fleets, Kenworth Trucks
 - Funding: DOE: \$10,000,000; Match Share: \$7,183,979; Contractors: \$3,075,841; Total Cost: \$20,259,820

ZECT I

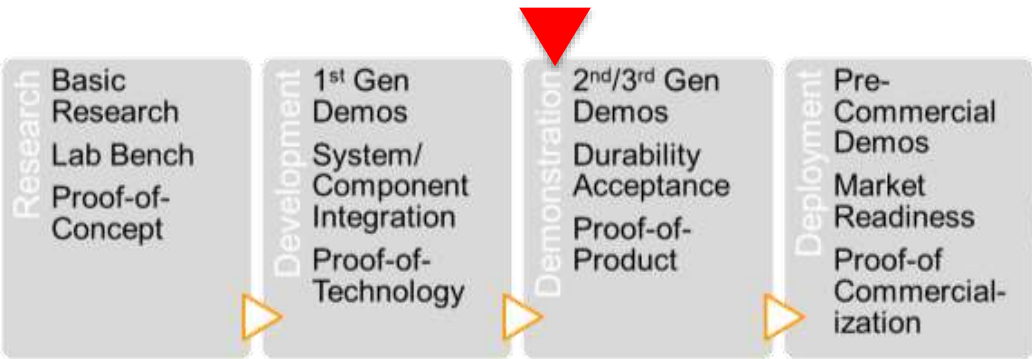
- Two Integrators: TransPower (TP) and U.S. Hybrid (USH)
- Three Technologies / Eleven Trucks:
 - Battery Electric: 4 TP ; 2 USH
 - Series Plug-In Hybrid: 2 TP
 - Parallel Plug-in Hybrid: 3 USH



ZECT I

	BET		PHET	
Developer	TransPower	US Hybrid	TransPower	US Hybrid
No. of Trucks	4	2	2 Series Hybrid	3 Parallel Hybrid
Chassis	International Prostar	International Prostar	International Prostar	Peterbilt 384
Traction	Dual IPM Motors	Induction Motor	Dual IPM Motors	IPM Motor
Motor	300 kW	320 kW	300 kW	222 kW (402 kW total)
Transmission	Automated Manual	Direct Drive	Automated Manual	Automatic
APU Displ./Fuel	N/A	N/A	3.7L / CNG	8.9L / LNG
APU Power	N/A	N/A	65-110 kW	180 kW
Battery/Fuel Storage Capacity	215 kWh -	240 kWh	138 kWh/	80 kWh/
	311 kWh		60 DGE	72 DGE
Charger On-Board	70 kW	60 kW	70 kW	20 kW
Recharge/Refuel Time	2.5-4 hrs	3-4 hrs	2 hrs/	3-4 hrs/
			10-15 min	10-15 min
Drayage Range (miles)	75-100 (@215 kWh)	70-100	250+ /	250+ /
	110-150 (@ 315 kWh)		35-50 AER	30 AER

ZECT II



- Four Integrators: TP, USH, Hydrogenics, BAE/Kenworth
- Three Technologies: Battery and Fuel Cell dominant Fuel Cell Trucks (FCT), Plug-in Series Hybrid Electric Near Zero Emission CNG
- Seven Trucks: 2 TP FCTs; 2 USH FCTs ; 1 BAE/Kenworth FCT(Ballard FC stack); 1 Hydrogenics FCT; 1 BAE/Kenworth Series Hybrid with Near Zero-Emission CNG engine



ZECT II

	FUEL CELL TRUCKS					PHET/CNG
Fuel Cell Configuration	BATTERY DOMINANT		FUEL CELL DOMINANT			
	TransPower	Hydrogenics	US Hybrid	BAE/Kenworth		
# of Vehicles	2	1	2	1		1
Platform	International	Freightliner	Kenworth T800	Kenworth T370		Kenworth T680
Mfg: Fuel Cell / APU	Hydrogenics	Hydrogenics	PureMotion	Ballard		CWI L9N NZE
Fuel Cell Power	60 kW	60 kW	80 kW	100 kW		n/a
Battery Capacity	125 kWh	100 kWh	26 kWh	100 kWh		100 kWh
Battery Chemistry	Li-ion	Li-ion	Li-ion	Li-ion		Li-ion
Traction Motors	2x 150 kW	1x 320 kW	1x 320 kW	2x 180 kW		1x 320 kW
Range (per fueling)	200 miles	150 miles	150-200 miles	100 miles		150 miles
Fuel Cap.: H2 (kg) / CNG (DGE)	27 kg @350 bar	30 kg @350 bar	20 kg @350 bar	30 kg @350 bar		30 DGE (assumed)
Plug-in Charging	Yes/bi-directional	Yes	Yes	Yes		Yes

GGRF Electric Truck Projects



- \$23.6M Award from ARB, \$10.4M State Air Districts, \$6M In Kind – Total of \$40.1M

- Total of 43 Drayage Trucks

25 Battery Electrics - BYD

12 Battery Electrics - Peterbilt

- In addition to the Battery electrics:

4 CNG Hybrids - Kenworth

3 Diesel Hybrids - Volvo

Phase I Phase II



2nd/3rd Gen Demos
Durability Acceptance
Proof-of-Product

Pre-Commercial Demos
Market Readiness
Proof-of Commercial-ization

Basic Research
Lab Bench
Proof-of-Concept

1st Gen Demos
System/Component Integration
Proof-of-Technology

Research

Development

Demonstration

Deployment

BYD Electric Drayage Truck

- BYD to develop 25 BETs based on T9 Prototype
 - Phase 1 trucks (5)
 - Phase 2 trucks (20)
- Production of Phase 1 trucks completed
- Five trucks delivered to fleet operators
 - TTSI
 - AJR Logistics
 - GSC Logistics



Peterbilt Electric Drayage Truck

- TransPower/Peterbilt to develop 12 BETs based on EDD drivetrain
 - Phase 1 trucks (4)
 - Phase 2 trucks (8)
- Phase 2 trucks are being developed
- Four phase 1 trucks have been delivered to fleet operators
 - TTSI
 - LADWP
 - NFI/Cal Cartage
 - Daylight Transport



Future Project – POLA ZANZEFF

Toyota/Kenworth Team to Build 10 New Fuel Cell Trucks



- Toyota and Paccar Inc.'s Kenworth brand are among several partners, including Shell Oil Co., participating in a \$41m grant from the California Air Resources Board
- The first of 10 hydrogen-powered fuel cell heavy-duty Kenworth trucks to haul freight to and from the ports of Los Angeles and Long Beach is being assembled at Toyota Motor Corp.'s research center in Michigan
- The Kenworth T680s with the Toyota hydrogen fuel cell electric powertrains and lithium-ion battery that powers air conditioning and other cab functions
- The driving range is about 300 miles based on 60 kilograms (132 pounds) of hydrogen

TakeAways

- Developing and deploying Zero and Near-Zero emission technology in parallel
- Sponsoring projects for heavy-duty trucks with innovative technology developers
- Need to partner with federal and state governments to initiate policies and markets
- Opening the market by policies cooperating with technology leaders, fleet leaders



Hydrogen Fuel Cell Bus Project Clean Fuels Retreat January 17, 2019



Patricia Kwon
Technology Advancement Office

Project Partners

- CTE—project manager
- CARB (GGRF)—funding agency
- SCAQMD, BAAQMD—air districts
- OCTA, AC Transit—transit agencies (site hosts)
- New Flyer—bus (glider)
- Ballard—fuel cell
- Trillium CNG--infrastructure



Overview

- 3rd generation demonstration: develop and deploy 20 fuel cell transit buses as bus ready for wider scale deployment
- Collaboration between New Flyer and Ballard Power Systems
- Buses to be deployed at OCTA + AC Transit
- Daily range 250 – 300 miles
- Two new hydrogen stations—OCTA, AC Transit



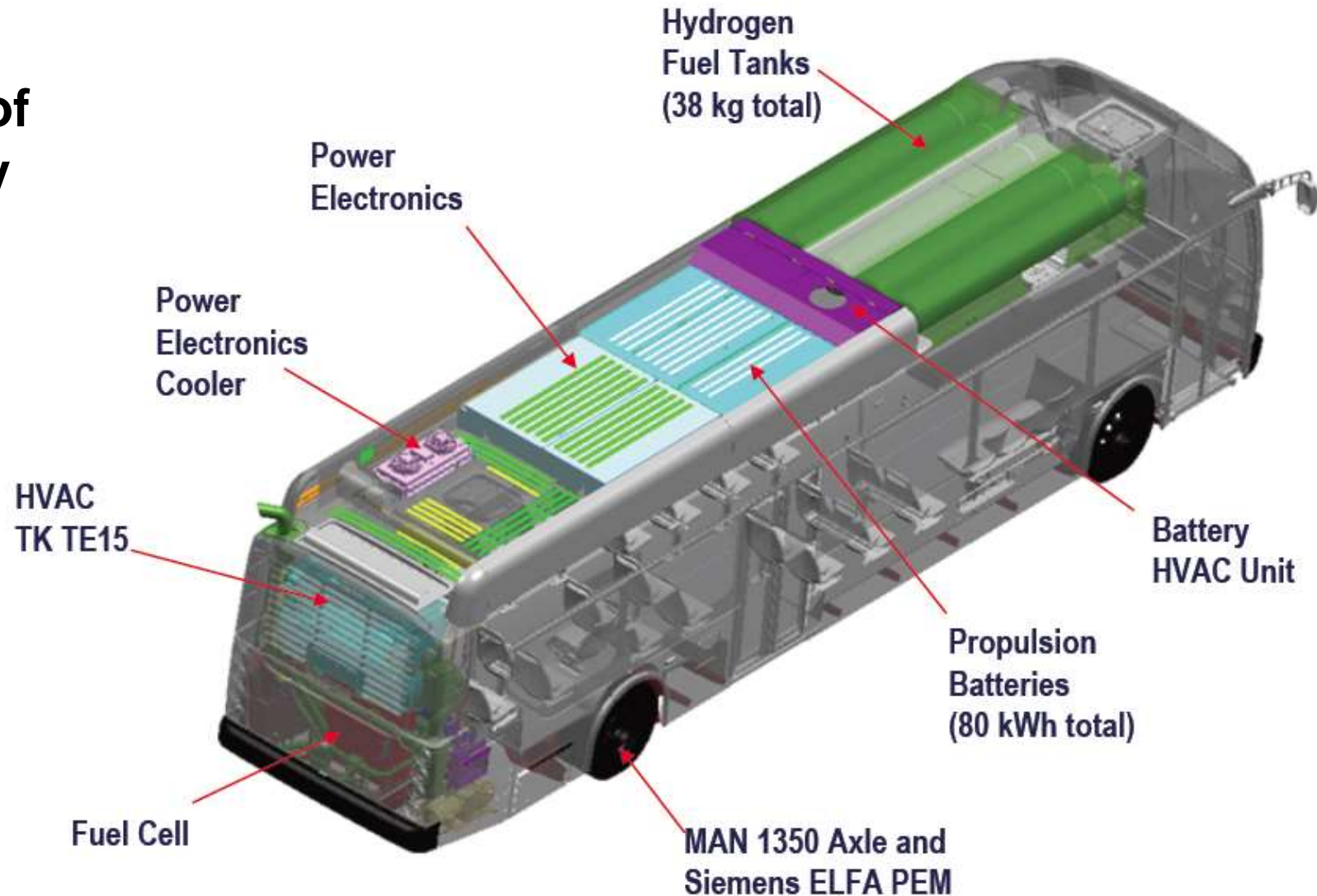
New Flyer Fuel Cell Bus

- Xcelsior XHE40 bus chassis
- FCveloCity H85 85 kW fuel cell
- 38 kg hydrogen storage @ 350 bar
- Battery energy storage 80 kWh Li-FePO₄
- Fuel cell with batteries for regenerative braking energy storage
- Service lifetime of 25,000+ hours
- 6 year or 250,000 mile warranty including service and support
- Ten New Flyer buses for \$13.3M
- Design: reduced battery size, fuel cell/inductors to boost wattage, hydrogen storage to reduce weight, noise, power consumption



New Flyer XHE40 Platform

Adaptation of XE40 battery electric bus



OCTA Liquid Hydrogen Fueling Station

- Trillium CNG will work with Air Products
- Fueling time 6 – 10 minutes/bus
- 280 kg peak back to back fills, 1,450 kg/day
- Each bus uses 35.6 kg/day
- No wait time between fills
- Infrared communication/grounding with TN1 receptacle on buses
- Compliant with SAE standards J2601-2 (2014), J2578, J2799, and J2719
- Total station cost \$6.472M for construction + 3 year O&M + liquid hydrogen deliveries



Current Project Status: Buses

- Bus #1 to be re-delivered to OCTA this week
 - Software upgrades to maximize fuel cell power output and vehicle speed
 - Noise remediation to reduce noise at 45-50 mph
 - Replace driver's window to improve sight lines to sideview mirror
- Remaining buses to be shipped in early March based on bus #1 design
- New Flyer XHE 40' bus passed Altoona testing
- OCTA bus to be deployed on five routes in disadvantaged communities



Current Project Status: Station

- New hydrogen station at OCTA to be commissioned in March 2019
 - Completed facility upgrades in December 2018
 - Rooftop chillers have been installed
 - Dispensers and other equipment have been shipped
 - Plumbing and electrical connection work will start once equipment arrives on site
 - Commissioning process to begin mid February and be completed by mid March
- OCTA bus currently using UC Irvine station



Clean Fuels Advisory Group Meeting January 17, 2019

Hydrogen Stations & ZEV Update

Lisa Mirisola
Program Supervisor
Science and Technology Advancement
South Coast Air Quality Management District



H2Freight Project

- CEC GFO-17-603 - Advanced Freight Vehicle and Infrastructure Deployment:
Award to Equilon (dba Shell) for 1,000 kg/day truck refueling to demonstrate zero emission goods movement at ports (H2Freight Project), with multiple fueling positions at 700 bar
- SCAQMD cost-share to refuel heavy-duty vehicles at 350 bar, supporting fuel cell demonstrations by multiple operators at local ports
- Evaluate fueling protocols, dispenser design, station throughput/reliability, etc.
- CEC award \$8M contracts are in process/under review.



Zero Emissions Freight



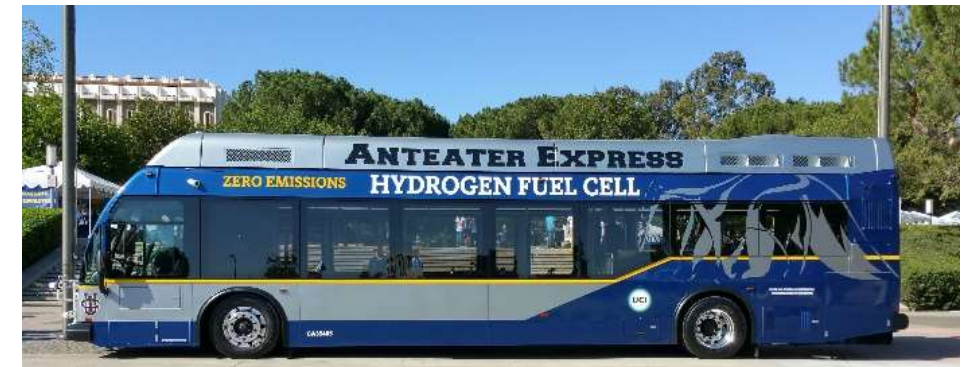
POLA – Zero Emissions Freight “Shore to Store” (S2S) Project (\$82.5M total)

- CARB (\$41M) & CEC (\$26M)
- Port of Hueneme
- Develop and demonstrate ten fuel cell trucks
- H2 stations in Wilmington and Ontario (Shell Equilon)
- SCAQMD \$1Million



UC Irvine Hydrogen Station Expansion

- UCI station has been operating at design capacity and is in urgent need of additional capacity to fuel cars and buses.
- Proposed expansion to 800 kg/day with liquid delivery, increased storage, and four fueling positions
- Public use will continue 24/7, with buses scheduled to refuel at night
- Co-funding approved & contracting in process:
MSRC for up to \$1M (PON 2018-02)
CEC \$400k (ARFVTP)
SCAQMD \$400k (Clean Fuels)



Heavy-Duty Hydrogen Background

- ZECT 2 – 350 bar for fuel cell trucks
- Toyota - 700 bar fuel cell truck demonstration at POLB
- Renewable hydrogen (biogas) produced by FuelCell Energy trigeneration at POLB



CA Retail Hydrogen Stations

- 39 public retail hydrogen stations operating in CA, including 21 in SCAQMD, support 5899 LDVs
- 25 additional stations in permitting & construction phase
- New Walther nozzle use at a few other APCI stations, helps address freeze issue

The screenshot displays the 'Station Status' page on the California Hydrogen Station Status website. The page features a table of 'Open Retail Stations' and a detailed view of the 'Diamond Bar' station.

Station Name	H70	H35
Anaheim	🟡	🔴
Campbell	🟢	🟢
Costa Mesa	🟢	🟢
Del Mar	🟢	🟢
Diamond Bar	🟢	🟢
Fairfax-LA	🟢	🟢
Fremont	🟢	🟢
Harris Ranch	🟢	🟢
Hayward	🟢	🟢
Hollywood	🟢	🟢
La Canada Flintridge	🟢	🟢
Lake Forest	🟢	🟢
Lake Tahoe-Truckee	🟢	🟢
Lawndale	🟢	🟢
Long Beach	🟢	🟢
Mill Valley	🟢	🟢
Mountain View <small>Open 6:00 AM - 10:00 PM</small>	🟢	🟢
Newport Beach (New)	🟢	🟢
Ontario (New)	🔴	🔴
Playa Del Rey	🟢	🟢
Riverside	🟢	🟢

Diamond Bar Station Details:

- H35 Status:** ONLINE
- H35 Capacity:** 75.99 KG
- H70 Status:** ONLINE
- H70 Capacity:** 74.00 KG
- Last Updated:** 09/04/2018 4:50 pm
- H35:** 35 MPa or 5,000 PSI
- H70:** 70 MPa or 10,000 PSI
- Address:** 21865 Copley Dr, Diamond Bar, CA 91765
- View on Map**
- Operating Hours:** 24/7
- Station Customer Service:** (800) 224-2724
- Note:** Use option 2 when calling the customer service number.





California Fuel Cell Partnership

2018 CaFCP 2030 Vision

- Reduce costs and increase renewable hydrogen production
- Accelerate the pace of adoption
- Enable 1 million fcvs and 1,000 hydrogen stations
- Diversify the portfolio of fuel cell products
- Deploy heavy-duty hydrogen fueling infrastructure along CA freight corridors
- Connect hydrogen and electricity as energy carriers

<https://cafcp.org/sites/default/files/CAFCCR.pdf>



CaFCP Truck & Bus Fueling Codes & Standards Coordination

To facilitate the foundational work required for the growth of medium- and heavy-duty fuel cell truck and bus deployments, tasks include:

- Sponsor SAE J2600 Compressed Hydrogen Surface Vehicle Fueling Connection Devices revision to include high flow interface geometries and align with ISO 17268
- Sponsor SAE J2601-2 Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles from TIR 2014 to Surface Vehicle Standard & align with J2600 & ISO
- General MD/HD vehicle and infrastructure safety, codes, and standards & update first responder training
- Facilitate task forces (truck & bus) and outreach; coordinate 2018 Fuel Cell Electric Truck (FCET) Action Plan with stakeholders



California Hydrogen Infrastructure Research Consortium

- U.S. DOE H2@Scale program with national labs, CA GO-Biz, CEC, SCAQMD, and CARB
- Joint agreement led by NREL to continue hydrogen infrastructure research efforts, focused on California near-term priorities
- Project Management Plan with schedule, budget, roles, milestones, tasks and reporting



SCAQMD's Clean Air Choices Program

- Features the cleanest new retail passenger vehicles
- Part of the AQMD website
<http://www.cleanairchoices.org>.
- Out of 35 models listed for 2019 so far
 - 18 Zero Emission (2 hydrogen fuel cell & 16 battery electric)
 - 17 Advanced Technology Partial (or new Transitional)
Zero Emission plug-in hybrid gasoline-electric
- Outreach Efforts with clean and efficient vehicles, and highlight new electric and hydrogen fueling infrastructure



SCAQMD Demonstration Vehicles

Vehicle Type	Demonstration* Vehicles In Use
Plug-In Hybrid	
2013+2016+2017 Chevy Volt	3 + 1 +1
2014 Ford Fusion ENERGY	2
2014 VIA PHEV Chevy vans	2
2018 Honda Clarity Plug-In Hybrid	1
*2018 Chrysler Pacifica Hybrid	1 (lab)
Battery Electric	
2017 Chevrolet Bolt EV	2
2019 Hyundai Kona EV	2 (order – Q2)
Fuel Cell	
2016 Toyota Mirai	1
2018 Toyota Mirai	2
2017 Honda Clarity Fuel Cell	3
2019 Hyundai Nexo Fuel Cell	1 (order – Q1)

*STA lab acquisition



Federal & CA Current Incentives

- \$2,500 – \$7,500 PEV federal tax credit for PEVs, phasing out
- Up to \$7,000 CA Clean Vehicle Rebate Project
<https://cleanvehiclerebate.org/eng>
- CA HOV lane access continues for new MY 2017+ FCV, BEV, & PHEVs (income limits), red expires 1/1/2022
- Governor Brown executive order B-48-18
 - 1.5 million ZEVs by 2025
 - 5 million ZEVs by 2030
 - Proposed additional 200 hydrogen fueling stations and 250,000 EV chargers; CARB LCFS credit changes
- CA (2016) & Multi-State ZEV Action Plan (2018-2021)
- CEC funding for Infrastructure; EVSE & H2
- Off-peak (TOU) electric rates



INCENTIVE PROGRAMS UPDATE



*Vicki White
Technology Implementation Manager*

SCAQMD'S MAIN INCENTIVE PROGRAMS

Carl Moyer Program

- Trucks
- Transit buses
- Refuse trucks
- Public agency/utility vehicles
- Emergency vehicles
- Construction/Ag
- Marine Vessels
- Shore Power
- Locomotives
- Cargo Handling
- Infrastructure

- 1998 – Present
- \$467 Million
- 6,708 vehicles
- Emissions Reduced (tpy): NOx: 7,598 PM: 222

Prop 1B

- Trucks
- Shore Power
- Locomotives
- Cargo Handling
- TRUs

- 2009 - Present
- \$485 Million
- >7,300 vehicles
- Emissions Reduced (tpy): NOx: 7,086 PM: 220

Replace Your Ride

- Light-Duty Vehicles
- Alternative Mobility Options (transit passes, Uber, Lyft)
- Electric vehicle chargers

- 2015 - Present
- \$24 Million
- 3,100 vehicles
- Emissions Reduced (tpy): NOx: 29 HC: 67 CO: 8,031

Lower Emission School Bus Program

- School buses
- Infrastructure
- CNG tank replacements

- 2001 - Present
- \$280 Million
- 5,000 vehicles
- Emissions Reduced (tpy): NOx: 219 PM: 25

INCENTIVE PROJECT TYPES



2018 ACCOMPLISHMENTS

Community Air Protection Program (AB 134)

- 85 contracts executed for \$48 million
- 383 new on- and off-road engines
- 310 tpy NOx, 13 tpy PM
- At least 80% in disadvantaged and low-income communities

Carl Moyer Program

- 48 contracts executed for \$25.3 million
- \$26.5 million expended for 430 new on- and off-road engines
- 240 tpy NOx, 5.6 tpy PM

On-Road Heavy-Duty Vehicles Voucher Incentive Program

- Designed for small fleets of 10 trucks and less
- \$3.54 million expended for 84 truck replacements



2018 ACCOMPLISHMENTS (CONT'D)

Proposition 1B – Goods Movement Emission Reduction Program

- 46 contracts executed for \$40.16 million
- \$17.3 million expended for replacement of 183 trucks
- 468 tpy NO_x, 0.1 tpy PM

Lower Emission School Bus Program

- 42 grant agreements executed for \$35.64 million
- Replacement of 206 older diesel buses with new, near-zero alternative fuel buses
- 27 tpy NO_x, 1.5 tpy PM

2018 ACCOMPLISHMENTS (CONT'D)

Electric School Bus Program

- 16 grant agreements executed for \$7.62 million
- 29 electric school buses and charging infrastructure
- Leveraged with funds from ARB's Hybrid and Zero Emission Truck and Bus Voucher Incentive Project (HVIP)
- 16 electric buses delivered to-date



Enhanced Fleet Modernization Program (Replace Your Ride)

- \$11 million expended for replacement of 1,358 passenger vehicles
- 94% of the participants located in disadvantaged communities



SUMMARY OF AWARDS – NEAR ZERO AND ZERO EMISSION TRUCKS

Technology	NZ Emission (0.02 g/bhp-hr)	Funding	Zero Emission	Funding
AB 134	424	\$23,758,695	76	\$14,466,150
Moyer	19	\$749,587	0 *	\$0
Prop 1B	672	\$65,235,000	256	\$36,200,000
Total:	1,115 **	\$89,743,282	332	\$50,666,150

* Applications received under Moyer for zero emission trucks will be funded through AB 134.

** As of December 31, 2018, 167 trucks delivered (with 5 fleets)

INCENTIVE FUNDING IN FY 2017/18

Program Title	Description	Funding Amount
AB 134 – Community Air Protection	Funds early action mobile source projects in disadvantaged and low-income communities	\$107.5 million Status: All funds awarded to qualifying projects and >50% of the contracts executed
CEC Grant for Near Zero Emission, Natural Gas Drayage Trucks	Accelerate deployment of near zero emission, natural gas trucks that service the Ports	\$8 million (+ \$6 million in cost share funds from SCAQMD, POLB and POLA) Status: MOU with Ports fully executed, truck projects awarded in October 2018
Enhanced Fleet Modernization Program (Replace Your Ride)	CARB granted additional funding for EFMP to continue vouchers for low and moderate income motorists for cleaner vehicles	\$16.4 million Status: Executed the grant agreement with ARB, received 1st installment of funds (\$4 million), spent about \$3 million
Voluntary NOx Remediation Measure Funding	Funds mobile source projects that will reduce NOx emissions to mitigate the NOx emissions increase from biodiesel use in CA	~\$2.67 million Status: Projects awarded in November 2018, ARB MOU in progress (not yet executed)

INCENTIVE FUNDING IN FY 2017/18

Program Title	Description	Funding Amount
EPA Targeted Air Shed Program Grant – Lawn and Garden Equipment	Funds zero emission, electric lawn and garden equipment for commercial use in environmental justice areas	~\$2.47 million Status: Program will be launched on January 29, 2018
EPA Diesel Emission Reduction Act (DERA)	Funds to replace older diesel trucks with new optional low NOx, natural gas trucks	\$1.6 million Status: Executed grant agreement
Lower Emission School Bus Program	Fund the replacement of older, high-polluting school buses with near-zero emission school buses	~\$35.6 million total (incl. \$32.5 million from SCAQMD and \$3.1 million from EPA) Status: Executed all grant agreements, first deliveries in progress
Funding Agricultural Replacement Measures for Emissions Reductions (FARMER)	Fund the replacement of agricultural equipment using the Carl Moyer Program Guidelines	~\$1.88 million Status: Projects awarded in November 2018, contracts in progress
		Total: \$182.1 million

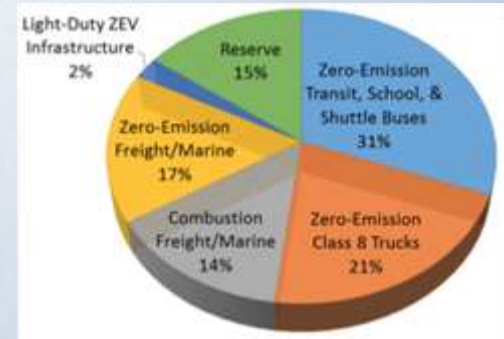
VOLKSWAGEN SETTLEMENT (2019)

- **Environmental Mitigation Trust (Appendix D)**

- \$423 million for California
- CARB will serve as lead agency

- **Beneficiary Mitigation Plan**

- Approved on April 25, 2018
- 5 eligible mitigation actions
- Mostly scrap and replace for heavy-duty sector
- 10,000 tons of NOx reductions over 10-yr period
- Funds available starting in 2019



CARB's Beneficiary Mitigation Plan

VW MITIGATION PROGRAM

Project Category	Technology	Allocation (millions)	Air District
Zero-Emission Transit, School and Shuttle Buses	Battery electric or fuel cell	\$130	SJVAPCD
Zero-Emission Class 8 Freight and Port Drayage Trucks	Battery electric or fuel cell	\$90	SCAQMD
Zero-Emission Freight and Marine Projects (airport GSE, forklifts, port cargo handling equipment, shore power at port terminals)	Battery electric or fuel cell	\$70	BAAQMD
Combustion Freight and Marine Projects (waste haulers, dump trucks, concrete mixers, switcher locomotives, ferries, tug boats)	Low NOx engine, Tier 4, or Tier 4 equivalent	\$60	SCAQMD
Light-Duty Zero-Emission Vehicle Infrastructure	Electric charger or hydrogen fueling station	\$10	BAAQMD
CARB Reserve		\$63	
	Total:	\$423	

SB 856 (BUDGET ACT OF 2018)

- Signed by the Governor in June 2018 - \$275 million for Community Air Protection
- Of these funds, \$245 million for financial incentives to reduce stationary and mobile source emissions
- Surplus reductions
- Project types:
 - Mobile sources (Moyer and Prop 1B) with zero emission priority
 - Charging infrastructure, especially for medium and heavy-duty vehicles
 - Stationary sources
 - Other projects included in community emission reduction plans

QUESTIONS/CONTACT INFO

Questions:

Vicki White (909) 396-3436
vwhite@aqmd.gov



Update on Facility-Based Mobile Source Measures

**Warehouse
Distribution
Centers**



**Commercial
Airports**



**New or
Redevelopment
Projects**



**Commercial
Marine Ports**



**Railyard &
Intermodal
Facilities**



Clean Fuels Advisory Group
January 17, 2019

Background

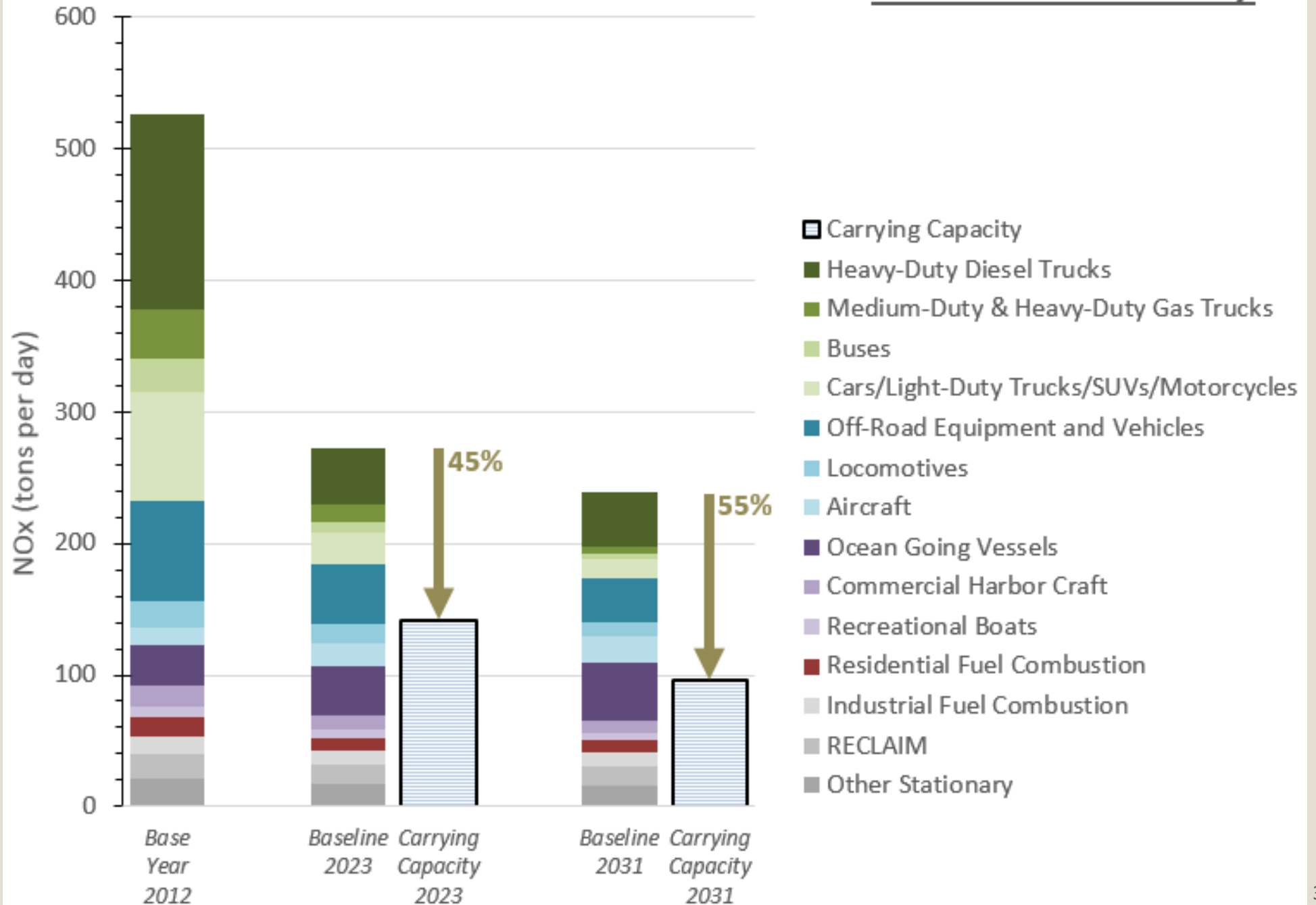


- 5 Facility-Based Mobile Source Measures (FBMSM) included in 2016 AQMP
 - Airports, New/Redevelopment, Ports, Railyards, Warehouses
- Primary goal of FBMSM is to reduce NO_x emissions
 - Need 45% reduction in NO_x basin-wide by 2023 to meet federal ozone standards
 - Assists in implementing CARB's Mobile Source Strategy
 - Measures need to be defined and in place 3 years before federal clean air attainment deadline
 - Mobile source strategies from CARB and SCAQMD are meant to complement each other

Baseline NOx Emissions & Air Basin Carrying Capacity

- Baseline inventory assumes full implementation of existing rules
- Carrying capacity based on modeling in 2016 AQMP

Baseline NOx Inventory



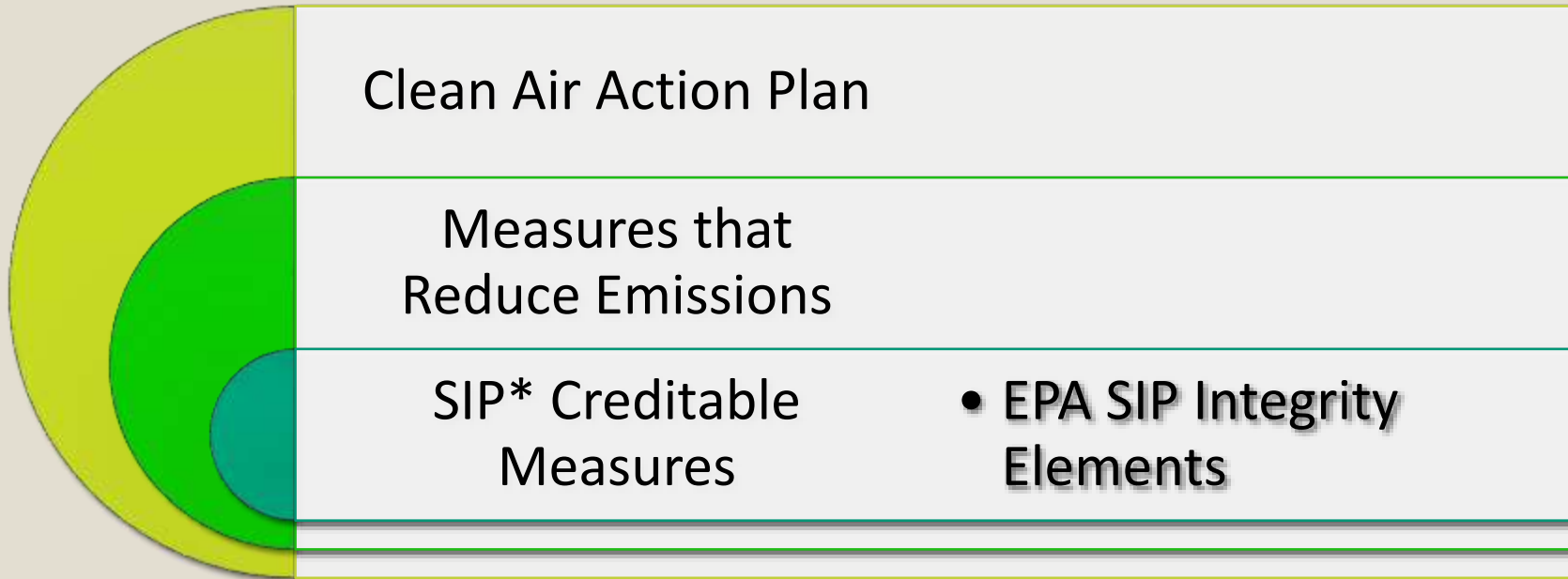
Background

- In May 2018, the SCAQMD Board directed staff to pursue Indirect Source Rules (ISR) for warehouses and rail yards
- Staff was also directed to pursue contract-based measures, including Memoranda of Understanding (MOUs), with marine ports and airports
- SCAQMD staff is still studying the potential for ISR for new/redevelopment projects

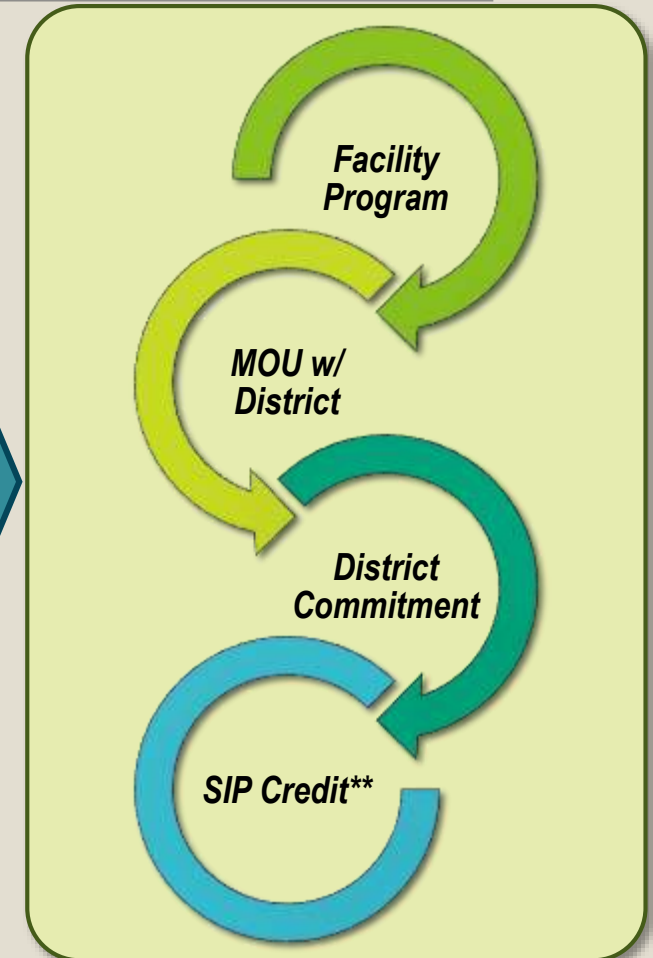
Summary of May 2018 Board Direction

Sector	Direction
Airports	Pursue MOUs to implement airport clean air action plans
Ports	Pursue MOUs to implement specific CAAP measures; pursue introduction of cleaner vessels
New/Redevelopment	Continue to work with stakeholders to develop rule concepts and preliminary costs/benefits
Warehouses	Develop rule concept; conduct economic impacts study to inform rule concept
Rail yards	Pursue rulemaking; explore potential for new agreements/MOUs beyond the 1998 and 2005 agreements

Potential MOU Approach for Clean Air Action Plans



- *MOU can include specific measures or emission targets*
- *With MOU, SCAQMD Board would commit to SIP-creditable emission reductions, or alternative measures if Facility Program/MOU unsuccessful*



Menu of Potential ISR Compliance Options

Facility Caps

- XX% below baseline emissions (*SJVAPCD approach*)
- <XX pounds of emissions per day per facility
- <XX pounds of emissions per goods throughput unit or sq. ft.

SOON Program Approach

- Indirect sources must apply for incentive funds and use them if available (e.g., warehouse operators that own fleets must apply for funding to replace trucks and use it if awarded)

Local Govt. Measure

- Local govt. programs/ordinances can be put directly into SIP (e.g., ordinance requiring new warehouses install alt. fueling infrastructure)
- Similar approach available in Rule 2202

Crediting/Banking Program

- Clean fleets generate credits managed through a bank and ISR facilities must obtain and retire credit
- Potential for localized overlay

Voluntary Fleet Certification Program

- Fleet owners may certify that fleets are cleaner than required by CARB regulation
- Facility owners required to use XX level of certified fleets

Onsite Best Management Practices

- Utilize ZE/NZE equipment onsite
- ZE/NZE fueling/charging infrastructure
- Solar/energy storage

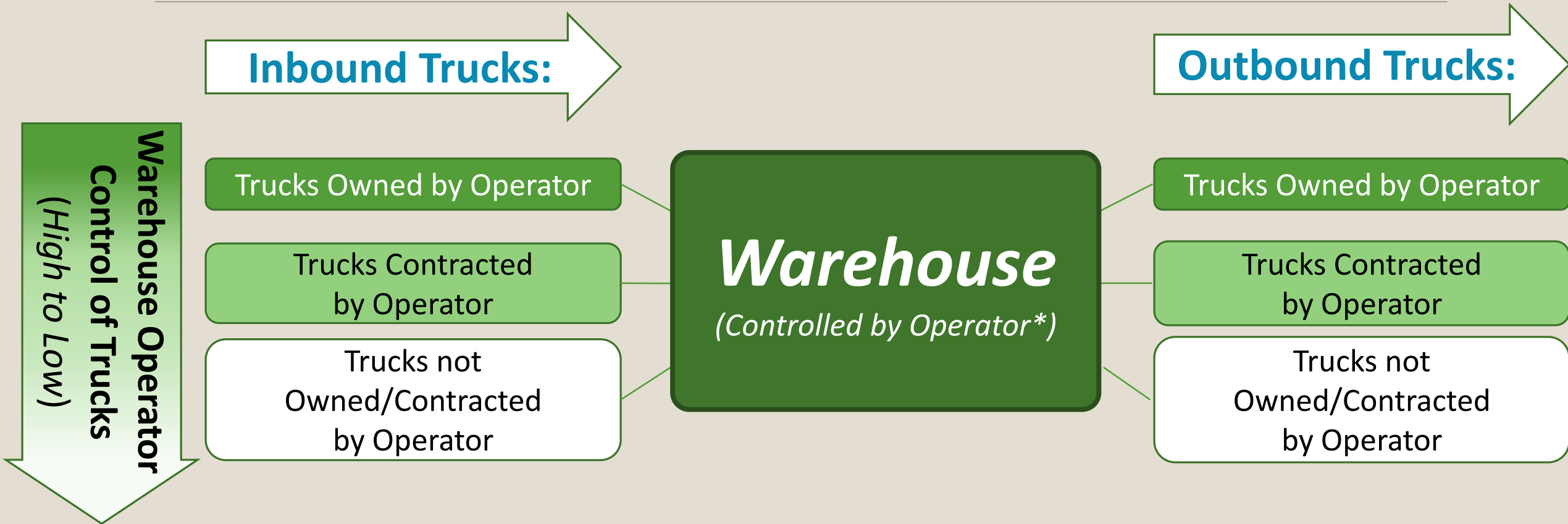
Mitigation Fee

- Pay a mitigation fee if other compliance options not chosen
- Collected funds are used to incentivize ZE/NZE equipment

Warehouse Business Models

- Simplified relationships are presented considering how a potential indirect source rule may apply to various warehouse industry participants
 - Logistics industry is substantially more dynamic and complex than shown on following slides
 - Additional complexities of these business relationships will continue to be explored with stakeholders during rulemaking
- Current preliminary ISR regulatory concepts include potential requirements addressing cleaner trucks and onsite infrastructure

Warehouse Operator / Motor Carrier Simplified Relationships



➤ *Any combination of inbound trucks and outbound trucks is possible*

Motor Carrier Contracts

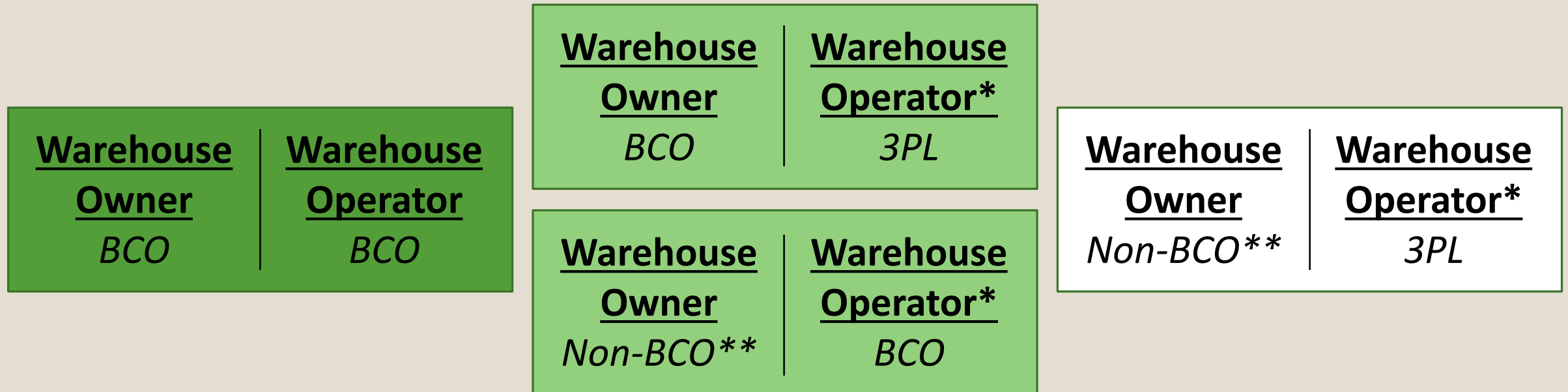
- If a cargo owner (BCO) needs to move goods without using its own trucks, it will contract with a motor carrier



- BCO may contract with a central intermediary (broker) who will then contract with one or more motor carriers
- Contract requirements between a BCO and an intermediary can 'flow down' into the contracts between the intermediary and the motor carrier



Warehouse Owner/Operator Simplified Relationships



Beneficial Cargo Owner Control of Warehouses
(High to Low)

*The warehouse operator may or may not lease the building from the owner

** Non-BCO can include 3PLs, investors, real-estate developers, etc.

SCAG Warehouse Analysis*

- *Number of warehouses in the 4 SCAQMD counties*

~4,800

>50,000 sq. ft.

~200

>500,000 sq. ft.

*2014 data

Intersection Between AB 617 & ISR

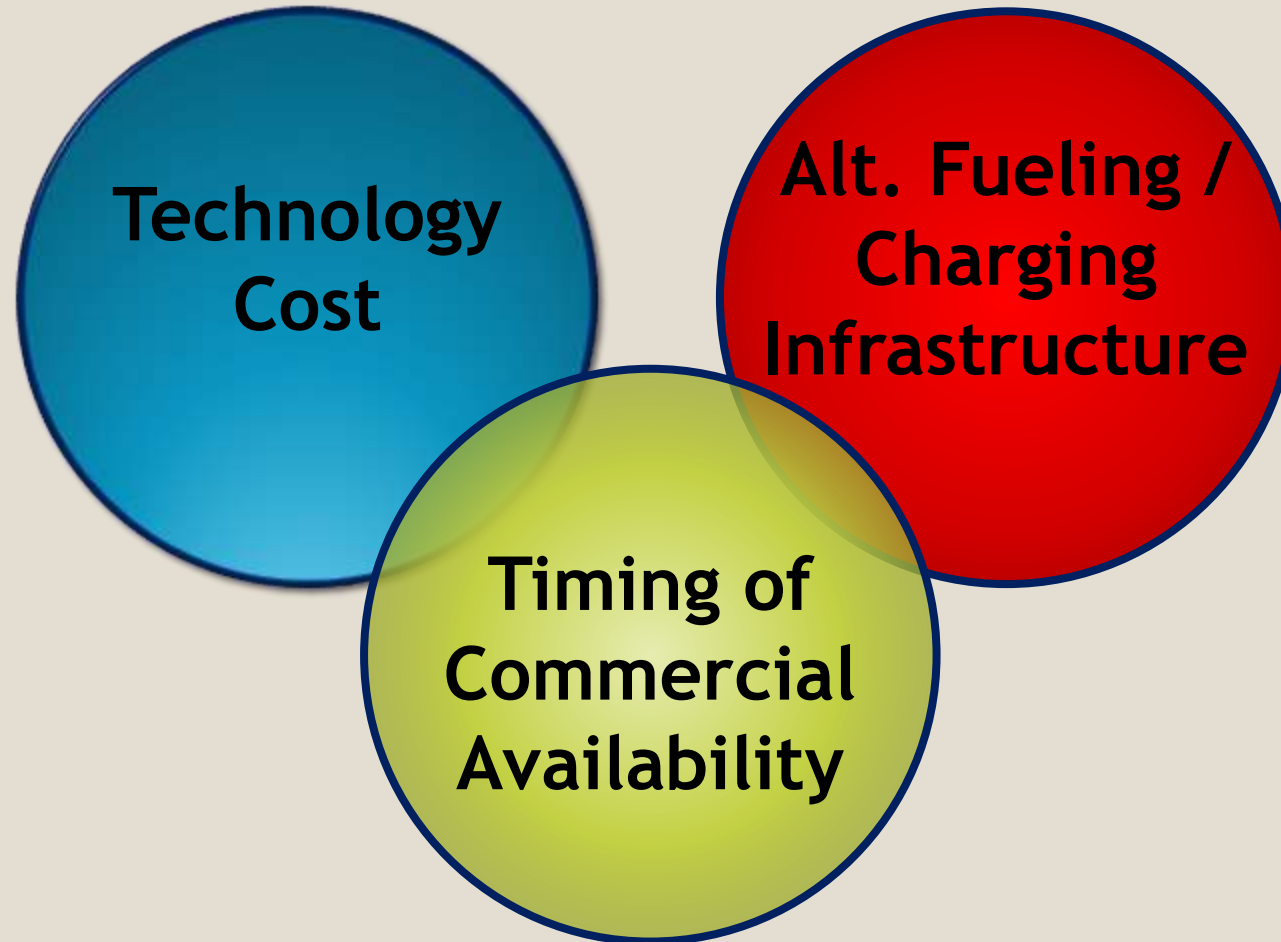
Key Elements of AB 617



All three
'Year 1' AB 617
Communities
have warehouses
and rail yards



Key Technology Challenges for FBMSM



Staff Lead Contacts

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- AB 617 - Jo Kay Ghosh (909) 396-2582 jghosh@aqmd.gov

- More information on facility based measures is available here:
<http://www.aqmd.gov/fbmsm>
- Email listserv:
<http://www.aqmd.gov/sign-up>