



**Concepts for In-Use Locomotive
Regulation Workshop
Day 2**

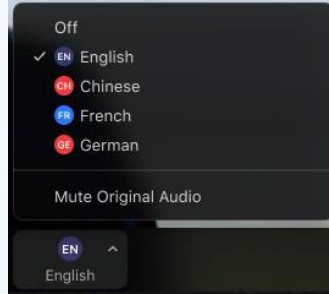
October 30, 2020

Cómo escuchar la interpretación de un idioma

1. En los controles de la reunión o el seminario web, haga clic en **Interpretación**. Esto se puede localizar en la parte de abajo.



2. Haga clic en el idioma que desee escuchar. Para esta reunión, va a poder ver la opción de inglés y español.



3. Para escuchar solo el idioma interpretado, haga clic en **Silenciar audio original**.
(Mute Original Audio)

Si tiene preguntas durante la reunión, utilice la función de chat y escriba su pregunta. El personal de CARB traducirá la pregunta para que los presentadores respondan. Si no puede utilizar el cuadro de chat, informe al intérprete de su pregunta levantando la mano y el personal de CARB lo interpretará y lo escribirá en el cuadro de chat.



Listening to Language Interpretation

1. In your meeting/webinar controls, click **Interpretation**. It can be located at the bottom of the screen.



2. Click the language that you would like to hear. For this meeting, you will have English and Spanish as your options.

3. To only hear the interpreted language, click **Mute Original**

If you have questions during the meeting, please use the chat feature and type in your question. CARB staff will translate the question for the presenters to respond. If you are not able to use the chat box, let the interpreter know of your question by raising your hand and CARB staff will interpret and type it into the chat box for you.

Tech Support

Please reach out for help if you have any technical challenges!

- Use Zoom **Chat** to contact Alyssa or just message Everyone

Reminders

- Meeting is being recorded
- Private chats are archived

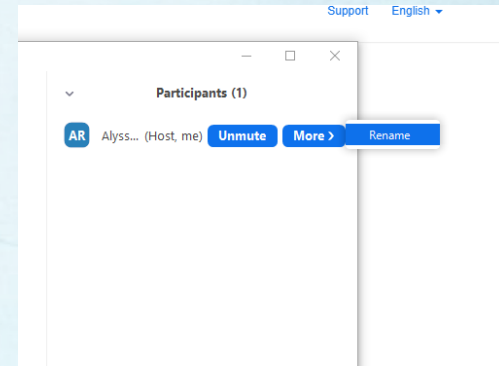
Staff Introductions

- Ajay – Facilitator and CARB Presenter
- Alyssa Rhodes – Zoom Technical Assistance
- Jennifer Kozumplik – CARB Presenter
- May Bhetraratana – CARB Presenter
- Mae Colcord – CARB Presenter
- Shannon Downey – Q&A Moderator

Before We Get Started...

- Please **mute yourself** and make sure your full name and affiliation are showing as your screen name
- To **rename**, click on the top right side of your picture/video.
- Use this naming convention, **Affiliation - First Last (e.g. CARB - Jane Doe)**
 - **P** – for General Public (e.g. P - John Smith)

To rename, find your name on the participant list. Hover over the right side and click more for the rename option.



- **Need help?** Use the Chat function to request assistance

Zoom Orientation

Mute/Unmute

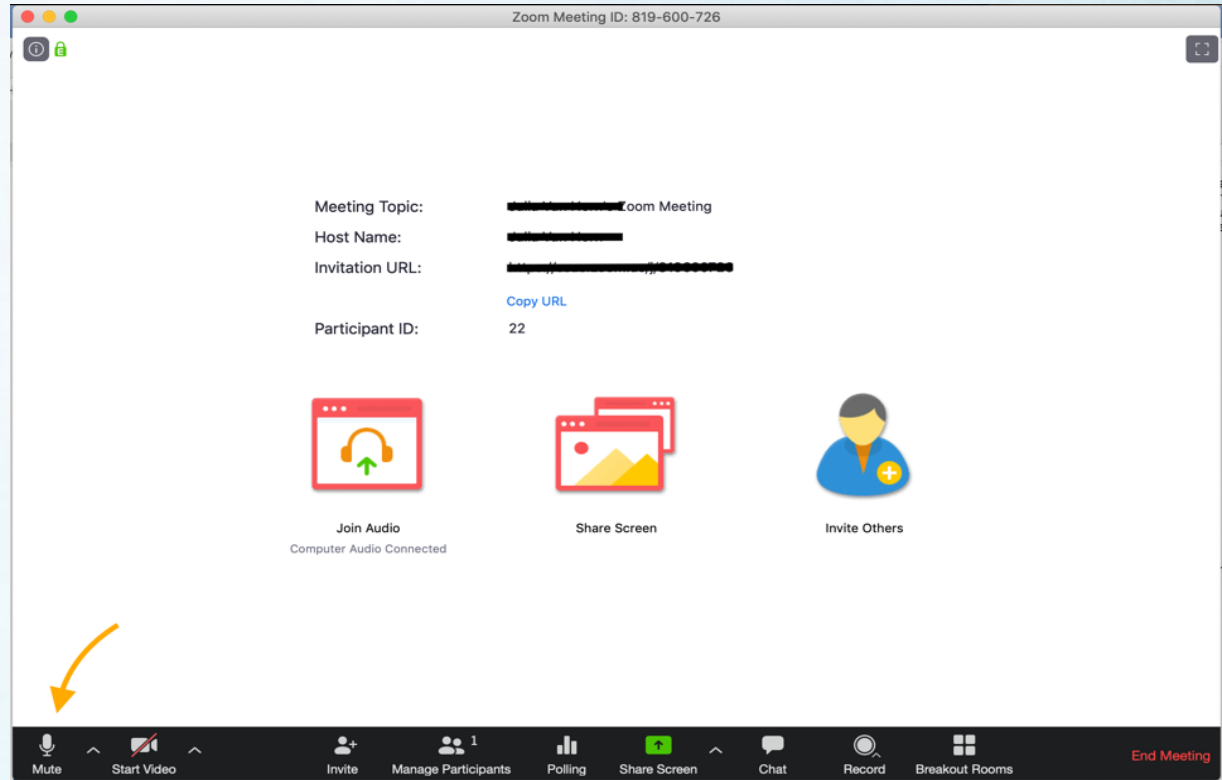
Please remain on mute unless your name has come up in the speaking queue

- Zoom:

Mute button at bottom left

- On phone:

Dial *6 to mute/unmute



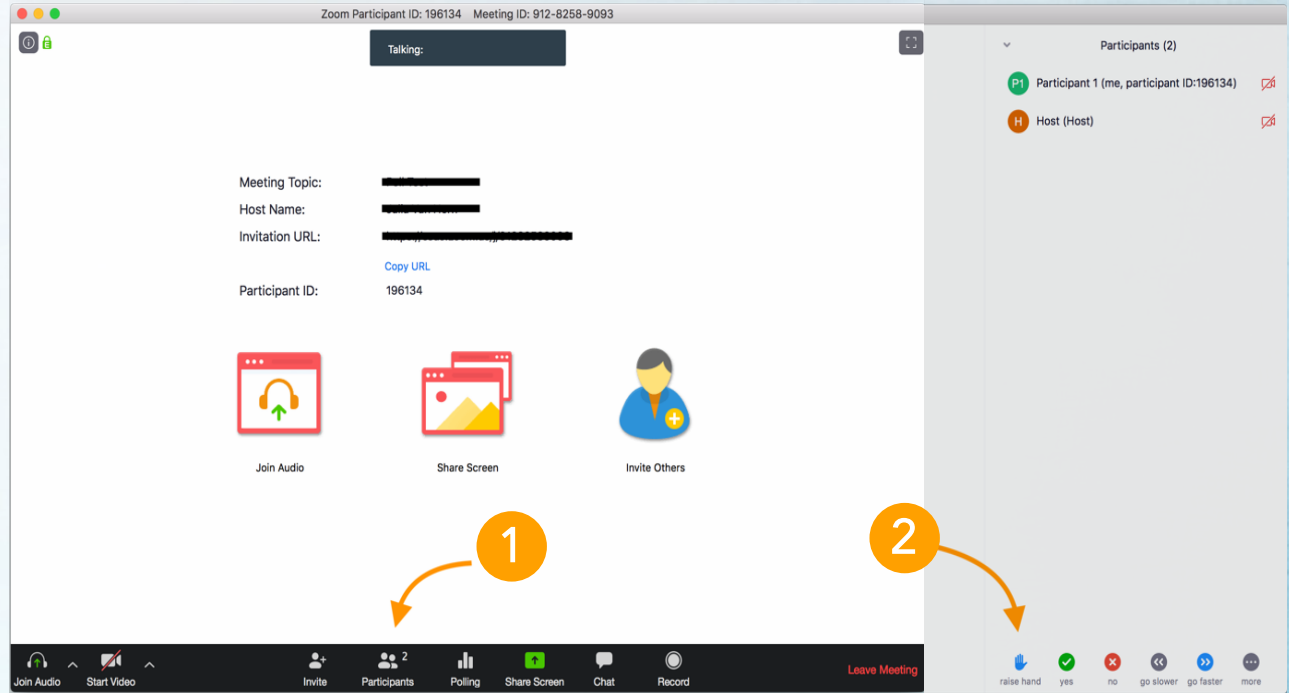
How to Ask a Question

Raise Hand

To be added to the speaking queue, please use Raise Hand

Click **Participants**, then **Raise Hand**. We'll also ask those on the phone.

On the phone Press *9 to Raise your Hand



How to Submit Questions

- Please submit questions in the general chat
 - When possible, please identify slide number you want to discuss

Goals for CARB Freight Actions



Cut community health risk

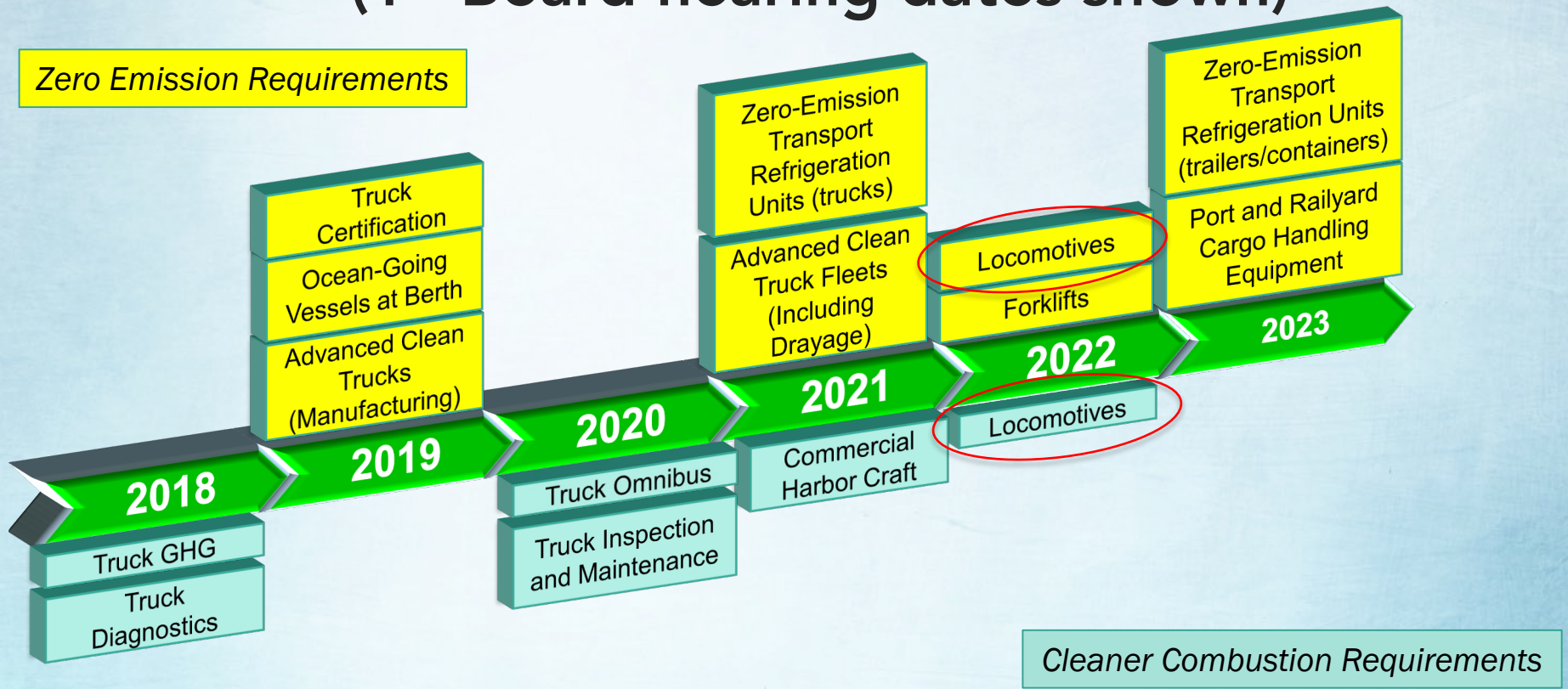


Attain regional air standards



Mitigate climate change

New CARB Freight Regulatory Actions (1st Board hearing dates shown)



Governor's Executive Order

- On September 23, 2020:
- The State Air Resources Board, to the extent consistent with State and federal law, shall develop and propose:
 - Strategies, in coordination with other State agencies, U.S. Environmental Protection Agency and local air districts, **to achieve 100 percent zero-emission from off-road vehicles and equipment operations in the State by 2035.**

Two Day Locomotive Workshop

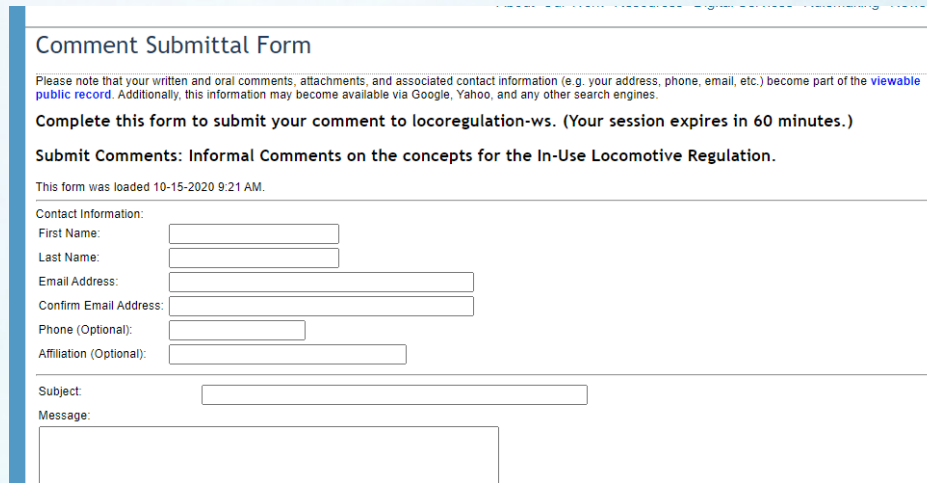
- Day 1 – State of Locomotive Technology and Emissions
- Day 2 – Locomotive Proposed Regulatory Concepts and Health Impacts

Outreach

- Previous workshops in November and December 2019
- Stakeholder meetings prior to workshop
- Continued stakeholder outreach during development
- Submit comments through website or contact freight@arb.ca.gov

Comment Log on CARB's Website

- https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=locoregulation-ws&comm_period=1



Comment Submittal Form

Please note that your written and oral comments, attachments, and associated contact information (e.g. your address, phone, email, etc.) become part of the [viewable public record](#). Additionally, this information may become available via Google, Yahoo, and any other search engines.

Complete this form to submit your comment to locoregulation-ws. (Your session expires in 60 minutes.)

Submit Comments: Informal Comments on the concepts for the In-Use Locomotive Regulation.

This form was loaded 10-15-2020 9:21 AM.

Contact Information:

First Name:

Last Name:

Email Address:

Confirm Email Address:

Phone (Optional):

Affiliation (Optional):

Subject:

Message:

Meeting Agenda

- 9:00 – 9:25 Housekeeping and Background/Recap
- 9:25 – 9:40 Health Characterization
- 9:40 – 9:55 Q&A
- 9:55 – 10:40 Proposed In-Use Locomotive Regulation Concepts
- 10:40 – 10:55 Q&A
- 10:55 – 11:05 CEQA
- 11:05 – 12:00 Q&A

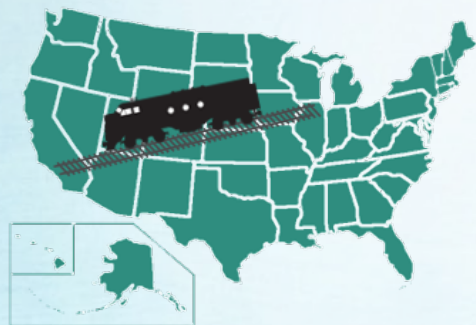
Locomotive Lingo

Line Haul Locomotives

Emissions Tier	Year of Manufacture	NOx	PM
		Standard (g/bhp-hr)	Standard (g/bhp-hr)
Pre-Tier 0	1973-1999	13.5	0.6
Tier 0	2000-2001	9.5	0.6
Tier 0+	Ongoing	8.0	0.22
Tier 4	2015	1.3	0.03


Switch Locomotives

Emissions Tier	Year of Manufacture	NOx	PM
		Standard (g/bhp-hr)	Standard (g/bhp-hr)
Pre-Tier 0	1973-1999	17.4	0.72
Tier 0	2000-2001	14.0	0.72
Tier 0+	Ongoing	11.8	0.26
Tier 4	2015	1.3	0.03



Locomotive Lingo: megawatt-hours (MWh)

- Amount of energy used by a locomotive when it is moving
 - Similar to what you see on your power bill
 - 1 MWhr = 1,000 kWhr

 Electricity Charges			
Item		Usage	Type
Electricity Usage		301	Summer kWh @

Categories of Railroads

- Class 1:
 - 24/7 activity
 - Pulling heavy freight nationwide
- Class 3:
 - Daily activity
 - Pulling heavy freight within California

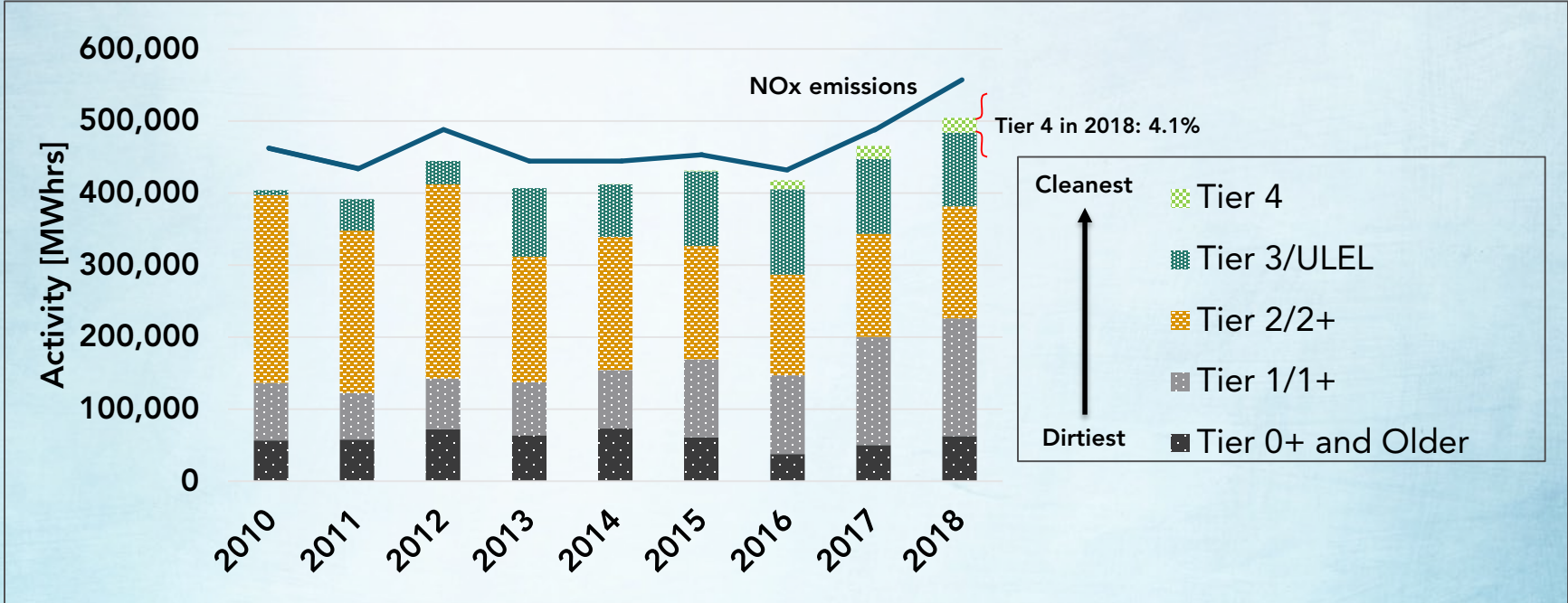


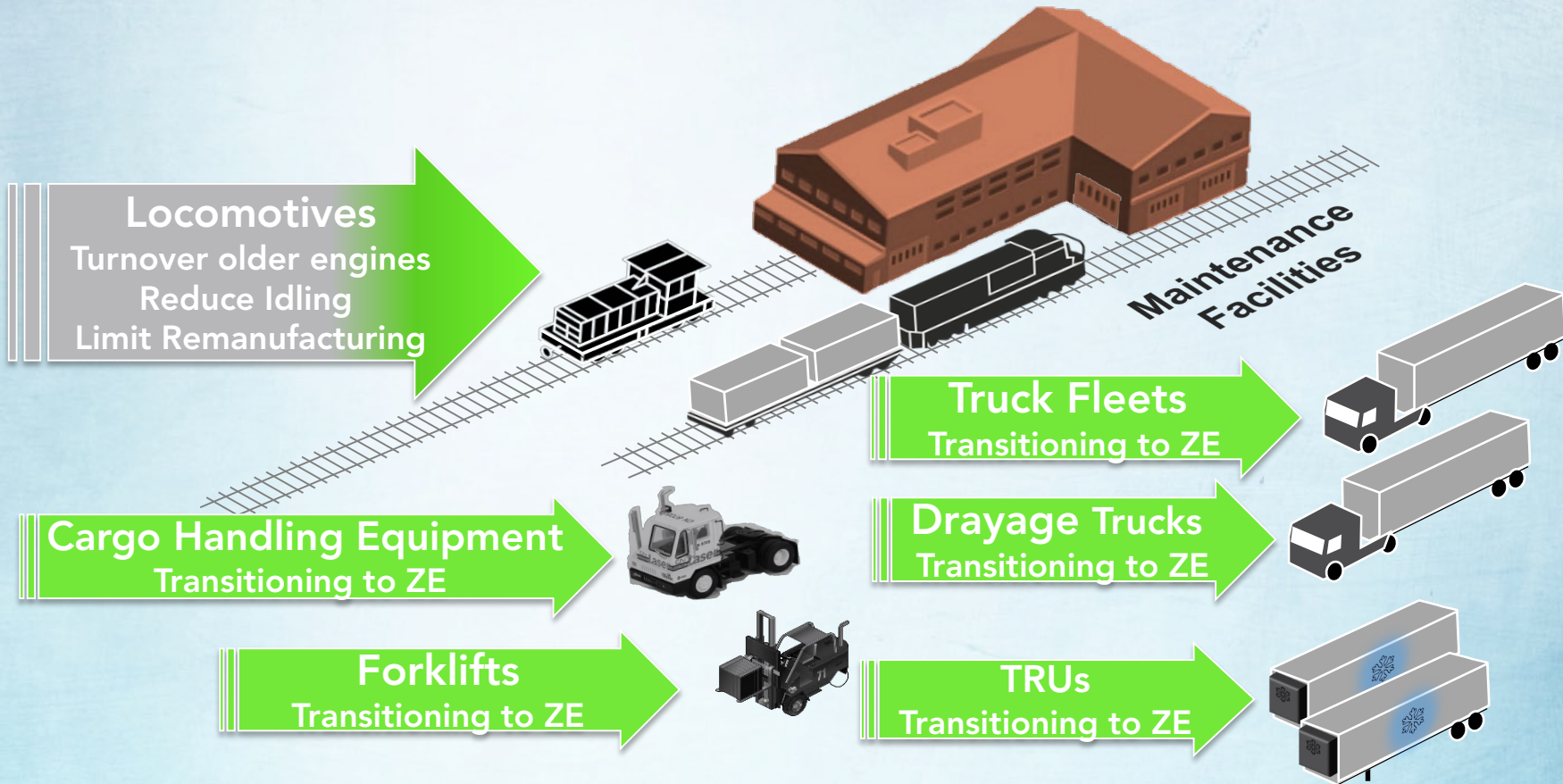
Categories of Railroads

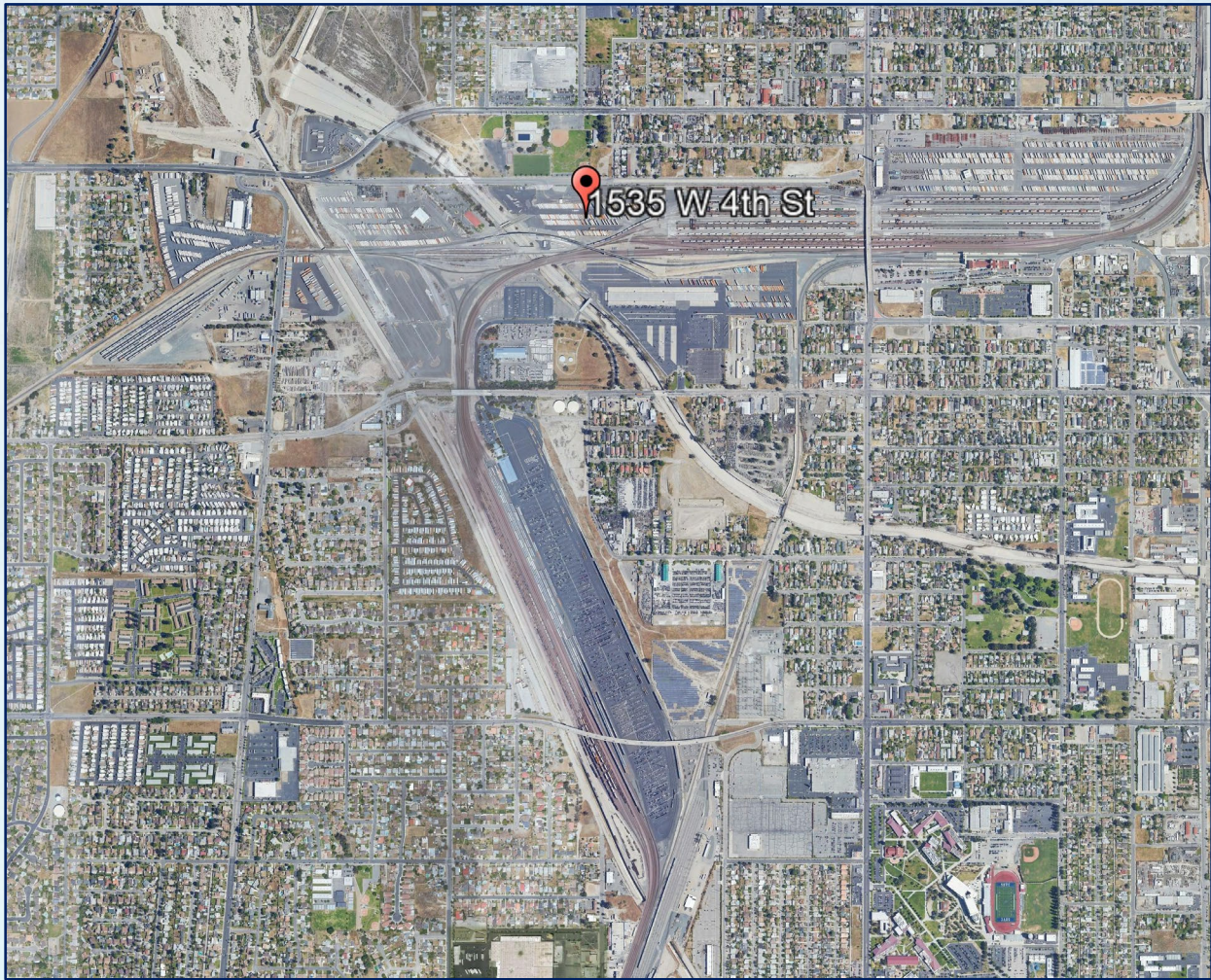
- Military and Industrial:
 - Used as needed for goods delivered to facilities
 - Pulling a few cars within the facility
- Passenger railroads:
 - Daily activity
 - Pulling passengers and prioritizing speed, mostly within California, captive routes



Locomotive Emissions in the South Coast



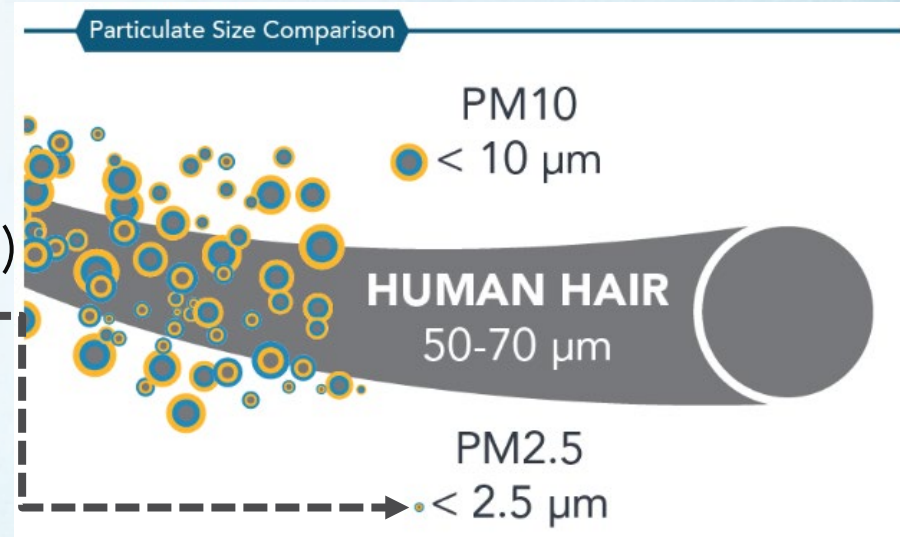




Diesel Exhaust

Diesel exhaust is a complex mixture of:

- Diesel particulate matter (DPM)
 - Subset of PM_{2.5}
 - Over 40 known cancer-causing compounds
- Gaseous pollutants, including:
 - Volatile organic compounds
 - Oxides of nitrogen (NO_x)



<https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>

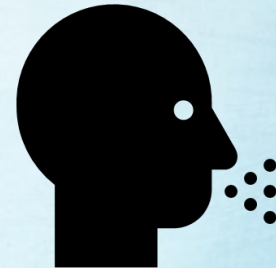
<https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>

Health Impacts of Diesel Exhaust

- Diesel emissions are linked to lung cancer & premature death:
 - DPM is a Toxic Air Contaminant (1998)
 - Diesel engine exhaust determined “carcinogenic to humans” (IARC, 2012)
- Non-cancer effects from diesel exhaust, including:
 - Worsening of asthma & allergies
- Acute effects

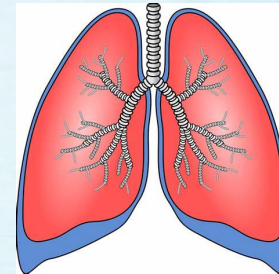
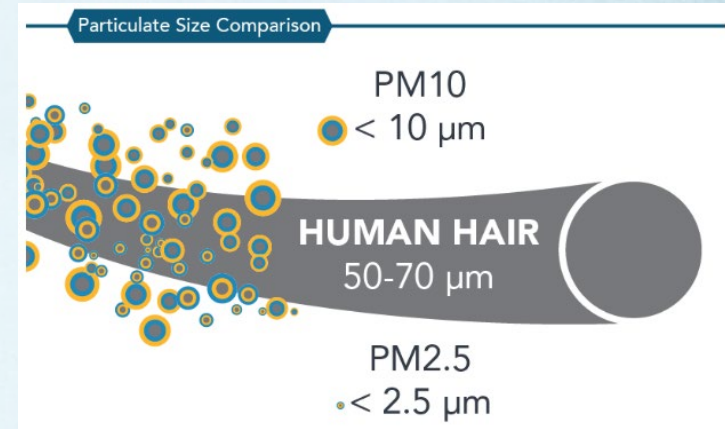
DPM = diesel particulate matter

IARC = International Agency for Research on Cancer



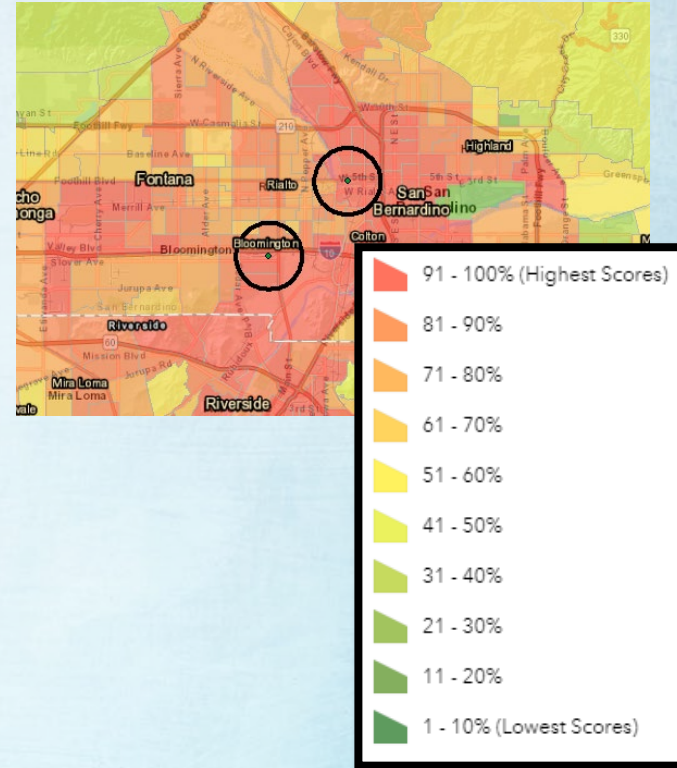
Health Impacts of PM_{2.5}

- PM_{2.5} health effects are widely studied. Exposures lead to:
 - Acute respiratory symptoms
 - Asthma exacerbations, ER visits for asthma
 - Bronchitis, chronic obstructive pulmonary disease (COPD)
 - Heart attacks
 - Nervous system effects (e.g., cognitive deficits)
 - Lost work days
 - Premature death
- The Children's Health Study found reduced lung development from high PM_{2.5} levels.



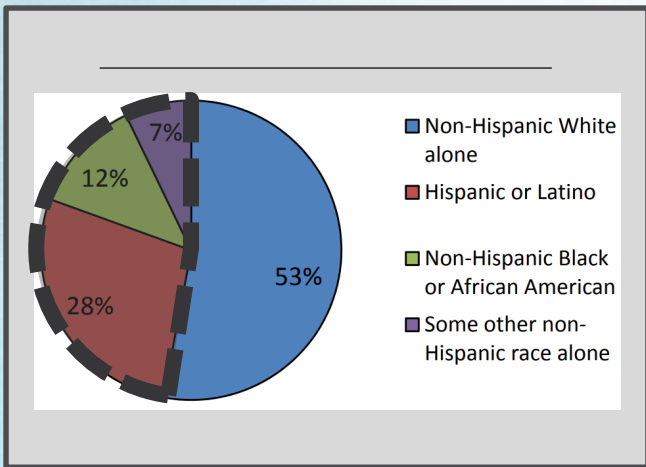
High Exposures from Rail Activity

- Rail activity is often near **disadvantaged communities (DACs)**.
 - **DACs:** identified by CalEnviroScreen scoring.
 - The majority of the state's major railyards are in/around DACs.
- Locomotive workers, passengers, and communities are exposed to high $PM_{2.5}$ levels from rail activity.
 - **In-vehicle $PM_{2.5}$ concentrations ranked highest in trains**, compared to commuting by personal car, light-rail, bus, or bike.



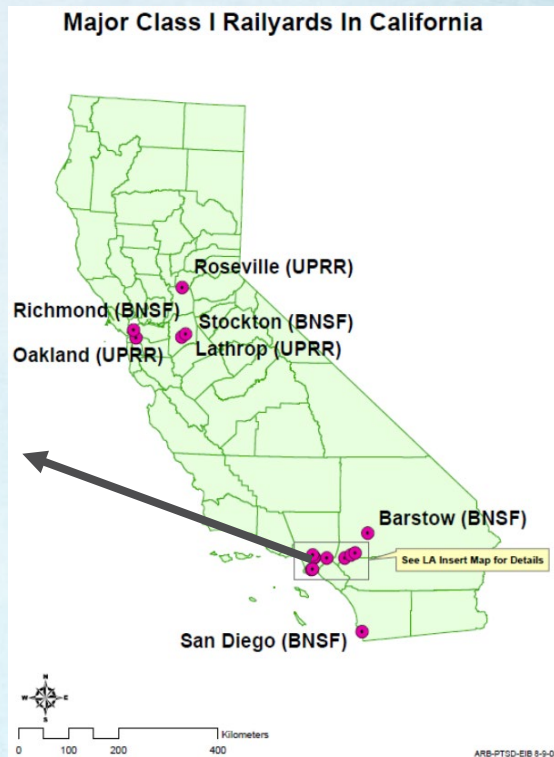
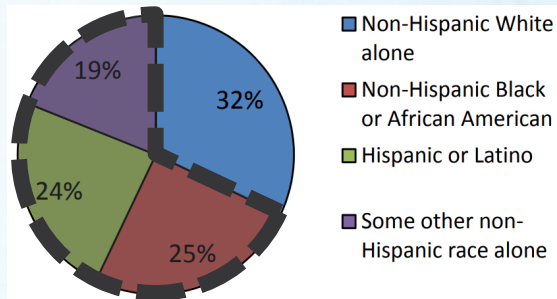
High Exposures from Railyards

California communities with higher pollution exposures from nearby major railyards usually have **larger proportions of people of color and low-income residents.**



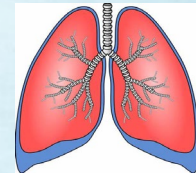
(derived from Hricko et al. 2014)

Community near major railyard within Los Angeles County (1980)



Railyard Health Risks on Communities

- Increased risk for cancer
- Increased risk for asthma-related ER visits in children
- Children going to school adjacent to a Southern California railyard can have:
 - Increased risk for reduced lung function
 - Increased risk for respiratory inflammation



Rail-Related Health Impact Analysis

- CARB estimates cases of adverse health outcomes related to PM_{2.5} exposure:
 - Cardiopulmonary mortality
 - Hospitalizations for cardiovascular & respiratory illnesses
 - ER visits for asthma



For more detail, please visit:

<https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution>

- Estimated burden of health impacts from locomotives (cumulative for 2020-2050, with business as usual, statewide):
 - 6,000+ deaths
 - 2,000+ hospitalizations
 - About 3,000 ER visits

Health Benefits from Average Tier 4

Statewide, Cumulative for 2020-2050

Estimated Number of Fewer Cases	
Cardiopulmonary Mortality	4,887 Fewer Cases (3,821 – 5,973)
Hospitalizations for CV & Respiratory Illnesses	1,576 Fewer Cases (201 – 2,921)
ER Visits for Asthma	2,303 Fewer Cases (1,457 – 3,149)

(Numbers in parentheses are the 95% confidence intervals)

Health Benefits from Average Tier 4

Top 3 Air Basins, Cumulative for 2020-2050

South Coast

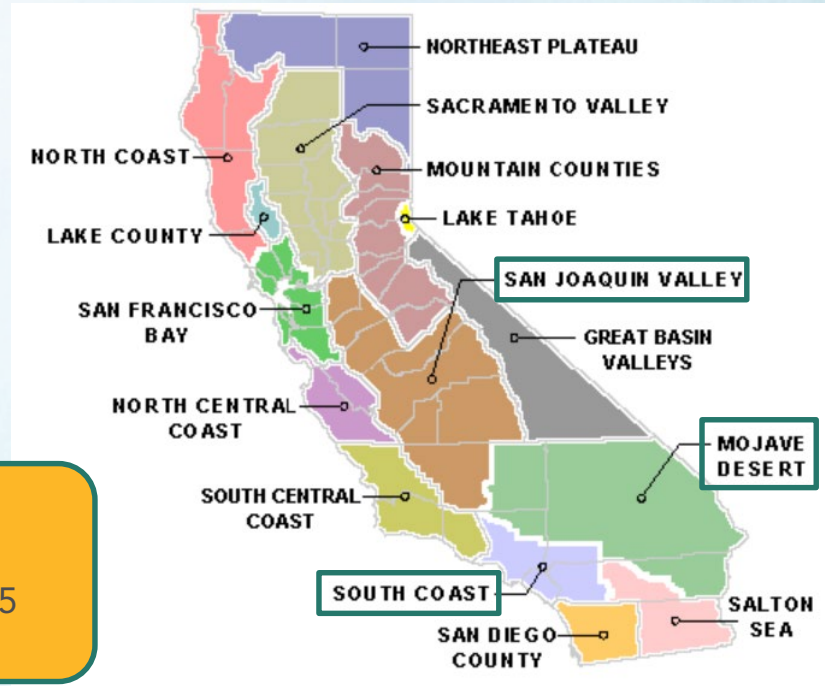
Fewer Deaths: 3,067 (2,399 – 3,747)
Fewer Hospitalizations: 1,087 (139 – 2,014)
Fewer ER Visits: 1,576 (997 – 2,154)

San Joaquin Valley

Fewer Deaths: 666 (521 – 812)
Fewer Hospitalizations: 165 (21 – 305)
Fewer ER Visits: 245 (155 – 334)

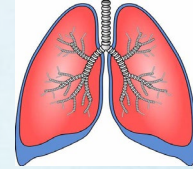
Mojave Desert

Fewer Deaths: 437 (341 – 535)
Fewer Hospitalizations: 132 (17 – 245)
Fewer ER Visits: 172 (109 – 235)



Summary of Health Effects & Analysis

- Studies show health impacts of DPM, PM_{2.5}, and rail activity include, but are not limited to:
 - Lung cancer
 - Asthma and respiratory effects
 - Cardiovascular effects
 - Premature death
 - If California moves to a Tier 4 average, there will be fewer cases of:
 - Cardiopulmonary mortality
 - Hospitalizations for cardiovascular & respiratory illnesses
 - ER visits for asthma
- with most of these reductions occurring in Southern California and in the San Joaquin Valley.

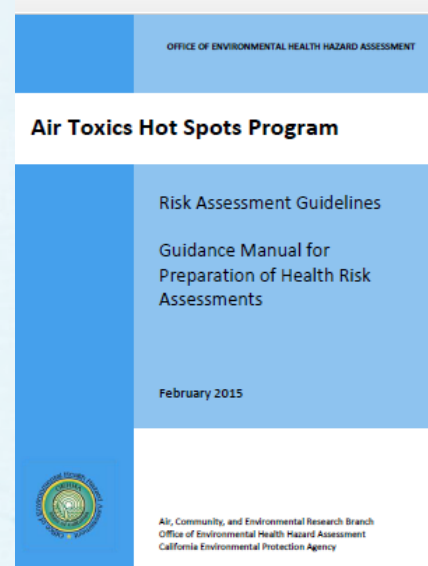


California's Major Railyards



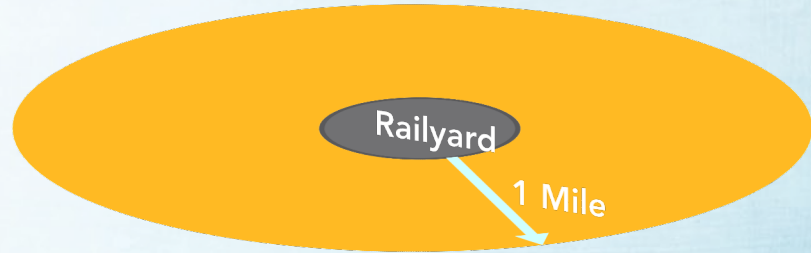
Diesel PM Risk Revision

- Office of Environmental Health Hazard Assessment Revised its guidance on cancer risk evaluation



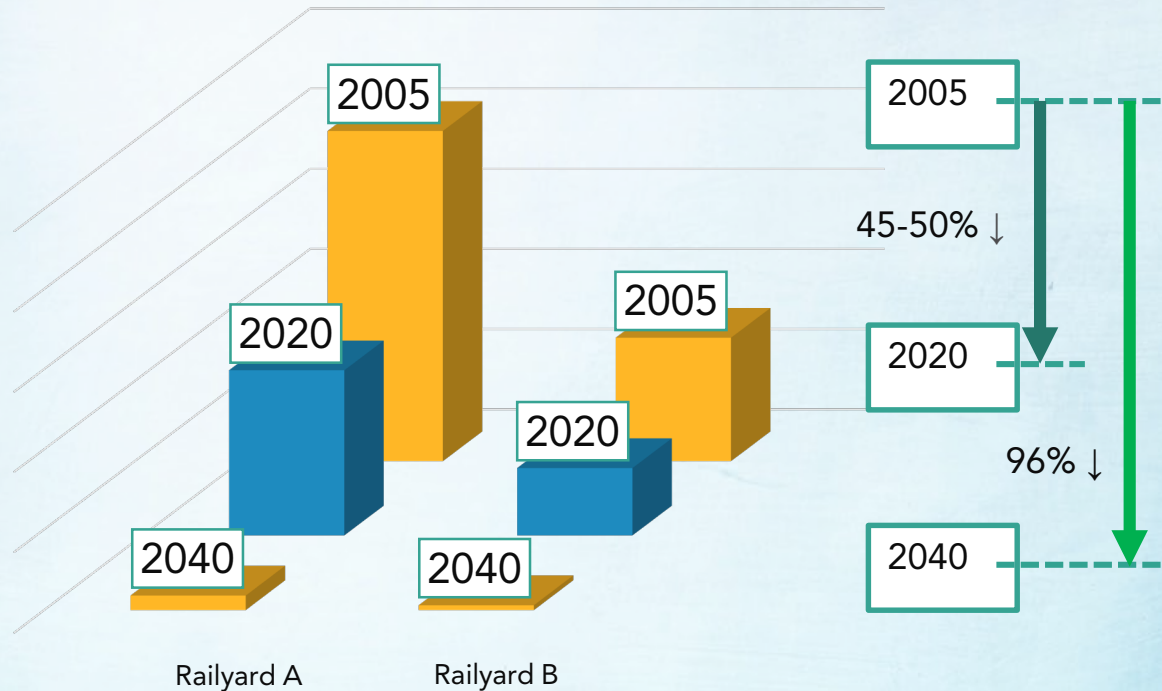
Cancer Risk From Locomotives Near Railyards

Using CARB inventory data and the 2005 Railyard Health Risk Assessments on Class 1 railyards, CARB staff modeled average risk throughout 1 mile surrounding a sample railyard in 2005, 2020, and a scenario of all Tier 4 locomotives.



Cancer Risk From Locomotives Near Railyards

Average Risk within 1 Mile of the Railyard



Comments/Questions

- 15 minutes
- Submit to general chat
 - When possible, please identify slide number you want to discuss

What is the Problem We're Trying to Solve?

- Slow turnover to Tier 4 locomotives
- Need to decrease locomotive emissions
 - Increase use of clean equipment
 - Decrease use of dirtier equipment
 - Eliminate unnecessary emissions, such as idling
- Need to move toward a ZE transformation for this equipment

Cost Assumptions

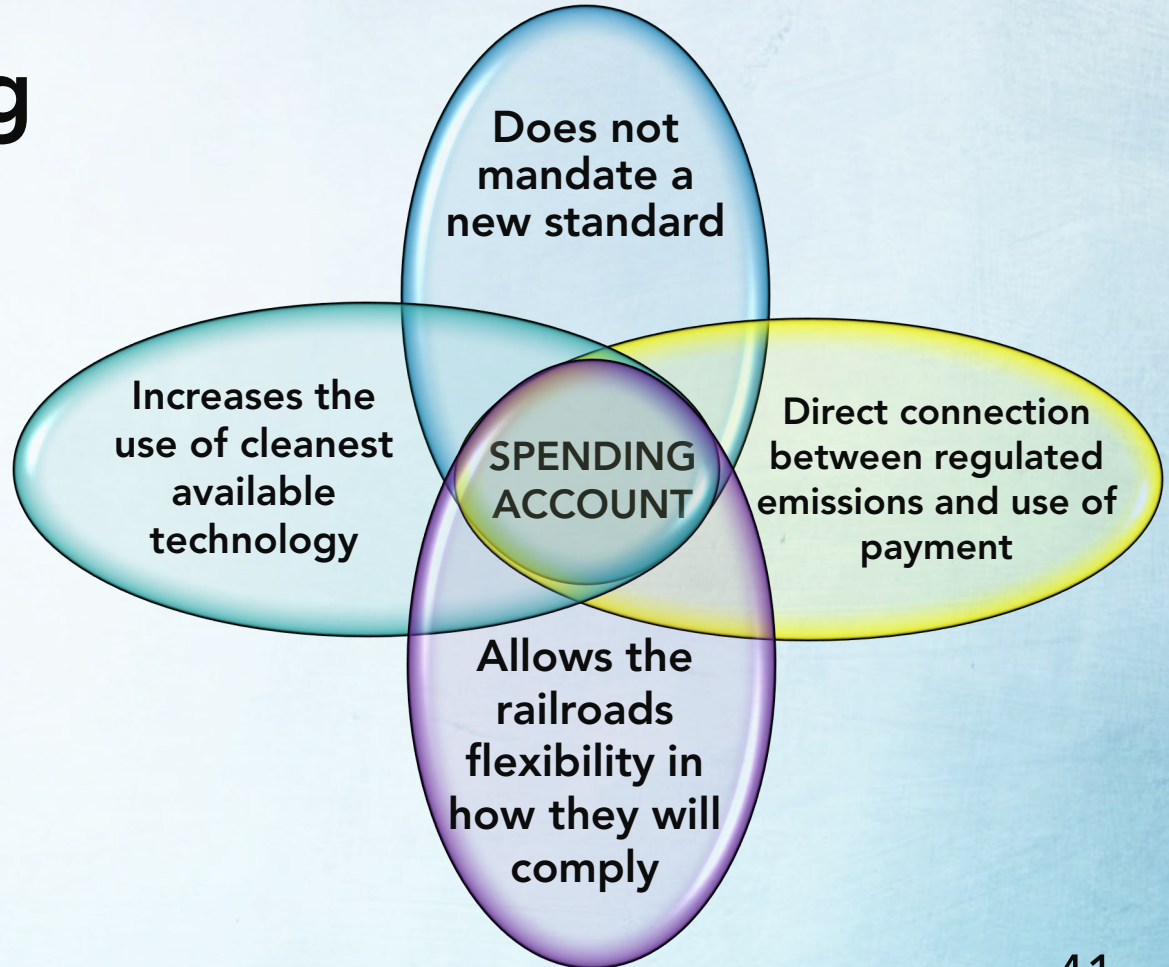
- Freight line-haul Tier 4 locomotive: \$3 million
- Freight line-haul Tier 5 locomotive: \$4 million
- Freight switch Tier 4 locomotive: \$2.25 million
- Passenger Tier 4 locomotive: \$8 million
- Zero emission: costs vary

Background and Constraints of Potential Solutions

- Feasibility: Zero-emission vs. cleanest diesel
- Constraints:
 - Must ensure a connection between the emission source and the use of the funds
 - States can not mandate an engine standard
 - CARB can only incentivize benefits that occur within the state

The Spending Account

Require mitigation to be paid for locomotive emissions, convert mitigation funds to cleaner locomotives.



Locomotive Emissions Reduction Spending Account

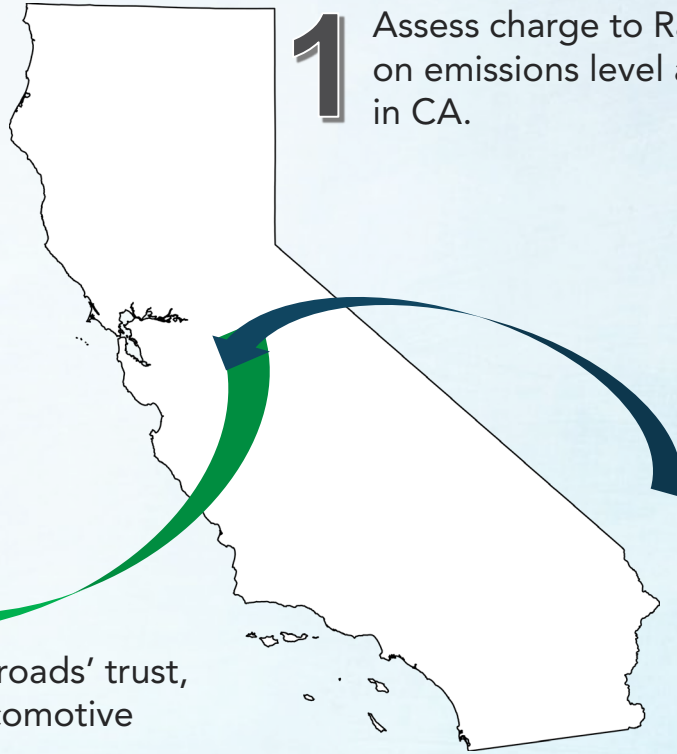
3 Railroad uses accumulated charges for cleaner locomotives, with reporting.

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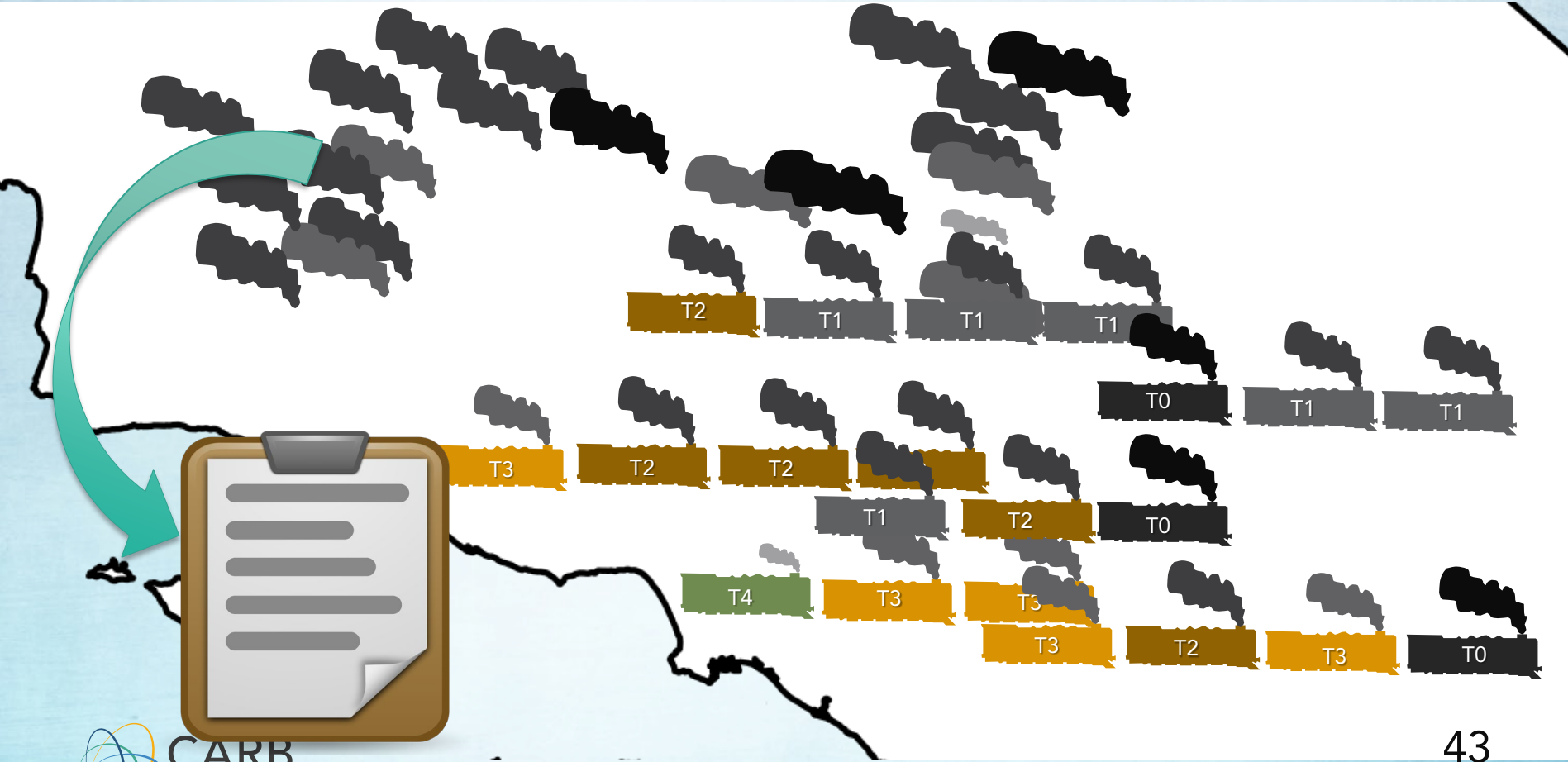


2 Charges held in the individual Railroads' trust, with annual public reporting of locomotive usage and funds deposited.

1 Assess charge to Railroads for locomotives based on emissions level and amount of work performed in CA.



Spending Account Part 1: Data Collection



Spending Account Part 2: Calculation and Deposit

- Operators track their spending requirements
- Funds must go into a trust for only this purpose
- Deposits can be made at any time
 - Must be complete by the reporting deadline
- Interest earned must be spent under the same requirements as principle



Spending Account Part 3: Reporting

Operators must submit reports by three months after the close of the year. Must include:

- PM emissions created
- Funds set aside
- Locomotives/remanufacture kits ordered
- Locomotives received/deployed during the year



Spending Account Part 4: Verification

CARB will verify and post reported data

- Staff will review reports and confirm that funds due were correctly calculated, deposited, and spent.
- On CARB's website, staff will post emissions, total funds set aside, and locomotive purchase and deployment numbers.



Spending Account Part 5: Purchase and Deployment

Annual Activity Report 2023 *submitted March 31, 2024*

Engine Data	###	##	###
Activity Data	###	##	###
Total PM			x tons
Funds that must be set aside for Tier 4 or cleaner locomotives			\$\$\$

Locomotive
Manufacturer



\$\$\$

- Operators order Tier 4 or cleaner locomotives or remanufacture kits.
- Delivery may take a year
Finally, cleaner locomotives are deployed



Spending Account Range Example

- Amounts increase with emissions
- Tier 5 based on emissions level from CARB's 2017 petition to US EPA
- ZE credits available for a limited time

Tier	Deposit per MWhr low end	Deposit per MWhr high end
Pre 0	\$900	\$1,500
Tier 0/Tier1	\$500	\$800
Tier 2/Tier 3	\$350	\$600
Tier 4	\$50	\$100
Tier 5	\$10	\$20
ZE	credit	credit

Locomotive Emissions Reduction Spending Account: Oversight

- Annual report review: to verify eligibility of equipment
- Periodic financial audit of trust accounts
- Site visits: to analyze data collection, analysis, and storage as needed

Concepts to Include Zero-Emissions

- All funds from Tier 4 go to zero emission projects
- Tiered contributions (funding percentages that increase throughout successive time blocks)
- More exploration is underway
- Submit input/comments

Comments/Questions

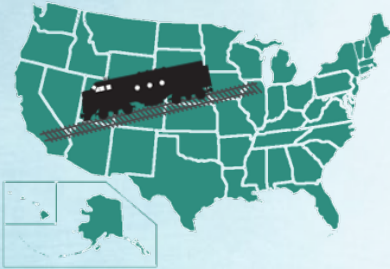
- 15 minutes
- Submit to general chat
 - When possible, please identify slide number you want to discuss

Typical Locomotive Life Cycle

New line haul locomotive built



1990



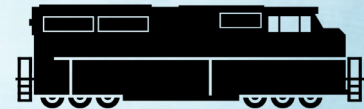
Same locomotive is remanufactured to 1990 standards approximately every 11.5 years. Doesn't travel as far as a line haul.



2010

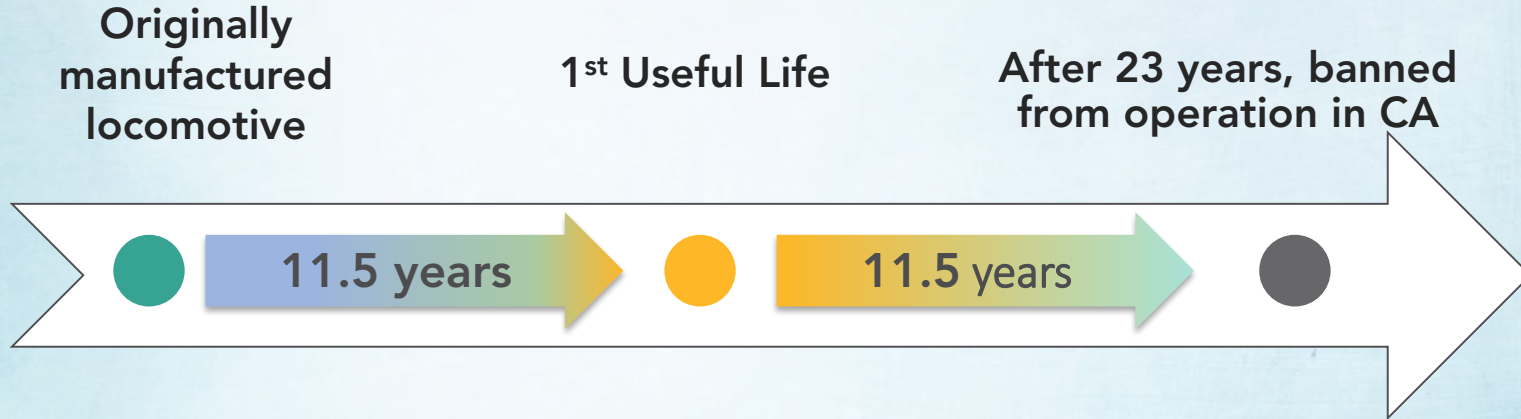


Put into local use that stays in communities.



2020

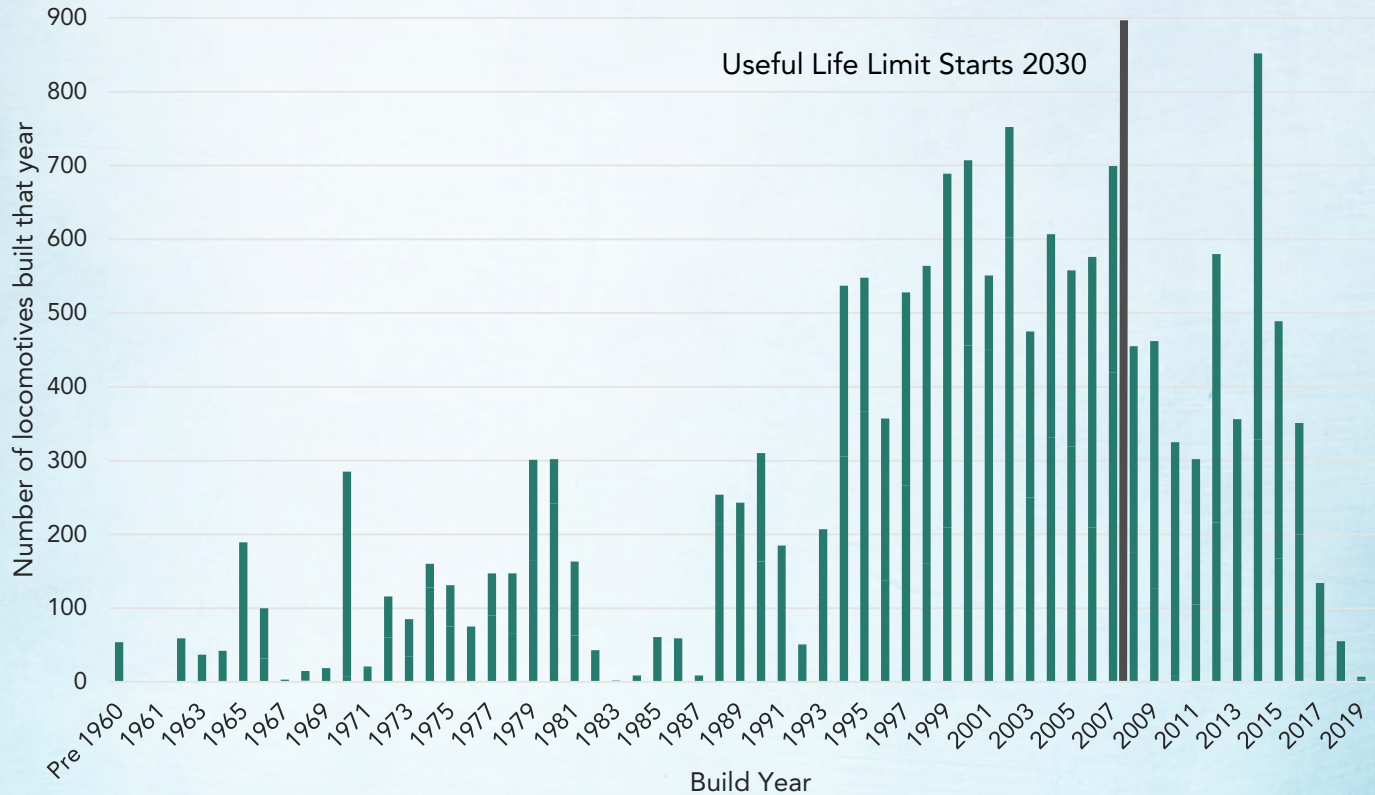
In-Use Locomotive Useful Life Limit



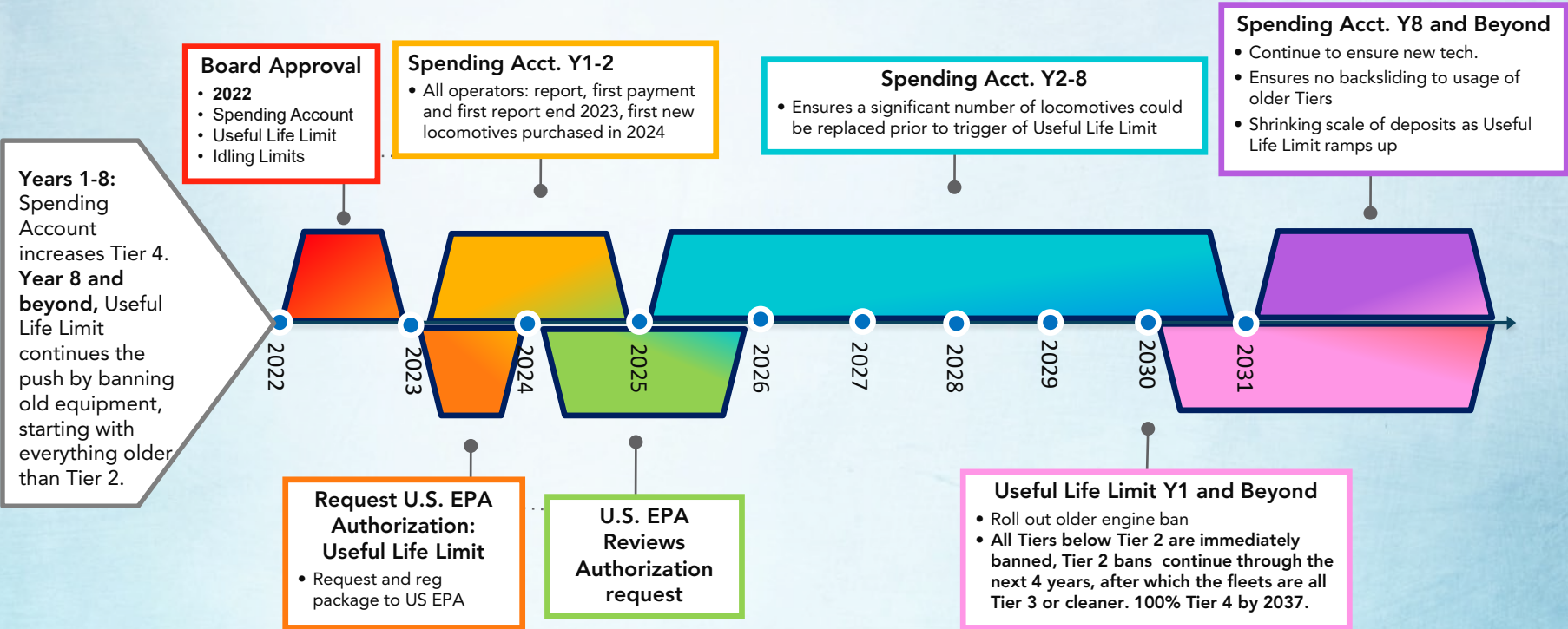
- Locomotives can continue to operate in California if they can demonstrate they have not operated beyond their useful life
- Locomotives can continue to operate in California if they rebuild or remanufacture to a Tier 4 or cleaner

In-Use Locomotive Useful Life Limit

California Class 1 Number of In-Use Locomotives Built Each Year



Regulation Implementation Timeline

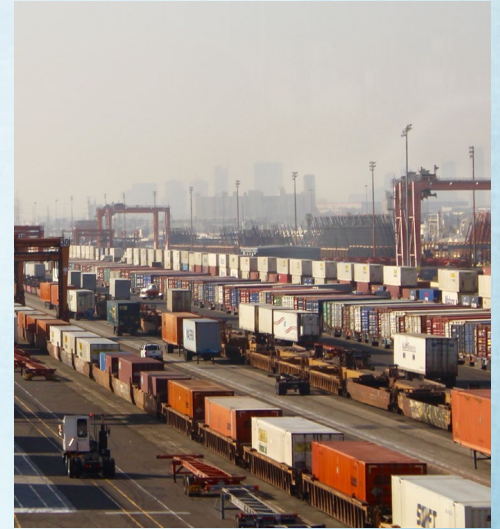


Comments/Questions

- 15 minutes
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 - When possible, please identify slide number you want to discuss

Implement U.S. EPA 30 Minute Idling Limit

- Incorporates requirements similar to Federal idling requirements in California SIP
- Makes the rule CARB enforceable
- Enforcement by Air Districts possible through enforcement MOU



Implement U.S. EPA 30 Minute Idling Limit

- CARB's proposed definition of idling:
 - Idle means the engine is running and not under load for purposes of propelling the locomotive.

Implement U.S. EPA 30 Minute Idling Limit

- Reasons Locomotives are allowed to idle more than 30 minutes:
 - To prevent engine damage such as to prevent the engine coolant from freezing
 - To maintain air pressure for brakes or starter system, or to recharge the locomotive battery
 - To perform necessary maintenance
 - To otherwise comply with federal regulations
- Locomotives will not be able to circumvent regulation by moving short distances to reset the 30 minutes

Applicability and Implementation

Requirement	Rail Class	2023	2024	2025	2026	2027	2028	2029	2030
Reporting	Class 1	X							
	Class 3, M&I		X						
	Passenger		X						
Spending Account	Class 1	X							
	Class 3, M&I		X						
	Passenger		X						
Useful Life Limit	Class 1								X
	Class 3, M&I								X
	Passenger								X
Idling	Class 1	X							
	Class 3, M&I	X							
	Passenger	X							

Reporting Requirements

- For each locomotive:
 - Locomotive ID
 - Engine Tier/Family
 - Original manufacture date and all remanufactures in the locomotive's history
 - Total MWhrs reading of each locomotive as of (for example) June 30 and December 31
 - Sum of MWhrs throughout the year in California, broken down by air district
 - Engine hours throughout the year in California, broken down by air district
 - Does the locomotive have an idle limiting device?
 - Location/Duration in idle over 30 minutes
 - Idle reason, if 30 minutes exceeded

Public Posting of Reported Information

- CARB will publicly post:
 - Aggregated distribution of tiers
 - Total emissions per operator
 - Funds set aside in spending account
 - New locomotives ordered
 - New locomotives deployed

CARB Not Pursuing – Genset Repurposing

- Tier 3 generator sets not fit for Class 1 use
- Class 3 operating much older, lower use locomotives
- Potential Class 3 use?
- Class 1 acquire new Tier 4?

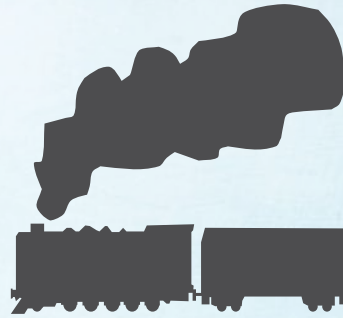


Class 1
Tier 3

becomes a



Class 3
Tier 3



Class 3
Pre Tier 0



Registration Fees

- CARB to collect a locomotive registration fee to offset program costs
- Frequency and amount to be determined

Railyard Enforcement

- Cargo Handling Equipment (CHE)
 - 100% in-use compliance at intermodal railyards statewide
 - Prioritizing AB 617 Communities for enforcement activities
- Transportation Refrigeration Units (TRUs)
 - 100% compliance of TRU gen sets and refrigerated railcars at intermodal railyards statewide
- Locomotive Idling
 - Collaborative approach to resolve idling complaints
- Truck and Bus and Drayage regulations



Comments/Questions

- 15 minutes
- Submit to general chat
 - When possible, please identify slide number you want to discuss

Regulatory Alternatives Solicitation

- Pursuant to SB 617 and the California Environmental Quality Act (CEQA), CARB welcomes public input on alternatives to the regulatory concept for the following:
 - Standardized Regulatory Impact Assessment
 - Environmental Analysis
- CARB encourages public input on alternative approaches that:
 - May yield the same or greater benefits than those associated with the proposed regulation, or
 - May achieve the goals at lower cost
- Please submit alternatives to ceqa.unit@arb.ca.gov by November 25, 2020.

Environmental Analysis

- Environmental Analysis (EA) to:
 - Analyze potentially significant adverse impacts caused by reasonably foreseeable actions
 - Meet requirements of CARB's certified program under CEQA
- The CEQA Environmental Checklist (CEQA Guidelines Appendix G) is used to evaluate potential impacts

Environmental Analysis

- Input invited at this early stage on appropriate scope and content of the EA
- Draft EA will be released for at least 45 day public comment period as an appendix to the Staff Report

Next Steps

- Comment log is open
 - Closes November 13, 2020
- Staff will refine concepts based on comments
- Draft regulatory language
- Board presentation in early 2022
- Stakeholders can also continue to comment through the formal regulatory process

Next Steps

- Draft regulatory package is planning to be released in late 2021
- Can still provide public comment via email anytime
 - freight@arb.ca.gov
- <https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california>

Comments/Questions

- 30 minutes
- Submit to general chat
 - When possible, please identify slide number you want to discuss
- Raise your hand on Zoom
 - Please keep comment to 1 minute to allow everyone to speak