



CALIFORNIA
AIR RESOURCES BOARD

WELCOME

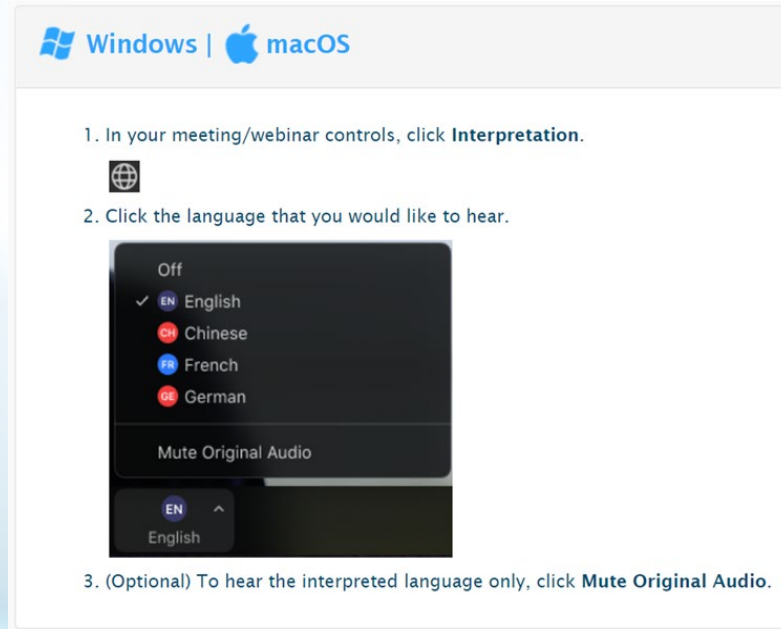
¡Bienvenidos!

The workshop will start at 1:02 P.M.

El taller empezará a la 1:02 P.M.

Listening to Language Interpretation

- In your meeting/webinar controls, click **Interpretation**. (located at bottom of screen)
- Click the language that you would like to hear. Options for this meeting are English and Spanish.
- To only hear the interpreted language, click **Mute Original Audio**.



- En los controles de su reunión/seminario web, haga clic en **Interpretación**. (ubicado en la parte inferior de la pantalla)
- Haga clic en el idioma que le gustaría escuchar. Las opciones para esta reunión son inglés y español.
- Para escuchar solo el idioma interpretado, haga clic en **Silenciar audio original**.



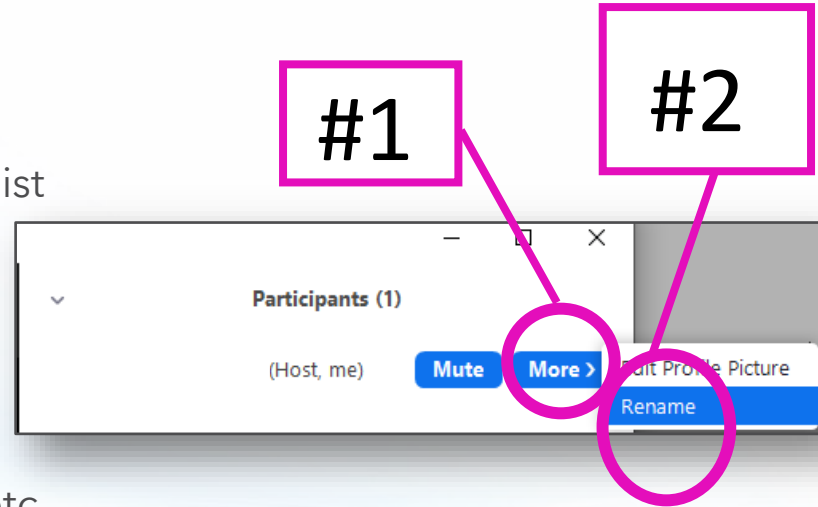
Concept Development Workshop

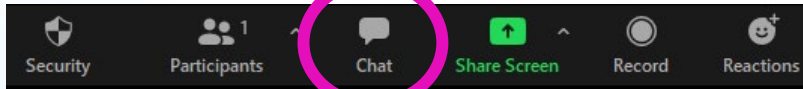
TRU Part 2: Zero-Emission Non-Truck Transport Refrigeration Units

November 15, 2023

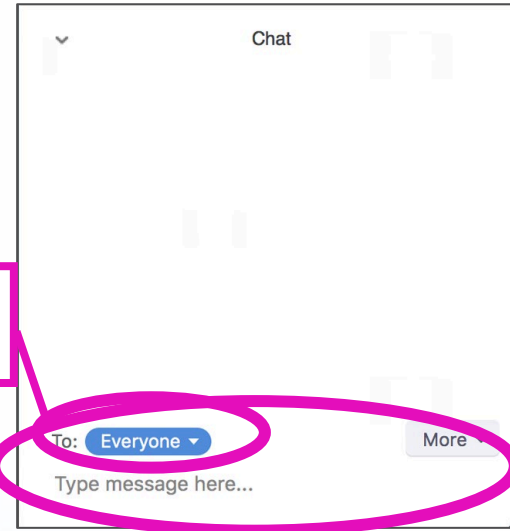
Before We Get Started

- Please **mute** and **rename** yourself to include your First Name, Last Name, and your affiliation:
 - To **rename**:
 - Hover over your name on the participant list
 - Click more and select rename
- Example: **Jane Doe - CARB**
- Affiliations: Community Organization / Agency / Air District / Company / Resident / etc.
- **Need help?** Use the Chat function to request assistance





#1

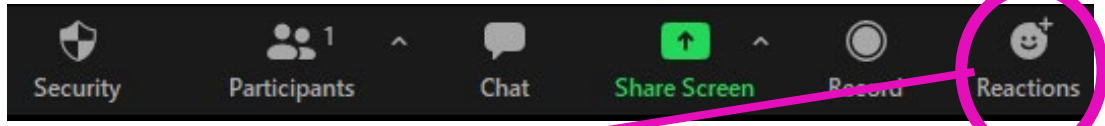


#3

#4

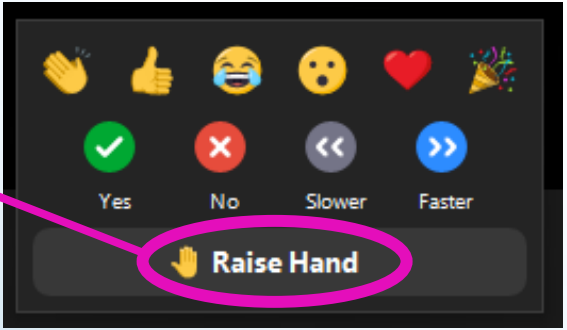
Say Hello to Everyone in Chat

1. On the Zoom Menu Bar, press the **Chat Button**.
2. The **Chat Window** will appear on the screen.
3. Make sure the drop-down says "**Everyone**."
4. Type into the box that says "**Type message here...**" & hit the **Enter key** to send.

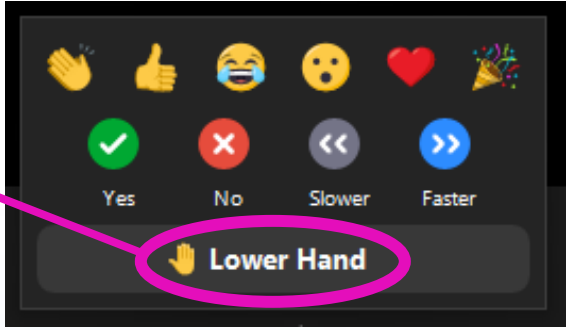


#1

#2



#3



Raise & Lower Your Hand

1. Press the **Reactions** button on the **Zoom Menu Bar**.
2. Press the **Raise Hand Button**. When raised, the button will say "**Lower Hand**."
3. Press the **Lower Hand Button** to lower your hand again.

Workshop Agenda

- 1. Background**
- 2. Pre-Regulation Development Work**
- 3. Known Zero-Emission Technology for Non-Truck TRUs**
- 4. Infrastructure for Zero-Emission Non-Truck TRUs**
- 5. Exploratory Ideas for Concepts**
- 6. Next Steps and Additional Resources**



Background

Goals for CARB Freight Actions



Meet Governor's Executive Order N-79-20



Help attain regional air standards
(support State Implementation Plan)



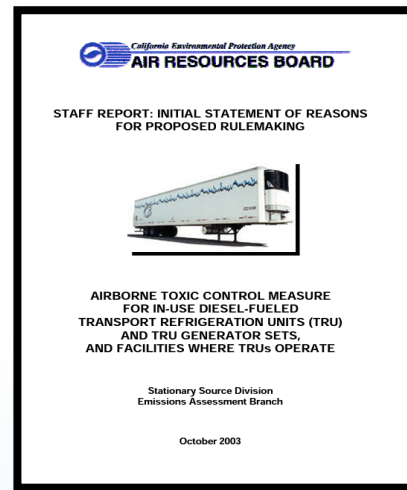
Cut community health risk
(support Assembly Bill 617 emission reductions)



Mitigate climate change (support Scoping Plan and
Short-Lived Climate Pollutant Reduction Strategy)

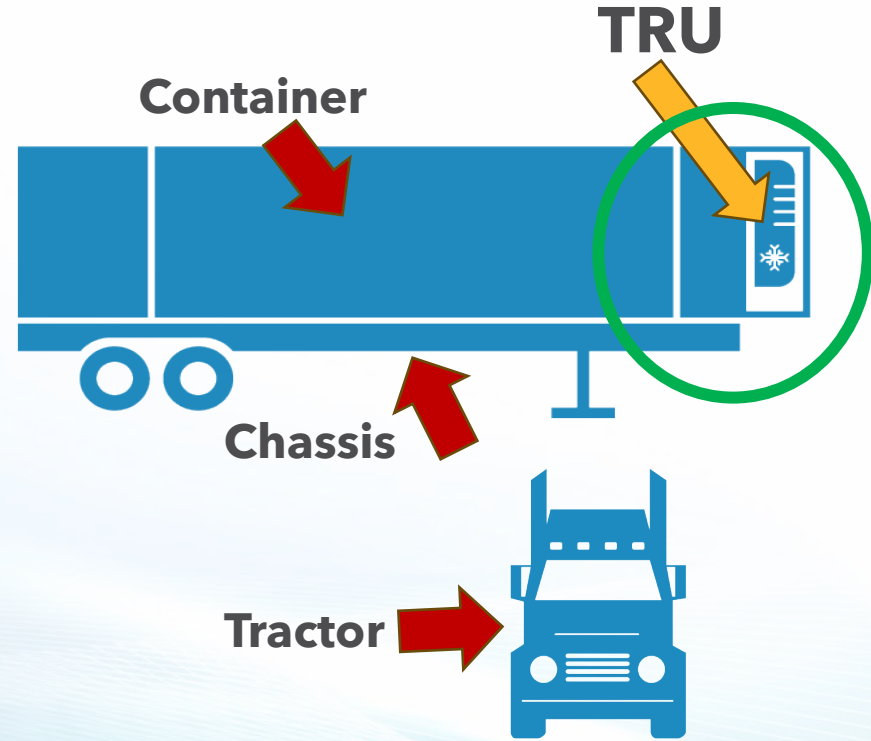
TRU ATCM

- Adopted in 2004, amended 2010, 2011, 2022
- Transition diesel-powered TRUs to zero-emission in two phases:
 - TRU Part 1 (2022 Amendments)
 - Zero-emission truck TRUs
 - Other key requirements
 - For TRU Part 1 questions, email: arber@arb.ca.gov
 - TRU Part 2 (Initial Planning)
 - Zero-emission non-truck TRUs



Non-Truck TRUs

- Control the environment of temperature-sensitive products transported in:
 - Trailers, shipping containers, and railcars
 - Includes TRU generator sets
 - Diesel-powered TRUs emit
 - Fine particulate matter (PM_{2.5})
 - Oxides of nitrogen (NO_x)
 - Greenhouse gases (GHG)



Non-Truck TRUs Cont.



Trailer
TRU



Domestic
Shipping
Container
(DSC) TRU

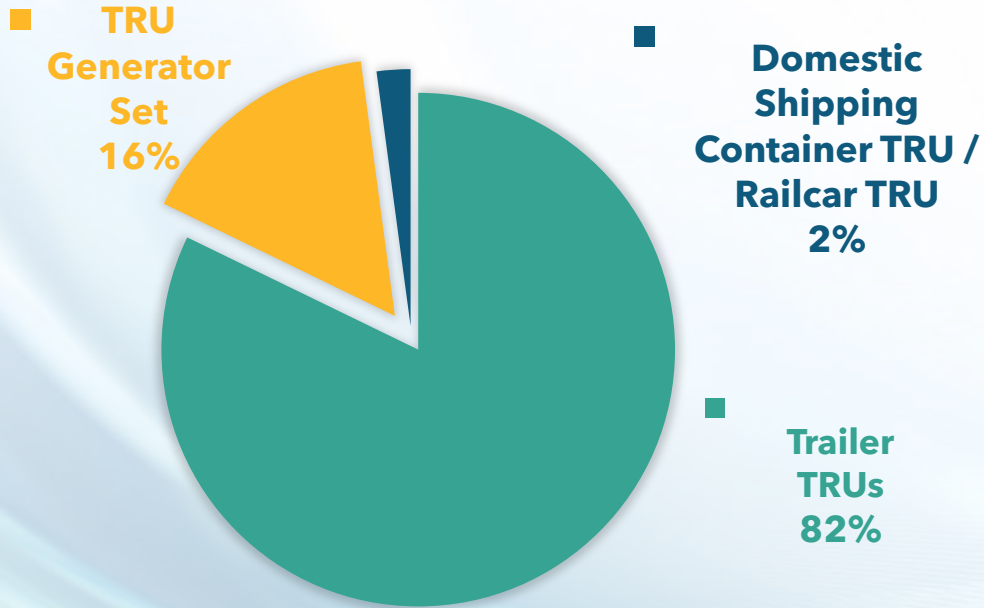
TRU
Generator
Set

Railcar TRU

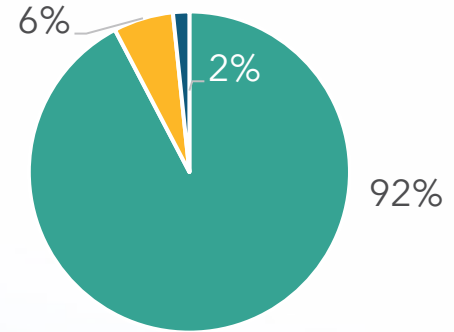


Non-Truck TRU Operations in California

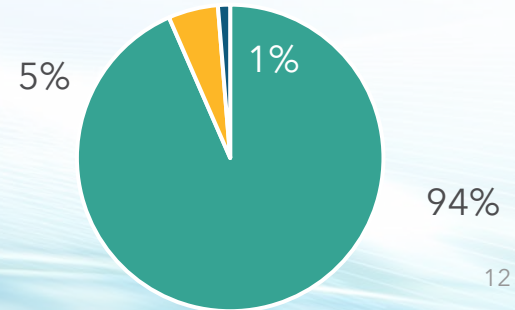
NON-TRUCK TRU POPULATION 2022



2022 PM2.5 Emissions (By TRU Class)

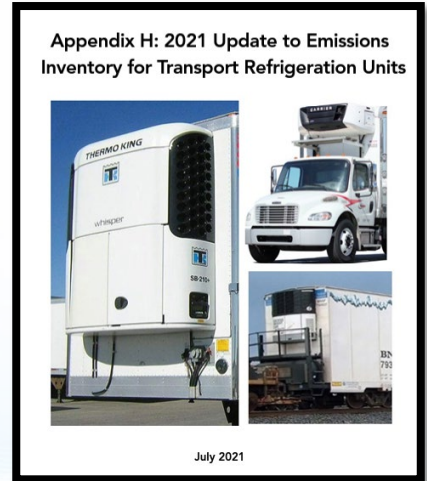


2022 NOx Emissions (By TRU Class)



TRU Emissions Inventory

- By end of 2024 - Update and “freeze” baseline inventory
- Current TRU inventory sources:
 - ARBER, EMFAC2017, Telematics Data, Survey Data
- Potential updates:
 - Operation assumptions at facilities
 - CA and out-of-state activity
 - Population and age
 - Model by company
 - EMFAC2021
- Send ideas for data sources to:
elizabeth.mazmanian@arb.ca.gov





Questions or Comments?

Please use the chat or raise your hand!



Pre-Regulation Development Work

Outreach Activities



Site Visits

- Refrigerated warehouses and distribution centers
- Cold storage warehouses
- Seaports and rail yards



Zero-Emission Technology Demonstrations

- Cryogenic TRU systems
- Battery-electric TRUs
- Zero-emission infrastructure



Stakeholder Calls and Meetings

- Original equipment manufacturers/technology providers
- Fleets

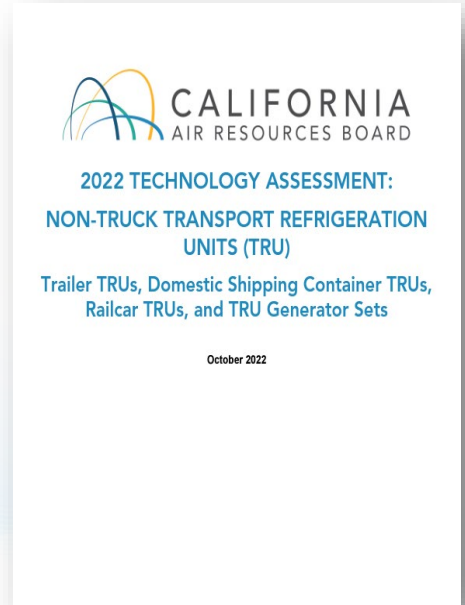


Community Engagement Plan

- Community events
 - September 12 event (2023)
- Environmental Justice tours (2024)
- Other activities (2024-2026)

Foundational Research

- **2022 Technology Assessment for Non-Truck TRUs**
 - Workshop on draft document: May 2022
 - <https://bit.ly/2022TechnologyAssessment>
- **2022 Non-Truck TRU Survey**
 - Included questions on fleet characteristics and operations
 - Shared with over 7000 fleets (99% were trailer TRU fleets)
 - Concluded October 2022



Overview of 2022 Non-Truck TRU Survey Results

- 98% of all respondents were trailer TRU fleets
- 5% of invited trailer TRU fleets responded
- Most respondents:
 - Complete daily routes before returning to their facility
 - Average routes 10+ hours
 - Stop at 1-2 facilities for 3-4 hours
 - Have temperature set points at chill
 - Use 6-12 gallons of fuel daily
 - Retire TRUs 9 years or less
 - Home facility serves 5 or less TRUs



Additional Non-Truck TRU Fleet and Applicable Facility Data Needed



- Requesting data from fleets on:
 - TRU fleet operations in-state and out-of-state
 - Fleet characteristics
 - Market segment, business type, classes operated, age of units, etc.
- Requesting data from applicable facilities (refrigerated warehouses and distribution centers, grocery stores, seaports, & rail yards)
 - TRU operations on-site
 - Zero-emission infrastructure
 - Installation plans or current availability
- Please email freight@arb.ca.gov to set up a meeting

Questions

1. **Is there other outreach you want to see?**
2. **Are the survey results representative of your operations?**
3. **What do your fleet or facility operations look like?**



**Let us know
in the chat!**



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Zero-Emission Technology for Non-Truck TRUs

Zero-Emission Technology: Non-Truck TRUs

TRU Type	Are Products Commercially Available?	Technology	# of Known Products (testing, or available in the U.S.)	Completed Demos or Plans for Demos?
Trailer TRU	Yes	Battery-electric, cryogenic	8	Yes
Domestic Shipping Container TRU	None known	TBD	0	None known
Railcar TRU	None known	TBD	0	None known
TRU Generator Set	Yes	Battery-electric	2	Yes

Table Source: Chapter 2 - <https://bit.ly/2022TechnologyAssessment>

Estimated Costs: Zero-Emission Non-Truck TRUs

Capital Cost Category	Battery-Electric	Hydrogen Fuel Cell	Cryogenic TRU System	Range Extending Technology
Trailer TRU	\$75,000-\$160,000	Info Requested	\$35,000-\$50,000 *depends on system type	E-axle/E-Hub/Solar: Info Requested
Domestic shipping container TRU	Info Requested	Info Requested	Info Requested	Not applicable
Railcar TRU	Info Requested	Info Requested	Info Requested	E-axle/E-Hub/Solar: Info Requested
TRU Generator Sets	\$30,000-\$85,000	Info Requested	Info Requested	Not applicable
Infrastructure	150 kW DC Fast Charger: \$100,000 Shore power: \$13,600***	Info Requested	\$120,000-\$180,000 or \$3000 / month lease**	Not applicable

Table Sources: Chapter 2 - <https://bit.ly/2022TechnologyAssessment>

**TRU Part 1 ISOR - Chapter 9 - <https://bit.ly/TRU2021ISOR>

*** TRU Part 1 Preliminary Cost Doc - <https://bit.ly/TRU1costdoc>

Seeking Additional Zero-Emission Cost Information

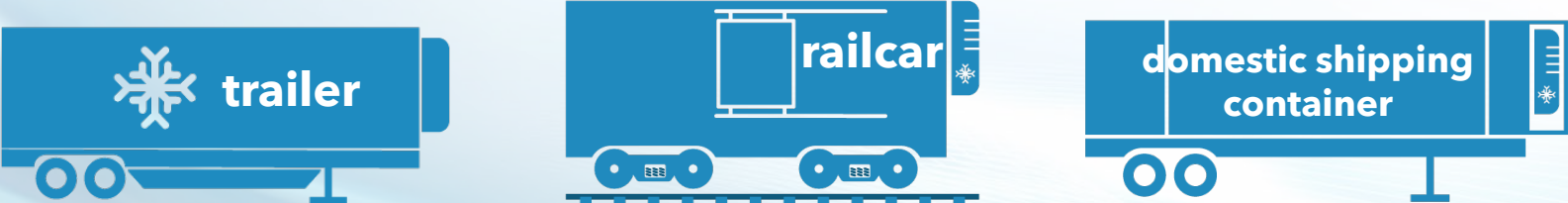
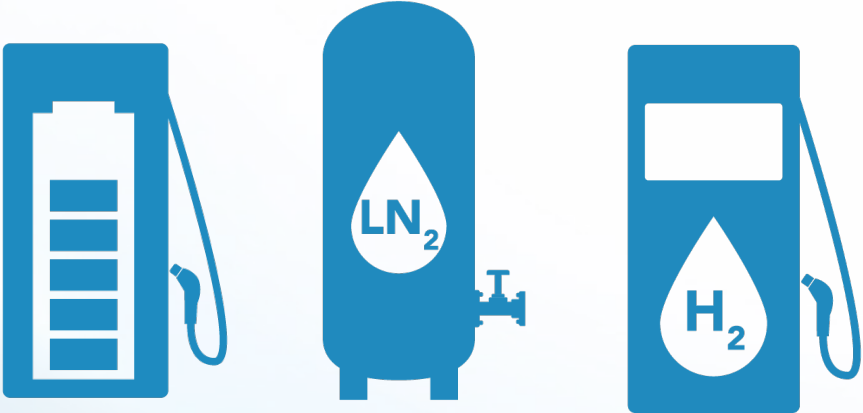
- Zero-emission non-truck TRUs
 - Capital purchase costs
 - Maintenance and operating costs
 - Impacts to costs from heavier batteries
 - Impacts to costs from associated useful life
 - Impacts to insurance costs
- Zero-emission infrastructure
 - Capital purchase costs
 - Installation costs
 - Maintenance and operating costs
 - Useful life





Infrastructure for Zero-Emission Non-Truck TRUs

Zero-Emission Non-Truck TRU Infrastructure





Infrastructure Coordination

Agency principles of coordination and cooperation:



Zero-Emission Infrastructure at Facilities



Complete process can take 3 years or more

Step 1. Planning Process



- Technology
- Supply chain
- Costs

ZE TRU

Fuel

- Determine needs
- Fuel provider coordination

- Site improvements
- Equipment
- Permits

Scope



Step 2. Design Elements

- Identify changes needed to site to support zero-emission technology
- Specify if utility upgrades will happen off-site (upstream of your utility service pole)
- Include site electrical improvement (service pole forward)

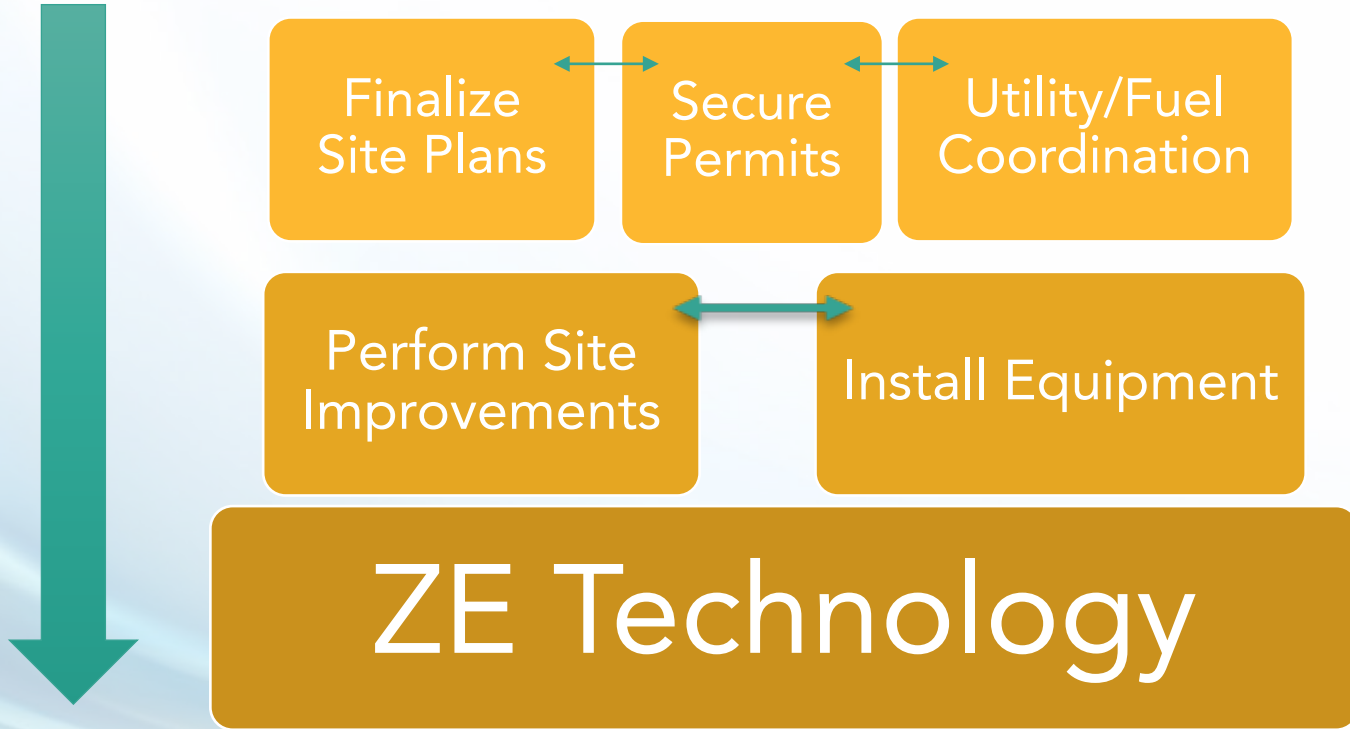


Step 2. Design Elements (cont.)

Consider ways to reduce new construction costs:

- Reduce amount of trenching
- Consideration now for future expansion needs
- Energy site management: site generation, storage
- Smart equipment that manages fuel costs

Step 3. Installation Process





Questions or Comments?

Please use the chat or raise your hand!



Exploratory Ideas for Concepts

TRU Part 2 Timeline and Milestones

Public Engagement

2023-2025

- Public workshops (concept development, inventory, reg. language)
- Baseline emissions inventory
- Standardized regulatory impact assessment (cost doc)
- Health risk analysis
- Environmental analysis (CEQA)
- Rulemaking package

2026

- Board Hearing Goal

2028

- Implementation Goal

Foundational Elements from TRU Part 1

- Applicable facility registration and reporting requirements
- TRU Part 1 applicable facilities include:
 - Refrigerated warehouses or distribution centers ($\geq 20,000$ square feet)
 - Grocery stores ($\geq 15,000$ square feet)
 - Seaport facilities
 - Intermodal railyards

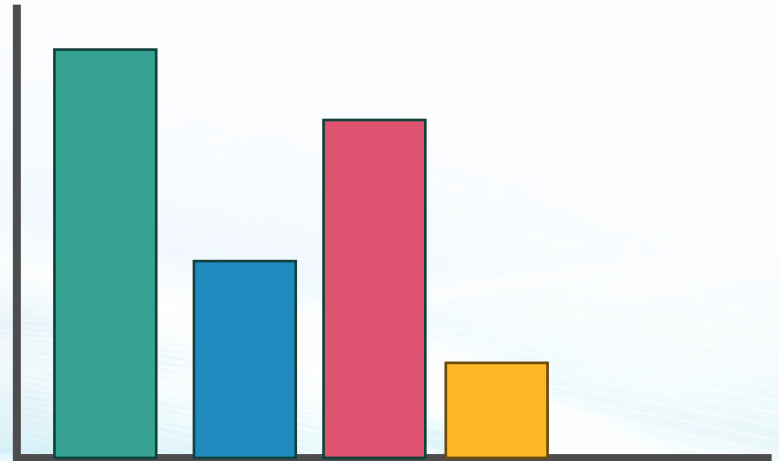


Considerations for Concept Development

- Air quality and community health risk impacts
- Technology readiness
- Fleet operations and duty cycles
- Food and pharmaceutical safety regulations
- Economics
 - Monetized health benefits from reduced PM2.5 exposure
 - Cost analysis methodology
- Impacts from other CARB regulations

What additional challenges or considerations do we need to think about?

Please submit answers or upvote answers that you agree with!



What additional challenges or considerations do we need to think about? / ¿En qué desafíos o consideraciones adicionales debemos pensar?

Nobody has responded yet.

Hang tight! Responses are coming in.

Ideas to Explore for Concept Development

Zero-Emission Manufacturing

Fleet Turnover to Zero-Emission Units

Zero-Emission Certification or Assurances

Lower Global Warming Potential (GWP) Standard

Fleet Operations Reporting

Zero-Emission Manufacturing and Fleet Turnover

- Plan to begin in 2028
 - Manufacturers only produce zero-emission non-truck TRUs
 - Non-truck TRU fleets turnover a percentage of their fleet to zero-emission technology each year
- What should turnover to zero-emission look like?



Zero-Emission Certification or Assurances

- Zero-emission certification/approval criteria
 - Formal CARB process to certify zero-emission TRUs
 - OEMs apply and meet requirements
- Zero-emission assurances
 - Comprehensive warranty
 - At least one authorized service-repair center in California



Lower Global Warming Potential Standard for Refrigerant

- For newly-manufactured TRUs
 - Existing Requirement: Usage of refrigerant with a GWP ≤ 2200 or no refrigerant



Fleet Operations Reporting

- Annual report to CARB on diesel operations. Possible data to be collected:
 - Routes (distance and time)
 - Stops
 - TRU operating times
 - Fueling or charging operations
 - Equipment and home base facility info



Additional Suggestions to Consider?

Zero-Emission Manufacturing

Fleet Turnover to Zero-Emission Units

Zero-Emission Certification or Assurances

Lower Global Warming Potential (GWP) Standard

Fleet Operations Reporting



Next Steps and Additional Resources

Next Steps

- Continue outreach and stakeholder discussions
- Refine ideas for concepts based on input received
- Next workshops:
 - Tentative: mid-2024
 - Refined concepts, impacts, and alternatives
 - Post CEQA notice of preparation
 - Initial cost estimates
 - Baseline emissions inventory
- Goal for Board consideration: 2026



Incentives and Other Resources

TRU Incentives Webpage

<https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/tru-funding-assistance>

TRU Program Webpage

<https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit>

The TruckStop

<https://ww2.arb.ca.gov/our-work/programs/truckstop-resources/truckstop>

REGULATIONS



MORE REGULATIONS

POPULAR RESOURCES

ZEV TruckStop

Off-Road Zone

Citations

Engine Filters

Buyer Beware Notices

Emission Control Labels

TruckStop Web Resources

TRUCRS Reporting

Privacy Policy

FINANCIAL INCENTIVES

FINANCIAL ASSISTANCE

TRAINING & EVENTS

Forms

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Staff Contacts

- Alyssa Rhodes, Lead Regulatory Staff
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- Elizabeth Mazmanian, Lead Inventory Staff
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- Stephanie Huber, Manager, Freight Operations Section
stephanie.huber@arb.ca.gov

Please send written comments and supporting data to:
freight@arb.ca.gov

Thank You for Attending!

Please take our survey and sign up for the [TRU list serve](#).

Post Workshop Survey: TRU Part 2
Concept Development

