CALIFORNIA
AIR RESOURCES BOARD

Truck Regulation Implementation Group (TRIG) Infrastructure Meeting #5
Future Outlook for Hydrogen

November 4, 2024

Agenda

- Introduction: meeting focus and objectives
- Hydrogen and fuel cell truck presentations
  - Truck dealership perspective – Tom's Truck Centers*
  - ARCHES overview – GoBiz*
  - ARCHES hydrogen cost and price assumptions – LBNL*
  - LCFS status update – CARB
  - Federal production tax credit and DOE H2 demand initiative – GoBiz*
  - Hydrogen producer prospective – Air Liquide*
  - Hydrogen distribution via retail truck stops – Pilot Travel Centers*
  - OEM updates on FCET commercialization plans
- Focused Discussion
- Recap and Next Steps

* Slides for these presentations in "TRIG 5 Other's slides"

LCFS Update

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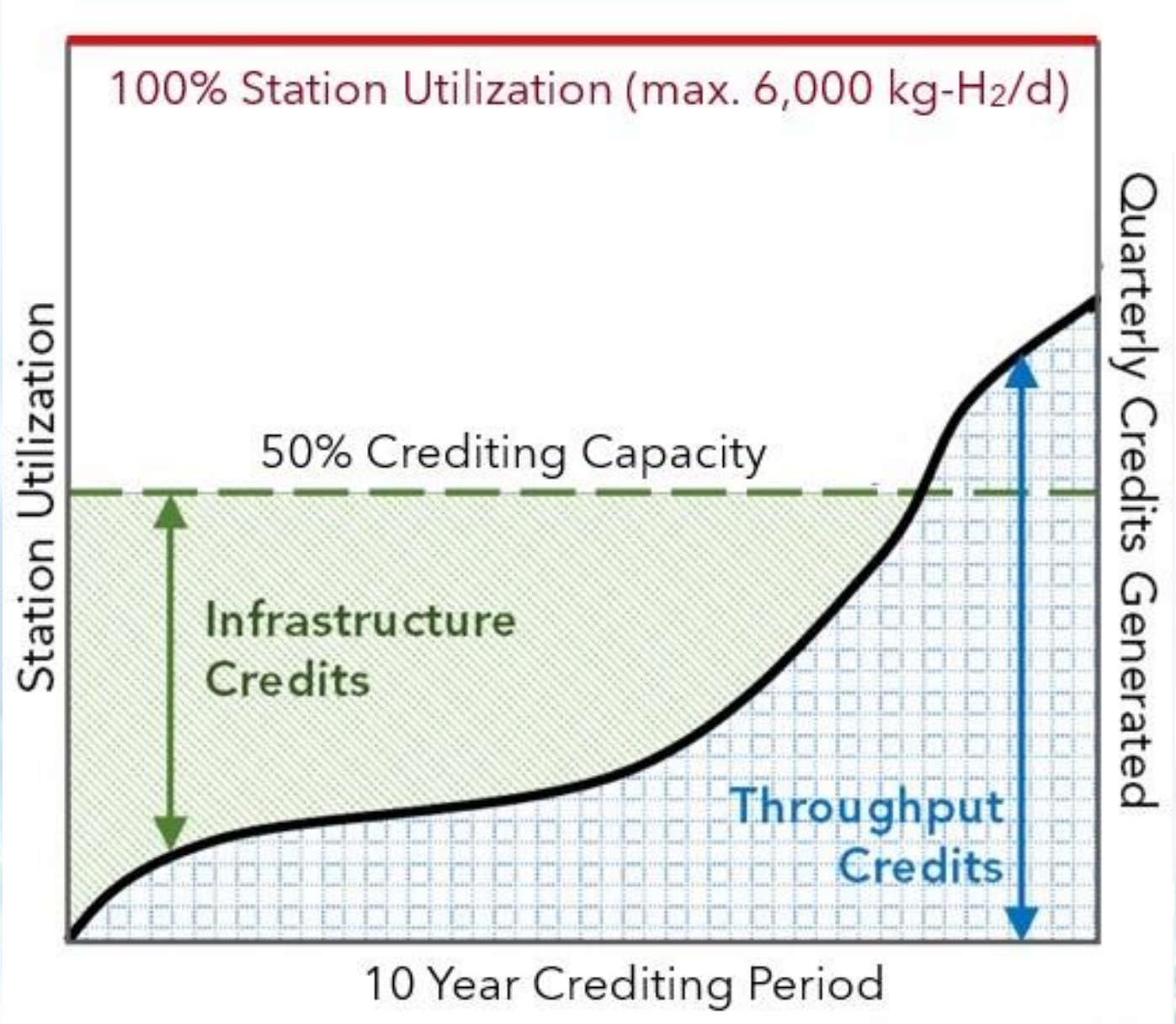
LCFS Credit Incentive for Heavy Duty H2 Stations



CARB is proposing creation of an incentive for heavy-duty hydrogen refueling infrastructure (HD-HRI) that guarantees LCFS credits for that station for dispensed hydrogen and unused refueling capacity.

https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting

HD-HRI Incentive Program

- Credits guaranteed based on the carbon intensity of H_2 dispensed by entity (≥0 gCO_2/MJ)
  - Before 2030: ≥40% renewable content, ≤150 gCO_2/MJ
  - 2030 onward: ≥80% renewable content, ≤90 gCO_2/MJ
- Credited HRI Capacity:
  - "Shared" stations 50% of total station capacity, up to 3,000 kg/d
  - "Private" stations: 25% of station total capacity, up to 1,500 kg/d
- Location: existing fleet overnight parking / <5 miles from an Alt. Fuel Corridor / award
- Accessibility: All fueling ports support Class 8 vehicles
- Reporting process
  - Eligible stations automatically issued HRI credits based on reported dispensed H_2
  - Quarterly reporting must include station uptime
- Light- and medium-duty hydrogen public station co-location
  - 100% capacity up to 1,200 kg-H_2/day
  - Can be used by heavy-duty vehicles

Updates from truck OEMs - Nikola

- Ole Hoefelmann – Verbal update

OEM Updates –Hyundai

"Hyundai has gathered lot of valuable data operating their 30 Class 8 fuel cell trucks for drayage and utilizing the high-capacity hydrogen fueling station in the Port of Oakland as part of the NorCalZero project. Yet Hydrogen price remains a major concern for maintaining and eventually extending the operation. Hyundai will start production of an enhanced model of XCIENT Fuel cell truck in Q1 2025. Contingent of available HVIP funding, we intend to sell this vehicle to eligible customers throughout Q2 – Q4 2025. Hyundai will focus on the drayage and regional haul market for these trucks and is currently testing a vehicle with a customer that runs it 400 miles/day in northern California regional haul with excellent efficiency and up time."

OEM Updates - PACCAR

PACCAR is leveraging next-generation hydrogen fuel cell technology developed in partnership with Toyota Motor North America, Inc. The companies have expanded their partnership to develop and commercialize the technology in Kenworth T680 and Peterbilt Model 579 Class 8 trucks. The powertrain was recently awarded the Zero Emission Powertrain certification by the California Air Resources Board. The Kenworth T680 FCEV on display at CES, and the hydrogen fuel cell powered Peterbilt Model 579, offer uncompromised zero emissions heavy-duty operations with up to a 450-mile range, an 82,000 lbs. max gross combination weight rating, and refueling times that are consistent with traditional diesel trucks. To date, PACCAR has received more than 150 paid deposits for Kenworth and Peterbilt FCEVs with customer deliveries commencing in 2025. Today, they are working to align deposit holders with fuel providers and infrastructure.

Full story in this press release from Consumer Electronics Show, January 8, 2024

OEM Updates – Volvo

"While Volvo does not have commercially available hydrogen vehicles presently, it is actively working on bringing that technology to market. For that reason, we support efforts by CEC and others to develop a refueling infrastructure that will be able to support those vehicles when they arrive in the marketplace."

From comment letter submitted to the CEC 2024-2025 Investment Plan Update for the Clean Transportation Program Docket

Clarifying questions for presenters

Focused Discussion

1. How is the hydrogen outlook today different from past hydrogen initiatives? Do we have more confidence this time?
2. What are metrics of success for trucking fleets?
   - What will it take for hydrogen and fuel cell trucks to be economically viable?
3. What are the challenges in today's market that to be addressed?
   - How can we achieve low-cost clean hydrogen?
   - Loss reduction during transport and storage (i.e., boil-off)
   - Right-sizing stations for near-term vs. longer-term demands

Focused discussion-if time

Given what customers expect from public ZEV infrastructure:

- Fuel price transparency and parity with diesel
- Station reliability – minimal downtime
- Fast refueling
- No restrictions on ability to receive maximum charge/fill
- Online access to station (via truck's navigation system)
- 24/7 support services
- Ability to restart after fill or power interruptions
- OEM interoperability/standardization
- Essential "Truck Stop" accommodates (truck/trailer pull-through, parking, showers, etc.)

- *Could fuel cell trucks be a viable ZEV solution if stations met expectations for availability, reliability and cost?*

Recap and Next Meeting

- Recap today's discussion
- Next steps:
  - 2025 Infrastructure TRIG meetings to resume in February 2025
  - Second Monday (1:00-3:00) in February, May, August and November?
  - What topics should we cover in 2025?
    - On-site generation, microgrids, stationary fuel cells?
- Refreshing the Infrastructure TRIG panel in 2025
- Email Leslie.Goodbody@arb.ca.gov