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Zero-Emission Vehicle Infrastructure Crediting within the Low Carbon Fuel Standard
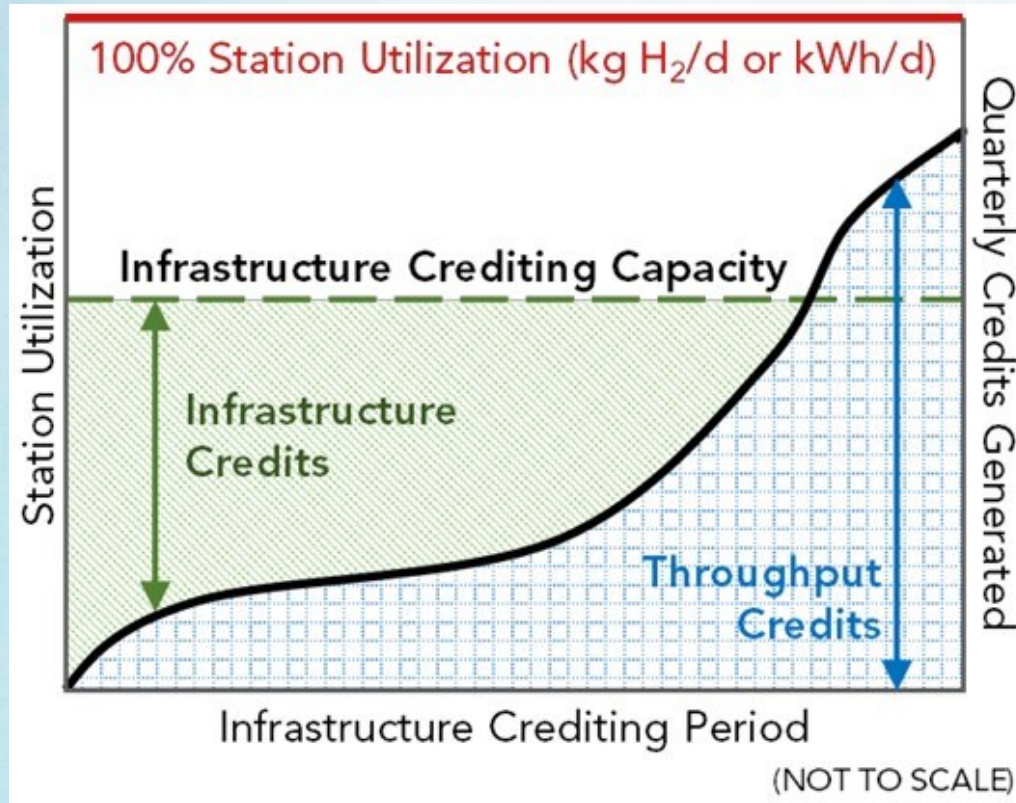
August 2025

Rationale for Infrastructure Crediting

- Zero-emission vehicles (ZEVs) and fueling infrastructure present a chicken-and-egg problem
  - Consumers may have "range anxiety" and want the assurance of refueling availability before buying ZEVs
  - Fleet owners need refueling certainty for freight routes
  - Industry may be reluctant to build ZEV fueling locations until there are enough ZEV consumers to utilize those stations

→ Infrastructure credits from the Low Carbon Fuel Standard (LCFS) provide a revenue stream for fuel supply equipment (FSE) until ZEVs become more commonplace

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History

- The first infrastructure program under LCFS was created during the 2018 rulemaking for light-duty hydrogen fuel cell and battery-electric vehicles
  - Governor Brown's Executive Order B-48-18 established initial 2025 goals:
    - 200 retail hydrogen stations and 10,000 direct current fast chargers
    - Recommended using LCFS to expand ZEV infrastructure
  - 2022 Scoping Plan Update reaffirms commitment to the buildout of ZEV technology and recommends expansion of LCFS capacity crediting provisions to cover medium- and heavy-duty vehicles
- Since this program took effect in 2019, CARB has issued nearly 1 million infrastructure credits, totaling almost $100 million in value (through Q4 2024)
  - As of 2025, over 50 HRI stations and 4,000 fast chargers are eligible to earn LCFS infrastructure credits

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Framework

100% Station Utilization (kg H$_2$/d or kWh/d)

Infrastructure Crediting Capacity

Infrastructure Credits

Throughput Credits

Station Utilization

Quarterly Credits Generated

Infrastructure Crediting Period

(NOT TO SCALE)

- Infrastructure crediting provides LCFS credits based on unused fueling capacity (credited capacity – dispensed fuel)

- Four categories of infrastructure crediting are available beginning July 1, 2025:
  - Heavy-Duty Hydrogen Refueling Infrastructure (HD-HRI)
  - Heavy-Duty DC Fast Charging Infrastructure (HD-FCI)
  - Light- and Medium-Duty Hydrogen Refueling Infrastructure (LMD-HRI)
  - Light- and Medium-Duty DC Fast Charging Infrastructure (LMD-FCI)

- As station utilization increases, the site will generate more LCFS credits for dispensed fuel and fewer infrastructure credits

- Total capacity for each program category is capped at 2.5% of LCFS deficits, calculated quarterly

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Criteria for New HRI Sites

	HRI
All Stations	• Must be connected to the Station Operational Status System (SOSS) • Must accept major credit/debit cards at POS terminal • Must not be directly related to a CA/Federal settlement or California Environmental Quality Act (CEQA) mitigation measure • Must not have been permitted to operate on/before 01/01/2022 • Dispensed hydrogen must have a CI ≤ 150 gCO2e/MJ before 01/01/2030 and ≤ 90 gCO2e/MJ thereafter • Dispensed hydrogen must be ≥ 40% renewable content or produced using CCS until 2030 and ≥ 80% thereafter
Heavy-Duty	• Application must be received on/before 12/31/2035 • Must accommodate Class 8 HDVs • Up to 6,000 kg/day refueling capacity • Shared site: 62.5% crediting factor; must be < 5 miles of any Alt. Fuel Corridor **or** on/next to existing truck overnight parking **or** funded by government competitive grant program • Private site: 31.5% crediting factor
Light- and Medium-Duty	• Application must be received on/before 12/31/2030 • Must not have previously been approved for HRI crediting • Up to 1200 kg/day refueling capacity • Public site: 62.5% crediting factor, 12/7 daytime access • Private site: 31.5% crediting factor

Criteria for New FCI Sites

	FCI
All Stations	• Must accept major credit/debit cards at POS terminal • Must not be directly related to a CA/Federal settlement or CEQA mitigation measure • Must not have been permitted to operate on/before 01/01/2022 • Minimum nameplate power rating ≥ 50 kW/FSE
Heavy-Duty	• Application must be received on/before 12/31/2035 • Must accommodate Class 8 HDVs • < 5 miles of any Alt. Fuel Corridor **or** on/next to existing truck overnight parking **or** funded by government competitive grant program • Up to 40 MW/site • Shared site: 20% crediting factor • Private site: 10% crediting factor
Light- and Medium-Duty	• Application must be received on/before 12/31/2030 • Must not have previously been approved for FCI crediting • ≤ 350 kW/FSE, ≤2,500 kW/site • Public site: 20% crediting factor, 12/7 daytime access • Private site: 10% crediting factor

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Capacity Evaluation

	HRI	FCI
Heavy-Duty	$Cap_{HRI}^i = F^{station} \times RF_{HRI}^i$ Cap_{HRI}^i is the HRI refueling capacity (kg/day) $F^{station}$ is the derating factor applied based on site type RF_{HRI}^i is the nameplate refueling capacity	$Cap_{FCI}^i = F_{HD}^{site} \times P_{FCI}^i \times 24$ Cap_{FCI}^i is the FCI charging capacity (kWh/day) for the HD-FCI FSE i F_{HD}^{site} is the factor applied based on site type P_{FCI}^i is the lesser of the FSE's FCI power rating and 2,000 kW 24 is the number of hours in a day (hr/day)
Light- and Medium-Duty	$Cap_{HRI}^i = F_{LMD}^{station} \times RF_{HRI}^i$ Cap_{HRI}^i is the HRI refueling capacity (kg/day) $F_{LMD}^{station}$ is the derating factor applied based on site type RF_{HRI}^i is the nameplate refueling capacity	$Cap_{FCI}^i = F_{LMD}^{site} \times P_{FCI}^i \times 24$ Cap_{FCI}^i is the FCI charging capacity (kWh/day) for the LMD-FCI FSE i F_{LMD}^{site} is the factor applied based on site type P_{FCI}^i is the lesser of the FSE's FCI power rating and 350 kW 24 is the number of hours in a day (hr/day)

- The fueling capacity of each FSE is calculated to determine the potential of each station:
    - HRI: nameplate refueling capacity is calculated using NREL HyCap model
    - FCI: Daily capacity, Cap_{FCI}^i (kWh/day), for each charger is a function of charger nameplate power rating, P_{FCI}^i (kW)

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Application Process

1. Register for an account on the [LCFS Reporting Tool](#) (LRT-CBTS)
2. Download an application template from the [LCFS ZEV Infrastructure Crediting page](#)
   - Templates include instructions for completing the application process
   - Must include owner info, FSE location, capacity, types, expected operation date, evidence that requirements are met, etc.
3. Rejected applications may reapply the following quarter
4. Site must become operational within 24 months of application approval, or risk cancelation
5. FSE must be registered in LRT before credits can be generated

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Quarterly Reporting Requirements

- FSE owners (or their designees) report fuel transactions and uptime on a quarterly basis in the LRT
  - An FSE must dispense fuel to earn HRI/FCI credits in any particular quarter

- Uptime: percentage of eligible hours each FSE was available for fueling/charging during the quarter
  - HRI: station is considered "up" when capable of refueling a vehicle to at least 95% state of charge

- Include cost and revenue data as an attachment in quarterly report using instructions and template provided in Guidance 19-02
  - Reported data to LRT is treated as confidential business information

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HD-HRI Credit Calculation

$$Credits_{HD-HRI} = \left(CI_{standard}^{diesel} \times EER^{diesel} - CI_{HRI}\right) \times E_{H2} \times \left(Cap_{HD-HRI} \times N \times UT - H2_{disp}\right) \times C$$

- $CI_{standard}^{diesel}$ is the average carbon intensity of gasoline; calculated annually ($^{gCO_2e}/_{MJ}$)

- EER^{diesel} is 1.9, the Energy Economy Ratio for non-forklift HD-FCVs, relative to diesel

- CI_{HRI} is the greater of company-wide weighted average CI for H_2, or 0 $^{gCO_2e}/_{MJ}$

- E_{H2} is the energy density for H_2, 120.00 $^{MJ}/_{kg}$

- Cap_{HD-HRI} is the HRI refueling capacity for the station ($^{kg}/_{day}$)

- N is the number of days in the quarter

- UT is the uptime multiplier for the fraction of time the FSE was available that quarter

- $H2_{disp}$ is the quantity of hydrogen dispensed during the quarter (kg). Must be non-zero*

- C is a conversion factor for mass, 10^{-6} $^{MT}/_{g}$

* To generate HRI credits, a station must dispense hydrogen for FCEV fueling. If $H2_{disp}$ is zero in a given quarter then HRI credits will not be calculated and issued for that quarter.

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HD-FCI Credit Calculation

$$Credits_{HD-FCI} = \left(CI_{standard}^{diesel} \times EER - CI_{FCI}\right) \times C_{Elec} \times \left(Cap_{HD-FCI}^{i} \times N \times UT - Elec_{disp}\right) \times C$$

- $CI_{standard}^{diesel}$ is the average carbon intensity of gasoline; calculated annually $\left(\frac{gCO_2e}{MJ}\right)$

- EER is 5.0, the Energy Economy Ratio for HD-BEVs, relative to diesel

- CI_{FCI} is the California average grid electricity carbon intensity; calculated annually $\left(\frac{gCO_2e}{MJ}\right)$

- C_{Elec} is the conversion factor for energy, $3.60\ \frac{MJ}{kWh}$

- Cap_{HD-FCI}^{i} is the FCI daily charging capacity for the FSE $\left(\frac{kWh}{day}\right)$

- N is the number of days in the quarter

- UT is the uptime multiplier for the fraction of time the FSE was available that quarter

- $Elec_{disp}$ is the quantity of electricity dispensed during the quarter (kWh). Must be non-zero*

- C is a conversion factor for mass, $10^{-6}\ \frac{MT}{g}$

*To generate FCI credits, a charger must dispense electricity for EV charging. If $Elec_{disp}$ is zero in a given quarter then FCI credits will not be calculated and issued for that quarter.

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LMD-HRI Credit Calculation

$$Credits_{LMD-HRI} = \left(CI_{standard}^{gasoline} \times EER^{gasoline} - CI_{HRI}\right) \times E_{H2} \times \left(Cap_{HRI} \times N \times UT - H2_{disp}\right) \times C$$

- $CI_{standard}^{gasoline}$ is the average carbon intensity of gasoline; calculated annually ($^{gCO_2e}/_{MJ}$)

- $EER^{gasoline}$ is 2.5, the Energy Economy Ratio for H_2 fuel cell vehicles, relative to gasoline

- CI_{HRI} is the greater of company-wide weighted average CI for H_2, or 0 $^{gCO_2e}/_{MJ}$

- E_{H2} is the energy density for H_2, 120.00 $^{MJ}/_{kg}$

- Cap_{HRI} is the HRI refueling capacity for the station ($^{kg}/_{day}$)

- N is the number of days in the quarter

- UT is the uptime multiplier for the fraction of time the FSE was available that quarter

- $H2_{disp}$ is the quantity of hydrogen dispensed during the quarter (kg). Must be non-zero*

- C is a conversion factor for mass, 10^{-6} $^{MT}/_{g}$

*To generate HRI credits, a station must dispense hydrogen for FCEV fueling. If $H2_{disp}$ is zero in a given quarter then HRI credits will not be calculated and issued for that quarter.

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LMD-FCI Credit Calculation

$$Credits_{LMD-FCI} = \left(CI_{standard}^{gasoline} \times EER - CI_{FCI}\right) \times C_{Elec} \times \left(Cap_{LMD-FCI}^{i} \times N \times UT - Elec_{disp}\right) \times C$$

- $CI_{standard}^{gasoline}$ is the average carbon intensity of gasoline; calculated annually $\left(gCO_2e/MJ\right)$

- EER is 3.4, the Energy Economy Ratio for electric vehicles, relative to gasoline

- CI_{FCI} is the California average grid electricity carbon intensity; calculated annually $\left(gCO_2e/MJ\right)$

- C_{Elec} is the conversion factor for energy, $3.60 \ ^{MJ}/_{kWh}$

- Cap_{FCI}^{i} is the FCI daily charging capacity for the FSE $\left(^{kWh}/_{day}\right)$

- N is the number of days in the quarter

- UT is the uptime multiplier for the fraction of time the FSE was available that quarter

- $Elec_{disp}$ is the quantity of electricity dispensed during the quarter (kWh). Must be non-zero.[7]

- C is a conversion factor for mass, $10^{-6} \ ^{MT}/_{g}$

[*] To generate FCI credits, a charger must dispense electricity for EV charging. If $Elec_{disp}$ is zero in a given quarter then FCI credits will not be calculated and issued for that quarter.

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Credit Availability

- Approval of sites can continue when potential HD-HRI, HD-FCI, LMD-HRI, and LMD-FCI credits are less (respectively) than 2.5% of total LCFS deficits in the previous quarter
  - Potential infrastructure credits: the number of infrastructure credits that would be generated if all approved FSEs were issued averaged FCI or HRI credits for their capacity
  - Single applicants limited to 1% of total LCFS deficits each for HD- and LMD-HRI and 0.5% of total LCFS deficits each for HD- and LMD- FCI
- Credits generated from dispensed fuel are unaffected by infrastructure credit availability
- Crediting period: 10 years starting in quarter of application approval
  - Accumulated FCI credit value limited to 1.5x owner's capital cost for each FSE

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Questions?

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