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Impetus for Infrastructure Credits

• ZEVs and Fueling Infrastructure, a chicken-and-egg problem
  • Consumers may have “range anxiety,” want assurance of refueling availability before buying Zero Emission Vehicles (ZEVs)
  • Industry may be reluctant to build ZEV fueling locations until enough consumers have ZEVs to utilize those stations

• Executive Order B-48-18 established a 2025 goal of:
  • 200 retail hydrogen stations & 10,000 direct current fast chargers
  • Recommended using LCFS to expand ZEV infrastructure
  • Board Resolution 18-17 directed staff to develop capacity-based crediting provision for ZEV refueling infrastructure

LCFS Infrastructure Credits provide a revenue stream for fueling stations until ZEVs become more commonplace.
Infrastructure Crediting Concept

Incentivize initial build-out of ZEV refueling infrastructure by providing credits when fuel demand is low in early years. A network of fueling stations should increase ZEV adoption.

• Provide low carbon fuel credits based on unused fueling capacity (total capacity – dispensed fuel)
  • HRI: Hydrogen Refueling Infrastructure
  • FCI: DC Fast Charging Infrastructure
• As more ZEVs use the station and the station utilization increases, the site will generate more LCFS fuel credits and fewer infrastructure credits.
• HRI & FCI total credit capacity each ≤2.5% of LCFS deficits, calculated quarterly.
Infrastructure Crediting: Eligibility

- Site must be publicly accessible
  - Accessibility less than 24 hours/day reduces site’s infrastructure credits
  - HRI: must be connected to the Station Operational Status System (SOSS)\(^1\)
- Must accept major credit/debit cards at POS terminal
- Must not be directly related to a CA/Fed settlement or CEQA mitigation measure
- Refueling infrastructure intended for light-duty vehicle refueling stations only
- Fueling Capacity Limits for each Site
  - HRI: 1,200 kg/day Max
  - FCI: 2,500 kW Max (up to 6,000 kW with approval), each charger 50 kW minimum
    - Must have started operating after 1/1/2019
    - Limited FCI credits if only one charger type (CSS, CHAdeMO, Tesla) available at site

\(^1\) SOSS Station Status Dashboard: [https://m.cafcp.org](https://m.cafcp.org)
Infrastructure Crediting: Application

• Register for an account on the LCFS Reporting Tool (LRT-CBTS)²
• Download a HRI or FCI Application template³
  • User guides will walk you through the application process using screenshots.
  • Owner info, FSE location, capacity, types, expected operations date, site agreement, etc.
• Corrections to application must be complete 180 days from 1st submission.
• Site must become operational within: 12 months after application approval for FCI
  24 months after application approval for HRI
• Fuel Supply Equipment (FSE) registered in LRT-CBTS before credits can be generated.
  • HRI FSE: The entire hydrogen station
  • FCI FSE: Each individual charger at the site
• Applications must be submitted on or before 12/31/2025.

² LCFS Reporting Tool Credit Bank & Transfer System: https://ssl.arb.ca.gov/lcfsrt/Login.aspx
³ ZEV Applications and Instructions: https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting
Infrastructure Crediting: Capacity Evaluation

• The fueling capacity of the fueling supply equipment (FSE) is calculated to determine the potential of each station.
  • HRI: Uses NREL HySCapE⁴ model to determine capacity based on station characteristics, with a few standard inputs:
    • Chevron-Friday demand profile and fill conditions.
    • Mass flow fueling rate: 1 kg/min
    • Time between fills: 255 seconds
    • Hourly distribution: Even
    • Vehicle storage volume: 126 liters
    • Storage level to trigger delivery: 30 percent
  • FCI: Daily capacity, $\text{Cap}_{FCI}^i$ (kWh/day) for each charger is a function of charger nameplate power rating, $P_{FCI}^i$ (kW):
    $\text{Cap}_{FCI}^i = 43 \times (P_{FCI}^i)^{0.45}$

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Infrastructure Crediting: HRI Locations

HRI station site location must be justified:

- The role(s) the station will play in the H₂ fueling network
- The means by which the station contributes to robust growth of the H₂ fueling network
- Demonstration of potential for consistent, calculable hydrogen demand
- Demonstration that proposed station capacity is appropriate
- Calculation of the projected trajectory of annualized average station utilization
- Demonstration that the proposed station location has been discussed with local authorities
Infrastructure Crediting: Quarterly Reporting

- FSE owners report fuel transactions on a quarterly basis to the LCFS Reporting Tool
  - HRI: Weighted average hydrogen carbon intensity must be less than 150 g/MJ and at least 40% renewable across all stations in the company’s network registered in the LCFS.
- Site availability: percentage of eligible hours each FSE was available for fueling/charging during the quarter
  - HRI: station is considered “available” when capable of refueling a vehicle to at least 95% state of charge
- Include cost and revenue data as attachment in quarterly report using instructions and template provided in Guidance 19-02
  - Reported data is treated as business confidential information.

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Infrastructure Crediting: HRI Credit Calculation

\[
\text{Credits}_{\text{HRI}} = (\text{CI}_{\text{standard}}^{XD} \times \text{EER} - \text{CI}_{\text{HRI}}) \times \text{E}_{\text{H2}} \times (\text{Cap}_{\text{HRI}} \times N \times \text{UT} - H2_{\text{disp}}) \times C
\]

- \( \text{CI}_{\text{standard}}^{XD} \) is the average carbon intensity of gasoline; calculated annually (\( \text{gCO}_2\text{e}/\text{MJ} \))
- \( \text{EER} \) is 2.5, the Energy Economy Ratio for H\(_2\) fuel cell vehicles, relative to gasoline
- \( \text{CI}_{\text{HRI}} \) is the greater of company-wide weighted average CI for H\(_2\), or 0 (\( \text{gCO}_2\text{e}/\text{MJ} \))
- \( \text{E}_{\text{H2}} \) is the energy density for H\(_2\), 120.00 MJ/kg
- \( \text{Cap}_{\text{HRI}} \) is the HRI refueling capacity for the station (\( \text{kg/day} \))
- \( N \) is the number of days in the quarter
- \( \text{UT} \) is the uptime multiplier for the fraction of time the FSE was available that quarter
- \( H2_{\text{disp}} \) is the quantity of hydrogen dispensed during the quarter (kg). Must be non-zero.\(^6\)
- \( C \) is a conversion factor for mass, \( 10^{-6} \text{ MT/g} \)

\(^6\) To generate HRI credits, a station must dispense hydrogen for FCEV fueling. If \( H2_{\text{disp}} \) is zero in a given quarter then HRI credits will not be calculated and issued for that quarter.
Infrastructure Crediting: FCI Credit Calculation

\[
\text{Credits}_{\text{FCI}} = \left( CI_{\text{standard}}^{XD} \times EER - CI_{\text{FCI}} \right) \times C_{\text{Elec}} \times \left( Cap_{\text{FCI}}^{i} \times N \times UT - Elec_{\text{disp}} \right) \times C
\]

- \( CI_{\text{standard}}^{XD} \) is the average carbon intensity of gasoline; calculated annually (\( g\text{CO}_2\text{e}/\text{MJ} \))
- \( EER \) is 3.4, the Energy Economy Ratio for electric vehicles, relative to gasoline
- \( CI_{\text{FCI}} \) is the California average grid electricity carbon intensity; calculated annually (\( g\text{CO}_2\text{e}/\text{MJ} \))
- \( C_{\text{Elec}} \) is the conversion factor for energy, 3.60 \( \text{MJ}/\text{kWh} \)
- \( Cap_{\text{FCI}}^{i} \) is the FCI daily charging capacity for the FSE (\( \text{kWh}/\text{day} \))
- \( N \) is the number of days in the quarter
- \( UT \) is the uptime multiplier for the fraction of time the FSE was available that quarter
- \( Elec_{\text{disp}} \) is the quantity of electricity dispensed during the quarter (\( \text{kWh} \)). Must be non-zero.\(^7\)
- \( C \) is a conversion factor for mass, \( 10^{-6} \text{MT}/\text{g} \)

\(^7\)To generate FCI credits, a charger must dispense electricity for EV charging. If \( Elec_{\text{disp}} \) is zero in a given quarter then FCI credits will not be calculated and issued for that quarter.
Infrastructure Crediting: Credit Availability

- Approval of sites can continue when potential HRI and FCI infrastructure credits each are less than 2.5% of total LCFS deficits in the previous quarter.\(^8\)
  - Potential infrastructure credits: the number of infrastructure credits that would be generated if all approved HRI or FCI FSEs dispense zero fuel in a quarter.
  - Total LCFS deficits: the number of credit deficits generated by fuel producers & importers.
- Credits generated from dispensed fuel unaffected by infrastructure credit availability
- Crediting period for infrastructure credits:
  - HRI: 15 years from quarter following the application approval
  - FCI: 5 years from quarter following the application approval
    Accumulated FCI credit value limited to owner’s capital cost for each FSE

\(^8\) See current status of 2.5% limit here: https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting
Infrastructure Crediting: Questions?

- Low Carbon Fuel Standard Contacts at