Regional Charger Incentive Program: CALeVIP San Diego County Incentive Project

September 24, 2020
Jeff Hoyos, SANDAG

Regional Electric Vehicle Charging Program: CALeVIP

- **2015 Regional Plan**: EVCP included as SCS measure and EIR mitigation measure
- **May 2018**: SANDAG kicks off Caltrans SB1 planning grant to develop EVCP
- **May 2019**: SANDAG adopts resolution to pursue CALeVIP partnership
- **August 2019**: CEC hosts CALeVIP Program Design Workshop for San Diego region
- **March 2020**: SANDAG formalizes partnerships with APCD and CSE
- **August 27, 2020**: CEC hosts San Diego County Incentive Project Final Requirements Webinar
CALeVIP San Diego County Incentive Project Overview

- **First-come, first-served** application process
- **Must be shared-use**
- **Base L2 rebate**: $4,500 per port
  - MUD $1,000 adder
  - DAC/LIC $500 adder
- **Base DCFC rebate**: $50k-$70k or 75% of project cost per charger, whichever is less*
  - $60k-$80k for DAC, LIC
- **3 Year Charging Infrastructure Estimates for the San Diego region**
  - L2: 1,100 charging ports
  - DCFC: 250 chargers

<table>
<thead>
<tr>
<th>Charger</th>
<th>Site Limit</th>
<th>Power</th>
<th>Range Enabled</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2 (L2)</td>
<td>1-10</td>
<td>7.2 kW</td>
<td>20 miles/hr</td>
<td>Public, Workplace, MUD, No Fleets***</td>
</tr>
<tr>
<td>Direct Current Fast Charger (DCFC)</td>
<td>1-6</td>
<td>50-350 kW</td>
<td>90+ miles/30 minutes</td>
<td>Public, must be accessible 24/7</td>
</tr>
</tbody>
</table>

* Rebate levels based on CALeVIP San Diego County Incentive Project presentation.
** Estimated based on various assumptions regarding applicant type and project costs.
*** CALeVIP does not specify the number of chargers that must be deployed in CALeVIP projects.
****L2 Chargers may not be dedicated to fleet use.

Site Eligibility

**DCFC**
- Urban/suburban retail cores
- Retail shopping centers
- Grocery stores
- Restaurants
- Retail gas stations
- Hospitals
- Sheriff/police stations
- Colleges/universities
- Airports
- Hotels
- Casinos
- Libraries
- Public transit hubs
- Curbside*
- Publicly available parking garages and surface lot (not workplace parking)

**Level 2**
- Installation site must be inside the project’s defined region.
- Must be shared use
- Many site types are eligible:
  - Multi-unit dwellings
  - Schools
  - Hospitals
  - Public agency sites
  - Workplaces
  - Tribal lands
  - Curbside
  - *Fleets are NOT an eligible site type
Additional SANDAG Resources

- EV Expert
- Workforce development
- Permit streamlining assistance

Next Steps

October 6th: CEC to host San Diego County Incentive Project Pre-launch Webinar

October 27, 2020: CALeVIP to launch in San Diego County
Questions?

CALeVIP Email: sdc-calevip@energycenter.org
Phone: (858) 769-0500
CALeVIP.org

Jeff Hoyos
jeff.hoyos@sandag.org
Susan Freedman
susan.freedman@sandag.org
The Role of Hydrogen in Reducing Greenhouse Gas Emissions

Keith Malone
California Fuel Cell Partnership
California H2 stations in 2020, 2025 and 2030

**By the Numbers**

<table>
<thead>
<tr>
<th>Numbers as of September 1, 2020</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>FCEVs—Fuel cell cars sold and leased in US</em></td>
<td>8,573</td>
</tr>
<tr>
<td>FCEB—Fuel cell buses in operation in California</td>
<td>48</td>
</tr>
<tr>
<td><em><strong>Hydrogen stations available in California</strong></em></td>
<td>42</td>
</tr>
<tr>
<td>Fuel cell buses in development in California</td>
<td>7</td>
</tr>
<tr>
<td>Fuel cell shuttles in development in California</td>
<td>4</td>
</tr>
<tr>
<td><strong>Retail hydrogen stations in development in California</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

### Breaking News!
- +36 new stations funded
- More than 100 over the next several years
Fuel cell passenger cars on the road

- 312-380 miles
- 3-to-5 minute fill
- Makes electricity on board vehicle
- Extreme temperature performance
- Multi-unit dwellers and on-street parkers
- Meet all global safety specifications
- Most automakers have fuel cell tech

And more cars on the way!

Hyperion XP-1
- Prototype
- 1,016-mile range
- 0 to 60 mph in 2.2 seconds
- Fueling in 5 minutes
- 300 units available

Second-generation Mirai
Hydrogen stations in California

La Canada Flintridge hydrogen station
Asset Classification: Limited
Next-generation stations already coming online

- Stations 2-to-8 times larger than the earliest stations
- Station costs coming
- Station development timelines decreasing

H2 fuel in California is on a renewable pathway

- 33% renewable content (2006)
- Low Carbon Fuel Standard
  - ZEV capacity credit
  - Renewable content increases to 40% (2019)
- Legislation re 100% renewable and decarbonized H2 fuel
  - Hydrogen Council goal for 2030
Hydrogen & Fuel Cell Activity – U.S.

Microsoft

• U.S. Hydrogen Road Map contributor
• Record of 48 hours powering data center servers

“...We very much see ourselves as a catalyst in this whole hydrogen economy.”

UC Irvine Road Map for Renewable Hydrogen Production

• Renewable hydrogen sector can reach self-sustainability by mid-to late 2020s

Hydrogen & Fuel Cell Activity - Global

Europe

• German H2 Strategy
  • South Korean investment response
• European H2 Strategy
• Increase in H2 chatter on European utilities earnings calls, from Q1 to Q2

“Economic recovery measures should support large scale initiatives that can accelerate cost competitiveness of hydrogen”

- Hydrogen Council

Headlines...

• As China moves to dominate the EV industry, Britain frets about energy security
• Britain lacks a clear hydrogen strategy
Heavy Duty: Bus & Truck

*Light duty needs heavy duty; heavy duty needs light duty*

**Fuel Cell Electric Trucks**

- Advanced Clean Truck rule
- Fueling infrastructure projects
  - 3 heavy duty H2 stations
    - More being announced
  - Ontario, Wilmington and Port of Long Beach
  - 1-2 temporary fuelers
- CARB & CEC Heavy Duty ZEV funds
  - Include heavy duty infrastructure

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The Other Electric Bus

**Advanced Clean Transit regulation**

- Transit buses on zero-emission pathway
- First wave of Zero Emission Bus Rollout Plans submitted

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**Foothill Transit cost comparison of BEBs and FCEBs**

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**CTE Guidebook for Deploying Zero-Emission Transit Buses**
References

- KEY DOCUMENTS
  - H2 stations list - https://cafcp.org/sites/default/files/h2_station_list.pdf
  - Zero Emission Bus Rollout Plans in California – www.cafcp.org/resources: key word is rollout
  - U.S. Hydrogen Road Map (full report) - https://cafcp.org/sites/default/files/Road%2BMap%2Bto%2BU.S.%2BHydrogen%2BEconomy%2BFull%2BRap port.pdf

- CAFCP PAGES
  - Station Map – www.cafcp.org/stationmap
  - SOSS (station operational status system) – http://m.cafcp.org
  - Resources – www.cafcp.org/resources
  - News clips – www.cafcp.org/news

Keith Malone
kmalone@cafcp.org
North County Transit District
Innovative Clean Transit ZEB Rollout Plan Overview

SANDAG’s Regional Energy Working Group
September 24, 2020

Agenda

- Provide Update on Zero Emissions Bus (ZEB) Pilot & ZEB Transition Planning Project
- Present Interim Analysis results
- Discuss ZEB Transition Alternatives & Next Steps
# NCTD’s Plans and Actions to Implement CARB Mandate

<table>
<thead>
<tr>
<th>Action Item</th>
<th>Target Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Study Report</td>
<td>January 2020</td>
</tr>
<tr>
<td>Draft CARB Roll-Out Plan</td>
<td>March 2020</td>
</tr>
<tr>
<td>ZEB Team Workshops</td>
<td>April 2020</td>
</tr>
<tr>
<td>Final CARB Roll-Out Plan</td>
<td>June 2020</td>
</tr>
<tr>
<td>Board Approval of CARB Roll-Out Plan</td>
<td>June 2020</td>
</tr>
<tr>
<td>Submit CARB ZEB Roll-Out Plan</td>
<td>July 2020</td>
</tr>
<tr>
<td>Board Approval of BEB Pilot Bus Purchase</td>
<td>July 2020</td>
</tr>
<tr>
<td>CARB Approval of Roll-Out Plan</td>
<td>September 2020</td>
</tr>
<tr>
<td>ZEB Pilot Program</td>
<td>July 2021 – July 2024</td>
</tr>
</tbody>
</table>

## Clean Fleet Rule

- **Adopted:** June 2000 by South Coast Air Quality Management District (SCAQMD)
- **Purpose:** Starting in July 2001, public transit fleets with 15 or more public transit vehicles shall acquire alternative fuel vehicles when procuring or leasing these vehicles, to reduce air toxic and criteria pollutant emissions.
- **Exemptions:** Paratransit vehicles, buses used for long-distance (out of district) travel, school buses, buses not used for public transportation (transportation of employees or prisoners)
Innovative Clean Transit Regulation

- Adopted December 2018 by California Air Resources Board (CARB)
- Cutaway buses, motor coaches, and articulated buses will be excluded until January 1, 2026 and will continue to be excluded until:
  - Applicable bus type has passed and obtained an Altoona bus testing report
  - Service requirements can be met by current technology
- Battery Electric Buses (BEBs) and Fuel Cell Electric Buses (FCEBs) placed into service prior to December 31, 2022 provide a credit which can be used to defer procurements equal to the number of credits until January 1, 2029.

CARB ICT Mandate

### ZEB Purchase Requirements

<table>
<thead>
<tr>
<th>Starting January 1</th>
<th>% of New Bus Purchases</th>
<th>Purchase Discharge Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>25%</td>
<td>If 850 ZEBs by 12/31/2020</td>
</tr>
<tr>
<td>2024</td>
<td>25%</td>
<td>If 1250 ZEBs by 12/31/2020</td>
</tr>
<tr>
<td>2025</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>2029</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
ZEB Technology Overview

- **Charging Interfaces**
  - Overhead Conductive
  - In-ground Conductive
  - Plug-in

- **Charging Locations**
  - Depot
  - On-Route

- **Charge Rates & Battery Types**
  - < 120 kW: plug in
  - < 200 kW: NMC, LiFePo
  - > 300 kW: NMC, Li-Titanate

Key Assumptions and Constraints

- Current service levels and fleet size remain constant
- Current bus series maintained
- NCTD’s 14-year fleet replacement cycle maintained
- Cutaway technology cannot yet meet service requirements
BEB Efficiency Range & Endurance Summary

- Nominal & Strenuous models represent a range for daily average efficiency.
- Efficiency at a given time can be higher than the strenuous model or lower than the nominal model.
- Using strenuous model for planning purposes to ensure that the bus will always meet service requirements.

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Range</th>
<th>Endurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>2.1 - 2.3 kWh/mile</td>
<td>117 - 160 miles</td>
</tr>
<tr>
<td>Strenuous</td>
<td>2.5 - 2.7 kWh/mile</td>
<td>99 - 133 miles</td>
</tr>
</tbody>
</table>

2019 Block Coverage: Depot-Only Charged BEB
### 2042 Block Coverage: Depot-Only Charged BEB

![Graph showing 2042 Block Coverage]

- **Achievable**
- **Unachievable**

### Progression of Block Coverage

![Graph showing Progression of Block Coverage]

- **Depot BEB**
- **FCEB**

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Regional Energy Working Group Item 7
September 24, 2020
NCTD Fixed Route Fleet Replacement Plans

- 6 BEBs in 2021
- 8 FCEBs in 2022
  - This combo will allow us to wait until 2025 to order any further ZEBs if we only order 10 CNG buses in 2023 and 2024
- Continue CNG bus purchases through 2028 (CARB mandated cut-off)
  - 20 each year planned for 2020, 2021, and 2022
- Remaining purchases starting in 2029 will be ZEBs (Battery Electric or Hydrogen Fuel Cell)

ZEB Transition
Fleet Composition Scenarios – 2042

*BEB Depot-Only
*Includes pilot procurement of 6 electric buses in 2021
ZEB Transition
Fleet Composition Scenarios – 2042

**BEB Depot + FCEB**

*Includes pilot procurement of 6 electric buses in 2021

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**ZEB Transition**
**Comparison Table – 2042**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>% ZEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Current Technology</td>
<td>4%</td>
</tr>
<tr>
<td>S1: BEB Depot Charging Only</td>
<td>86%</td>
</tr>
<tr>
<td>S2: BEB Depot + On-Route Charging</td>
<td>100%</td>
</tr>
<tr>
<td>S3: Mixed Fleet (BEB Depot + FCEB)</td>
<td>100%</td>
</tr>
<tr>
<td>S4: FCEB Only</td>
<td>100%</td>
</tr>
</tbody>
</table>

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Regional Energy Working Group Item 7
September 24, 2020
Comparison of Estimated Capital Cost by Propulsion System for Bus Procurement

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Per Bus Cost</th>
<th>Total Fleet Cost (152 Buses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>$500,000 - $600,000</td>
<td>$76,000,000 - $91,200,000</td>
</tr>
<tr>
<td>Battery Electric</td>
<td>$750,000 - $900,000</td>
<td>$114,000,000 - $136,800,000</td>
</tr>
<tr>
<td>Hydrogen Fuel Cell</td>
<td>$850,000 - $1,100,000</td>
<td>$129,200,000 - $167,200,000</td>
</tr>
</tbody>
</table>

Estimated Capital Cost by Propulsion System for Infrastructure Improvements

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Cost to support NCTD fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>$0</td>
</tr>
<tr>
<td>Battery Electric (Depot + On Route Charging)</td>
<td>$55,000,000* for charging equipment and related electrical infrastructure at both bus maintenance facilities. Add $25,000,000 for PV/BESS</td>
</tr>
<tr>
<td>Hydrogen Fuel Cell</td>
<td>$46,000,000 to construct a hydrogen fueling station and related fueling infrastructure at both bus maintenance facilities. Add $12,500,000 for PV/BESS</td>
</tr>
</tbody>
</table>

PV = Photovoltaic
BESS = Battery Energy Storage System
*Does not include cost of Pilot Program charging infrastructure.
Facilities Improvements (BEB)

- **100% BEB System - $55,000,000 (Estimate)**
  - Power infrastructure from SDG&E; transformer, switchgear, metering
  - NCTD switchgear and power distribution to chargers
  - Chargers and cabling
  - Overhead support structure with pantograph charge connection
  - Minor modification on maintenance facilities
  - Decommissioning of CNG and diesel fueling systems
  - Photovoltaic and Battery Energy Storage Systems
  - Updated site lighting and CCTV
  - On-route charging at three transit centers with total capacity for 24 buses

Facilities Improvements (FCEB)

- **100% FCEB System - $46,000,000 (Estimate)**
  - Modification of existing electrical system (may require new SDG&E transformer)
  - Two hydrogen fuel storage tanks (trucked-in hydrogen), four pumps, dispersers, gaseous buffers
  - Minor modification of maintenance facilities
  - Decommissioning of CNG and diesel fueling systems
  - Photovoltaic and Battery Energy Storage Systems
  - Updated site lighting and CCTV
SDG&E Medium-Heavy Duty (MD/HD) Electric Vehicle Infrastructure Program

- NCTD and SDG&E signed a non-binding agreement on May 16, 2017 that supported program development and approval
- Final CA Public Utilities Commission (CPUC) decision August 23, 2019 for $107M, 5-year program

SDG&E Electric Vehicle High-Power (EV-HP) Charging Rate

- Pending CPUC approval – SDG&E Filed application July 2019
- New monthly subscription charge vs. demand charge
  - Customer subscribes to desired power level
  - Declining discount in the first ten years of the program
- Time-of-use energy rates per kilowatt hour (proposed)
  - On-peak: $0.39-summer / $0.37-winter
  - Off-peak: $0.16-summer/winter
  - Super off-peak: $0.11-summer/winter
## Estimated Operating Cost by Propulsion System for Bus Operations

<table>
<thead>
<tr>
<th>Location</th>
<th>Annual kW</th>
<th>Annual $</th>
<th>Annual Miles</th>
<th>Fuel $/Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Division</td>
<td>5,288,900</td>
<td>$1,098,200</td>
<td>2,321,300</td>
<td>$0.47</td>
</tr>
<tr>
<td>West Division</td>
<td>7,450,000</td>
<td>$1,375,500</td>
<td>3,225,100</td>
<td>$0.43</td>
</tr>
<tr>
<td>Opportunity Charge 1</td>
<td>602,700</td>
<td>$208,000</td>
<td>262,400</td>
<td>$0.79</td>
</tr>
<tr>
<td>Opportunity Charge 2</td>
<td>602,700</td>
<td>$208,000</td>
<td>262,400</td>
<td>$0.79</td>
</tr>
<tr>
<td>Opportunity Charge 3</td>
<td>602,700</td>
<td>$208,000</td>
<td>262,400</td>
<td>$0.79</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14,547,000</strong></td>
<td><strong>$3,097,700</strong></td>
<td><strong>6,333,700</strong></td>
<td><strong>$0.49</strong></td>
</tr>
</tbody>
</table>

Assumes "Managed Charging" and SDG&E Proposed EV-HP Tariff

<table>
<thead>
<tr>
<th>Location</th>
<th>Annual kg H₂</th>
<th>Annual $</th>
<th>Annual Miles</th>
<th>Fuel $/Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Division</td>
<td>355,300</td>
<td>$2,664,750</td>
<td>2,343,500</td>
<td>$1.14</td>
</tr>
<tr>
<td>West Division</td>
<td>605,100</td>
<td>$4,538,250</td>
<td>3,990,200</td>
<td>$1.14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>960,400</strong></td>
<td><strong>$7,203,000</strong></td>
<td><strong>6,333,700</strong></td>
<td><strong>$1.14</strong></td>
</tr>
</tbody>
</table>

Assumes $7.50/kg

## Comparison of Operating Cost by Propulsion System for Bus Operations

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>CNG</th>
<th>Battery Electric</th>
<th>Hydrogen Fuel Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Cost</td>
<td>$0.26</td>
<td>$0.49</td>
<td>$1.14</td>
</tr>
<tr>
<td>Fueling Station Maintenance Cost</td>
<td>$0.39</td>
<td>$0.03</td>
<td>$0.09</td>
</tr>
<tr>
<td>Bus Maintenance Labor &amp; Materials Cost</td>
<td>$0.87</td>
<td>$0.52</td>
<td>$0.70</td>
</tr>
<tr>
<td>Mid-life Overhaul Reserve Cost</td>
<td>$0.09</td>
<td>$0.34</td>
<td>$0.15</td>
</tr>
<tr>
<td>Total Fuel &amp; Maintenance Costs</td>
<td>$1.61</td>
<td>$1.39</td>
<td>$2.08</td>
</tr>
<tr>
<td>Annual Est. Fuel &amp; Maintenance Costs</td>
<td>$10,170,081</td>
<td>$8,790,733</td>
<td>$13,175,849</td>
</tr>
</tbody>
</table>

Pricing is preliminary and is for comparative purposes only, it does not represent a complete estimate of all costs.
### Cost Summary

#### Hypothetical 14-Year Cost Comparison

<table>
<thead>
<tr>
<th>Technology</th>
<th>Fleet (Low)</th>
<th>Fleet (High)</th>
<th>Infrastructure</th>
<th>14 Years Fuel &amp; Maint. (Low)</th>
<th>14 Years Fuel &amp; Maint. (High)</th>
<th>TOTAL (Low)</th>
<th>TOTAL (High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>$76,000,000</td>
<td>$91,200,000</td>
<td>$142,882,000</td>
<td>$218,382,000</td>
<td>$233,582,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEB</td>
<td>$114,000,000</td>
<td>$136,800,000</td>
<td>$55,000,000</td>
<td>$123,071,000</td>
<td>$134,871,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCEB</td>
<td>$129,200,000</td>
<td>$167,200,000</td>
<td>$46,000,000</td>
<td>$184,462,000</td>
<td>$200,862,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology</th>
<th>Incremental Costs vs. CNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEB</td>
<td>$73,889,000</td>
</tr>
<tr>
<td>FCEB</td>
<td>$141,280,000</td>
</tr>
</tbody>
</table>

### Summary

- CARB mandates that by 2029, 100% of bus purchases shall be Zero Emission.
- All CNG buses phased out by 2042, based upon 14-year service life.
- BEBs cannot cover all NCTD’s blocks without on-route charging.
- NCTD’s options:
  - 100% BEB fleet (depot + on-route charging)
  - 100% FCEB fleet
  - Mixed fleet of FCEB + BEB (no on-route charging)
- Buy America and Altoona Testing consideration may impact timing and availability of given ZEB models.
QUESTIONS?