Zoom to Zero: Best Practices for EV Infrastructure

(Co-Hosted by CALSTART)

September 25, 2019
Support for ICT Regulation Implementation

- Advocacy
- Outreach/Education
- Compliance
How to Ask Questions

• Submit your questions anytime during the program using the Questions module in your webinar control panel at the right of your screen.

• We will collect all questions and get to as many as time permits during the Q&A portion of the program.
Your Guidance Tool for

→ ZEB Infrastructure Planning

Alycia Gilde, Director of Fuels and Infrastructure
CALSTART
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Wednesday, September 25, 2019
OVERVIEW

• About CALSTART
• Infrastructure Barriers
• Important Considerations
• Your Check List
• 5 - Smart Planning Steps
CALSTART’s 220 + Member Companies and Organizations
Changing Transportation for Good
CALSTART – A National Non-Profit Organization
9 Offices (Six Regional Offices + Four Field Offices)

California
- 3 offices
- 2 field offices
Challenges for Electric Bus Deployment

- Deployment Lead Time
- Costly Upgrades
- Permitting
- Space Constraints
- Demand Charges
- Lack of Technical Assistance

Infrastructure remains to be the Biggest Barrier to ZEB Deployment!
Infrastructure Planning Considerations

- Anticipate potential scaling needs.
- Infrastructure costs do vary.
- Begin working with your utility now.
- Evaluate EV rates and demand charges potential.
EV Infrastructure Planning Tool for Transit

An Infrastructure Decision Tree for Transit Fleets
Five Smart Steps to Plan for Electric Bus Charging

Step 1: Consideration of Electric Bus Deployment
- Evaluate utility, identify needed technical support, and obtain a new service request form.
- Confirm charging requirements, needs, and costs from vehicle manufacturer and EVSE supplier.
- Determine fleet size and potential.

Step 2: Bus Fleet Electrification
- Plan for phasing and timeline for deployment.
- Perform system modeling and understand daily cycling and projected energy needs (daily kWh, charging times, and speed).

Step 3: Depot Yard Analysis
- Evaluate site infrastructure and grid infrastructure needs.
- Identify grid availability.
- Identify charging renewable energy options.

Step 4: Development of Charging Schedule
- Identify charging hardware.
- Develop charging schedule (best window for charging).

Step 5: Development of Electric Service Plan
- Obtain permits.
- Determine costs for design, site work, and installation.

Important Considerations to Infrastructure Deployment
- Fleet Deployment Goals
- Project Team (Internal & External)
- Utility Point of Contact
- Staff Electrical Engineer (or external)
- Estimated Project Timeline
- Capital Budget for Project

Contact CALSTART for infrastructure planning assistance: www.calstart.org
Your Infrastructure Planning Check List

- Fleet Deployment Goals
- Project Team
- Utility Point of Contact
- Staff Engineer (External)
- Estimated Project Timeline
- Capital Budget for Project
- Available Zero Emission Bus Options
- Charging and Fueling Options
- Available Incentive Programs
- Permitting Requirements
- Codes and Standards
5 Smart Steps to Infrastructure Planning

1. Consideration of Electric Bus Deployment
2. Bus Fleet Electrification
3. Yard Depot Analysis
4. Development of Charging Schedule
5. Development of Electric Service Plan
Step 1: Consideration of Electric Bus Deployment

- Engage your utility, identify needed technical support, and obtain a new service request form.
- Confirm charging requirements, needs and costs from vehicle manufacturer and EVSE supplier.
- Determine fleet scaling potential.
- Communicate early plans with local utility.

Step 2: Bus Fleet Electrification

- Plan for phasing and timeline for deployment.
- Perform system modeling and understand bus duty cycles and projected energy needs (daily kWh, charging times and speed).
Step 3: Depot Yard Analysis

- Evaluate site infrastructure and utility grid infrastructure needs.
- Identify space availability.
- Evaluate charging/renewable energy options.

Step 4: Development of Charging Schedule

- Identify charging hardware.
- Develop charging schedule (best window for charging).
Step 5: Development of Electric Service Plan

- Detail requested service voltage and load schedule.
- Identify service drop and transformer locations.
- Develop conceptual electric single line diagram.
- Determine costs for design, site works and installation
Deployment Timeline

Planning: Steps 1 - 5  
3 – 12 months

Development
6 – 48 months

Deployment
1 - 3 months
EV Infrastructure Planning Tool for Transit

Infrastructure Planning Check List

- Fleet Deployment Goals
- Project Team (Internal & External)
- Utility Point of Contact
- Staff Electrical Engineer (or External)
- Estimated Project Timeline
- Capital Budget for Project
- Available Battery Electric Bus Technologies
- Electric Vehicle Supply Equipment Options
- Smart Charging Software & Networking
- Available Incentive Programs
- Permitting Requirements
- Understanding of Contracting Process

Important Considerations to Infrastructure Deployment

- It is critical to anticipate potential scaling needs in case a fleet transitions from 10 to 100 electric buses.
- Demand, infrastructure costs can vary with factors such as required utility upgrades, trenching, and laying down conduit, and additional energy storage.
- Working with your utility from the onset of the planning process is critical to understand potential build out requirements, cost and development timelines. Lastly, working with your utility to evaluate electric vehicle rates and potential demand charges are important to avoid high charging costs while operating an electric bus fleet.
Your Guidance Tool for

→ ZEB Infrastructure Planning

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Wednesday, September 25, 2019
Transit Agencies: How to work with your utility to deploy EV Bus fleets

Andrew Papson, Advisor, eMobility
Southern California Edison
September 25, 2019
If we want to get to **zero emissions**, eventually we have to **replace** many of the things we rely on today that require combustion.
Vehicle pollution impacts a concentrated number of communities disproportionately

82% of NOx emissions are caused by mobile sources

Note: Communities are considered DACs if they are in the worst quartile of environmental & economic burden, as evaluated by the California EPA using CES 3.0. Freight corridors.
SCE’s Transportation Electrification Pathway to 2030

Clean Power and Electrification Pathway white paper available at: sce.com/pathwayto2030
Setting the right Frame of Mind for EV Bus infrastructure projects
EV Bus infrastructure is NOT plus-size EV car infrastructure

• Looks similar, but completely different in scale and requirements
• Especially true when you scale to 10, 20, 40 buses
EV Bus infrastructure draws as much power as large commercial buildings

• An electric bus yard draws as much power as medium and large office buildings

• Imaging installing a Las Vegas casino in your bus yard – this is the scale of electrical infrastructure that is required!

• This requires extensive and complex civil engineering work
Who should be on your EV Bus infrastructure team?

• Fleet Manager
• Facilities Manager
• Energy Manager
• Bring resources from rail division (already deals with high power)

• Private contractors providing input:
  • Vehicle OEM
  • Charger hardware manufacturer
  • Third-party consultant
  • Utility
Charging Infrastructure Overview
Diagram of Charging Infrastructure Components

SOURCE: Idaho National Lab, Considerations for Corridor and Community DC Fast Charging Complex System Design
Typical Electrical Infrastructure Project

Utility build off-site transformer & service drop to the meter

Customer installs on-site electrical panel, conduit, and charging stations
Introducing Charge Ready Transport: Infrastructure for Electric Truck and Bus Fleets
Charge Ready Transport provides infrastructure for fleet electrification

Decision Summary

- Approved total program budget of $356.4M
- Achieve minimum 870 sites with 8,490 electric vehicles procured or converted
- Charging station rebates available for transit/school buses and sites in DACs
- Launching Q2 or Q3 2019

Budget Allocation

- Minimum 15% infrastructure budget should serve transit agencies
- Maximum 10% infrastructure budget should serve forklifts
- Minimum 25% of infrastructure budget should serve ports and warehouses
- Minimum 40% infrastructure budget should serve sites in DACs
How the Program Works

• Under the Charge Ready Transport Program, SCE will provide the infrastructure to support the installation of EV charging equipment at no cost to the Program Participant.

• This is a unique opportunity for fleet operators who choose to acquire EV’s because the infrastructure required to support the installation of EV charging equipment typically represents a sizable investment.

• SCE will design, construct, and install the necessary infrastructure on both the utility-side and customer-side of the electric meter at no cost.

• Program Participants are responsible for the selection, purchase, and installation of the EV charging equipment.

• The Charge Ready Transport Program offers two rebate options to help Program Participants offset a portion of their costs.
Typical Electrical Infrastructure Project

- Utility builds off-site transformer & service drop to the meter
- Customer installs on-site electrical panel, conduit, and charging stations
Charge Ready Infrastructure Project

Utility builds off-site and on-site infrastructure, including transformer, meter, panels, trenching, and conduit. ("make-ready" project)

Customer installs charging stations. Transit agencies, schools, and some businesses in disadvantaged communities eligible for rebate.
Choose from a pre-approved list of chargers and charging speeds to meet your needs

**AC Charging**
- Up to 19 kW
- Standard J1772 Connector

**DC Charging**
- Up to 150 kW or more
- Standard CCS Type 1 Connector
Additional Programs and Services

**Transportation Electrification Advisory Services**
- Total Cost of Ownership Analysis
- Rate Intro and Rate Analyses
- LCFS Credit Estimation
- GHG Reduction Calculations

**New Rates for EV Trucks & Buses**
- Simplifies how the rates are charged
- Waives demand charges for five years
- Reduces uncertainty in your electricity costs

**Transportation Electrification Project Management**
- Single Point of Contact for multi-site projects
- Support customer-led projects outside of programs
Steps for completing a Charge Ready Transport Project

or,

Why does it take so long?
How can we speed up the process?
Getting Started with your Charge Ready Transport project

• Visit the Charge Ready Transport Website to learn more about the program
  • [https://www.sce.com/crt](https://www.sce.com/crt)

• Submit Expression of Interest to start discussions with an SCE Advisor
  • Contact your Account Manager
  • Submit online: [https://pages.email.sce.com/chargereadytransport](https://pages.email.sce.com/chargereadytransport)
  • Email me at [andrew.papson@sce.com](mailto:andrew.papson@sce.com), I’ll get the ball rolling

• Submit a Charge Ready Transport application
  • Submission portal at [https://www.sce.com/crt](https://www.sce.com/crt)
  • Typically 2-4 months to review and finalize application
  • It’s an iterative process w/ Advisor to finalize details and meet program requirements.
  • There are many ways applicants can do to speed up or slow down an application
Tips to accelerate the application review process

• The best applications have a clear scope that answer four questions:
  • Is there a firm decision on the number of Electric Vehicles?
  • Is there a firm decision on number of charging stations?
  • Has the customer selected charger type and manufacturer?
  • Is the charger on our approved product list?

• A customer can submit an application before these questions are finalized, and work with an advisor to find answers to these questions.

• However, a project can’t move to design/build until these are finalized.
Steps in the design/build process (1)

• Pre-design: finalize charger placement, yard layout and other details. An iterative process with the customer to agree on a design.

• Review and sign the Program Participation Agreement (PPA)
  • Note: PPA is a contract that may require legal review and board approval
  • Once PPA is signed, vehicles must be onsite within 18 months

• Customer procures/contracts for vehicles and charging equipment
  • 45 day window from signing PPA

• Engineering design

• Easement agreement
  • Note: Easement contract may require legal review and board approval.
Steps in the design/build process (2)

• Permitting process
  • Note: Permitting depends on number authorities with jurisdiction, and their timeline for review and approval

• Civil work begins; break ground on make-ready project (up to concrete pad)
  • Timeline can have unpredictable delays, such as encountering a natural gas pipeline that wasn’t on the original diagrams, or the trenching work is more difficult than expected.

• Customer installs charging equipment on concrete pad

• Interconnect and ENERGIZE!
Timelines

• From Expression of Interest to application submitted
  • As long as the customer needs, until they are ready to proceed

• From application submitted to Program Participation Agreement signed
  • Rule-of-thumb, 2-4 months
  • Customer can accelerate by developing firm project scope
  • PPA starts the clock on procurement contract and vehicle delivery, so may need to delay signing until the vehicle components are ready-to-go

• From PPA signed to Make-ready construction complete
  • 45 days to finalize procurement contract
  • Rule-of-thumb, 6-9 months for the civil engineering work
  • Depends on unexpected delays encountered in the construction process

• Customer installation of charging hardware and energize
  • Up to the customer and contractor, depends on complexity of charger installation
  • Vehicles must be on-site within 18 months of signing PPA
Get started right now!

Program web page: https://www.sce.com/crt
Expression of Interest: https://pages.email.sce.com/chargereadytransport
Contact your Account Manager
Contact me: andrew.papson@sce.com
Transit & High Power Charging

Dean Siegrist
AVP, Transformative Technologies
25 September 2019
Real Life Stories: Transit & High Power Charging

- About Black & Veatch
- Electric Vehicle Infrastructure Projects
- Stakeholder Alignment & Project Goals
- Project Approaches & Risk Models
- Paperwork, Process & Permissions
- Project Scope & Schedule Management
- Equipment, Equipment, Equipment
- Rocks, Water, Trees, Traffic & Other Discoveries
- Utility Interconnection & Power Delivery Schedule

> Clients: Vehicle OEMs, Transit Agencies, Fleet Operators, Hardware OEMs, EV Network Service Providers & Utilities
About Black & Veatch

- Power Infrastructure / Clean Energy
- Transformative Technologies
- Mission Critical Facilities

- 11,000+ Professionals
- 110+ offices
- Six continents
- 7,000 active projects worldwide

- $3.4 Billion in revenue in 2017

- Safety Performance
  - 0.37 Recordable Incident Rate
  - 0.06 Lost Time Incident Rate
Transformative Technologies

Scaling Distributed Clean Energy Infrastructure

- Electric Vehicle Infrastructure
- Hydrogen Infrastructure
- Energy Storage Networks
- Emerging Distributed Technology
- Autonomous, Connected Vehicle Infrastructure

Over 1,000 250KW+ High-Power Sites

We build complex networks faster
End-to-End Approach Leverages Black & Veatch Capabilities for Efficient Electrification Plans

Partnering with a vertically integrated company such as Black & Veatch reduces development time and cost and allows for least regret investments as fleets Electrify.

- Analysis of Infrastructure Needs
- Evaluation of Utility Grid Infrastructure
- Charger Location & Yard Layout Analysis
- Renewable Energy Analysis
- Facility Design
- Equipment Procurement
- Utility Connection
- Site Construction
- System Integration
- Commissioning & Turnover
Stakeholder Alignment & Project Goals

- Existing Project History
- Concurrent, Future Projects

- Building Load Integration
- Cost of Energy, Renewable Content
- Resilience
- Future Proofing Infrastructure

- Project Timeline
- Project Budget
- Total Cost of Operation

> Agencies & Fleets, Utilities, Cities, Vehicle OEMs, Clean Energy, Community Interests, Project Execution Team, Funding & ROI
Project Approaches & Risk Management

- Evolving Procurement Landscape
  - Bundling Infrastructure with Vehicles
  - Separate Infrastructure and Vehicle RFPs
  - Turn-Key or Separate Hardware, Software, Deployment Services, Operations & Maint.

- Alternative Contracting Methods & Tools
  - Public Contracting Rules Vary
  - Design-Build
  - Design-Bid-Build
  - Owners Engineer, Construction Administration
  - Fixed Price, Cost Plus, Open Book
  - Engineering “Bench” Services
  - Internal Engineering and Construction Services

Project Delivery/Risk Models: Different Levels of Scope Clarity & Cost Certainty
Paperwork, Process & Permissions

- Start EARLY on EVERYTHING
- Inter-Agency Agreements & Approvals
- State Environmental Impact Filings
- Sorting out Applicable Terms & Conditions, including differences between Vehicles, Infrastructure & Deployment Services
- Utility Load Letters, Right of Way & Service Agreements
- DOT & City Approvals & Special Permits
- Building & Electrical Permits (Can expire!)

> Patience & Persistence
Equipment, Equipment, Equipment

- Chargers
- UL Listings & Field Certification
- Compatibility / Interoperability

- Switch Gear
- Transformers
- Cable & Special Connectors

- Manufacturing Slots, Lead Times
- Specification Changes

- Site Delivery / Storage / Laydown Areas

> Changes Impact Schedule and Cost
> Un-documented, buried objects, required hand digging & re-routing
Rocks, Water, Trees, Traffic & Other Discoveries

- Rocks, Asphalt, Compaction Ratios
- Walls, Floors, Roofs
- Environmental Conditions
- Water
- Utilities, Hidden Obstructions
- Abandoned Conduits & Structures
- Underground Hazards & Discoveries
- Traffic Control & Security

- Re-Mobilization, Hand Digging

> Re-Engineering, Schedule and Cost Impacts
Utility Interconnection & Power Delivery Schedule

- Evolving charging loads
- Service upgrade
- Existing building Loads
- Metering location
- Switchgear sizing
- Power levels & voltage
- Lead times for increasing power
- Distribution grid upgrades
- Re-Mobilization

> Race is on for Real Estate and access to Power
Power Delivery, Grid Upgrade Schedules

Potential Grid Upgrades Required, Schedule Impacts

<table>
<thead>
<tr>
<th>Potential Power Delivery Upgrades</th>
<th>Typical Ranges (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Conductor (Service Extension)</td>
<td>0 - 2</td>
</tr>
<tr>
<td>Medium Voltage (Service Provisioning)</td>
<td>0 - 5</td>
</tr>
<tr>
<td>Feeder Re-Conductor</td>
<td>6 - 36</td>
</tr>
<tr>
<td>Feeder Additional Conductor</td>
<td>6 - 36</td>
</tr>
<tr>
<td>New Feeder</td>
<td>9 - 48</td>
</tr>
<tr>
<td>Substation Upgrade Required</td>
<td>18 - 36</td>
</tr>
<tr>
<td>New Substation Required</td>
<td>24 - 48</td>
</tr>
</tbody>
</table>

Example ranges – Power delivery scenarios are specific to a location, feeder access, existing, in queue projects and utility operating / power provisioning standards.
Download the Latest Black & Veatch eBooks:

- bv.com/evtols
- bv.com/ElectricFleets
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Remember to Register!

• Session 4: Zoom to Zero: Fund the Electric Fleet (10/3)

Register at caltransit.org/events/webinars
Contact Us

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