

PG&E

Electric Vehicle Charging Retrofit Project: “Lessons Learned”

CARB ZEV Infrastructure
Workshop

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Sacramento, California

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Sr. Program Manager
Clean Air Transportation
Department



*Pacific Gas and
Electric Company*[®]

Electricity Is a Low-Cost and Cleaner Alternative

- Fuel Cost: <\$1.00 / gge
- Significant GHG reductions
- Infrastructure not as simple as some people think





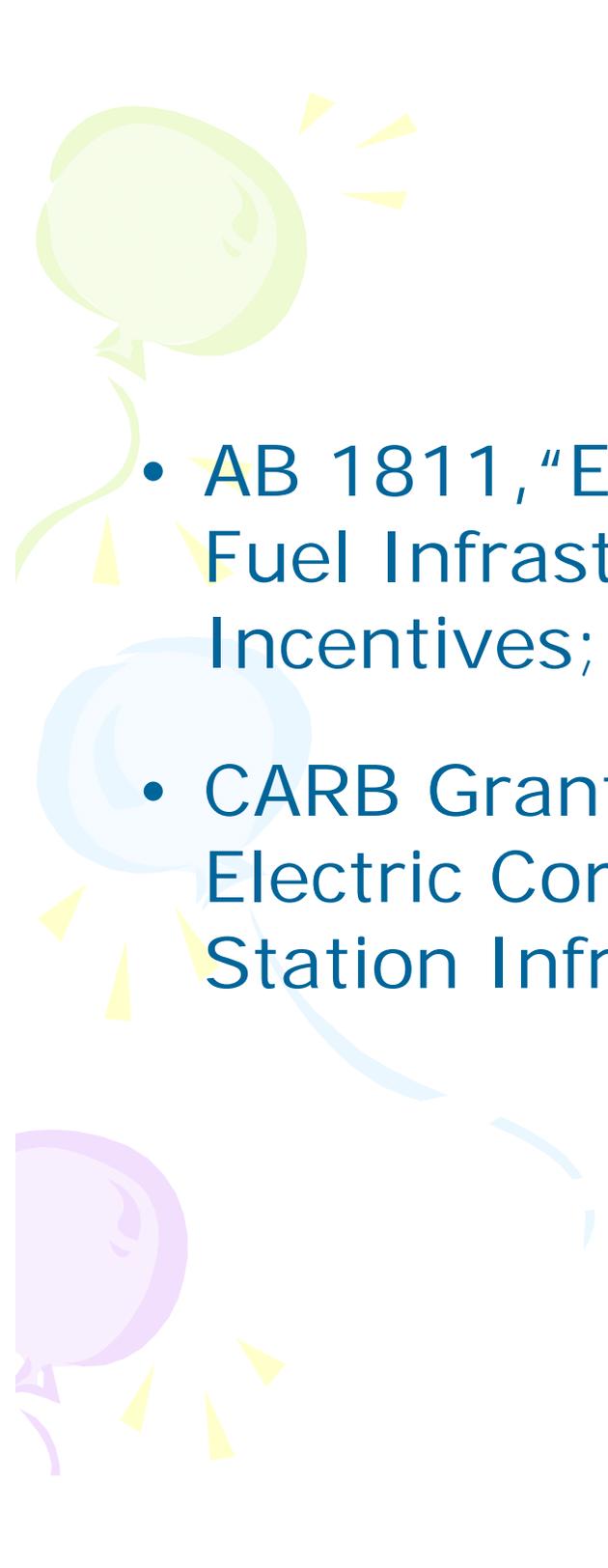
Project Scope

This project addressed the construction and/or refurbishing of various electric vehicle charging station sites, each with various charging capabilities (level II and DC Fast Charging).

The goal focused on enhancing the San Francisco to Sacramento corridor and to bring all the stations installed and retrofitted under this grant in full compliance with, the still to be approved, SAE J1772™ updated standard for conductive charging.

The sites are located in the following areas:

- San Francisco
 - Davis
 - Dixon
 - Vallejo
 - San Ramon
 - Fairfield (2 sites)
 - Vacaville (2 sites)
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Funding

- AB 1811, "E85 and Other Alternative Fuels: Fuel Infrastructure Projects and Price Parity Incentives;" Retail Project
- CARB Grant G06-AF18, Pacific Gas and Electric Company, Electric Vehicle Charging Station Infrastructure



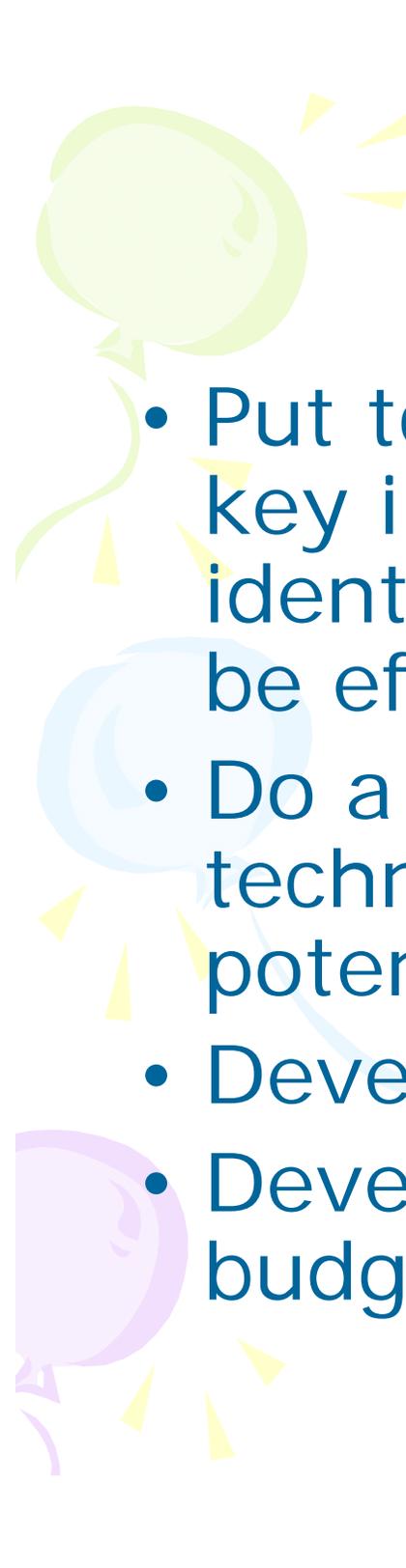
First Steps-Planning

- Clear Goals and Focus
 - Type of users you want or need to serve
 - Range extending or
 - Destination
 - Fleet
 - Type of infrastructure
 - Level I, II or DC Fast Charging
 - Qualified Manufacturer i.e. UL and SAE compliant
 - Complexity
 - Retrofit
 - New Installations



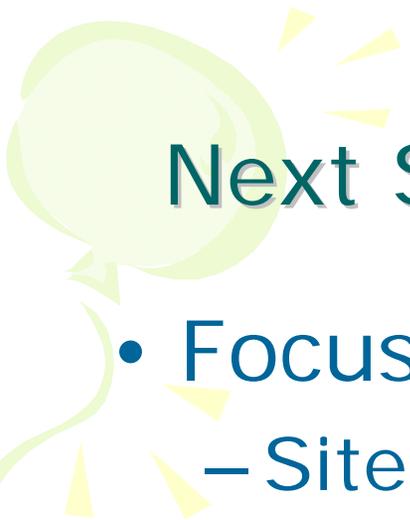
First Steps-Planning-continued

- Funding Source and Budget
 - Strategic Partners
 - Utility
 - EVSE manufacturer
 - Electrical Contractor
 - EV users groups e.g. EAA
 - OEMs
 - Fleet users
 - City/County
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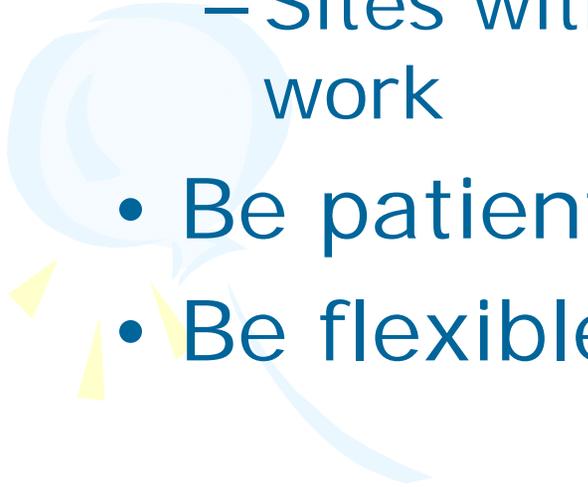
A decorative graphic on the left side of the slide features three balloons: a light green one at the top, a light blue one in the middle, and a light purple one at the bottom. Each balloon has a string and is surrounded by several small, yellow, triangular streamers.

Next Step-Survey and Scope

- Put together a small working group of key individuals to begin site selection or identification. Keep the team small to be effective
- Do a site visit to every site with a technical lead and electrician to evaluate potential and limitations
- Develop a short list of projects
- Develop a cost for the project based on budget available



Next Step-Survey and Scope, continued

- Focus on “Low hanging Fruit” first
 - Sites that are upgrade ready
 - Sites with minimally evasive installation work
 - Be patient
 - Be flexible
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EVSE Siting Decisions

EVSE siting is especially important in public sites and can significantly affect the cost of the installation. There are many siting considerations relating to costs, safety, and aesthetics. These include:

- *Public Safety:* Chargers should be sited away from traffic and other hazards. Adequate lighting should be provided for security.
 - *Convenience:* Chargers should be located conveniently near the main building or facility.
 - *Proximity to Utility Equipment:* Siting charge stations near the electric utility's feeder lines or transformers may reduce installation costs.
 - *Cable Management:* To avoid injury from tripping over cables, cords and cables should not cross sidewalks or pedestrian traffic patterns, and should be installed with the EV user's convenience in mind. Cable retractors should be considered for permanently wired cables.
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Key Evaluation Criteria

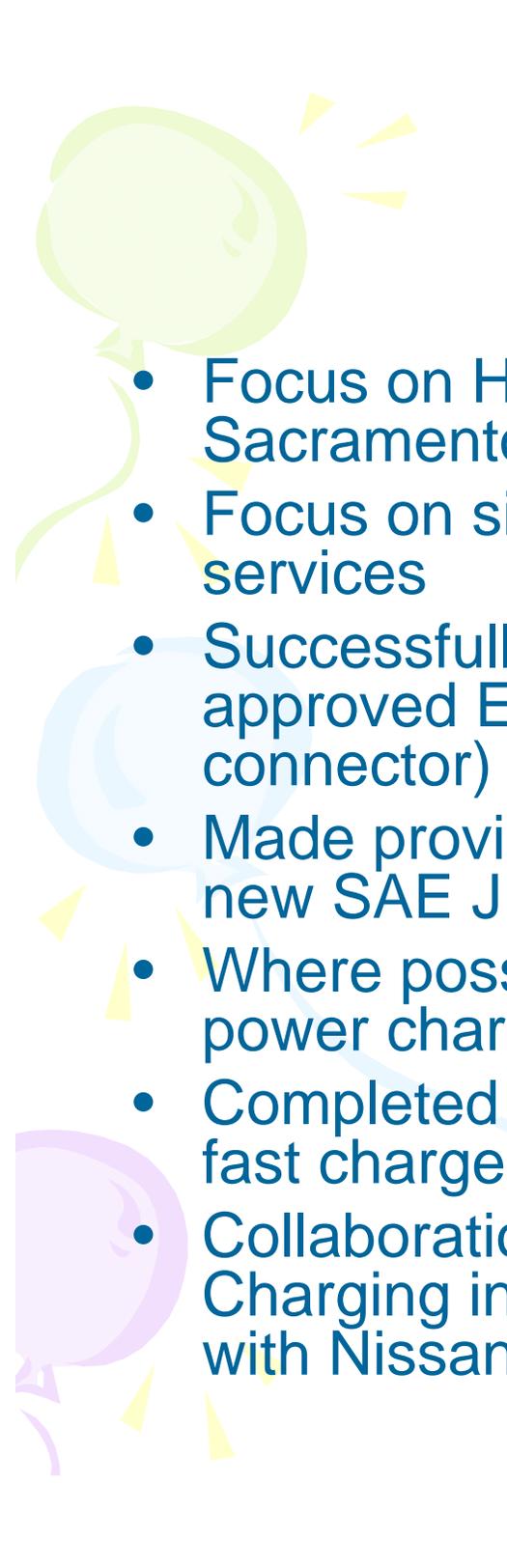
Site Evaluation Checklist:

- Location of the main electrical panel, branch circuits, and conduits
 - Location of hazardous materials
 - Location of charging stations
 - Lighting
 - Traffic flow
 - Ventilation (not need with advanced batteries)
 - Description and locations of signs
 - Curbing, wheel stops, cutouts, setbacks, and bumper guards
 - Parking spaces, striping, driveways, and walkways
 - Landscaping
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EVSE Siting Decisions

- *Potential Hazards:* Ensure that EV charging spaces are not located near potential hazards. EVSE should not be installed near explosive material; flammable vapors, liquids and gases; combustible dust or fibers; and materials which ignite spontaneously on contact with air.
 - *Curbs, Wheel Stops, and Setbacks:* Curbs, wheel stops, and setbacks should be provided so that EVs or other vehicles cannot inadvertently drive into the EVSE. When installing curbs, wheel stops, and setbacks, consider ease of access to the charger, mobility of users and foot traffic in the area.
 - *Signs and Visibility:* The electrical codes require special signs for EVSE. Signs may also be needed to designate parking spaces for EV-use only. These signs should be positioned high enough to be seen over parked vehicles.
 - *Disabled Access:* ADA compliance.
 - Insurance considerations
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Summary of Project

- Focus on Highway 80 corridor from San Francisco to Sacramento
- Focus on sites with easy accessibility and proximity to services
- Successfully installed 14 new SAE compliant and UL approved EVSEs from Clipper Creek (Model TS70-Tesla connector)
- Made provisions for future cordset and coupler upgrades to new SAE J1772™ standard
- Where possible, station infrastructure sized to provide highest power charge rates to a 70 amp max.
- Completed planning and site prep for installation of two DC fast charge stations rated 50-60Kw (300-500V max.)
- Collaboration agreements in place with TEPCO to test Fast Charging in cooperation with Mitsubishi and in discussions with Nissan



Level II EVSE Detail of Equipment By Locations: G06-AF18

Date	Location	Address	Description	Type	S/N	Vac	Breaker	80% rating	program
4/24/2009	Davis	5th & G St.	Plaza Parking	TS-70	TS1C09041208	208	70	56	TS-90-C2-L25-10
4/24/2009	Dixon	Pitt School Rd.	Baskin Robbins parking lot	TS-70	TS1C09041199	208	40	32	TS-90-C2-L25-10
4/28/2009	San Ramon	3301 Crow Canyon Rd.	SRVCC parking lot	TS-70	TS1C09041204	208	60	48	TS-90-C2-L25-10
5/1/2009	Vacaville	782 Davis Ct	Belle Vista park n ride	TS-70	TS1C09041201	240	40	32	TS-90-C2-L25-10
	Vacaville	782 Davis Ct	Belle Vista park n ride	TS-70	TS1C09041202	240	40	32	TS-90-C2-L25-10
	Vacaville	190 Hickory Lane	Vacaville Regional Transit	TS-70	TS1C09041205	240	40	32	TS-90-C2-L25-10
	Vacaville	190 Hickory Lane	Vacaville Regional Transit	TS-70	TS1C09041213	240	40	32	TS-90-C2-L25-10
5/14/2009	Fairfield	2000 Cadenasso Dr.	Fairfield Transit Center	TS-70	TS1C09041200	208	50	40	TS-90-C2-L25-10
	Fairfield	2000 Cadenasso Dr.	Fairfield Transit Center	TS-70	TS1C09041203	208	50	40	TS-90-C2-L25-10
5/24/2009	San Francisco	77 Beale St	PG&E garage	TS-70	TS1C09041210	240	40	32	TS-90-C2-L25-10
	San Francisco	77 Beale St	PG&E garage	TS-70	TS1C09041211	240	40	32	TS-90-C2-L25-10
5/27/2009	Vallejo	495 Mare Island Way	Ferry Terminal parking	TS-70	TS1C09041214	240	40	32	TS-90-C2-L25-10
5/28/2009	Davis	UC Davis	Mondavi Center parking	TS-70	TS1C09041206	208	40	32	TS-90-C2-L25-10
5/30/2009	Fairfield	501 Union Ave	Solano County Gov parking	TS-70	TS1C09041212	208	40	32	TS-90-C2-L25-10
5/29/2009	Portable	3400 Crow Canyon Rd	stock - San Ramon	TS-70	TS1C09041207				TS-90-C2-L25-10
5/29/2009	Spare	3400 Crow Canyon Rd	stock - San Ramon	TS-70	TS1C09041209				TS-90-C2-L25-10

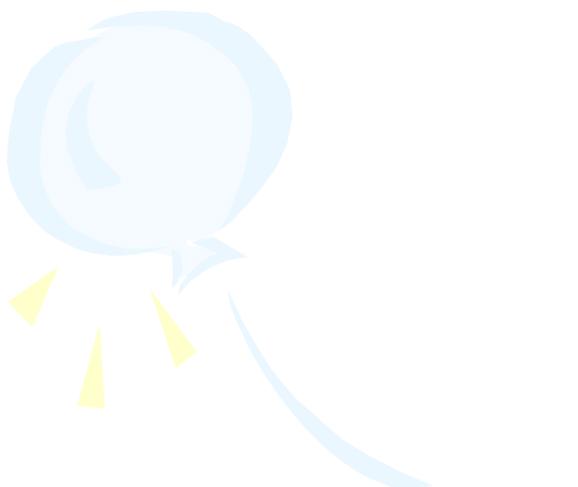


Key lessons learned

- EVSE product availability can be an issue
 - SAE compliant equipment
 - EVSE
 - Coupler
 - UL approved
- Future upgradeability and capability
- Engage stakeholders early e.g. EAA and others, Can help with many issues
- Awareness of legacy vehicle needs, there are still old EV running around out there!
- Educate local planning and permitting agencies, generally not aware of codes or standards involved with EV infrastructure
- Posting of charge rates on equipment
 - New standards allow for rates as high as 80 Amps
 - Some vehicles default to highest charging rate e.g. Tesla
 - Can cause breaker tripping issue
- ADA issues that need to be addressed
- Communicating changes to charging network
 - Online station location maps
- Maintenance considerations, who will maintain or pay to fix?
- Siting agreement for new installations, attorneys are not your friends!



Questions?



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