Attachment 1

Electric Vehicle Growth Projections

There are many factors that are expected to contribute to continued growth of the EV market, including:

- *Battery Cost Reductions* – The dominant cost associated with building EVs is the battery. The Nissan LEAF's battery was estimated to cost around $18,000 initially (2010), but Nissan now (2014) offers replacement batteries at a cost of $5500. Estimates for continued cost reductions over the next several years vary widely, but it's clear that a large investments are being made to reduce costs and dramatically increase capacity – an example is Tesla Motor's recent decision to build a $5 billion battery "gigafactory" in Nevada.
- *Public Charging Availability* – As public charging stations become more widely available, potential BEV adopters see limited driving range as a less serious drawback to owning a BEV. This becomes a virtuous circle – more public charging capacity results in more EV adopters, which in turn creates demand and funding for more chargers, and more awareness of EVs in general. Charging at workplaces has also become far more common, particularly in Silicon Valley.
- *Increasing Range* – Likely the greatest limitation to BEV adoption is the limited driving range of the affordable BEVs offered today. Most offer a driving range of around 60-80 miles. While that range is sufficient for the majority of Bay Area commutes, particularly of workplace charging is available, it can be limiting for weekend trips or errands run before or after a commute. PHEVs, like the Chevy Volt, can be a good compromise for buyers today, as they provide extended range with a gasoline engine. But as battery energy density increases and costs drop, the industry fully expects affordable BEVs with ranges of 150-200 miles within the next few years [1]. It is reasonable to expect a spike in demand in BEVs when those vehicles become available.
- *Incentives* – Government incentives such as federal tax credits, state tax rebates, and carpool lane privileges are expected to continue for at least the next few years. As these incentives ultimately phase out, the cost structure of EV manufacturing will likely drop sufficiently to compensate.
- *Gas Prices* – Gas prices are currently in decline, which could slow EV adoption to the degree that fuel cost savings is a driving factor in purchasing an EV. In the long run, gas prices will inevitably go up again, but even at current gas prices around $2.50-$3.00 per gallon, EVs have a fuel cost advantage for the vast majority of owners, depending on local electricity rates.
- *Word-of-Mouth* – Many EV owners purchased or leased their vehicle because they know someone else who has one. Once drivers see that they can live with their

---

[1] http://green.autoblog.com/2010/05/15/nissan-leaf-profitable-by-year-three-battery-cost-closer-to-18/

limited range, and experience the other advantages of EVs including low noise and vibration, lower maintenance cost, and peppy acceleration, they become EV converts.

- *Low Maintenance Costs* – BEVs have far fewer moving parts than ICE vehicles. They do not require oil changes, smog checks, belt replacements, maintenance of emissions control systems, etc. This advantage is particularly appealing as vehicles age.
- *Used Car Market* – as the earliest EVs come off their original 3-year leases, a market for pre-owned EVs will grow, making EVs available to a larger demographic of car buyers. The expected low maintenance cost of EVs relative to traditional gasoline vehicles will be particularly appealing in the pre-owned car market. These factors will tend to keep EVs on the road as they age, and in areas where there is good EV support, such as the Bay Area.

San Francisco Bay Area Estimates

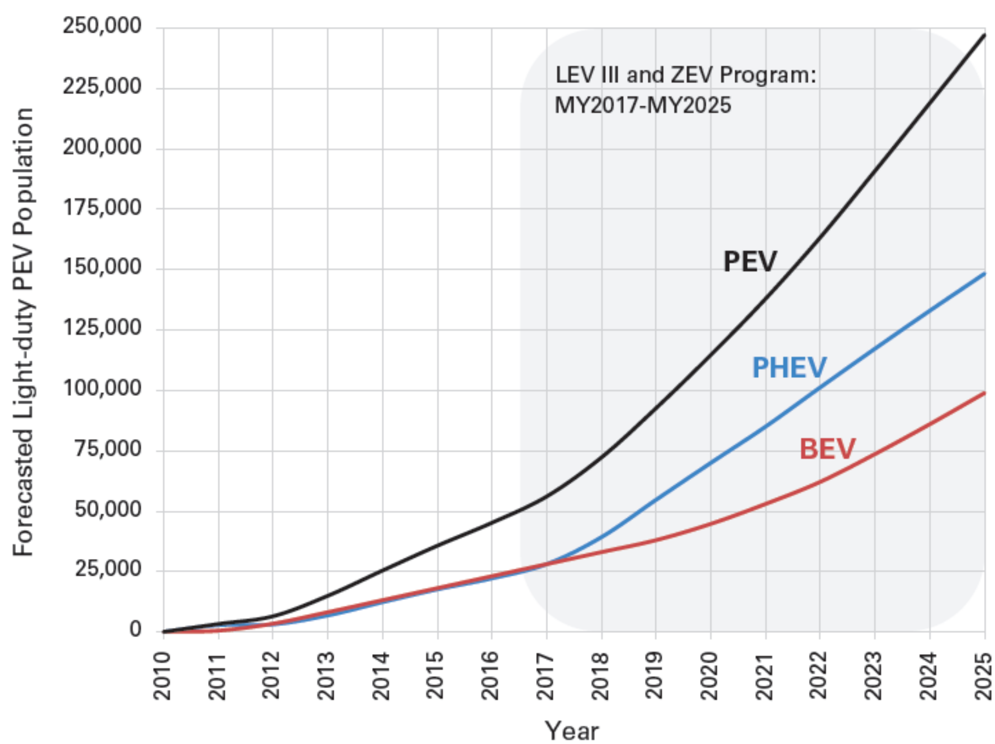

Figure 1 — Forecasted Baseline PHEV and BEV Populations (in the light-duty sector) for the Bay Area

Estimates prepared for the Bay Area Air Quality Management District show the number of EVs and required charging stations over the next 10 years. Figure 1 shows the forecasted number of EVs in the Bay Area over the next 10 years, while Table 1 shows the projected demand for Level 1 and Level 2 charging stations needed to support the forecasted EV population.

Year	Vehicle Forecasts		Estimated Demand for L1 and L2 EVSE			Estimated Demand for DCFC
			ICF Estimates		Estimates Using EPRI Method	
	PHEV	BEV	Low	Mid		
2015	17,600	18,100	7,900	14,200	4,370	75–150 DCFC stations at 35–50 locations
2020	70,000	44,700	13,960	30,960	16,730	
2025	148,000	98,900	20,790	45,190	35,550	

Table 1 — Estimated Publicly Available Level 1 and 2 Chargers Needed to Support Forecasted PEV Population

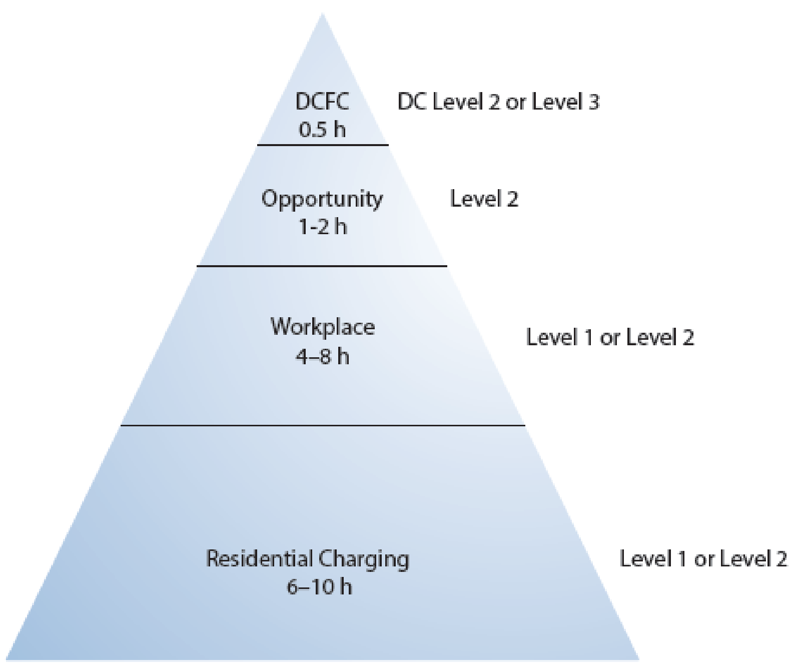

Figure 2 — Charging Triangle, By Charging Type and with Charging Level

Electric vehicle charging can be broken out into several categories, as depicted in Figure 2. As represented by the base of the triangle, most electric vehicle charging occurs at residences while vehicles are parked overnight. This may extend to regular overnight charging at public stations, if they are made available close to residences that do not have charging capability, particularly apartments and condominiums. The second most popular category of charging occurs at workplaces, where employees are generally parked long enough to receive a significant change, utilization rates are more consistent and predictable, and funding for providing such an employee benefit is likely to be available. Workplace charging allows for much longer all-electric commutes. The third category, Opportunity or DC Fast charging at public locations, makes up the least amount of overall vehicle charging, but is critically important to enable longer trips or multiple trips between overnight charges, to encourage BEVs over PHEVs, to cover drivers when trip distances are less predictable, and to generally reduce the need for families to own and maintain a fossil-fuel-powered vehicle in addition to their PEV.

Table 2 shows typical full-charging times for several popular EVs. Charge times can vary across different trims or model years, even within the same model. Late-model Nissan LEAFs (2013 and later), for example, can fully charge at Level 2 in about three hours, as can most current BEVs.

EVSE Type	Power Source	Estimated Time to Achieve a Full Charge			
		Toyota Prius Plug-in	Chevrolet Volt	Nissan LEAF	Tesla Model S
Level 1	Typical wall outlet (120V)	3:00	7:30	15:30	37:30
Level 2	Similar to household electric dryer outlet (240V)	1:20	3:10	6:30	16:00
DC Fast	Specialized power source	n/a	n/a	00:40	00:30

Table 2 — Power Sources and Estimated Charging Times for Different Types of Chargers

ChargePoint is the manufacturer and maintainer of perhaps the most popular network-linked public charging stations in the US. Their data shows that EV owners are increasingly willing to pay to charge their EVs. Figure 3 shows this trend over the first 2.5 years of EV adoption.

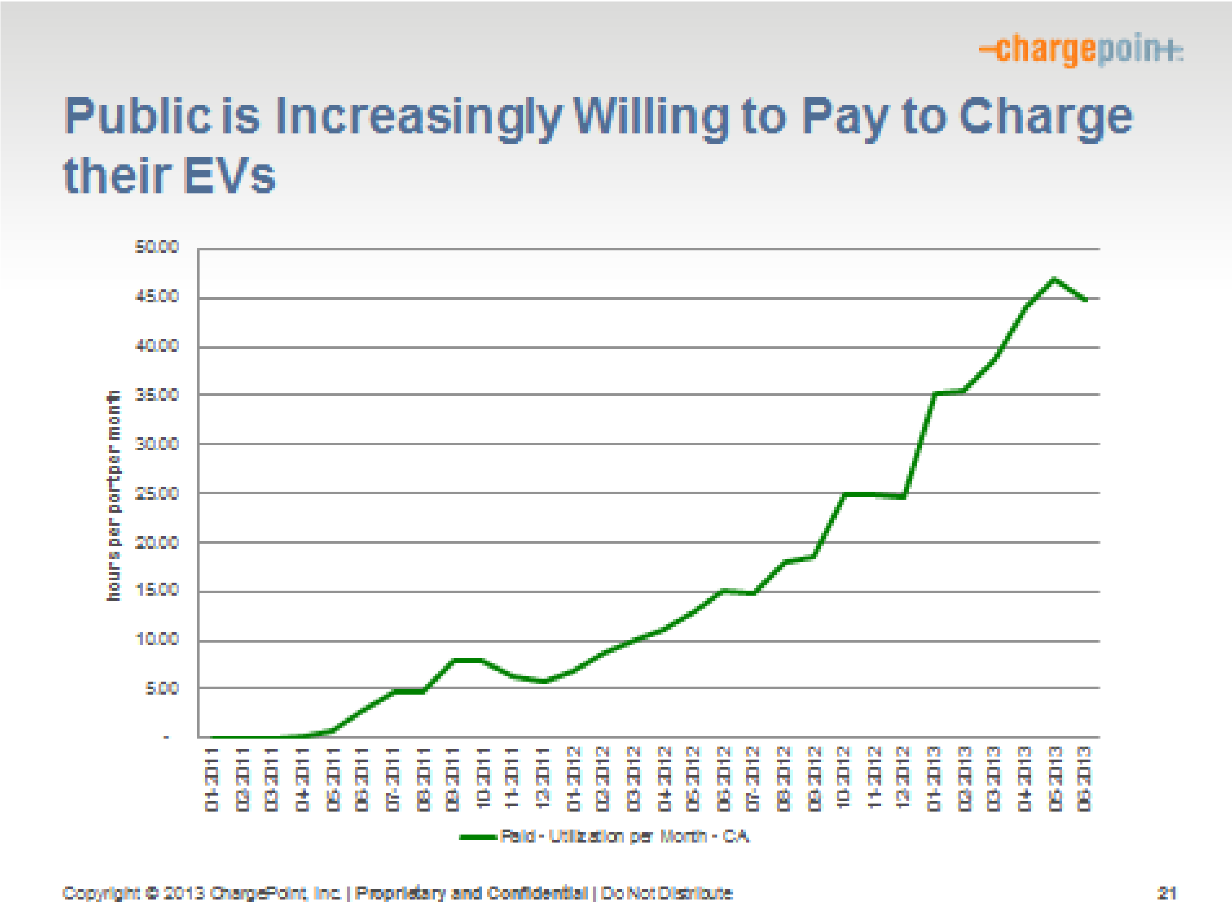

Figure 3 — Number of Paid EV Charging Hours, 2011-2013