Electric Highway Tasmania, Hobart EHT Fast Charger Network Project
LESSONS LEARNT REPORT 3

Project Details

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EXECUTIVE SUMMARY

Economies of scale or economies of opportunity? To achieve commercial viability, EV charging sites need to be cost effective. Depreciation of equipment and site development costs are a major part of the total cost of providing an EV fast charger. This paper discusses some alternate approaches to manage these costs to develop viable charging sites and proposes a strategy to combine the best of both approaches.

KEY LEARNINGS

Lesson learnt No.3: Getting the economics right where you can

Category: Commercial/Risk/Strategy

Objective: The objective of the Project is to address blackspots by improving the availability of public BEV Fast Charging Stations which will support BEV uptake by the public and businesses, including fleets.

Detail:
Electric Highway Tasmania (EHT) currently operate thirteen sites in Tasmania with sixteen under development and others under consideration. Our first sites have operated since August 2020.

EHT has had some experience with the process of developing new sites including the lead times associated with negotiating site agreements, selecting and sourcing suitable equipment and contracting with electrical and civil contractors for installation and commissioning.

To be viable, EHT must have sites that meet customers expectations about reliability, charging speed, amenity, location and cost. A significant part of the cost of delivering EV fast charging is in the capital investment to develop a site plus the cost of electricity delivered. The choice of site can have a dramatic effect on one or both of these costs. But it can also have follow-on implications if other aspects of site selection have not been given due weight.

Economies of opportunity

Some networks have sought sites with a low cost to develop as a principal strategy. This is widespread in New Zealand for example and apparent in the pattern of development in Japan and parts of China.

In Tasmania, a basic connection (100A 3P) can be obtained at a set, minimal cost from the distribution network to serve existing public parking spaces that currently lack a power supply to the site. In other cases, a willing site host with parking available may have up to 60A-100A readily available from existing capacity and a see an opportunity to attract business to their site.

Such sites may be developed with limited fast charging capacity, generally up to 75kW DC serving one or at most two bays.

Such sites may achieve quite low capital costs and moderate electricity costs. However, they may be constrained in meeting future expectations for higher charging power or more bays if power supply upgrade costs are high or if they are unable to expand because available parking capacity is limited.

Low cost to develop sites are often limited to being single charger sites. These can be relatively higher cost to maintain (per charger) and provide poorer user experience: if the single charger is occupied or out for service the user needs to search for another – hopefully – available, working charger nearby.

Some sites may be cheap to develop and expandable but poorly located or low amenity from the user's perspective. These are vulnerable to competition from a better placed, better amenity site opening in the same user catchment, leaving the 'cheap' site underused. There are already examples of unused or underused sites being dismantled overseas.

Low cost to develop sites can be developed with confidence if they also offer:

- A pathway for increasing power supply that is both adequate and cost competitive;
- Scope to increase the number of bays served as demand increases;
- A good level of amenity in terms of immediate environment and access to toilets, shelter, food and beverage, etc.

A low cost to develop site will also be an option if a superior site is expected to be available in the future. It can establish service to a community and meet EV travellers needs until such time as the better site – and increased demand – warrants development of the other site.

A low cost to develop site may be the only realistic option along infrequently travelled routes that have limited growth prospects and are not vulnerable to competition. Here provision of even limited charging may

be a better alternative to none. And if it is occupied, users will prefer waiting for a charge as a safer option than risking a flat battery on the way to the next – distant – charger.

Economies of scale

Larger sites with multiple charging bays that are appropriately matched to demand have several advantages:

- Users are more likely to find a free charger even during busy times, and if they must queue, chargers become available on shorter intervals than at smaller sites with fewer bays.
- A large site can offer a variety of charge connectors and power levels to better suit a range of EV types and charge rates.
- A larger site will have a larger public profile making it easier for users to discover and hence attract more users than smaller, less visible sites in the area.
- The capital cost per bay of civil and electrical supply works are generally lower.
- There may be lower costs per bay for communications, security, billing, insurance, etc.
- Maintenance costs per charger are lower, due in large part to less travel time.
- There are opportunities to share power across the varied charge events making better use of available power supply.
- Demand management across many simultaneous charge events can reduce the ratio of peak to average demand, lowering electricity costs where demand charges apply while being less noticeable to users than on small sites.

The challenge is to match scale to demand in appropriate steps. Developing a large site when there is not sufficient demand to support it increases the cost per user, resulting in accumulating larger losses until sufficient demand is established. If sites are established where general parking is in high demand, site hosts are understandably unwilling to allocate more parking bays than necessary for EV charging if they remain little used, perhaps for years. While low parking demand sites may offer spaces for EV charging, perhaps they are low demand for a reason and may be unattractive to users.

Ideally a site would start small but have a clear plan for growth to match expected future demand. Starting small allows deployment with less initial capital and allows a site to demonstrate the local level of demand and rate of demand growth. Initially low volume sites may be supplied from the low voltage grid and not be subject to demand charges. Demand charges are a potentially crippling cost if there is not a high enough average demand to support the peak delivered. Growing capacity with demand is a strategy to avoid demand chargers initially, then upgrading to medium voltage supply as the scale warrants it.

This proves challenging in several respects when the scale of that growth in terms of charging power delivered is at least ten fold, perhaps more:

- Electricity supply authorities have relatively long lead times to assess and respond to requests to upgrade capacity to a site. Each upgrade step involves site (re)assessment, quoting and planning lead times adding to costs and at times significant delays. There is currently not an easy pathway to pre-plan for power supply augmentation to a site over a 5-10 year in several development stages.
- Switchboard manufacturers are not accustomed to making designs that can accommodate a ten or twenty fold increases in stages. Breakers are available that can be varied in capacity but usually only by a factor of 2 or 3. This requires replacement of main breakers as the site grows, but the scale of bus bars and other elements must anticipate the future demand and would be well oversized for the initial demand. Some of this can be managed with modular design but a certain element of ‘waste’ is inevitable as early hardware is outgrown even with best efforts.

- The future upgrade pathway will be uncertain as charging technology develops. Chargers are now available that support more sophisticated dynamic allocation of power between bays, cooled cables, higher voltage (800V) vehicle charging and user features such as plug and charge that were not cost effectively available three to five years earlier. Future chargers may offer induction charging, more battery buffering/peak management options, etc that are currently technically proven but not offered by vendors or not yet cost effective to deploy. The specific site and electrical requirements for these often cannot be anticipated by charge point operators when laying out sites today.

There are potential downsides to larger scale sites, particularly if the capacity is established early, before demand is proven:

- If the site has been poorly chosen, a large-scale site may never reach a level of use that makes it viable, particularly if a better sited/equipped/amenity competitor opens in the same area.
- If a site is too large relative to the growth of demand over a reasonable timeframe, equipment may become aged or obsolete long before it reaches a significant level of use leading to financial losses.
- The site may lead to unrealistic expectations about availability of charging capacity and never having to queue. Alternatively, it may result in operators raising prices in an attempt to recover costs. Neither outcome is desirable in a balanced, mature charging network.

While the economies of scale increase with larger sites, they diminish per additional bay. Very large sites would be fewer and further between than smaller ones, reducing convenience and accessibility for users. The optimal scale very much depends on context, primarily recharging demand density and public charging energy demand per km along different routes.

In the Tasmanian context, our assessment is that there are unlikely to be many, if any, sites needing more than eight bays per site. Most of the user benefits diminish above this size and would come at the expense of fewer sites or less competition.

At very busy locations there may be two or even three providers offering up to eight bays providing ample capacity. It is likely to be more common that regional sites will have one site with three or four bays. Two bays would be considered a minimum for all sites *in the long term*, just to ensure a degree of redundancy for site reliability.

Management response:

EHT has chosen to use a combination of the two approaches. We seek economical sites, but without compromising on essential site characteristics. We will not develop sites just because they are ‘cheap’. For every site we attempt to ensure a growth path is available to enable growth to the long term expected scale suitable to the context, up to a maximum of eight bays. Our growth in capacity is calibrated on keeping queuing at a site to less than 5% (on average, over a year) acknowledging that at this level, demand on peak days will still result in significant queuing.

Implications for future projects:

EHT continues to work on strategies for flexible, expandable site designs that minimise hardware costs as sites double or triple the number of bays and quadruple power deliver in intervals of 2-4 years at each site.

Conclusion: Plan ahead.