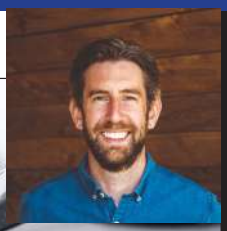
by Charles Sainsbury, Energy and Sustainability Manager at The Eden Project



EV charging infrastructure and operation – a destination perspective from The Eden Project

Background to Eden
Located in the far South West of England, The Eden Project in Cornwall is an iconic example of regeneration and nature recovery, which aims to build relationships between people and planet to demonstrate the power of working together for the benefit of all living things. Now more than 21 years old, the popular attraction is a living theatre of plants and people that welcomes almost 1m visitors a year to explore its mission through education, plants and nature, arts and culture, regenerative sustainability and communities.

Having generated £2.2 billion in economic impact, the organisation is now using its success to expand its mission to new audiences with further sites planned both in the UK and abroad.

Eden Project Cornwall
Being home to more than 300 full-time employees, our demonstrator site is proof that positive transformation is possible and that by working with nature, rather than against it, we can achieve great things. The site recovers two-thirds of its water demand for irrigation and toilet flushing from ground and rainwater sources, and is in the middle of delivering a ground-breaking deep geothermal energy plant that will provide a plenteous source of on-site renewable heat to be delivered directly to its Rainforest and Mediterranean Biomes.

The site's energy demand is managed with a highly specialised Building Management System and the organisation promotes a culture of energy and sustainability awareness through its teams and working practices.

Our commitment to being Climate Positive by 2030
Following 10 consecutive years of certification with Planet Mark and achieving consistent reductions in operational carbon, in 2021 we reaffirmed our response to planetary emergency by setting the ambitious commitment of becoming a climate positive organisation by 2030 as part of the United Nations Race to Zero campaign. The level of our ambition in our pathway seeks to not only rapidly reduce all emissions across scopes 1, 2 and 3 but crucially, go beyond net zero to a point where we store away more carbon than we emit.

Our approach is centred around nature recovery – we see the biodiversity and climate crises as being part of the same wider problem rather than separate issues. Ultimately our approach to going beyond net zero seeks to demonstrate the possible to our audiences and inspire them to make changes in their own lives.

The challenge and opportunity
Having calculated our extended scope 3 emissions footprint through a detailed study with Planet Mark (these account for 75 per cent of total emissions), it was clear that tackling emissions from visitor travel would be a key area of focus in delivering our decarbonisation pathway. Despite being served by a regular bus route with onwards connections to St Austell railway station, the rural location of our site

makes for challenging use of public transport (which was especially highlighted during the coronavirus pandemic) and means 95 per cent of our visitors arrive by private car. Despite these challenges, the scale of the opportunity to develop our site into a regional sustainable transport hub that supports rapidly increased demand for electric vehicles (EV) and public transport is significant.

The benefits and case for electrification

To seize the opportunity, we rapidly needed to increase our on-site capacity for EV charging and upgrade the electrical infrastructure needed to support a new EV charging service. As a destination location, our use case for EV charging is somewhat atypical compared with a convenience location and needed to satisfy a number of different users.

As well as improved charging facilities for visitors, creating an incentive for greater take up of staff personal vehicles (we offer a salary sacrifice scheme via Octopus EV) was important. Whilst expensive, investing in our site's electrical infrastructure would also create opportunities for additional revenue streams as well as facilitate future connections to energy generation sources (such as solar canopies) and battery storage. Finally, introducing better charging facilities for our fleet of electric vehicles would also support improved logistics across site with a lower environmental impact from operations.

Transforming our infrastructure

Arguably the largest hurdle to delivering the EV charging hub was completing the required infrastructure upgrades. An in-depth electrical study concluded that to meet future demands for electrification of transport and heat as part of the site masterplan, an increase in grid capacity of 2 Megavolt-amperes (MVA) could be needed within five years' time.

Following an initial request for an additional grid connection with Western Power Distribution, it quickly became apparent that relying on further reinforced grid import connections would quickly become insufficient. In fact, by engaging with the distribution network operator (DNO) early on, we were able to settle on a suitable network design quickly which, rather than relying on an external grid connection, would be predicated on developing our own private high voltage (HV) network in order to support our goal of achieving energy autonomy in the future. Delivering the EV hub was therefore phase one of expanding our private HV network, with the intention that it would incorporate further strategic power hubs over time as demand requires.

Following an eight-week design and due diligence exercise, we completed the installation of a new 1 MVA substation within 12 weeks which now provides power to 10 x 22kw dual alternating current (AC) dwell time appropriate chargers spread across 20 dedicated, well-spaced EV charging bays.

Market evaluation – choosing the right commercial approach

From our market evaluation, it quickly became clear that there was no 'one size fits all' approach when contracting for an EV charging service. In fact, the reality emerged to be far from it! In a rapidly expanding market with regular new entrants, for us, it came down to a trade-off between being able to retain operational control of our hub versus the level of capital investment we could stretch to.

The three options we considered were broadly as described in the table below. In the end, we settled on option 3 – a hybrid option that allowed us to contract for a fully subcontracted operational and maintenance service but still retain control of rights and revenue for the hub. It also didn't require us to resource operations and maintenance support ourselves – we had to be realistic about our level of expertise in the EV market!

	1 Self-finance, own & operate	2 Outsource and lease to CPO	3 Hybrid model (EV charging as a service)
Pros	Retain full control and rights	Minimal capital outlay	Minimal capital outlay
	No requirement to lease	Outsourced O&M to experts	Control over appointed CPO
	No financial liabilities		Retain revenue and rights
Cons	Capital outlay	Loss of operational control	Ongoing repayments
	Responsibility for O&M	Potential loss of revenue	Ongoing service fees
		Lengthy lease term	

Table: Choosing the right commercial approach options

Although the EV as a service model results in ongoing service and maintenance fees, these are largely offset by the revenue generated from the charging tariff payments. Crucially, our chosen approach keeps our options open for future service development in what is a rapidly evolving market.

EV charging hub in numbers

The EV hub went live in early August 2022, just in time for peak season, and was immediately welcomed by our visitors, delivering 26 charging sessions on the first day and receiving positive feedback on Zap Map since. Our highlights from August and September 2022 data include:

- Charging sessions delivered – 652
- Energy delivered – 15,704 kWh
- Avg. charge time – 3.5 hours
- Avg. energy per charge – 25 kWh
- Emissions avoided 1.3 t/CO2e

Key considerations – lessons learned so far

We are still learning as we go, refining and evolving our EV service as required, but some of the key lessons we have learnt so far are as follows:

- **Signage and pre-visitor comms** – keep it simple and clear – we want our visitors to enjoy a stress-free stay with us.
- **Etiquette and overstay policies** – think carefully about the behaviours you want to encourage and be prepared to adapt and change your approach when needed.
- **Consider user policies for staff** – we implemented a short policy to ensure fair and responsible use of charging facilities for all staff and fleet users, again making the sort of behaviour we want to encourage clear from the start.
- **Keep improving user experience** – we are still listening, reviewing and adapting!
- **Technical design** – don't underestimate the practical considerations – an EV hub without sufficient spacing between bays is unlikely to meet accessibility requirements and might not be suitable from a fire and health and safety perspective.

Future plans – what's next?

The first phase of our electrical infrastructure expansion has successfully enabled demand for EV charging to be met and provided the platform for future growth as demand builds over time, as we anticipate it will. We are fine-tuning our user experience as much as possible and keeping a close eye on emerging EV usage trends with a view to being able to capitalise on these within our service offering.

We realise it won't be long before demand for charging outstrips our current capacity and by future-proofing the design of our electrical infrastructure, it may be that we can soon provide a rapid, convenience-style charging solution support with direct current (DC) chargers for both our visitors and regional transport providers alike.

Author's profile:

Charles Sainsbury is Energy and Sustainability Manager for The Eden Project, responsible for delivering its regenerative sustainability approach both at Eden Project Cornwall and in the design and construction of future Eden Projects. Charles is an Energy Savings Opportunity Scheme (ESOS) lead assessor, accredited with the Energy Managers Association (EMA).