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There are companies that scale too quickly and too early in a developing marketplace: Alex Hearn, CEO and Co-Founder of Lightstate Ltd.

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Alex Hearn, CEO and Co-Founder of Lightstate Ltd., an upcoming EV charging infrastructure company in the UK, spoke to S&P Global Mobility Senior Research Analyst Amit Panday on a range of topics, including the roll out of ultra-fast EV charging hubs at a time when large global CPOs are struggling to make money in the business, path to break-even and the tipping point in EV adoption in the UK, government support, need for innovative solutions in EV charging space, cautious expansion and fundraising strategy, among other plans. Edited excerpts from the interview:

S&P Global Mobility: Please tell us about the origins of Lightstate. How did it come into being? Is it the opportunity size that pulled you?

Alex Hearn: The purpose starts with passion rather than financial motivation. The origin of Lightstate lies in the idea to help tackle climate change and the path to net-zero emissions. We have seen rapid decarbonization in power generation around the world. However, we are still emitting about 14.9 billion metric tons of carbon a year, and transportation is the second-largest industry that generates carbon emissions. That is a much more intractable problem because it is a multipolar world with billions of consumers. There are multiple sources of power generation; so, it is a multifaceted problem.

So that is a DNA of Lightstate. We want to contribute to eliminating greenhouse gas (GHG) emissions by 2050.

We have a significant segment to focus on - electrification of road vehicles. Here, we have a particular niche, where we develop ultra-rapid electric vehicle (EV) charging hubs. It's a very capital-intensive area. Then there is a sub-segment of that, where I think we are the pioneers in self-generation of energy within an ultra-rapid EV charging station. We call it a smart energy hub.

These smart charging hubs generate a lot of power through sophisticated solar architecture, heavy onsite battery, and the ability to operate where grid connections are limited. We may move into no-grid connections at some stage in the future, but we are on low-grid connections at the moment. This is a particular niche that we operate in, and it is on the edge of the distribution network.

By utilizing a different approach, we like to reimagine EV infrastructure with these new architectures. It has a particular purpose within this market as it complements all the other existing charge point operators (CPOs) and the great work that they are doing. But it remains a huge problem to address.

So currently Lightstate's ultrafast charging hub draws 100% renewable energy? Is drawing sustainable energy a challenge currently?

Yes, it is entirely renewable energy sourced. Depending on where you are in the world, the grid mix is a serious problem for EV charging infrastructure, because what is the point if the grid is running on coal? We are lucky to be in the UK where there has been a substantial decarbonization of the power grid already. We can source relatively cheap, reliable, 100% renewable energy. However, the pace of adoption of renewable energy has to always be ahead of the pace of vehicle electrification.

In the interim period, we see a real gap in energy sustainability, which is the self-generation of

energy. This made it through our architecture using our battery trading systems. We are generating a substantial amount of onsite energy, and also storing a substantial amount of onsite energy, mainly through renewable energy that is lost through the system. This is in addition to sourcing locally generated renewable energy and the option of a limited 100% renewable energy grid connection. But in the total [energy] mix at the moment, in most locations that we are building EV charging hubs into, we will have a low-grid connection that is 100% renewable.

I think when we accelerate our scale, we will probably move into areas where there is no available grid infrastructure, and that would be a different architecture from what we are using at the moment. It's exciting because then you are fully independent as a [charging] hub but that is equally hard to do. It is not possible just yet but we have plans to reach there.

Can you tell us where you source the storage batteries and EV charging equipment from?

We are generally supplier agnostic. We look to source from tier-one suppliers, generally bankable assets. There are a variety of very good producers around the world. We do not make the EV charging equipment ourselves, but we do develop the software that sits on top of these [EV] chargers in some circumstances and the machine learning that governs the management system of the architecture. So, this is the energy generation, the battery storage, the chargers, and the grid connection, which all work together like a relatively sophisticated brain that runs on a predictive machine learning algorithm.

The EV charging business, particularly setting up direct current or DC fast chargers, is capital-intensive and immensely dependent on government support. There are big players in this space that struggle to make profits. How do you plan to steer through the tough market situation where EV sales are declining globally?

I do not think this is a bad market, I think the market will have various bumps on the road. But ultimately, we will live in a world with electric mobility. I think we are seeing players come in and out of the market. Timing potentially has not been on their side.

The government does have a very strong part to play. If you look back at any serious renewable energy adoption, there has always been government's pull and it still exists in most countries around the world. In the UK, I imagine, there will be more incentives that will come through.

We have seen large incentives with the US Inflation Reduction Act and the Europeans are starting to move as well. There are always companies that scale too quickly and too early in a [developing] marketplace.

If you look at the fundamental economics in the UK, passenger car drivers spend about £700 million a week on fuel, which equals to a £42 billion market. That market is going to materially change, almost inverting from where it is today - 2.7% of fuel is battery fuel, essentially EV charging, while the vast majority is petrol and diesel.

So, what is the composition going to be in 2050? It is probably going to be the opposite. We have to prepare for the long road, and we have to have very solid capital efficiencies and be careful not to scale too quickly too early. It is also a huge benefit to have the government behind you.

What we have seen in the UK is the push that essentially is in the form of quotas and regulatory bans. That is one way of doing it and trying to stimulate private investment in the market. The other way normally is a tax-based approach, which the USA is doing at the moment. Both these approaches have merits and demerits.

How do you deal with the pressure from investors as they do not like businesses burning cash for a long period of time? Moreover, the UK pushed the ban on new combustion engine cars by five years to 2035. That is not good news for a cash burning business. How do you process that?

Such changes in regulatory position are very damaging. Companies such as Lightstate need certainty. Moving regulatory bans [on internal combustion engine or ICE cars] back and forth is not good for anyone. It is certainly not good for investors because it creates uncertainty.

Now, we have gotten past that. There is a big question in the UK on whether the 2035 ban will be moved forward. We look at several different sensitivities that come out of the UK, for instance, the national grid's future energy scenarios. So, we analyze what would be the four likely outcomes of customer adoption of EVs, fleets and industry. Then we normally sensitize the lowest case to evaluate what happens.

There is another interesting graph of the law of diffusion of innovation, which is very relevant to this area. If you look at the adoption of new technologies, it is a bell curve, where we have four or five distinct profiles. At the moment, we are among the early adopters, and normally they are about 3% to 6% of the overall market. For the market to get to a tipping point as per the law of diffusion of innovation, we need to be at around 16% to 18% of the overall market before that early majority turns into a mass majority.

We have a very steep climb from where most countries are now. The UK, which is no different to so many of the other countries on this, needs to move from about 3% of EV adopters to about 16% of the market, then we will be at some tipping point, and then things will change.

If you look at it from a mass market position, suddenly it is just too big of a problem to tackle. So, these small, incremental parts are very, very helpful. The government needs to really work with the companies to incentivize this next leg. When the governments withdraw support too early as soon as they see growth trajectories, it can push back the markets quite considerably. The government's support needs to remain beyond early adopters and into the early majority.

The two big drivers in the UK are the quota enforcement that comes in. There is a steadily rising quota for EV sales every year, leading up to a complete ban [on new ICE cars] in 2035. I would say there is a path to an early majority [on battery electric vehicles or BEVs on the road] by the early 2030s in the UK. So, we base our own capital stack and look at future capital efficiencies on a seven-year cycle. You cannot really look at them much more than that; three-to-five-year cycles are just too short.

Several governments around the world are gradually pulling back subsidies from EV sales but are incentivizing expansion of EV charging networks. How do you assess that?

I think there is a dependency in the market between EV infrastructure and EV sales. If EV sales outnumber the EV infrastructure rollout, customers suffer. If EV infrastructure expansion outpaces EV sales, the CPOs suffer. Ideally, there should be broad support for both over a suitable period.

I have had several conversations about this as well. The government incentivization of the CPOs is also a double-edged sword because you want innovation in the space. And the way innovation works generally is that companies compete and find a competitive edge. So, if you're blanketing CPOs with heavy subsidies, you get this law of averages and a lack of innovation because everyone's doing the same thing.

You said Lightstate is very careful in rolling out its ultra-fast charging hubs in the UK. How many do you have currently in the UK? Do you plan to expand your EV charging footprint beyond the UK? How do you select a suitable site for installing such charging hubs?

Let's start with sourcing first. We generally run demand modelling in-house, which essentially is a mixture of artificial intelligence (AI), machine learning and human insight.

We look at pattern recognition, essentially around the UK, with several different data layers on top. This might be available grid connection or distribution, network coverage, road connectivity or lack of available infrastructure – we call them CIGs or critical infrastructure gaps. On top of that, we look at local demographics, EV ownership and mobile data. So, with all these, we try to develop a broad picture of which areas are underserved, and where our kind of product offering would fit best.

This is the sort of approach we take, and it can get sophisticated in terms of rollout. We generally operate on a cautious scale-up model. We are in the process of setting up three [battery-integrated fast charging hubs] this year. We have to go through local planning processes to ensure they are right for the area, community, and local authority. We are aiming for five next year, depending on the EV uptake. We plan to have a run rate of setting up five EV charging hubs every year in the UK. For other markets which we are exploring, including the US, Europe and the Middle East, we may operate on a franchise model. But we have not decided anything on this yet.

Lightstate's ultra-fast EV charging hub in the UK. Source: Lightstate Ltd.

On average, how many EV chargers do you install at one EV charging hub? Do you focus only on electric cars or also electric vans and other light-duty commercial vehicles?

Our charging hubs can serve electric cars, vans and light-duty commercial vehicles. The only restriction at the moment is heavy goods vehicles (HGVs). But we may look at that in the future. We are looking at all sorts of community vehicles such as police vehicles, fire, ambulances, in addition to the consumer passenger vehicles once we have the infrastructure.

On EV chargers at our hub, we have a modular approach. We fit the architecture as per the demand

of the particular location. It can vary from 8 to 36 EV rapid chargers per charging hub. We focus on providing a smooth customer experience, which means a very frictionless throughput. That also helps utilization for us.

What is the average utilization rate for your EV charging hub(s) currently?

The average simulation is wide because the voltage architecture of the cars is wide itself. So, if you have an electric Mini and an electric Porsche Taycan, both cars cannot use the same EV charger. So, we are expecting that over the next few years once the [high voltage] architecture catches up, we may see an average utilization charge time of 25 minutes coming down to 10 minutes or less.

We aim for it to be six minutes; hence, we are looking to provide 100 miles in 6 minutes of charging time. That will incentivize the right kind of consumer behaviour [to charge EVs at public charging hubs], not encouraging charging from 80% to 100% of the battery for example, which at this phase in the market is not what we need to be doing.

Europe's Fit for 55 mandate requires EV charging infrastructure at every 60 kms on the highways for electric cars. What are the biggest roadblocks, in your view, when it comes to executing that plan?

Lack of available grid connection is the number one problem. If you look at the number likely to be required by 2050 in the UK alone, it is about 65 terawatt hours. We currently consume about 300 terawatt hours in total. So, it is a significant component of the total energy system. It is not just a few wires on the edge of the grid, it is almost a whole new grid to get to these levels of energy.

This is why we need innovation in this area because if you lay down just cables, substations, and high-voltage lines, it is going to take a very long time and be very expensive. While that has to be a part of the picture, other solutions can complement the key infrastructure.

If you try to understand how Europe's arterial road network and power distribution grids were built in the past, you will realize they catered to very different needs. So, electrifying remote motorway areas will always be an incredible challenge. I think the UK has done a decent job in trying to tackle some of that problem, but there still are gaps where it is very difficult.

Now, we have over a million EVs on the road in the UK. We have data behind travelling trips, most of them are base-to-base because the users do not have the confidence to drive their EVs too far. This is the early adopter's market. I believe we need a more frequent EV charging stations, which is not necessarily as heavy as a motorway service station which generally has a very large footprint and can serve a large footfall. A more modular approach can help where we have more of these EV charging stations but smaller.

Some CPOs claim that they can offer EV charging services without having to depend on the power grid. How easy or difficult that proposition is especially in areas with lack of grid availability?

Yes, EV charging stations can be set up without any grid dependency. We have two candidates at the moment for a no-grid set-up. But it is not without its challenges. You have to look at a different energy-sourcing mix. It will have a different capital appreciation profile and a different capital efficiency profile among other factors.

Generally speaking, a no-grid solution is going to be more remote. Currently, there is a lack of available demand and the EV population to support the capital economics of that. But it will

certainly happen. At the moment, there is not enough power coming out of the grid, and so there are charging sites that need supplementation from local and on-site generation.

How important is the concept of destination charging?

What we're seeing in our data is that destination charging is less appealing than maybe originally thought. Many CPOs thought it was going to be the number one of two use cases. This can change over time, but it is not what we can see in our data at the moment.

Can you tell us more about the different revenue streams of Lightstate, and where does EV charging stand in that?

The EV charging business is a significant component of our overall revenues. For us, having the lowest levelized cost of energy is very important. There are ancillary services. So, in some areas, we have export licenses, and we provide grid balancing services. The real focus is to get the energy balance right. Energy is volatile as we have seen over the past few years, and to stay on the course over 20 to 30 years, you need to be in control of your energy systems. Our focus area and charging software enable us to do that. It involves machine learning and some of the new AI tools. They are helping us become not quite energy traders ourselves, but when we start to operate, it will be a bit further than a normal CPO.

Can you give us a sense on your fundraising? Are you looking to raise funds as we speak?

We are just about to start [raising funds under] Series A. We are in the process of completing pre-series A and we have raised several rounds to get to this stage. We are looking to raise a total of £85 million, with £20 million in our Series A, with a mix of equity and debt. When Series B happens, we will fully capitalize the company for the UK rollout. The plan is to use the Series A funds to build out the next three EV charging hubs. After that, [we plan to] use the Series B funds to build out the next 30 EV charging hubs, which is our target by 2032. However, these strategies can change as we are constantly renewing them to suit the rapidly changing market dynamics.

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