

Sundeep Singh

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As part of a project with Western Power Distribution, BRUSH has developed an innovative plug-and-play substation solution that is a unique offering on the marketplace with many applications.

Pablo Castaño



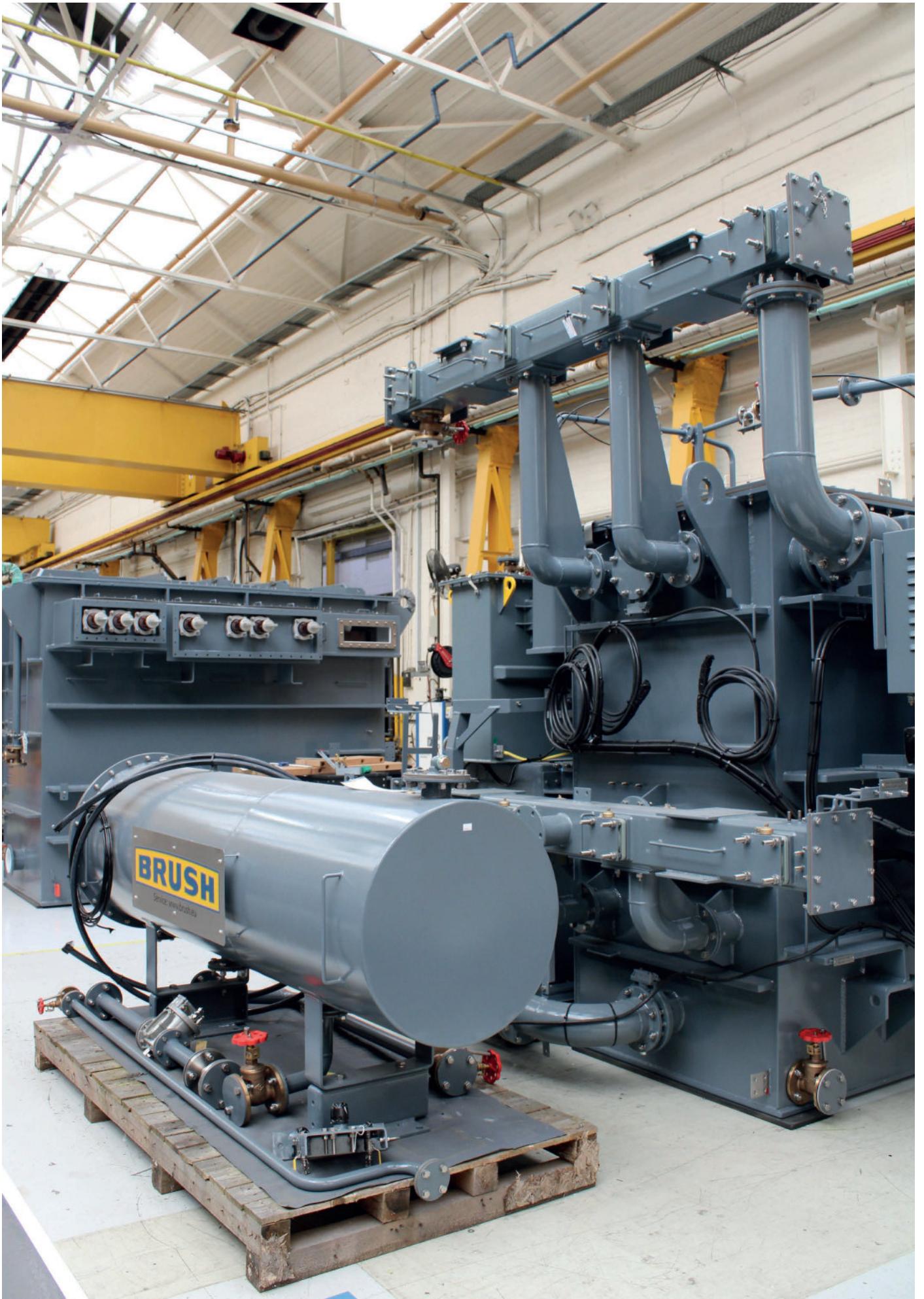
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and **Sundeep Singh**
Product Manager for Switchgear at BRUSH

Interview with **Pablo Castaño**
Product Manager for Transformers at BRUSH

BRUSH
TRANSFORMERS



In this interview we hosted Pablo Castaño, Product Manager for Transformers, and Sundeep Singh, Product Manager for Switchgear from BRUSH, a power transformer manufacturer and service provider that has been around for over a hundred years. But our guests are talking about the future and a unique new offering that BRUSH is bringing out, which we happen to think is going to change the landscape.

Alan Ross: The new solution that we mentioned in the introduction is heavily needed. But before we go into what that product offering is and what it means to the marketplace, let me first say thank you for joining me, Pablo and Sundeep.

Pablo Castano: Thank you, Alan.

Sundeep Singh: It's great to be here.

AR BRUSH is a company that has been around a long time in this industry, and it was named after a man called Brush. A lot of people in the industry are not aware of this and they think a brush is some sort of component in an electrical system. Pablo, could you tell us a little bit about the history of the company?

PC The company was founded 146 years ago by Charles Francis Brush. He came over from your side of the Atlantic, and he purchased the site from an old carriage company and started setting up with generators and motors and eventually moving to switchgear, transformers, and so on.

AR 146 years create a pedigree. What are some of the values that BRUSH company brings to the marketplace?

SS The most important thing we offer is quality. Quality of product is at par compared to anybody else in the market. Another example is that we found a BRUSH transformer which was installed in 1938 and is still working, still providing electricity to the site in Nottingham. So, you can imagine that the kind of products we offer are built to last

and they last for, I won't say forever, but for a very long time.

AR 1938? That's one of the older transformers. What size is it?

PC It's a small 750 kVA distribution transformer, but it's 90 years old.

AR That is a true testament to quality. It's also a testament to great engineering. We believe that you have to engineer quality and that reliability happens by design. You have to design reliability into a product. I would like to talk about the products that you have developed. But before we go into the mobile substations that you've developed, I want to ask a question. What is the problem in the industry that you are trying to solve?

SS One is that the industry is trying to move towards net zero which includes the automotive sector. Secondly, the UK government has announced that after 2030, there won't be any new petrol or diesel engine cars on the market. This means the market needs to move quickly to an alternate source of power. And right now, electric vehicles are the most preferred option and they are the ones that are booming in the market. This in turn brings a lot of challenges for the power distribution industry because the grid is not designed to provide that much power. If we are talking about the concept of charging, let's say there are 200 cars on a toll station at a time, that is the same amount of power needed for a small town. In order to make that possible, a lot of investment and infrastructure upgrading are required and that's where we come into the picture by designing a product that can feed that demand.

Electric vehicles are booming in the market, which brings a lot of challenges for the power distribution industry because the grid is not designed to provide that much power. If there are 200 cars charging on a toll station at a time, that is the same amount of power needed for a small town.

The challenge was to design a product that is a plug-and-play solution that can be quickly installed. We created an innovative containerized solution that we can put on the back of our trailer and mobilize it, and within a couple of days it's up and running on the site.

AR I was reading about challenges that the utilities in the United States along the coast where we get hurricanes face. The last two major hurricanes in New Orleans completely knocked their power out. Trying to get the substations back up and running after such a catastrophe is a process that takes weeks, not days. So, the need for mobile substations when you have a weather event is enormous. Purchasing mobile substations for backup, resiliency and reliability for the network is another reason. So, we have the growth of EV, and we have weather events that are causing a need for a lot of change. Is there anything you would like to add to that?

SS Another challenge that utilities face, especially in the coastal area, is that during the holiday season they suddenly get a lot of tourists and if everybody needs to charge their car, there won't be enough power available. So that would be an alternate or additional requirement for a mobile substation to cater for the demand during the peak season which could be two, three or five months, depending on the weather and season.

AR In California, for example, there is a scramble because the state has been very aggressive in terms of what percentage of the cars being sold will be EVs. California has been the most forceful about it in the United States and as a result of that, they are going to have to develop new infrastructure to keep up. And what you at BRUSH are building is infrastructure. Right now in the United States, I think we are spending 4.3 billion dollars every year for the next ten years to build infrastructure in the grid, which is something we've never done on a national scale before.

Let me move on to the product itself. Obviously, it took time to develop it, and I believe the reliability starts with design. Could you talk a little bit about the product development process?

SS The challenge was to design a product that is a kind of plug-and-play solution that can be quickly installed. If you go with a traditional design, it could take up to six to eight weeks or maybe longer to install a substation, subject to planning, approval and all other permissions and products are available. So, the challenge was to design something which can be used quickly. That was our starting point. Then WPD, engineers and BRUSH designers worked together to create an innovative containerized solution.

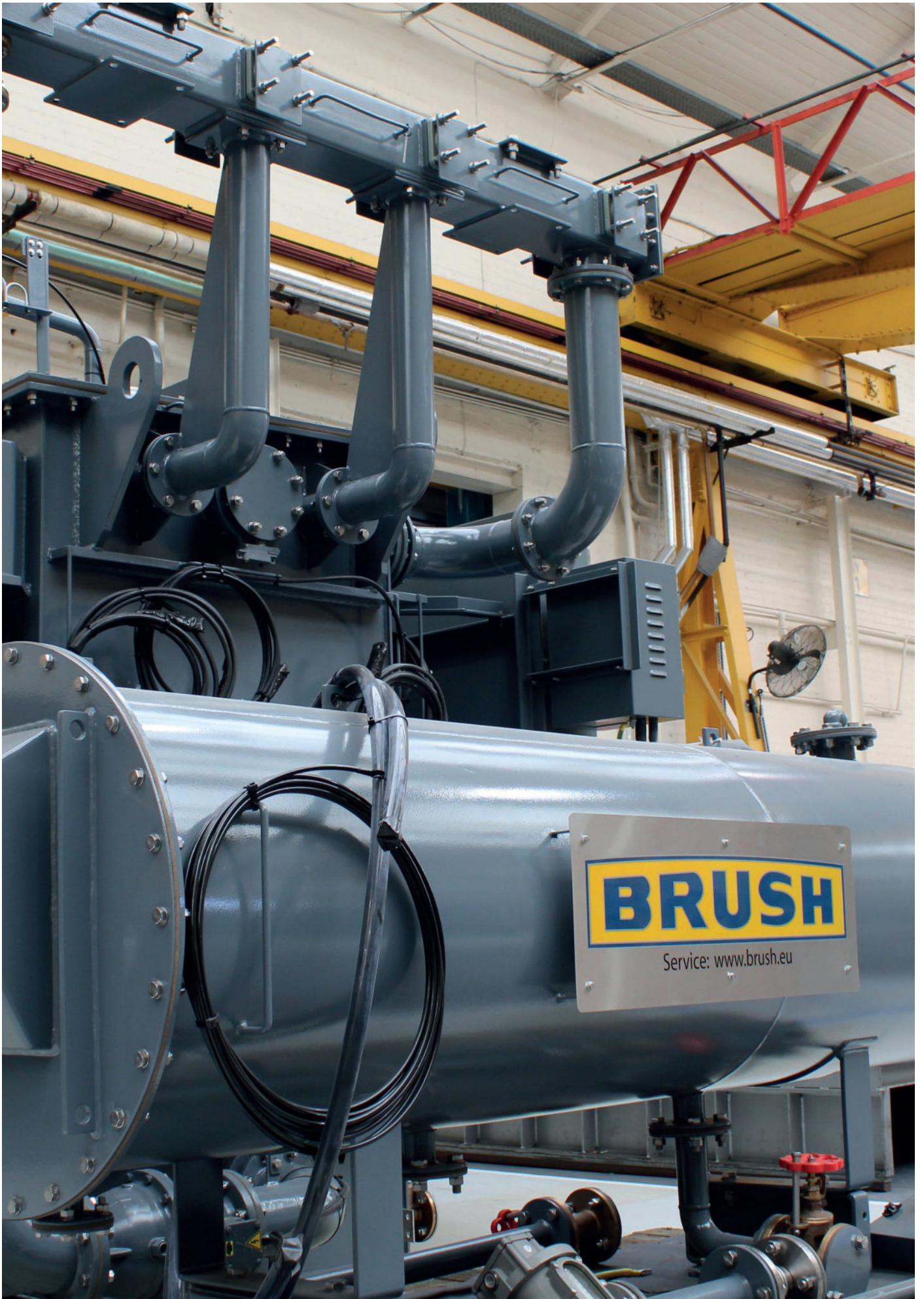
We put that box on the back of our trailer and mobilize it, and within a couple of days it's up and running on the site.

AR I love plug-and-play. Drive it up, plug it in, and film at eleven, as we say here. Pablo. I know you are doing a project with Western Power Distribution in the UK. Could you talk about how the parameters of that project were designed, the timing and what you expect to happen?

PC The project came via Western Power Distribution, one of the utility DNOs here in the UK, or, to be more precise, it came through the market regulator for the UK, Ofgem. They have what they call the Network Innovation Allowance, which allows for the production of novel designs, new approaches to new problems, or new challenges. And this EV charging project on motorway services was an ideal candidate for that application. The project was registered in mid-2020 and we delivered the substation to the first site, which is in the southwest of England, in Exeter, to one of the motorway services about three weeks ago. The project is not concluded, but it was executed already. The next step will be gathering feedback from Western Power and from Ofgem. In terms of the solution, it is a good fit-for-purpose solution as well as being economical, efficient, and cost-effective. I really do believe we checked every box.

We just delivered the substation to the first site as part of the EV charging project on motorway services. In terms of the solution, this substation is a good fit-for-purpose solution as well as being economical, efficient, and cost-effective.





AR So, you created a solution, and now you are implementing the solution with them to test it. When does it go to scale? When do you expect BRUSH to suddenly go to scale in that area and maybe scale in the UK and in the US?

PC Well, it should be soon. The reason for that bold statement is that if we put into perspective the ambition of the plans of the government to effectively ban the sale of the internal combustion engine in less than eight years, the transformation required on the infrastructure has to be dramatic. It has to be radical even. In order to do that, adding and implementing this sort of solution has to be really quick. There are already so many issues.

AR I have a feeling that a company that is 149 years old has probably figured out a way to scale to get it to what it needs to be.

PC Oh, there is no problem with the scale we have got already. Currently, the solution goes from seven MVA to 20 MVA. However, making it even bigger, up to 40 MVA with the transformer is absolutely no issue. And the limitation in terms of available technologies has to do with the maximum available current for the switchgear. I believe the limit sits in around 45 MVA equivalent, which produces around 4,000 amps in terms of maximum amperage. So, scaling up to that size is no problem because it's just making the transformer bigger effectively and we can do that.

AR Are there challenges to this scale-up? What are they? Because going from 2 MVA to 40 MVA is a pretty broad range.

SS That's the scaling up of the capacity. But if you are talking about scaling up the volume of the business compared to us, a small country, we have approximately 4,800 motorway petrol stations. And literally, at some point in time, each and every station would need a solution like this to charge electric vehicles. So, we see that the demand will grow and will grow very quickly. As Pablo mentioned, by 2030 internal combustion engine vehicles will be limited and electric vehicles will begin to dominate. That means that in the next three to five years' time, I would say it is going to be a good problem to have, but yes, we would be struggling to keep up with that amount.

AR Why did you go for a mobile solution when it's a permanent solution that you need?

PC It's more to do with the compactness and quick deployment. Usually when you have what we call a primary substation, it takes a lot of paperwork and permissions and complications around the land, and the amount of available space is very limited. Next to a motorway with this type of solution, you get both sides of the switchgear into one compact container and then again optimize and reduce the footprint of the transformer. With the plug-and-play principle, you can simply drop the substation in there and walk away. This makes it simple and cost-effective.

SS Another advantage, as you mentioned Alan, is the bad weather factor. If a substation is damaged because of the weather, a lightning strike, or similar, the repair could take a long time. So, with this solution, if anything were to happen to it that was beyond repair or would take a very long time to repair, you can just take the container out, put the new one in and the lights are on again.

AR Incredible. I think you have developed an amazing solution. There are going to be other applications, for instance, cities where you can't get a substation in. You are going to need something smaller, easier to get in. I never thought about the idea that for damaged or aging equipment you need a replacement sometimes. Right now, the standard for some of the lead times has gone up to five years for transformers. How are you going to meet demand considering the supply chain and the labor issues we are all facing? Because I think you're going to be very successful with this product.

PC I hope we will be able to. We have plenty of capacity on the site if need be and plan to increase it as well.

AR This is going to be fascinating because I know that there's so much change going on in the marketplace right now and we need new solutions.

We will follow your projects and get updates to see how things are going. I want to thank you both for joining us.

Plug-and-play mobile substation is a solution that can be applied at EV charging stations, used as a backup for a damaged substation after a catastrophic weather event, used to create a more reliable power supply in tourist areas, and in city environments that require small and compact solutions.