Seamus Allan

LV & Distributed Monitoring Product Manager at Dynamic Ratings

Interview with **Seamus Allan**

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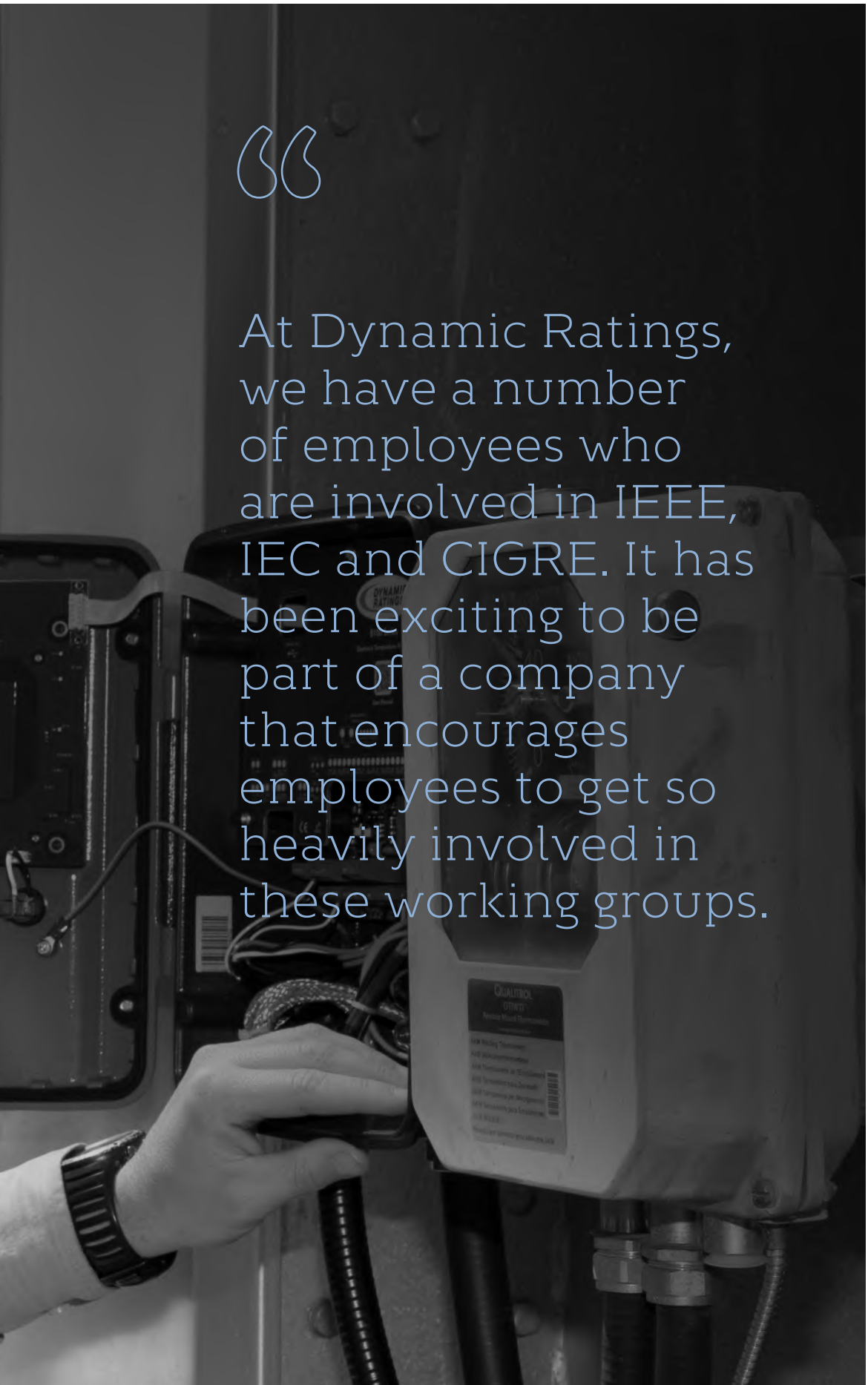

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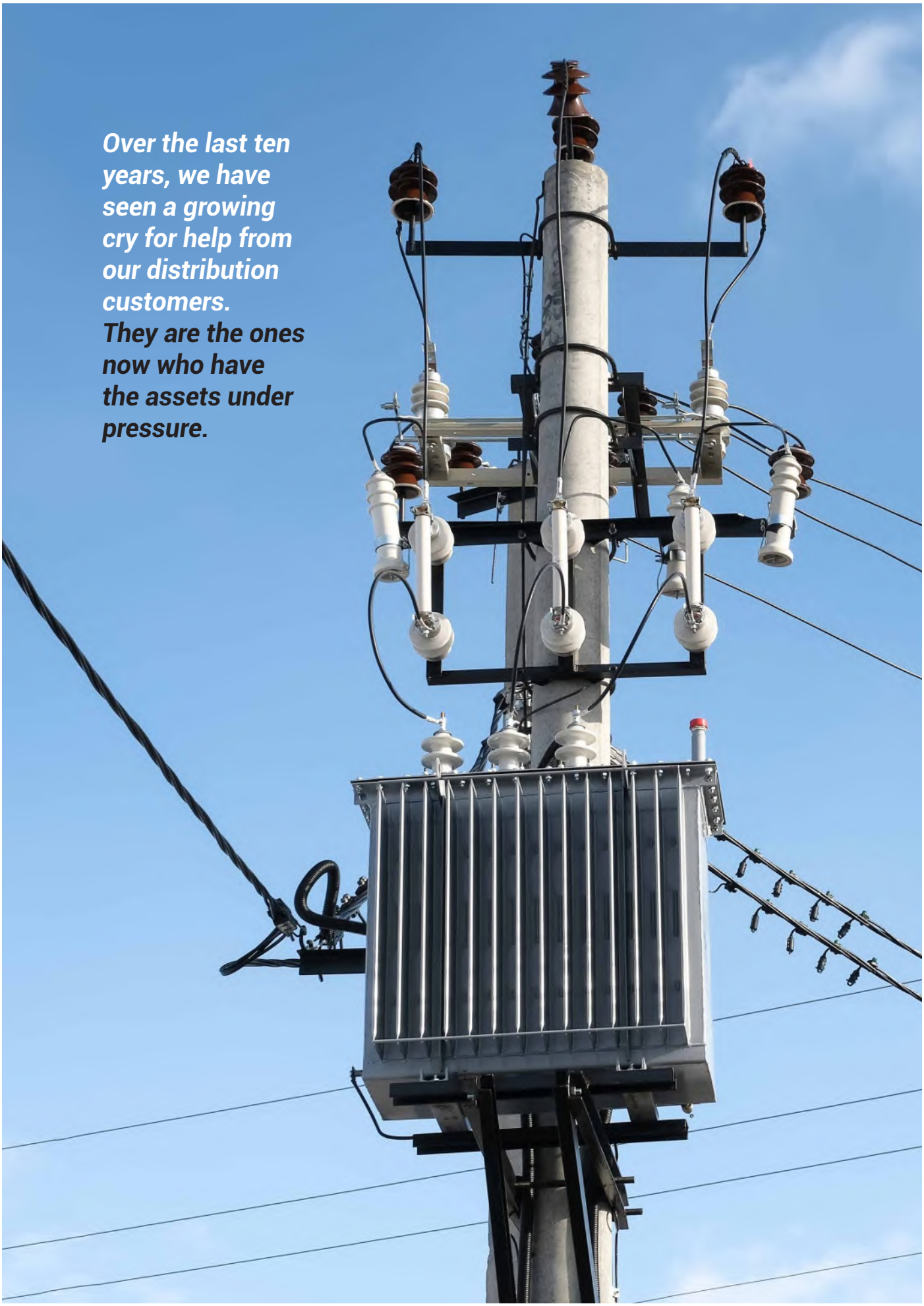
Seamus Allan is the Product Manager for LV & Distributed Monitoring at Dynamic Ratings’ Australian headquarters in Melbourne.



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Seamus Allan is the Product Manager for LV & Distributed Monitoring at Dynamic Ratings' Australian headquarters in Melbourne. In this interview, our editor in chief touched on different hot topics in the industry with Seamus, who is a recognized subject matter expert in many areas, including transformer and electrical apparatus monitoring and control technologies.

Alan Ross: I am delighted to welcome Seamus Allan from Dynamic Ratings. Seamus, I would like to go a little bit into your background. We know Tony Pink, General Manager at Dynamic Ratings, has done great things with the company and how Wilson [Transformer Company] has taken it to the global level. You have been in the US, in the UK and now you are in Australia. Can you tell us a little bit about the time you spent in the UK?

Seamus Allan: Thank you, Alan. Yes, that was a crossover role between WTC and Dynamic Ratings, providing support on both sides. Living in the UK was a really exciting time because the networks there are similar to North America - in that they have been around for a long time.

AR You have a lot of experience in the low-voltage area of the world. You have seen how the grid is changing and how utilities are having to adapt to the changing requirements of the grid. What are some of the big changes that are taking place and are causing professionals in the utility industry to change the way they do what they do?

SA It is an interesting time for our industry globally, I think. As a two-second background of Dynamic Ratings, our main focus has been on substations and substation assets, transformers and breakers. That is where my background comes from - looking at large power transformers and the substation assets. Over the last ten years, we have seen a growing cry for help from our distribution customers. They are the ones now who have the assets that are under pressure. That seems to be happening in certain areas in the world more than in others.

Those changes are coming from the very large increase in distributed generation in the network - solar photovoltaics and similar resources. The changing technology mix with battery storage going into the network is a huge aspect of it. Another aspect, depending on which country we are in, is the switching off of the large synchronous generation: fossil fuel generation, coal burning plants, etc. That massive shift in energy landscape has now put the distribution networks as a horizontal energy transfer mechanism rather than the traditional top-down energy transfer that came from the traditional networks.

AR We used to have the step-down system, as you said, and now we have an inverter-based system. With all of that happening, what do you think are the caveats for the engineering and the procurement, maintenance and management of utilities, especially the distribution utilities and the people in distributed energy resources (DER)? What are the main challenges they are going to be faced with?

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SA A large part of the challenge that we are seeing in these emerging markets is the loss of synchronous generation, which is a huge issue now in Australia. As of 2020, Australia has the most solar capacity installed per capita. It is a small country in terms of population, with around 25 million people, but are leading in that respect. 22% of residential houses have solar [PV] systems on the roof. There are a lot of commercial solar operations happening in the countryside.

The loss of synchronous generation here in Australia has driven a huge growth of the Frequency Control Ancillary Services (FCAS) market, because trying to prop up the frequency when there is a system event has become extremely difficult. Probably one of the major challenges are a lack of grid support services. Another aspect is in terms of loadings. The diversity factor for most LV connections - and this varies by country - is approximately 2.5 kW, which is what a residential house is expected to be drawing on average.

The entire distribution network was built around this diversity factor. Now we are dropping electric vehicles (EV) and other large batteries into the network, and they might draw 32 Amps, each one by themselves. That is just the distribution transformers, the connecting circuits. All of that was not designed for the intense loads we are seeing at the moment. When you hear talk in the UK of going fully electric in their transport space by 2030, and other countries having very strong incentives to go in the same direction, the transformer asset managers and people working in line ratings are starting to panic, because they are suddenly going to be putting huge loads onto the network. And this wasn't expected before. Load management is one of the pretty serious areas.

AR Load management is changing the specifications for transformers. If you are purchasing transformers, the specifications should be different. You can't simply replace the one that was there because the loads are going to be different.

22% of residential houses in Australia have solar systems on the roof.

Due to the massive shift in energy landscape, the distribution networks have now become a horizontal energy transfer mechanism, rather than the traditional top-down energy transfer that was the case in the traditional networks.

The electrification of transportation creates its own problems, and I would like to see that from your perspective. What is Dynamic Ratings doing about that and what it means for your company as it relates to opportunity?

SA I will speak from the work that we have been doing in the UK, in Australia, and a little bit in New Zealand. Admittedly, in Australia the government incentives haven't been there, so the uptake of electric vehicles here is a little bit behind other countries. On the flip side, some of the countries in Europe have had phenomenal uptake.

Probably the biggest challenge is plonking really large chargers into people's homes. Everybody wants to come home from work, plug in their car and have it ready for the morning. While the traditional load that happened in the evening came from everyone switching their ovens or their kettles on, now people are bringing home enormous loads, 16 or 32-Amp chargers, which, if they all get on the same time, have significantly greater draw than what the network was designed to provide; both from the top-down level, and also in the distribution network.

The biggest challenge that we are seeing is how to have equitable sharing of the network resources across the different users. There have been a lot of different trials to try and maximize the use of the available capacity of the LV network, the transformers and the feeding circuits, so that all

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users are able to charge their cars when they want as much as they can, without turning their neighbors off and without tripping out a whole street. It becomes very unpopular when you plug your car in and everyone's lights turn off! We are trying to do that in a fair way and without having a significantly bad impact on the network assets.

been largely focused on demand management of those particular EV chargers. We are involved in projects globally where we provide measurements of the LV network based on measurements done on transformers and at the ends of feeders and circuits, working with utilities that are developing operating envelopes

When you hear talk in the UK of going fully electric in their transport space by 2030, and other countries having very strong incentives to go in the same direction, the transformer asset managers and people working in line ratings are starting to panic, because they are suddenly going to be putting huge loads onto the network that was not designed for that.

A small side aspect of that is that many of these inverter-based generation and power electronics control devices are putting quite significant harmonics back into the network that are having an impact on the distribution transformers, which weren't designed for the K-factors coming from the levels of harmonics that are going back into the network. In a lot of cases, if you are talking kVA or kilowatts of charging, that is not even factored into the discussion.

That is a massive challenge as well. In reality, the projects that we are involved in today have

or state estimations for the networks. These estimations suggest what the impact on the network is going to be if we were to switch on a particular charger at certain rates, and how hard we can switch them on before the network starts to sag badly, and then sending out those commands to the charges and having active control over them. That has been really interesting - communicating with customers about whether they want to do the social good and allow us to turn the charger off or if we have to pay them to turn their charger off. There are many social challenges that are involved there.

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AR There is going to be another challenge in the United States. Recently, a number of cities such as San Francisco and New York have been looking at making it illegal to build a house that uses natural gas. Safety is one aspect of it, and another is moving away from fossil fuels. Everything is going electric.

SA Yes, and vehicles-to-grid is going to be a very big part of this. People are already putting residential batteries in, and utilities are putting grid-scale batteries in. Here, at the zone substation or the local substation, we are seeing 10 or 20 MW batteries going in. There are a lot of trials of much smaller, 30 kW batteries going up poles in the neighborhoods.

Then there is also Tesla Powerwall and all the other associated residential batteries. The automobile is becoming one of those large battery assets in the network that will be able to be controlled. And, yes, it will be interesting. A lot of these scenarios are partly state or power company-owned, and then in other cases, they are privately owned. And that does tag along onto the Federal Energy Regulatory Commission's (FERC)

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Order No. 2222 in terms of the virtual private power plants, in terms of aggregators of (residential) electricity (generation), or it might be (dispatchable demand, such as) electric vehicle chargers.

Here in Australia, there are a couple of companies that do private EV chargers, and they are basically talking to utilities about how they can work together on managing their customer base in terms of charging and vehicle-to-grid connection as a business model in its own right. It will be very fascinating to see how that pans out.

AR You mentioned the FERC Order No. 2222, which enables distributed energy resource aggregators to compete in all regional organized wholesale electric markets. What do you think the impact of that order is going to be on the load management issue?

SA It is hard to say at this point. There is the idea of virtual power plants, VPPs as they are being called here, and it is essentially what is referred to in FERC 2222. There are a lot of organizations in Australia that have been doing this. They have been talking to residential solar owners, telling them that we can pool our purchasing power and buy electricity off the wholesale market, and then sell on the wholesale market at a better rate, and get them better feed-in dollars for their kilowatt-hours. The government regulator for the electricity networks ran a lot of trials across the networks here. They found that, because the networks here need it most, these VPPs are being used as a method not so much for demand control, but more for those frequency control ancillary services. Basically, VPPS are being used as grid support services because they are able to accurately forecast how much residential solar energy will be available. It is very diversified. There is a very large number of generators pooled into one, so it has got a high reliability factor. Battery-based loads have really good visibility as to how much energy is going to be coming in.

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AR That is excellent work. Seamus, one of the things that interests me greatly about you is your commitment with CIGRE and IEEE. How long have you been involved, and what does it mean to you to be part of that part of the industry?

SA It is super exciting to be involved in this industry in general. The electrical industry globally is quite small, which makes a nice community to be involved in. Coming into Dynamic Ratings, there were a lot of people involved in IEEE, IEC and CIGRE that drew me in as well. It has been pretty exciting to be part of a company that encourages employees to get so heavily involved in these workgroups. My statement is that no matter which country you're in, no matter what language you speak, we are all moving electrons around the network, around the same transformers and the same wires. It is amazing how many times the wheel has been reinvented in every country. Every power utility has the same problem with voltage management or demand management or transformer oil testing, and they go and reinvent the wheel. It is super exciting to be involved in these global workgroups with like-minded people who are all passionate about the same things, who can share their experiences, the great successes and failures, which can then be used to build the body of knowledge and make advancements.

The more that happens, the more exciting things we get to see. I am currently in the Dynamic Thermal Modeling of Power Transformers workgroup, and I see models that are currently used by most people, which are not that great. But there are so many more technologies available now with machine learning, neural networks, etc. for us to make it better. It is quite thrilling to see how we can use this to improve the utilization of transformers and to be involved in these organizations.

AR That is what collaboration and getting everybody involved does. We want to connect people from around the world and start to share collaboratively.

Thank you so much, Seamus, for being part of that great change.

SA Thank you very much, Alan.