Charles Nobles

Vice President of Utility Business Development at Ubicquia

Interview with **Charles Nobles**

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Photo: Ubicquia

Alan Ross: My guest today is Charlie Nobles. Charlie, thank you for joining me. He's the vice president of utility business development with Ubicquia. I love that name. You made it up, didn't you?

Charles Nobles: Well, I didn't make it up, but it is made up. Ubicquia comes from the word "ubiquitous", which means everywhere. We use the carrier networks, LTE-based networks, which are everywhere. They're already built out.

AR What I want to ask you first is how did you get involved in the industry? Not just Ubicquia, but how did you get involved? It's always a strange story for most people.

CN Well, when I was in grad school, I worked for Carolina Power and Light. They funded my grad school in engineering. I worked for them part time at a power plant. That was my first exposure to the utility industry on the generation side. I came back to Carolina Power Light years later, and I worked on the metering side. At one point I ran all the metering for north and South Carolina for Progress Energy, which now is a part of Duke Energy.

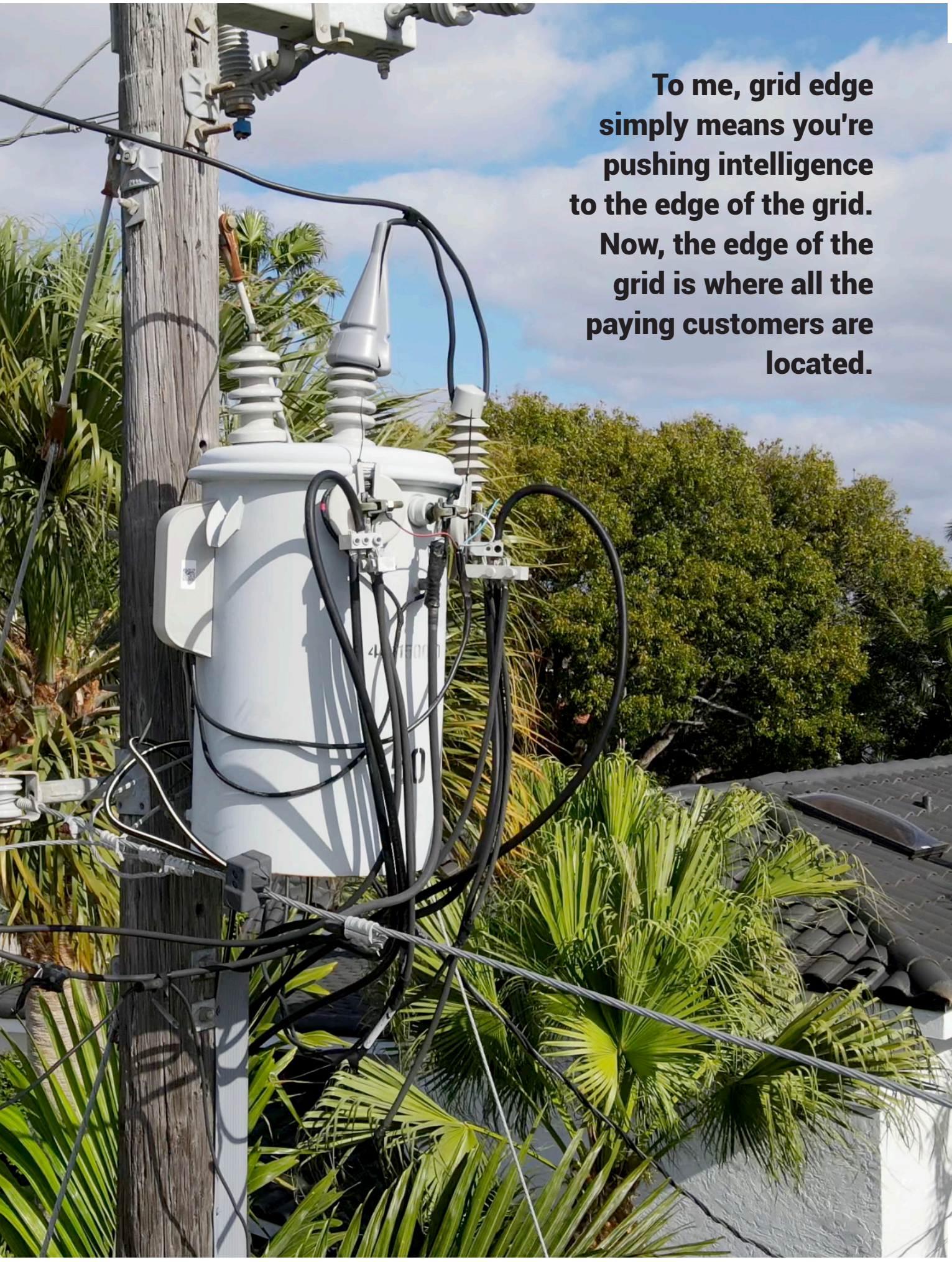
AR So now we know why you got in the industry, and you've been in it long enough now to be an expert. I have to ask you, as an expert - define the grid edge. What is it?

CN If you ask eight people that question, you'll get 15 answers. Historically, all the compute, all the analytics, all the intelligence is at the core. Years ago there was a move to digital signal processing technology in the client, where much of the intelligence is at the edge. It's faster that way, with less latency in moving the critical data up and down. You can make decisions more quickly. To me, grid edge simply means you're pushing intelligence to the edge of the grid. Now, the edge of the grid is where all the paying customers are located. All the money comes in from the edge of the grid, and all the rest of the grid is just to get power to the edge of the grid, so you're putting the intelligence where the customers consume the product.

AR And that's where smart meters started, so that we can get the customers to give us information. And when the power went out, we didn't have 50 people calling us saying, my power is out, right? The meter told them exactly.

CN The meter tells you. You're exactly right. There are two places today where all the intelligence seems to be located - at the meter, which is at the edge, but only at the meter, and then at the substation. And in between there's a vast arid landscape.

Photo: Ubicquia



To me, grid edge simply means you're pushing intelligence to the edge of the grid. Now, the edge of the grid is where all the paying customers are located.

AR When I think of grid edge, I used to think of it that way, the low-voltage side of the grid, right? Well, now you've got at the grid edge wind, solar storage, electrification of transportation. We changed the whole thing, so the definition of grid edge had to change. Now transmission is at the grid edge coming into the system. What does that mean?

CN Sure, especially when you have micro grids. The edge changed. The edge used to be just basic energy consumption, kilowatt hours. The nature of the kilowatt hour load didn't matter. The utilities used to define load by three types - industrial, commercial, residential. That's it. But now there's different types of load. It's intermittent load. Some of the load back-feeds into the edge, back into the grid, so the edge has become significantly more complicated. Now the meters alone are not enough to measure the total consumption for a bill. You need to know the type of loads. Is it intermittent? Is it steady state? Does it have harmonics? Is the energy flow bidirectional? There's so much more sophistication required at the edge, because the edge has become more complicated.

AR And with that you have more power quality issues introduced into the grid. It used to be substation and meter, forget about everything in between. Now we got to think about everything in between, right?

CN Yes. In fact, I like to call it *from feeder to meter*. The visibility gap is from the head of the feeder to the meter. But these other devices and loads connected to the meter, they're not electrically clean devices. Let me give you an example. Back in the day when I worked for the utility, we could always tell if there was a reactive power issue, if there was a log mill or some inductive load, because it

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Photo: Ubicquia

caused imbalance and poor power factor on the grid. That was kind of a rare occurrence for just occasional industrial loads. Nowadays, every rooftop solar installation can produce harmonics back-feeding into the grid. Every electric vehicle plug in could have an AC to DC conversion that creates harmonics back-feeding. So now there are elements at the consumption side that back-feed. It's literally biting the hand that feeds you. The grid is feeding you and the hand is being bitten by these types of load.

AR I don't know if it's true in Carolinas, but in most states, they don't have a choice as to whether they take that dirty power. They have to take it.

CN Well, they have to take it. But also, if you think about it, historically in the utility business, if a large industrial customer or even a real estate developer was going to build a plant or install a development, they would come to the utility and say, hey, I'm getting ready to build out this load. Here's the profile of the load so that the utility could build infrastructure to support it. When you buy an electric vehicle, do you call the utility and register it? No, you just buy it. You just install it. The local utility doesn't know you did it. So they see this as unplanned load. It's not planned, and it's not insignificant, because there are often groups of EVs in certain neighborhoods or certain areas. So now they're seeing this unplanned load that has other harmful attributes and they have to not just supply power for it, but they have to withstand it, and so they're flying blind.

AR Now we're going to talk about solutions. You just introduced enough problems that I want to be out of the utility industry. There's too much going on, right? There's a lot of older people in the industry saying I'm done with all this, I'm retiring. And you got a lot of younger people coming in that have to manage all of this. They don't have legacy knowledge. I wrote an article one time and I said it's like the wild, wild west. And I got really attacked for it. They said no, it's all planned out. Talk about Ubicquia and what it is that you are bringing to solve some of the problems at the grid edge.

CN Let's go back to smart meters. Back in the day, all the smart meters communicated on bespoke networks; RF mesh networks, licensed spectrum networks. You had to build a network just to communicate with your devices. And the cost and the maintenance of these networks was expensive for utilities. Today we have the ubiquitous LTE networks. If you have a cell phone in your pocket, you use an LTE network connection today, you depend on it. They're robust, they have low latency. Why not use them? They're cost effective. I think utilities are realizing, *I still need the devices at the edge, but do I need to build a network to bring the data back?* Because every single point solution has its own point network. Now utilities are maintaining eight networks. Makes no sense. So even for smart meters, they're looking at maybe using LTE. Ubicquia leverages the existing LTE networks that the carriers support, e.g., ATT and T Mobile and Verizon, but also private LTE networks.

Many utilities are thinking, why don't I build a private LTE network? It's LTE-based, so it's standards based, but I own it. All my devices can operate and communicate on the one network. Ubicquia promotes the use of LTE, whether public or private. We tell utilities, don't build another bespoke network. Don't place these devices on your existing AMI networks because they're slow.

They're not built for it. They're built for meter reading. But there are other options. Use the existing LTE networks. They're fast, they're pervasive, they have low-latency. They can handle lots of data. They're cost effective. That's the core piece of information about Ubicquia - we leverage LTE networks that are already in place. And the second thing is, we wrap solutions around LTE networks for the grid operations, monitoring assets in the grid, at the edge, in between. But we use LTE to bring that data back.

AR A lot of it you mentioned earlier, substation to meter. You're talking about everything in between now, which we typically didn't monitor.

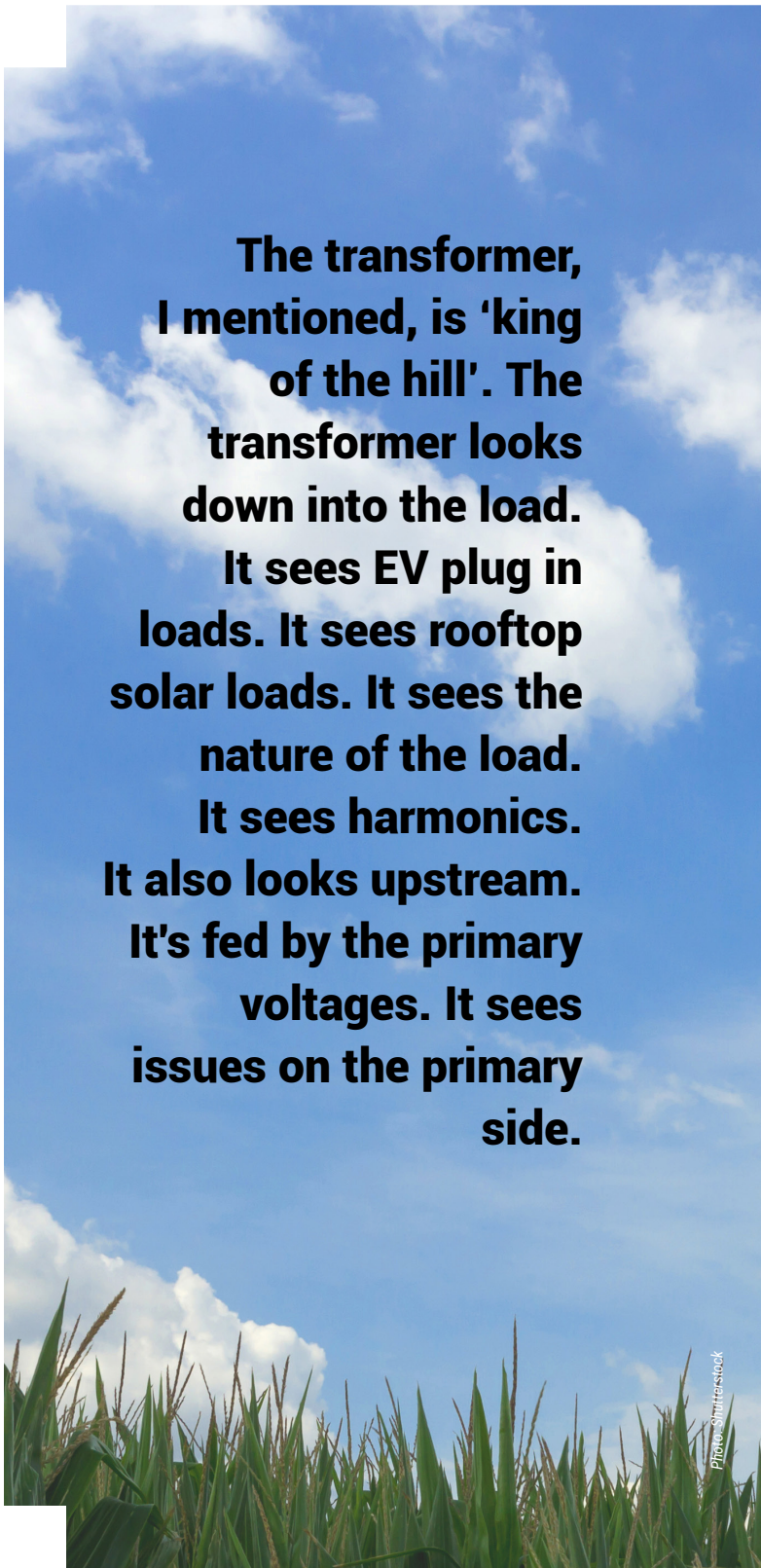
CN No, we don't. If you think about it, there is a finite number of devices that utilities can control and monitor. Capacitor banks, voltage taps, regulators, et cetera. But those are just a small portion of all the grid connections and devices between the substation and the meter. If you had to pick one spot to claim as 'king of the hill', that I will measure from this point, what would you choose? You would choose the transformer. Every single meter must be fed by a transformer, a distribution transformer.

AR I have to tell you, I'm a transformer guy, right? I believe the transformer is the heart of the system. And I'm a reliability guy, so the reliability of transformers okay, you're speaking my language.

CN You start at the transformer, whether it's a pole mount, pad mount, single phase, or a three phase. Because every meter, every customer is served by a transformer in some way or fashion. So you start there, because the transformer, I mentioned, it's 'king of the hill'. The transformer looks down into the load. It sees EV plug in loads. It sees rooftop solar loads. It sees the nature of the load. It sees harmonics. It also looks upstream. It's fed by the primary voltages. It sees issues on the primary side. Therefore, it's kind of uniquely positioned. And so, we focus on monitoring the grid at the transformer. It's a three-legged stool: What's the true condition of that transformer? What's the nature of the load it's serving? What's the nature of the primary voltages that feed it? It's looking upstream, downstream, and then at the asset itself.

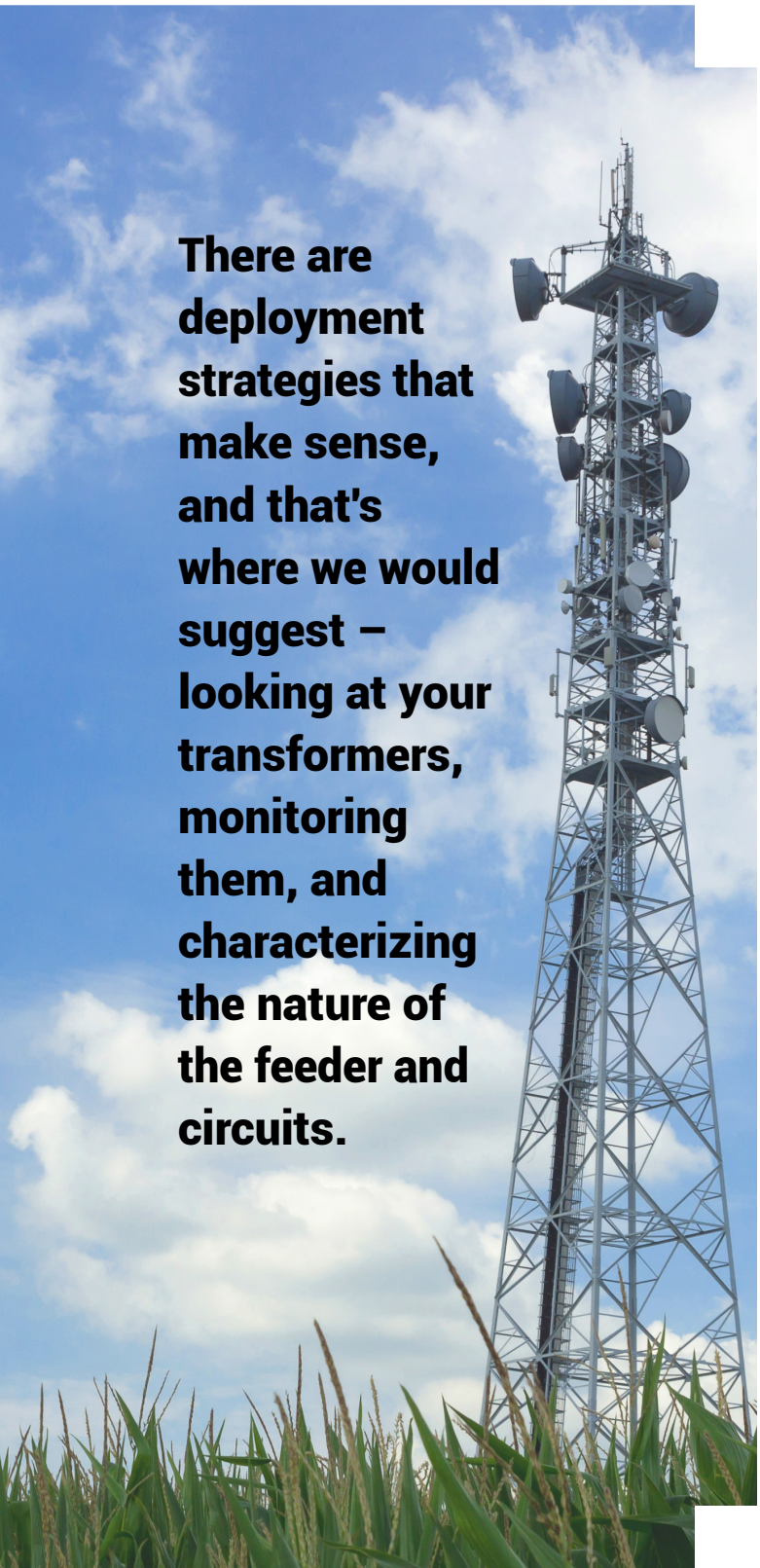
AR That's brilliant. Most people in utilities would say, yeah, but those are run to failure. We just let them pop, and who cares? Make a case for why they should care. What is the value of me suddenly going from RTF - run to failure - to really monitoring all those assets?

CN Have you checked the lead time for transformers lately? We have this global issue called 'supply chain'. And it's getting worse. Can you really afford to wait till it fails to order a new one? Do you have one on hand or is it 15 months out? The second thing is, if you have important critical load customers, do you really want to put them in the dark? Do you really want to interrupt their processes, their commercial opportunities for a day or two while you roll trucks out there? Is that really good customer stewardship? The third thing is, you mentioned earlier that smart meters now tell the utility when there's an outage, it's not waiting for the call to



come in. Do you really want a call to come in? Because a transformer issue is a meter issue. It is a customer issue. They will call in, or the meters will say, I'm out. But where is the failure point, is it further upstream? A lot of time is spent by utilities driving around trying to figure out where the fault is.

Do you want to spend a lot of time saying, *let's start at the meter, let's work way back to the transformer. Oh, it looks good from here. I can't tell anything wrong with it. Is the issue further upstream? Let's re-energize it (the transformer). It blows. Okay, now let's replace it.* How many truck rolls have you just spent? The bane of utilities is



O&M expense. Wouldn't you rather know - "I've got a transformer that's in distress". It's going to fail. Let's get one ready to replace it. Let's take an outage on a blue-sky day when I can replace it. Or one just failed, I know exactly what happened with it. It can't be repaired in the field. It must be replaced. Here's the size it was. Maybe it was undersized. Just replace it in this one truck roll; one stop resolution. So it really impacts safety, customer satisfaction, and grid resiliency. Sometimes you need to change the failed transformer to a different transformer. If you remember, back to the EV load discussion, what if you found out that, because of unplanned EV load, the transformer is over utilized? You don't replace it with what was there originally. Replace it with the next size up.

AR Well, that's brilliant. I know you can do dissolved gas analysis (DGA) in an oil-filled transformer. Pretty expensive.

CN That's substation magic. You can't afford to do that *en masse*. The trick in the distribution grid is scalability and cost effectiveness. There are literally millions of transformers and you don't necessarily need to monitor them all, but maybe transformers at the head end of the feeder, maybe transformers at a midpoint, at the end of a circuit, where you go from overhead to underground service, etc. There are certain locations, certain deployment strategies that make a lot of sense. Take problematic feeders, for example, where you have voltage issues and want to know why, what's causing the issue. There are deployment strategies that make sense, and that's where we would suggest - looking at your transformers, monitoring them, and characterizing the nature of the feeder and circuits.

AR What data are you getting? What are you monitoring?

CN We're monitoring secondary voltages and currents, primary currents, oil pressure, oil temperature, and tilt/impact of the unit, which is important for pole mounted transformers. If you had to assess the true condition of a transformer, that's what you would measure. Electricals, mechanicals, oil pressure, oil temperature. You don't need to use dissolved gas analysis, but oil pressure and oil temperature, measured within the context of true delivered power tell you a lot about the condition of the transformer.

AR That's excellent. You know what? It ought to be ubiquitous.

CN I love that, you sold me.