Transcript: Distribution Transformer Convening Webinar

Event Details:

Date: March 5, 2026

Start time: 3:00 PM Time zone: ET Duration: 90:00

Platform / Location: Webex

Speakers (ordered by appearance):

Moderator: Celia Lane

Speaker 1: Catherine “Katie” Jereza

Speaker 2: Brian Rowden

Speaker 3: Killian McKenna

Speaker 4: Sherin Ann Abraham

Speaker 5: Hernan Yepez

Speaker 6: Joe Tirocchi

Speaker 7: Carlos Gaytan

Speaker 8: Jake Westhoff

Speaker 9: Patrick Gorman

Transcript:

[00:00:05–00:00:32] MODERATOR (Celia Lane):

Welcome to the Distribution Transformer Convening Webinar. Over the next hour and a half, we'll learn about Department of Energy’s (DOE) work convening stakeholders to confront distribution transformer supply chain vulnerabilities. After presentations from Oak Ridge National Lab, the National Lab of the Rockies, and National Grid, we'll have a moderated panel discussion with some of the manufacturers, distributors, and experts behind this effort. We'll conclude with 10 minutes of audience Q&A.

[00:00:32– 00:01:04] MODERATOR (Celia Lane):

Please use Slido, found under the apps panel, to type out your questions and vote on the ones you'd most like to hear answered. We will go through the top questions during the 10-minute Q&A at the end of the webinar. Now we will watch a message from Assistant Secretary for Electricity, Katie Jereza.

[00:01:04] Topic: A message from Catherine Jereza

[Video Begins]

[Video Description] Catherine “Katie” Jereza sets the stage for the webinar by laying out the current state of the industry, the challenges they are facing, potential solutions, and other topics that will be covered in today’s session.

[On Screen] Department of Energy logo opens video. Katie Jereza on camera between United States Flag and U.S. Department of Energy Flag. Banner at bottom of the screen shows Catherine “Katie” Jereza, Assistant Secretary, Office of Electricity, U.S. Department of Energy.

[00:01:04–00:01:42] SPEAKER 1 (Katie Jereza):

Good morning. I am Katie Jereza, Assistant Secretary for the Office of Electricity at the U.S. Department of Energy. Our electricity grid delivers the energy we need to live, Americans to prosper, and our industries to dominate the world markets. President Trump signed the Executive Order, Unleashing American Energy, and in that, he ordered us to protect the United States economic and national security and military preparedness by ensuring that an abundant supply of reliable energy is readily accessible in every state and territory of the nation.

[00:01:42–00:02:08] SPEAKER 1 (Katie Jereza):

This order comes against the backdrop of soaring U.S. and global electricity demand. Demand that will only increase in the coming years. Our challenge is urgent. How do we rapidly scale grid capacity to meet this demand and ensure every person, community, and business receives affordable, reliable power, day in and day out?

[00:02:08–00:02:40] SPEAKER 1 (Katie Jereza):

First, we must stabilize the grid. Address the immediate acute needs that strain reliability. Next, we must optimize the grid. Improve system performance while maintaining or even lowering costs. And third, we must grow the grid. Expand infrastructure to connect America's energy

resources, including nuclear energy, natural gas, and coal, to meet growing demand at data centers, new and existing manufacturing facilities, and more.

[00:02:40–00:02:59] SPEAKER 1 (Katie Jereza):

Today's webinar concerns transformers, the fundamental building blocks of our electricity grid. Much of our grid still relies on 1960s and 70s engineering and infrastructure. As a result, we face a shortage of the critical components that sustain it.

[00:03:00–00:03:32] SPEAKER 1 (Katie Jereza):

This adds up to a big problem that's reflected by these numbers. Demand for distribution transformers has jumped 41% since 2019, and the lead times for orders for these transformers have skyrocketed from three to six months in 2019 to an alarming one to two years or even longer in 2024, the most recent year for available data. Large transformers for substations and generators have lead times growing from three to as much as four years.

[00:03:33–00:04:10] SPEAKER 1 (Katie Jereza):

Several factors created this situation, including:

- Surging post-pandemic demand combined with a rise in electricity consumption,
- Aging infrastructure,
- Difficulties rebuilding the American workforce, and
- Shortages of essential raw materials

This is the perfect storm for the 21st-century electricity grid. A couple of years ago, DOE took on the challenge. We partnered with all of you to form a supply chain tiger team to focus on strengthening our domestic manufacturing capabilities and reducing our reliance on foreign countries for critical components.

[00:04:11–00:04:26] SPEAKER 1 (Katie Jereza):

We are not done. We are at a critical moment, and we must continue what we started to drive down lead times and accessibility to grid components now. We must meet the current moment and make these improvements for generations to come.

[00:04:26–00:04:50] SPEAKER 1 (Katie Jereza):

My office, the Office of Electricity, is taking the lead in creating innovative solutions to problems such as the massive number of configurations of distribution components like transformers, switch gears, and breakers. Here's another startling statistic that all of you know. There are almost 40,000 different distribution transformer configurations nationwide.

[00:04:51–00:05:06] SPEAKER 1 (Katie Jereza):

This staggering number of configurations make it difficult for utilities to share equipment and emergencies, and it creates a manufacturing quagmire that is clearly resulting in long lead times and deliveries of these critical grid components.

[00:05:06–00:05:37] SPEAKER 1 (Katie Jereza):

Our team is working closely with utilities and manufacturers to reduce the number of transformer configurations and reduce the delays. And we have already seen very promising results. Time is money, and the ratepayers are the ones footing the bill.

Component shortages sap our economy with every delay in receipt of a critical piece of infrastructure. Time is too precious to allow this to go on, considering:

- The global energy dominance race,
- The Artificial Intelligence (AI) race, and
- The race to onshore manufacturing

[00:05:38–00:05:59] SPEAKER 1 (Katie Jereza):

All races we must win. That's why this effort today is so important. I am incredibly proud of the public-private partnerships that have brought us to this moment, yielding powerful tools that will benefit every American by:

- Creating jobs,
- Driving down prices for everyday items, and
- Making electricity more affordable

[00:06:00–00:06:15] SPEAKER 1 (Katie Jereza):

Today, we will talk about our vulnerabilities, including reliance on single suppliers and incompatible specifications. This effort is about empowering utilities and manufacturers with a

broader understanding of the supply landscape.

[00:06:15–00:06:45] SPEAKER 1 (Katie Jereza):

Our success will mean less vulnerability to disruptions and a more consistent supply of critical components. This is about ensuring that the lights stay on, our economy thrives, and our nation remains strong. I'm excited you're here today to explore the ways we can work together toward an abundant energy future for all Americans.

[Onscreen] Video fades to U.S. Department of Energy logo

[00:06:45– 00:06:56] MODERATOR (Celia Lane):

We now have a presentation from Brian Rowden at Oak Bridge National Lab on updates from the distribution Transformer Convening Group.

[00:06:56] Topic: Distribution Transformer Taxonomy, Configuration Matrix, and Interchangeability Matrix

[00:06:56–00:07:12] SPEAKER 2 (Brian Rowden):

Good afternoon, everyone. Thank you for joining. I'm going to talk about the distribution transformer convening group outputs, and thanks to the Office of Electricity, Fernando Palma, Dave Howard, and Andre Pereira for their support on this. Next slide.

[00:07:01] On Screen: Title slide for Distribution Transformer Taxonomy, Configuration Matrix, and Interchangeability Matrix presentation.

[00:07:12–00:07:32] SPEAKER 2 (Brian Rowden):

I think everyone knows about the Office of Electricity. Just a few bullet points to highlight. The goal of the Office of Electricity is to look at the energy delivery system for the nation, making it reliable and resilient for all of us moving forward—focusing not only on hardware and software, but also on how we address innovation and improve and transform the utility delivery system.

[00:07:21] On Screen: A slide shows the goal of the Office of Electricity.

[00:07:32–00:08:01] SPEAKER 2 (Brian Rowden):

So, a lot of expertise across the research that's working, system-level analysis, different demonstrations, technologies, but we're leveraging all of that into what we move forward on this work for distribution transformers. Next slide.

[00:08:06–00:08:27] SPEAKER 2 (Brian Rowden):

So, what is the problem that we're working on? Next slide. The main drivers that we're going to focus on are for the distribution transformers, as were mentioned in the talk. There is the lead time used to take, you know, from weeks to moving to months and years, depending on the size and complexity, over the last few years. The other item there is the price.

[00:08:09] On Screen: A slide listing out the main drivers: lead times, prices, extreme weather events, aging fleet, and increase future demand.

[00:08:27–00:08:57] SPEAKER 2 (Brian Rowden):

So as that lead time increase, so did the price, so a lot of effort in that regard to bring both of those items together for more transformers. Extreme weather events, wild wildfires, and hurricanes are increasing to some extent that puts a strain on the distribution transformer stock that's not planned. And then ultimately, as we look at this from a national perspective, we have an aging fleet.

[00:08:57–00:09:19] SPEAKER 2 (Brian Rowden):

About two-thirds of new manufacturer transformer is currently used as planned replacements. So that, coupled with the next topic, there that will be discussed further in the next presentation. The increased future demand is also significant increase to the stock capacity required between now and 2050.

[00:09:19–00:09:42] SPEAKER 2 (Brian Rowden):

So, all of these component's kind of lead us into how do we attack the distribution transformer market, and the supply chain issues moving forward. Next slide. So, we focused on ten key attributes for distribution transformers when looking at the landscape.

[00:09:39] On Screen: A slide with a table listing out the ten key attributes of distribution transformers.

[00:09:42–00:10:00] SPEAKER 2 (Brian Rowden):

The first of which, of course, that comes to mind is the system voltage. The system voltage and the type of winding configuration that's required limit some of the different capability and combinations, but we still went through the operations of that input here.

[00:10:00–00:10:20] SPEAKER 2 (Brian Rowden):

Comparing overhead and padmount, different kVA (kilovolt-ampere) size ratings for different markets and different utilities, single phase versus three phase, and most of the effort was focused on oil field transformers for this discussion that we have moving forward.

[00:10:20–00:10:42] SPEAKER 2 (Brian Rowden):

Next slide. We take all of those attributes, the number of possible transformer configurations just continues to increase, right? So, we're looking at 80,000 possible transformer configurations/combinations that could come from those ten attributes that we just discussed. So, you see a breakdown there of the different groups.

[00:10:22] On Screen: A table listing out the different transformer types and the total number of possible transformer combinations.

[00:10:42–00:11:14] SPEAKER 2 (Brian Rowden):

As we move forward through the discussion, most of the work will be focused on:

- Overhead single phase,
- Padmount single phase, and
- Padmount three phase efforts for the configuration discussions.

Next, the base configurations are only one attribute to this; the number of accessories and options that are required by a utility currently, in addition to those combinations, add to this problem as well.

[00:10:59] On Screen: A table showing the add-ons for each transformer type combination.

[00:11:14–00:11:32] SPEAKER 2 (Brian Rowden):

So, you can see the number of configurations just continues to increase as we start to take all of those items into account. Some of these can be aftermarket applied, but most of these have to be done at the manufacturer ahead of sending that out to the bigger system.

[00:11:32–00:11:51] SPEAKER 2 (Brian Rowden):

Next slide. So, what is the approach that we took with this was to look at this distribution transformer convening. As was mentioned, there are a lot of effort came about with industry leaders and agencies' discussions on the support supply chain issues.

[00:11:39] On Screen: A slide outlining distribution transformer convening.

[00:11:51–00:12:09] SPEAKER 2 (Brian Rowden):

The action that was identified in regard to this area is to look at the potential reduction for the total amount of configurations for distribution transformers. So, this convening was industry-led, and government supported through the OE work that you're seeing here.

[00:12:09–00:12:37] SPEAKER 2 (Brian Rowden):

Different participants are listed. We had the trade groups with the NEMA (National Electrical Manufacturers Association) and IEEE (Institute of Electrical and Electronics Engineers), but also the utility trade associations and we looked at bringing in a minimum of five utilities from each of their associations in order to get a broader representation of the size, the regions, the different areas of the different utilities and what they bring to the table for this configuration area.

[00:12:37–00:13:01] SPEAKER 2 (Brian Rowden):

And then also bringing in transformer manufacturers, some of which you'll hear from today as well, because they play a critical role in providing the feedback with the utilities and in the trade organizations on 'how do we really address this?' so that so that we can make a reduced configuration and increase the capability here for manufacturing distribution transformers.

[00:13:02–00:13:23] SPEAKER 2 (Brian Rowden):

Next slide. So primary goals for the group, the short-term goals were three-fold:

- Create a distribution transformer taxonomy,
- Create a configuration matrix, and
- Develop an interchangeability matrix

We'll go into those in more details one-by-one.

[00:13:03] On Screen: A slide describing the distribution transformer convening group short term and long-term goals.

[00:13:23–00:13:42] SPEAKER 2 (Brian Rowden):

All of those to support longer-term goals, which naturally would be research and

development for flexible transformers, you know, more interchangeability, different procurement strategies, and how different ways to attack the supply chain for the longer-term efforts.

[00:13:42–00:14:04] SPEAKER 2 (Brian Rowden):

Next slide. So, the first item we tackled was the distribution transformer taxonomy, and this is really just making sure everyone in the discussions, independent of whether you're a utility procurement organization or research organization, the manufacturer was using the same terminology, the same language.

[00:13:44] On Screen: A table listing the distribution transformer taxonomy, including design attributes, windings/coil, and insulation systems.

[00:14:05–00:14:28] SPEAKER 2 (Brian Rowden):

So, what are the critical parameters and components that we're discussing? You know, what are the design and operational inputs that are required? We naturally started with input from traditional IEEE standards, USDA RUS documents, and existing utility specifications to make sure that we captured as much of that area as possible moving forward.

[00:14:28–00:15:01] SPEAKER 2 (Brian Rowden):

So that was the first goal. And this is just a very brief discussion of all of these entities. The full dissemination of information will be listed at the end, so if you have in any of these in more detail, you can definitely reference that information. But next slide. So, the main bulk of the work was targeted at this core transformer configuration matrix, and every utility has their own requirements at the moment.

[00:14:49] On Screen: A slide depicting the core transformer configuration matrix with table showing minimalist configuration, standard baseline configuration, and custom utility specific configuration.

[00:15:01–00:15:29] SPEAKER 2 (Brian Rowden):

And when we look at this from the large attribute to the large number of configurations that we saw, the goal was how do we bin these into different groups so that they're easier to understand? And maybe we start aligning them to a point that we can get some commonality. And we did that by breaking this down into what we call a minimalist configuration. What is just required from a transformer's perspective to operate?

[00:15:29–00:15:49] SPEAKER 2 (Brian Rowden):

So, it has no, you know, enhanced features. It does the fundamental application of a transformer. And then the next line was a standard baseline configuration, so most utilities might use this, at least some portion of this configuration, and then the custom utility version.

[00:15:49–00:16:30] SPEAKER 2 (Brian Rowden):

This is full customization. You pick whatever you want, however you want, within the reasons of the traditional requirements. All of those pieces kind of come together with identifying what are the critical considerations that the utilities are looking at when they do these, you know, multiple configuration requirements. We took that information, we compared that with the feedback from manufacturers, so they could look at and provide information on what all of these features mean to their lead time, specification time, design time, and what trade-offs are coming into play.

[00:16:17–00:16:45] SPEAKER 2 (Brian Rowden):

So, all of these, you know, we were able to go back and forth between the groups. Very, very good working group. We appreciate everyone who was involved in that and outlined some areas for opportunity for common configurations.

[00:16:45–00:17:17] SPEAKER 2 (Brian Rowden):

Next slide. The last of these three items is the interchangeability matrix, and this sounds pretty straightforward. We have a lot of influences to the supply chain and overall lead time of a distribution transformer. Some of these supply chain issues, or lead time issues, are specific to critical components within the distribution transformer, not just the manufacturing of it itself.

[00:16:45] On Screen: A slide showing the main points of the Interchangeability Matrix.

[00:17:17–00:17:46] SPEAKER 2 (Brian Rowden):

So, the goal of this effort was to identify those critical components and accessories that might impact lead time, whether it is planned or unplanned. Those impacts could be sole source, which, you know, that has you know we don't have a lot of interchangeability options there. Specific duty ratings or specific requirements that a limited number of component manufacturers might be able to supply.

[00:17:46–00:18:14] SPEAKER 2 (Brian Rowden):

Production constraints or location constraints, and then of course, raw materials and several other items. But those impacts were the goal of those was to define here's a list of common components that we have in these different distribution transformer configurations. Now, not everybody, not every utility, not every manufacturer has the same experiences, inputs, supply chain type of interfaces.

[00:18:14– 00:18:46] SPEAKER 2 (Brian Rowden):

So, in order to get a larger actionable input across the different groups of manufacturers and utilities. We asked all of the manufacturers and utilities to provide their critical

components, sources, alternative manufacturers, component families, in one large, combined list. And that way, we could leverage these different inputs for different manufacturers and utilities for options for interchangeability.

[00:18:46– 00:19:12] SPEAKER 2 (Brian Rowden):

Some of that is to use for proactive discussions. So, when you're looking at procurement up front, and you have a specific lead time, you may be able to optimize the lead time from the manufacturer's perspective based upon specific component availability. Also, if you're in the middle of manufacturing this, and for some reason you have a supply chain shortage or a component shortage.

[00:19:12–00:19:32] SPEAKER 2 (Brian Rowden):

That's another way to have an option to reference for alternative components to be considered. So that was the primary goal for the interchangeability matrix and getting a larger working document for those in distribution transformer industrial group.

[00:19:32–00:19:52] SPEAKER 2 (Brian Rowden):

Next slide. So, what does it all mean? Again, this is very simplified, running through a year or two of input in a few slides, but what came out of the first group of the distribution transformer convening is a common configuration matrix.

[00:19:33] On Screen: A slide with four convening outcomes: Common Configuration Matrix, Improve Manufacturing Efficiency to increase overall capacity, Identify Interchangeable components and potential new vendors, and distribution transformer convening content for public access.

[00:19:53–00:20:15] SPEAKER 2 (Brian Rowden):

As part of that, we saw the potential to reduce the number of distribution transformer types up to 40%. That came from a variety of ways. One of those ways is identifying the areas of electrification. Some of that's going to drive new minimum sizing requirements or upsizing requirements in the industry.

[00:20:15–00:20:33] SPEAKER 2 (Brian Rowden):

An example, shown here, is really just looking at the replacement of 10 to 15 kVA units with 25 or 50 kVA units, either for immediate electrification requirements or short-term upcoming electrification requirements.

[00:20:33– 00:20:59] SPEAKER 2 (Brian Rowden):

So, the ability to get a common sizing helps reduce the number of configurations that are required going forward. And also, you know, starts to look at how do we leverage that into things like longer-term mutual assistance options, so that you have more standard offerings instead of, you know, really just looking to require as much as you can when you have that issues.

[00:20:59–00:21:15] SPEAKER 2 (Brian Rowden):

Improving manufacturing efficiency was also something we looked at to increase overall capacity. This is really to understand the drivers for the manufacturing complexity and then streamline some of the processes. How do we get a better economy of scale, so that we have, you know, more manufactured units per design in a given manufacturer?

[00:21:15–00:21:43] SPEAKER 2 (Brian Rowden):

So that should help increase the efficiency at the manufacturing level. The interchangeable components, again, we kind of talked about that. The living library for those critical components and vendors, is really a good way to have a meaningful discussion between the manufacturers and utilities on the scope of the supply chain.

[00:21:43–00:22:06] SPEAKER 2 (Brian Rowden):

And that will continue to evolve as we get more suppliers and as the supply chain evolves in their capacity. So next slide. So, where are we today? We have continuing actions, so this content that I mentioned is out for public access. There is a direct link to the content available

that's included in this document.

[00:21:56] On Screen: A slide describing the continuing actions, including distribution transformer convening content for public access and the Department of Energy forming a smaller distribution transformer group.

[00:22:06–00:22:27] SPEAKER 2 (Brian Rowden):

It can also, if you search for the open energy Hub website and distribution transformer convening, you can get access to that directly. And then lastly, the DOE formed a smaller DT convening group, which was comprised of volunteer utilities, and that group is focusing on the implementation stage.

[00:22:27–00:22:47] SPEAKER 2 (Brian Rowden):

So how do we take the DT convening content, in particular the common configuration matrix, and implement that on some specific transformer requirements, and start to show how that actually works, and then how we can leverage that to the larger working group. Next slide.

[00:22:48] On Screen: A thank you slide with Fernando Palma, David Howard, and Brian Rowden's contact information.

[00:22:27–00:22:47] SPEAKER 2 (Brian Rowden):

And if there are any questions or comments, definitely you can reach out to the Office of Electricity's Fernando Palma, David Howard, or myself (Brian Rowden). We can definitely give you more information regarding the work that's been done or the ongoing work.

[00:23:03–00:23:11] MODERATOR (Celia Lane):

Great, thank you, Brian. We'll now have a presentation from the National Lab of the Rockies.

[00:23:11] On Screen: A title slide about the U.S. Distribution Transformer Demand Phase III – Key Drivers and Managing Demand from the National Laboratory of the Rockies.

[00:23:11] Topic: U.S. Distribution Transformer Demand Phase III – Key Drivers and Managing Demand from the National Laboratory of the Rockies

[00:23:11–00:23:29] SPEAKER 3 (Killian Mckenna):

Yeah, thanks so much. So, Killian Mckenna here, I'm within our grid planning analysis center at National Laboratory of the Rockies, and we'll talk about:

- Work that Office Electricity has been supporting here at the lab
- Looking at transformer demand
- Looking at key drivers and managing demand going forward Next slide.

[00:23:30] On Screen: A table of contents slide.

[00:23:29–00:23:47] SPEAKER 3 (Killian Mckenna):

We'll talk about context and challenge, modeling approach and sensitivities, existing in-service transformer characterization (what's the current distribution and what's out there), drivers of future growth, the role of utility practices, and industry challenges and demand management strategies. Next slide.

[00:23:47] On Screen: A slide with three images of different types of transformers: Split-phase pole-mount distribution transformer, split-phase padmount distribution transformer, and three-phase padmount distribution transformer.

[00:23:47–00:24:09] SPEAKER 3 (Killian Mckenna):

So, some of this context has been set up for us already, but essentially, we're looking at transformers that are, you know, stepping down for service with a high-side voltage of less than 34.5 kVA, for an analysis of rating of less than 5000. Our estimates are around 60 to 80 million of those types of distribution transformers across the U.S.

[00:24:09–00:24:37] SPEAKER 3 (Killian Mckenna):

And as highlighted by the assistant secretary and Brian, there's been long lead times in escalating prices. We issued two reports in February and November of 2024 were

widely picked up in the space, and we've been continuing that, some of that work supported by OE (Office of Electricity), so our scope is, you know, covering split-phase pole-mount transformers, three-phase, padmount; kind of the works of everything below, you know, 34.5 and less than 5000 kVA.

[00:24:38–00:25:09] SPEAKER 3 (Killian Mckenna):

Next slide. So, this is our kind of basic flow chart. We've, there's a lot of details behind the analysis here, but essentially, we're modeling new customers and increases in loading on an annual basis. So new customers are a critical part of transformer demand as you install new

Greenfield infrastructure, both for new residential, commercial, and industrial customers. We're capturing the transformer grading and installation types of Poland and padmount. Capturing that for every we're doing this analysis on the state level for all of those different sectors.

[00:24:38] On Screen: A slide with a flow chart showing the basic overview of modeling future demand.

[00:25:09–00:25:41] SPEAKER 3 (Killian Mckenna):

We also have separate analysis that we've included here on step-up transformers because those share many of the same similar characteristics as distribution transformers, so many forms of renewable generation and batteries also require step-up transformers. Data centers are also another pretty rapidly growing area for transformer demand. We model unconstrained demand for transformers, so we're doing this on an annual basis. We're looking at aging, applying failure, applying replacement, looking new customer growth, and seeing what that demand is in the coming years. Next slide.

[00:25:44] On Screen: A slide showing the key aspects driving sensitivities: Distribution and average size of existing transformers, utility transformer loading, utility age distributions and failure rates, utility decision-making process, and demand scenarios.

[00:25:41–00:26:03] SPEAKER 3 (Killian Mckenna):

And this is forecasting work, so it's inherently difficult, and there's a lot of sensitivities to apply and think of here. So, one of them is the distribution and average size of existing transformers. So, we've been estimating what is the average size of the capacity, obviously, the lower that number, the more transformers there are; the higher that number, the less.

[00:26:03–00:26:24] SPEAKER 3 (Killian Mckenna):

Similar what utility transformer loading, we're actually constraining this based on U.S.-wide energy consumption, so obviously, lower loading, higher transformers, higher loading, less transformers. We also look at utility age distribution and failure rates, utility decision making in terms of whether we're in a run-to-fail environment or active replacement.

[00:26:24–00:26:42] SPEAKER 3 (Killian Mckenna):

Looking at redeployment versus load splitting, all of those can heavily impact demand, and then obviously, a lot of different demand scenarios on the forecasting side. So, a lot of what we're

doing is taking other forecasts and translating that to the specific asset demand for distribution transformers. Next slide.

[00:26:42] On Screen: A slide with three circular pie charts showing Number of Assets by Mounting Type, Capacity Share by Mounting Type, Number of Assets by kVA Rating, and Capacity Share by kVA Rating.

[00:26:42–00:27:02] SPEAKER 3 (Killian Mckenna):

So, just importantly, as Brian was talking, there's a lot of different types of distribution transformers. Generally, when you think of this in terms of the capacity of assets that are in service out there, the majority of these assets are small, split-phase, pole-mounted

transformers.

[00:27:02–00:27:22] SPEAKER 3 (Killian Mckenna):

You know, a vast majority of the number of assets are those less than 50 kVA that are going to be pole-mounted. When you think about the capacity rather than the number of assets, that's when some of these padmounted three phase larger transformers take up a larger percentage of the number of assets out there. So just kind of thinking about this in terms of the.

[00:27:22–00:27:50] SPEAKER 3 (Killian Mckenna):

The volume of numbers, a lot of that are these smaller transformers, if you're driving in kind of suburban and rural environments, if you're going to see these in poles all the time, we're talking about buckets and poles, and that's a lot of what the numbers of the assets are. And we're estimating anywhere between, you know, 2.5 to 3.5 terawatts of capacity is out there. And this particular estimation around 66 million transformers.

[00:27:50–00:28:16] SPEAKER 3 (Killian Mckenna):

Next slide. One thing that's really important is that we're seeing aging infrastructure, right?

Transformers follow growths in building stock. So as new greenfield infrastructure gets built, we build out the electric grid too. So, the age of transformers follows those kind of you know, growth periods and how new construction was put out there.

[00:27:53] On Screen: A slide with an image of a pole-mounted transformer and three graphs showing aging infrastructure, low-loading, and low thermal aging.

[00:28:16–00:28:46] SPEAKER 3 (Killian Mckenna):

Another thing, you know, on the distribution side, we've been moving from a network that was kind of fit and forget with low visibility, and in that case, utility planners made you know conservative decisions on sizing, which means that a lot of transformers out there are lightly loaded. If you talk to utilities, you'll frequently hear them talk about transformers that are fifty, sixty, seventy years old, well beyond their expected lifetime. Our conservative estimate is that around 17.5 million of these transformers are beyond their expected designed life.

[00:28:46–00:29:04] SPEAKER 3 (Killian Mckenna):

But part of that is because they've been lightly loaded. It means that the thermal aging that they experienced, which, you know, if you think of thermal aging, it's like how hard do you drive a car? The harder you drive it, the faster it's going to age. Similarly, on a transformer side, the more lightly loaded it is, the longer it's going to last.

[00:29:04–00:29:30] SPEAKER 3 (Killian Mckenna):

But a lot of our estimations is that this the stock has been lightly loaded from a thermal perspective, which is one of the factors of why the stock has lasted beyond its expected life. Yeah, next slide. So emerging sectors are really significant when compared to kind of what we think of a traditional residential, commercial, and industrial transformer demand.

[00:29:21] On Screen: A slide with four graphs showing the Annual Transformer Additions by Category in the U.S., RCI, and Transportation Demand, Step-up Transformer Demand, and Data Center Demand.

[00:29:30–00:29:47] SPEAKER 3 (Killian Mckenna):

So, there's a couple of graphics here on the slide that I'll take my time to go through, but we are analyzing on an annual basis the turnover of the stock in terms of what's replaced, what are dedicated new customers coming along, what is dedicated transportation as well?

[00:29:47–00:30:09] SPEAKER 3 (Killian Mckenna):

Because we're also seeing this new sector of you know, tree phase transformers coming in for charging stations for vehicles, that is another kind of large area of growth. But essentially, there's a couple of different things that are going on, and I'm going to pass it over to my colleague Sherin Ann Abraham and the remainder of this deck to talk about some of these details.

[00:30:09–00:30:29] SPEAKER 3 (Killian Mckenna):

But when we talk about RCI, we're seeing this bump out in the next decade or so, and a lot of that is due to adding these kind of large transformers, particularly on the transportation side for charging stations. But another large component of this is really important to pay attention to is staff of transformers for generation technologies.

[00:30:29–00:30:46] SPEAKER 3 (Killian Mckenna):

We're seeing large increases in demand, and those will go through, you know, additions and then replacement of those as we get out to the, you know, 2040s–2050s. And then the kind of the other kid on the block right now is data centers, of which we're seeing a lot of demand for.

[00:30:46–00:31:14] SPEAKER 3 (Killian Mckenna):

So, when you think of a data center, there's kind of two phases of step down. You've got power transformers going from the medium voltage to commercial service, and then you've got power distribution units inside these data centers. So that's another huge area of demand, and when you look at generation step of transformers and data centers transformers in a high scenario combined, you're looking at close to the same capacity of transformers that we had from residential, commercial, and industrial.

[00:31:14–00:31:38] SPEAKER 3 (Killian Mckenna):

Another important point that you're seeing on this slide, when you compare the top right to these figures down the bottom, is the numbers of transformers editions sure are increasing, but more importantly and more rapidly, the capacity is increasing in some instances as far out seeding that of the numbers, which is generally that we're seeing a transition and Sherin will get into this shortly, that we're upsizing transformers and going for larger transformers over time.

[00:31:38–00:31:59] SPEAKER 3 (Killian Mckenna):

So, if you think of, you know, a transformer that's going to reach its end of life, we're upsizing that transformer, which means that the capacity for larger transformers is increasing quite rapidly. I'm going to hand over to Sherin to cover the rest of this deck here. So next slide. Yeah.

[00:31:57] On Screen: A slide with two graphs showing the total demand for increased transformer capacity (MVA) will outpace demand for number of transformers.

[00:31:59–00:32:34] SPEAKER 4 (Sherin Ann Abraham):

Thanks, Killian. So, continuing looking at future growth demand, one key point to note is that the total demand for transformer capacity would outpace the demand for number of transformers. So, if you look at the image here and also thinking about what Killian just mentioned about the upsizing that might happen, the growth in capacity that you see is higher relative to the growth and the number of new transformers, and so that means that the demand for larger size transformers would be the cause for that.

[00:32:34–00:33:04] SPEAKER 4 (Sherin Ann Abraham):

And those that is primarily due to the drivers of new customers, expansion in the residential sector, and additions in the transportation sector as well. Next slide. Another key point is that, demand for transformers in the future, the type of transformers that are being requested will evolve over time.

[00:32:48] On Screen: A slide with three tables and three images of different types of transformers. The tables show Transformer kVA Rating Distribution: 2021 vs. 2050, Transformer Annual Additions by kVA Rating: 2022 vs. 2050, and Number of Transformer Assets by Type Over Time in the U.S.

[00:33:04–00:33:33] SPEAKER 4 (Sherin Ann Abraham):

The type meaning it can be the rating of the transformer or the type of mounting. So, if you look at the chart on the top, we can see it shows the distribution of transformers by their ratings and compares the transformer stock in 2021 versus 2050. And I think one key point is that when you look at these 10 kVA sizes, we see a large drop in that.

[00:33:33–00:34:06] SPEAKER 4 (Sherin Ann Abraham):

And that is reflective of the ongoing sizing, utility sizing practices to use larger kVA transformers. And also, three-phase transformers for EV charging stations are also set to rise. And then going into the mounting type, we can see in the plot below. The padmount transformers, the demand for that is also set to rise because of the utility hardening programs that are in place or coming into place now. Next slide, please.

[00:34:04] On Screen: This slide shows four charts. The two top charts in the upper right show the Data Center Transformer Demand, and two lower right charts show Step-up Transformer Demand.

[00:34:06–00:34:31] SPEAKER 4 (Sherin Ann Abraham):

Now going over to what Killian briefly touched upon: data centers and step up transformers. There is a large uncertainty, as we can all imagine, in the data center growth forecasts. For this modeling, every slow and high demand growth scenarios were considered, and those reflect a range of growth from 3.7% through 15% of compounded annual growth rates.

[00:34:31–00:34:52] SPEAKER 4 (Sherin Ann Abraham):

And so that, and you can see that up till 2030 the demand or the growth is dominated by new loads, and post that it is dominated by replacements. And you can see that for PDUs (Power Distribution Unit), the higher there's higher long-term demand because of the lower replacement age.

[00:34:52–00:35:21] SPEAKER 4 (Sherin Ann Abraham):

And then going on to step up transformers, technologies like wind solar or batteries, they require step up transformers to transform the voltage to medium voltage levels, and they can exhibit similar characteristics to distribution transformers and looking at their demand, we can see that the early demand is dominated by new growth, but in later years it is the replacement demand due to replacement is what picks up after 2040.

[00:35:21–00:35:52] SPEAKER 4 (Sherin Ann Abraham):

Next slide. So, one key point I wanted to highlight here is that, and what Killian also mentioned in the sensitivities discussion, is that utility sizing practices and decision-making will impact the demand for distribution transformer assets. That is shown in the slide here by characterizing them in terms of utilization and existing headroom.

[00:35:26] On Screen: A bar graph showing four different scenarios on utility sizing practices and decision making.

[00:35:52–00:36:30] SPEAKER 4 (Sherin Ann Abraham):

For example, they can have assets with a low utilization and existing headroom. But when considering for standard replacement, they could bring in a transformer anticipating load growth and upsizing. So, leaving a larger headroom for future growth. Or, as you can see in the third bar, it can increase the asset utilization when upsizing or continue to keep the low utilization and headroom. And as you can imagine, all of this impacts the thermal aging, the upfront costs, and the capacity and the demand for capacity in the long term as well.

[00:36:30–00:36:55] SPEAKER 4 (Sherin Ann Abraham):

And so, these are important factors to keep in mind as we look to forecast, not just forecast, but also understand the demand for these assets. Next slide. So given these challenges, there are, we also wanted to discuss a few different strategies that can help manage demand.

[00:36:44] On Screen: A slide with a pole-mounted and padmounted transformer images. An illustration of a house with icons showing a Breaker Panel, Smart Meter, HEMS, Thermostat, Electric Vehicle, Water Heater, and Battery. There is a graph showing the Total Installed Meters (Millions) per year (2013–2023).

[00:36:55–00:37:18] SPEAKER 4 (Sherin Ann Abraham):

The first one being advanced transformer monitoring. The AMI (Advanced Metering Infrastructure) infrastructure rollout has been increasing, as you can see in the chart on the right. And when that's paired with GIS and meter mapping, that can potentially help improve the visibility on transformer loading and enable wide-scale monitoring of loading conditions for transformers.

[00:37:18–00:37:37] SPEAKER 4 (Sherin Ann Abraham):

The other thing is on granular utility forecasts. By having accurate or more granular long-range forecasts, it can help anticipate what types of transformers might be needed in the future and help manufacturers manage supplies for that.

[00:37:37–00:37:59] SPEAKER 4 (Sherin Ann Abraham):

And the third one is load management schemes like home energy management systems, smart breakers, or smart thermostats, as you can see in the graphic in the bottom right. It can help modulate the demand and can help reduce peak loading conditions and mitigate the need for upgrades of existing transformers.

[00:37:59–00:38:26] SPEAKER 4 (Sherin Ann Abraham):

On the next slide. These are some of our key references, and if you're interested in taking a deep dive into some of these, then you can find more information on this slide. And in the next slide, that concludes our presentation. Thank you so much. And with that, I pass it over to the team at National Grid.

[00:38:03] On Screen: A slide with a list of references.

[00:38:26] On Screen: A thank you slide.

[00:38:26–00:38:35] MODERATOR (Celia Lane):

Yes, thank you both. Our final presentation, now before we move into the moderated panel, is the presentation from National Grid.

[00:38:36] On Screen: A title slide for Transformer SKU Reduction.

[00:38:36] Topic: Transformer SKU Reduction

[00:38:35–00:38:58] SPEAKER 5 (Hernan Yepez):

Great. Thank you very much. And I'm going to use Joe, who's next to me, his computer video and audio, so we don't get feedback. Good afternoon, everyone. My name is Hernan Yepez. I'm an engineer, a standards engineer over at National Grid. So, today we're going to be talking about the distribution transform and SKU reduction initiative at National Grid.

[00:38:58–00:39:23] SPEAKER 5 (Hernan Yepez):

This is a structured effort designed to:

- Simplify a transformer portfolio,
- Improve supply chain resiliency, and
- Reduce long-term costs

This is an important project for National Grid as we modernize infrastructure, respond to growing electrification demands, and streamline the way we engineer, procure, and manage feed weight assets. Next slide, please. Information about our company.

[00:39:20] On Screen: A slide with a map showing customer accounts by service category and fuel types. Five icons break the one million customers into groups: A residential house, a commercial apartment, a lightning bolt for electric fuel, a flame for gas fuel, and a chain link for dual fuel.

[00:39:23–00:39:51] SPEAKER 5 (Hernan Yepez):

So, the National Grid serves 7 million customers accounts reaching approximately 20 million people across Massachusetts, upstate New York, Newark City, and Long Island. We support a mix of electricity, electric gas, and nearly 1 million dual-fuel customers. This diversity across territories, voltages, and legacy systems influences the complexity of a transformer fleet and is a major contributor to our large skew account. Next slide, please.

[00:39:51–00:40:09] SPEAKER 5 (Hernan Yepez):

Over time, our transformed portfolio has become highly diverse due to our electric company acquisitions, different voltage classes, a wide range of kVA ratings, and various specialized applications.

[00:39:53] On Screen: A slide describing the SKU Reduction Strategy Background: Diverse Portfolio Challenges, Strategic Need for Optimization, and Core Objectives.

[00:40:09–00:40:29] SPEAKER 5 (Hernan Yepez):

This diversity leads to longer lead times, higher costs, and increased supply driven obsoletes. By consolidating skills, we benefit through better demand forecasting, strong negotiating, powerful suppliers, more efficient inventory management, and simplified engineering.

[00:40:29–00:40:45] SPEAKER 5 (Hernan Yepez):

Our objective is to strategically reduce the roughly 700 distribution transformer SKUs across New York and New England and target eliminating more than 220 SKUs. Next slide, please.

[00:40:46] On Screen: A slide comparing the U.S. and UK Electric Distribution. Two graphs show the Distribution Transformer SKUs per country and the Distribution Transformer Statistics.

[00:40:45–00:41:03] SPEAKER 5 (Hernan Yepez):

So this comparison, this slide right here, is going to illustrate how we ended up in the U.S. with so many transformer configurations. National Grid owns electric distribution in the U.S. and also in the UK.

[00:41:03–00:41:27] SPEAKER 5 (Hernan Yepez):

In the UK, utilities were consolidated back in the 1930s, resulting in a standardized grade with only 30 SKUs, and it's going to soon going to be reduced to 16. They use just one primary voltage and one secondary voltage, and the transformers fall into only three types. In contrast, the US utilities grew independently over a century.

[00:41:27–00:41:46] SPEAKER 5 (Hernan Yepez):

National Grid in the U.S. supports 35 primary voltages, 70 secondary voltages, and seven different types of transformers, all of which generate a massive SKU footprint. These structural differences explain why standardization efforts are both necessary and challenging. Next slide,

please.

[00:41:47] On Screen: A table describing the key attributes governing distribution transformers: Mounting, Phase, Size (kVA), Primary Voltage, and Secondary Voltage.

[00:41:46–00:42:06] SPEAKER 5 (Hernan Yepez):

This slide breaks down core variables that create the SKU proliferation, and this is how we develop the strategy and the decision-making that took place.

[00:42:06–00:42:27] SPEAKER 5 (Hernan Yepez):

Transformers vary by mounting type:

- Overhead
- Pad Mount
- Underground

As well as phase, kVA rating, primary voltage, and secondary voltage. Some attributes can be consolidated, such as kVA and ratings, and primary voltage classes, while others, like mounting and phase, remain constant.

[00:42:27–00:42:38] SPEAKER 5 (Hernan Yepez):

Understanding these variables help us know whether production is possible without compromising the system reliability. So, I'm going to turn it over to Joe now.

[00:42:48–00:43:04] SPEAKER 6 (Joe Tirocchi):

All right, next slide please. So over here, you can see the project timeline, phase 1A and 1B were completed in early 2024. Phase 1A focused on Rhode Island and eliminating the smaller transformers Hernan spoke of, the smaller kVAs (the 10s and possibly 25s).

[00:42:41] On Screen: A slide with a project timeline: Phase 1A, Phase 1B, Phase 2A, Phase 2B, and Ongoing.

[00:43:04–00:43:32] SPEAKER 6 (Joe Tirocchi):

Phase 1B identified the work orders and the transformers to be phased out and to update the documentation in our SAP systems, our standards, and also our GIS systems. Phase 2A and 2B expanded reduction efforts, the four KB class, so if you look at that, we've tried to want to

eliminate the four KV class by using dual ratio transformers and convert as much four kVA over as we can.

[00:43:32–00:43:57] SPEAKER 6 (Joe Tirocchi):

And, you know, we also have long-term activities underway, including harmonizing standards across regions and identifying voltage upgrades. Converting, like I said, where possible, and although the progress continues, it has moved slower than we initially had anticipated, which makes prioritization and cross-functional alignment even more critical.

[00:43:57–00:44:19] SPEAKER 6 (Joe Tirocchi):

Next slide. So, reducing skew improves both operational and financial performance from electrification perspective, having fewer standardized transformer types position us for better future system low growth and enhanced grid resiliency.

[00:43:59] On Screen: A bar chart showing Inventory Rundown and cost benefits: SKU (QTY), Baseline, and Reduction by time.

[00:44:19–00:44:33] SPEAKER 6 (Joe Tirocchi):

Operationally, simplifying the transformer catalog improves inventory management and reduces the complexity of the ordering stock and deploying of transformers. And financially, fewer SKUs lead to lower inventory carrying costs.

[00:44:33–00:44:52] SPEAKER 6 (Joe Tirocchi):

More efficient purchase contrast, the longer-term cost savings, and as you can see, the chart illustrates the skew reductions across the various categories, single-phase three-phase, single-phase overhead, three-phase padmount, single-phase padmount, and all this. Next slide.

[00:44:53] On Screen: Two graphs showing the SKU Reduction Summary.

[00:44:52–00:45:12] SPEAKER 6 (Joe Tirocchi):

So, this is the SKU Reduction Summary sheet. This summary sheet shows the progress achieved to date. Out of the original 700 SKUs, we've eliminated 223, which is a 32% reduction, leaving around 477 SKUs or 68% in the fleet.

[00:45:12–00:45:28] SPEAKER 6 (Joe Tirocchi):

The breakout by states shows how significant reductions in Massachusetts and also

meaningful progress across New York as well. This is a major step towards a more unified and sustainable transformer fleet.

[00:45:25–00:45:43] SPEAKER 6 (Joe Tirocchi):

Next slide. This is a SKU reduction process steps; there's eleven steps used to validate the approved SKU reductions.

[00:45:36] On Screen: A table showing the SKU Reduction Process Steps.

[00:45:43–00:46:00] SPEAKER 6 (Joe Tirocchi):

It begins with standards engineering identifying candidate SKUs, and then followed by multiple layers of review and approvals from all the disciplines and our director areas. So, including the designs and standards, and operations.

[00:46:00–00:46:22] SPEAKER 6 (Joe Tirocchi):

And then we had next is inventory warehouse assesses inventory levels, procurement performance cost analysis and procurement, then negotiates supplier contracts while the inventory manages monthly inventory rundown. And then finally, the peer-to-peer update SAP records to complete with the SKU elimination.

[00:46:22–00:46:49] SPEAKER 6 (Joe Tirocchi):

These steps ensure reductions are thoughtful, strategically, operationally sound, and the green box actually is highlighting where we are in the process of the reduction. So, in closing, in summary, the transformer skew reduction initiative is a foundational effort to streamline our infrastructure, strengthen supply chain resilience, and reduce long term cost while maintaining system reliability.

[00:46:49–00:47:04] SPEAKER 6 (Joe Tirocchi):

We've already made significant progress by removing more than 220 SKUs and continue collaboration across all disciplines. And not to that, that's all I have, thank you.

[00:47:04–00:47:13] MODERATOR (Celia Lane):

We will now move into our panel discussion. We'll start off with a brief presentation from each or our panelists, starting with Prolec.

[00:47:06] On Screen: A title slide for Prolec GE Insights on Standardization of Distribution

Transformers for Supply Chain Resilience.

[00:47:06] Topic: Prolec GE Insights on Standardization of Distribution Transformers for Supply Chain Resilience

[00:47:13–00:47:43] SPEAKER 7 (Carlos Gaytan):

Good afternoon. This is Carlos Gaytan from Prolec GE. Can we move to the next slide, please? With over 50 years of experience, Prolec GE delivers a full range of liquid field transformers from the distribution to large power and renewable energy applications across the Americas. There are five transformer manufacturing facilities, three of them in the U.S, one in Mexico, and one in Brazil.

[00:47:43] On Screen: A map of North and South America with seven cities highlighted: Waukesha, WI, Sterling, IL, Goldsboro, NC, Dallas, TX, Shreveport, LA, HQ- Monterrey, MX, and Canoas, BR.

[00:47:43–00:47:56] SPEAKER 7 (Carlos Gaytan):

And the full range of products covered from the 5 kVA up to the 1,200 MVA for power transformers. Next Slide, please.

[00:47:56] On Screen: The slide shows standardization opportunities for driving efficiency and flexibility.

[00:47:56–00:48:23] SPEAKER 7 (Carlos Gaytan):

The main challenge is although the lead times for distribution transformers have normalized over the last several months, we still have some challenges related with the lead times of some special components, such as special-purpose lightning arresters, secondary breakers, fuses, dual voltage, and other types of low-break switches.

[00:48:23–00:48:40] SPEAKER 7 (Carlos Gaytan):

What is followed right now is to manage some increased inventory levels in order to have more flexibility to respond to fluctuations in the demand from customers and be able to provide a stable lead time response.

[00:48:40–00:49:31] SPEAKER 7 (Carlos Gaytan):

So, the need for having a flexible and reliable supply chain continues to be relevant, and we

have gone through some standardization efforts along with the DOE-led working group, and for example, we have identified opportunities to reduce cycle time in the range of five to 8% by simplifying certain characteristics of the transformer requirements, such as:

- Voltage connections
- Taps
- The use of single voltage versus dual voltage
- Arrangements

As well as other tank construction-related requirements that have an impact on the cycle time in manufacturing.

[00:49:31–00:49:56] SPEAKER 7 (Carlos Gaytan):

And, we also have some effectiveness demonstrated on the use of tools such as the interchangeability matrix that the DOE created as a faced with the circumstances, probably develop a similar tool where we seek.

[00:49:56–00:50:20] SPEAKER 7 (Carlos Gaytan):

For approval for some of our large utility customers and we were able to get approval to have an increased variety of certain components, and that was well received, and we were able to improve the lead times and keep them within the expected cycle time ranges.

[00:50:16–00:50:40] SPEAKER 7 (Carlos Gaytan):

And so, this to us demonstrates that the use of this type of tools is an evidence that it can be effective to provide a more consistent cycle time and lead time response to our utility customers.

[00:50:40–00:51:26] SPEAKER 7 (Carlos Gaytan):

Next slides as closing, please, next slide. So, project continues to be committed to collaborate collaborating with the DOE and the other participants in this working group in order to continue pursuing improvements in the standard configurations and the interchangeability criteria, and in order to achieve the objectives for 2026 that are related with continue with keeping reduced lead times, also improving the resiliency of the supply chain and promoting the flexibility through initiatives of such as this component interchangeability. Thank you very much.

[00:50:40] On Screen: Closing and Thank you slide.

[00:51:26–00:51:43] MODERATOR (Celia Lane):

Thank you, Carlos. We'll now hear from our next panelist. Our next panelist is Jake Westoff.
[00:51:44] On Screen: WEG Transformers USA Title Slide

[00:51:44] Topic: WEG Transformers USA

[00:51:43–00:51:49] SPEAKER 8 (Jake Westhoff):

Alright, unmuted now. Good afternoon, everyone. Yeah.

[00:51:49–00:52:09] SPEAKER 8 (Jake Westhoff):

I work at Weg Transformers, the commercial leader for the distribution transformer product. Yep, so you can go to the next slide, please. This is the outline of the manufacturing facilities that WEG has across North America and also in South Africa.

[00:52:06] On Screen: A map of the transmission and distribution facilities across North America, South America, and South Africa.

[00:52:09–00:52:38] SPEAKER 8 (Jake Westhoff):

WEG is headquartered in Brazil. There are five manufacturing locations there. What we're focused on here today is we have the three factories in Washington, Missouri. Also, there's three manufacturing sites in Mexico. They do serve into the U.S. market, but not so much on the distribution transformer scale, more power transformer. Then also two sites in South Africa and two in Columbia.

[00:52:38–00:52:58] SPEAKER 8 (Jake Westhoff):

Next slide, please. So, these are the three factories in Missouri. The one on the left, the distribution transformer factory, that's the one that's really supplying for this product type that we're discussing today.

[00:52:44] On Screen: Three images showing a distribution transformer, a power transformer, and a specialty transformer factories.

[00:52:58–00:53:20] SPEAKER 8 (Jake Westhoff):

It's a three-phase liquid-filled padmount arrangement. We build from a 45 kVA up to the 5000

kVA level, and then we have a power transformer factory up to 60 MVA, and then another padmount transformer factory that does larger-sized padmounts and substation-style transformers. Next slide, please.

[00:53:22] On Screen: This slide shows four images: Distribution Transformers, Specialty Transformers, Small/Medium Power Transformers, and Large Power Transformers.

[00:53:20–00:53:36] SPEAKER 8 (Jake Westhoff):

Yeah, just we're all familiar with these types, but the pictures of those type of products, distribution transformers on the left being the three-phase padmounts that we're discussing today.

[00:53:36–00:53:58] SPEAKER 8 (Jake Westhoff):

I won't go into a whole lot of extra details. I think that Carlos had covered a lot of the comments from a manufacturer's standpoint. We are seeing reductions in material lead times, but they are still higher levels than what we had seen prior to the COVID Pandemic.

[00:53:58–00:54:34] SPEAKER 8 (Jake Westhoff):

It does strain our supply chains. Standardization of products is ways to, you know, reduce the amount of different types of conductors for the transformers. That's obviously going to standardize systems, and yeah, less machine turnover or changeover on the machines is going to increase productivity, duplication rates of transformers, obviously, it's going to increase the economies of scale, and increase efficiencies in the factories. So that's all I have there.

[00:54:39] On Screen: A thank you slide.

[00:54:34–00:54:43] MODERATOR (Celia Lane):

Great, thank you. Thank you. Now we'll hear from our last panelist before we move on to the moderated panel. Take it away, Patrick.

[00:54:42] Topic: DOE Briefing

[00:54:43–00:55:02] SPEAKER 9 (Patrick Gorman):

I appreciate it. Thank you. And Carlos and Jake, looking forward to being on the panel with you guys. We work with your companies and really enjoy doing so. So, you can go to the next slide, please. Just really quick on Pat Gorman. I'm our senior vice president and general manager of

our North American utility business.

[00:54:42] On Screen: DOE Briefing Title Slide

[00:55:02–00:55:18] SPEAKER 9 (Patrick Gorman):

I work hand in hand with most utilities our team does throughout the U.S., and Canada do have a manufacturing background prior to joining Westco I spent 15 years at General Cable worked in the wire and cable world.

[00:55:04] On Screen: Introduction for Pat Gorman, Senior VP and GM, Utility Wesco Distribution, Inc.

[00:55:18–00:55:34] SPEAKER 9 (Patrick Gorman):

Not as technical as your transformers, but have a good understanding of the grid. We can go on to the next slide, please. And just real brief about Westco, you know we're a global supply chain solutions company. We're in over 50 countries around the world.

[00:55:25] On Screen: Wesco overview with a map of factory locations and key company statistics.

[00:55:34–00:55:54] SPEAKER 9 (Patrick Gorman):

We have three main business segments that we operate: our utility and broadband, which I'll talk about a little bit more in-depth in here in one second. We have our communications security segment. They do a lot of work with data centers, but also protecting substations with physical security as well.

[00:55:54–00:56:49] SPEAKER 9 (Patrick Gorman):

We have our EES group, which is really focused on OEM work, construction, and industrial. Next slide, please. Our Utility and Broadband Solutions group. We have our core broadband market, which is really focused on the service and wireless providers around the world. We have our utility business, which service our colleagues on the phone here. Heavily involved in the IOU and public power markets, municipals, co-ops, and the contractors that service the utilities. We basically go from the meter backward, all the way to the generating facilities in different capacities.

[00:56:08] On Screen: The slide shows a pie chart of Sales by Market for Utility and Broadband Solutions.

[00:56:49–00:57:13] SPEAKER 9 (Patrick Gorman):

And then we have our Grid Service group, which focuses more on large-scale projects and programs for powering solutions. So, really looking forward to being a part of the panel today and answering questions and continuing this dialogue. I will send it back over.

[00:57:13] On Screen: Wesco Logo

[00:57:13–00:57:32] MODERATOR (Celia Lane):

Great. All right. We will turn off the screen share and invite back the rest of our panelists, as well as Brian Rowden, to moderate the discussion.

[00:57:32–00:57:44] SPEAKER 2 (Brian Rowden):

All right. Thank you all for being part of the panel. I think we also had a National Grid on here, Celia, if we can.

[00:57:44–00:57:48] MODERATOR (Celia Lane):

Yes, I will add them to the panel.

[00:57:48] Topic: Panel Discussion Q&A

[00:57:48–00:58:11] SPEAKER 2 (Brian Rowden):

Okay, thank you. So, first off, we will go through some questions. The first question for the group here is: Based upon what we have seen, what we have proposed from the configurations options, what kind of advantages do you see coming to the industry with this type of approach?

[00:58:11–00:58:27] SPEAKER 2 (Brian Rowden):

I think everybody has a different view from it, from the utilities or the manufacturing or the distribution side, so it'd be interesting to hear from the group on what you think about what kind of advantages we might see coming from these common configurations.

[00:58:27–00:58:45] SPEAKER 9 (Patrick Gorman):

I'm happy to start off. I'll come from a macro side. Less into the expertise of the group on the call. The one thing I would like to say is this is not only going to apply to what you're talking about today. This is going to apply across the grid.

[00:58:45–00:59:01] SPEAKER 9 (Patrick Gorman):

And many different you know, really from a, I'll take it from a supply chain side. The reduction in complexity of the carrying number of SKUs, you know, especially a lot of the unique SKUs.

[00:59:01–00:59:17] SPEAKER 9 (Patrick Gorman):

Carrying costs lower capital that you'd have tied up in, like slow-moving spare parts, you know, a lot of work from our standpoint, we'd see a lot of simplified warehousing, a little easier for life cycle management.

[00:59:17–00:59:35] SPEAKER 9 (Patrick Gorman):

You know, aggregating some of the buying power into, you know, cost advantages around fewer SKUs, more predictable demand patterns. You know, we see how we could pool demand across many utilities.

[00:59:35–00:59:52] SPEAKER 9 (Patrick Gorman):

For the same transformers or any other apparatus or product, you know, we'll get better economics, especially like around things that you might not even think about, freight, you know, priority app allocation during times of supply constraints.

[00:59:52–01:00:15] SPEAKER 9 (Patrick Gorman):

Investing in multi-utility inventory where you can share it across the country or the region, you know, it probably has some preferred accounting benefits for those when you are looking to capitalize it, versus having to move it across, especially if you have multi-jurisdiction.

[01:00:15–01:00:34] SPEAKER 9 (Patrick Gorman):

You know, service territories. You know, we see improved turns, and then, you know, even if you think about critical spares and if you're standardizing again, if you get through that piece, you know, being able to share those as well.

[01:00:34–01:00:55] SPEAKER 9 (Patrick Gorman):

You know, there's also, I mean, we've got the big utility like National Grid, but also I, as a distributor, we think often about the smaller, yeah, you know, 500-meter utility or a 1,000, you know, 5000-meter utility, you know, we have a proxy for where we become a proxy for scale.

[01:00:55–01:01:17] SPEAKER 9 (Patrick Gorman):

We help them with greater supply chain resiliency, reduce dependency on specific

constructions. I think it's we can work through together with easier qualifications and build trust across multiple manufacturers.

[01:01:17–01:01:29] SPEAKER 9 (Patrick Gorman):

Then you have greater supply chain flexibility during disruptions, I mean, we're just coming, everybody has some level of PTSD coming out of COVID, but you know, it's when we do have demand surges.

[01:01:29–01:02:04] SPEAKER 9 (Patrick Gorman):

The ability to buffer those with the right type of inventory that's very fungible, it gives the utilities a greater benefit. And then, you know, bottom line, you know, with those common configurations, you know, you have greater reliability, you're improving your working capital.

From a storm standpoint, faster restoration, access to product, improved workforce effectiveness. If you've got fewer work methods that you have to deal with, there is a lot of benefit from that.

[01:02:04–01:02:24] SPEAKER 9 (Patrick Gorman):

And then it's just overall supplier, a stronger supply chain resiliency. So, I appreciate the opportunity to take the lead off question on that. I'll turn it over to somebody else who would like to provide a different input.

[01:02:24–01:02:27] SPEAKER 2 (Brian Rowden):

Carlos, you or Jake have…

[01:02:27–01:02:49] SPEAKER 7 (Carlos Gaytan):

Yes. We have found a very good collaboration environment with the large utility customers on cases with single-source components, which sometimes we have observed increased lead times above the 30 weeks for a single order.

[01:02:49–01:03:19] SPEAKER 7 (Carlos Gaytan):

So, by working along with the utilities, we have found opportunities to demonstrate that there are other solutions that are equivalent, that are reasonable, and that addresses the utilities' concerns and we have received approval of some substitutions that show a more consistent lead time in the industry and that has allowed us to have a better response times to these

customers.

[01:03:19–01:03:46] SPEAKER 7 (Carlos Gaytan):

Also, by letting the customers know about the factors that affect to our cycle time, we have been able to agree on certain simplification of some features that add to the cycle time and that has allowed to reduce in some cases the number of different SKUs and therefore be able to manage a larger average batch sizes for production to make the logistics a more streamlined process.

[01:03:46–01:04:04] SPEAKER 7 (Carlos Gaytan):

With increasing the performance in the accuracy that we promise to the customer in terms of delivery dates.

[01:04:04–01:04:09] SPEAKER 2 (Brian Rowden):

Excellent. Thank you, Carlos.

[01:04:09–01:04:35] SPEAKER 5 (Hernan Yepez):

Yeah, I can jump in. So, from the utility side, shorter lead times it's one big benefit. A lot of times, we saw during the pandemics that we had commitments with customers. So, you know, it's good to have those lead times secured so that we can provide service when, you know, when, when we stipulate it to do it.

[01:04:35–01:05:16] SPEAKER 5 (Hernan Yepez):

So, also lowering cost. If that's something that's going to be achieved, then it's going to of course, benefit everyone. The other thing that I saw was mutual assistance, so we just had a big storm here in the northeast last week so if you run into issues and you run out of transformers, maybe you can go to your neighboring utility and we all if we all had the same model transformer for the same standard then you know we could probably be able to assist each other sooner. So that's our point of view.

[01:05:16–01:05:18] SPEAKER 2 (Brian Rowden):

Thanks, Hernan.

[01:05:19–01:05:27] SPEAKER 2 (Brian Rowden):

Excellent. Anyone else want to comment on this before we move to the next group?

[01:05:27–01:05:48] SPEAKER 2 (Brian Rowden):

Alright, well, we'll ask the hard question now. So, the hard question, what are the roadblocks of acceptance, right? This is, I think, everybody agrees that we can see some good ideas coming here. What are the roadblocks do we think that we see? You know, how far can we really extend these types of attributes?

[01:05:48–01:06:24] SPEAKER 9 (Patrick Gorman):

Yeah, I'm happy to take a first pass, just having been dealing with this issue across multiple products for a long time. You know, I think I mean, there's the, I think the basic legacy, you know, like system diversity, right? So, you've got, you know, a number of different voltage classes that you have to deal with. You've got the legacy networks that were built to serve a certain population. I think that the one underlying is our engineering conservatism at times. A level of risk aversion. Who wants to be the first one to change?

[01:06:27–01:06:47] SPEAKER 9 (Patrick Gorman):

I believe our industry prioritizes, you know, proven reliability over theoretical efficiencies, right? Or effectiveness. So, and I think there may be some concerns around what does a standard mean versus does it mean the lowest common denominator? And that that does bring out a lot of debate.

[01:06:47–01:07:19] SPEAKER 9 (Patrick Gorman):

So, I think there's looking for extensive testing and standards endorsement, and pure adoption becomes real issue that we have because you're not just talking about a bolt.

You’re talking about a highly technical piece of equipment that you need to have confidence that it’s going to work in all applications that we say it is. Then, from a supply chain standpoint, we think about inventory transition risk.

[01:07:19–01:07:50] SPEAKER 9 (Patrick Gorman):

There is a lot of inventory out there. When you make changes, you have to figure out how you're going to bleed out what you have, work down the legacy stock, avoid stranded inventory. Everybody's carrying a different financial risk during that process. And then that often will slow down adoption, and really, where you want to get to. This one probably won't apply to National Grid, but it does apply into the market that we service quite frequently.

[01:07:50–01:08:06] SPEAKER 9 (Patrick Gorman):

Which is there are some older bidding requirements that we have, especially in the public power sector, where it's traditionally three bids in a buy for everything of a large sum of money, and they all define that differently.

[01:08:06–01:08:49] SPEAKER 9 (Patrick Gorman):

That will work only when there is available inventory. You still need to pick your partners and have that security that somebody is going to be out there looking out for you. That is still an issue that needs to be addressed. Bottomline, trying to get the willingness to align on specifications. And then, I'd be interested to hear what Prolec and WEG has. How would you react with the volume commitments you're going need? Are you really going to see that volume if we make these changes?

[01:08:49–01:09:14] SPEAKER 9 (Patrick Gorman):

Do you feel comfortable you're going to see it? I think that the biggest barriers are really not necessarily technical, but they're more around governance, risk allocation, and cultural. So, I mean, I applaud, by the way, I applaud that we're going through this process because the industry is, there's a lot of opportunity here.

[01:09:14–01:09:15] SPEAKER 2 (Brian Rowden):

Thank you, Patrick.

[01:09:15–01:09:49] SPEAKER 7 (Carlos Gaytan):

I would like to add most of the transformer manufacturers have gone through significant growth projects. One of the challenges is the lack of experience of personnel. Not only for workforce, but also for engineering in general. So, that is one of the obstacles that has prevented to execute an additional growth plan. Also, there has been a generational change in the transformer industry.

[01:09:49–01:10:31] SPEAKER 7 (Carlos Gaytan):

In some cases, the lack of experience may be a roadblock for the evaluation and adoption of new proposals that may change what is written in the transformer specifications, so that is another challenge that in many cases, people are used to writing the specifications the first time are no longer involved. So, we need to go through a more detailed work in order to get approvals

on some of these proposals for simplifications and more flexibility. Thank you.

[01:10:33–01:10:34] SPEAKER 2 (Brian Rowden):

Thanks, Carlos.

[01:10:34–01:10:41] SPEAKER 3 (Killian Mckenna):

Happy to jump in here, too. Yeah, sorry, go ahead, Jake.

[01:10:44–01:10:45] SPEAKER 2 (Brian Rowden):

Go ahead, Killian.

[01:10:44–01:11:09] SPEAKER 3 (Killian Mckenna):

One of the things is the amount of different entities in the space. On the distribution utility side, there is over 3000 distribution utilities in the U.S. I thought it was quite remarkable showing; I've always wondered this, comparing the National Grid in the UK versus the National Grid in the U.S. and having one primary voltage in the UK National Grid system is quite remarkable.

[01:11:09–01:11:28] SPEAKER 3 (Killian Mckenna):

Even when you think about the diversity in primary voltages across the U.S., the distribution utilities, we are talking about a lot. On the service side, there are two service sides for residential. You can have a three-phase 120 208, or a 120/240 split-phase distribution system as well.

[01:11:28–01:11:47] SPEAKER 3 (Killian Mckenna):

Which inherently limits that we can go to these, like much larger transformers, and take advantage of diversity demand, and I kind of just lowered not only the SKU, but the numbers of transformers needed, right? I think there's a cap with just having a 120-volt system, and the voltage drop that you will see there, and how many customers you can get onto a single transformer.

[01:11:47–01:12:17] SPEAKER 3 (Killian Mckenna):

Trying to get the community of utility together on showing that cost-benefit analysis or even the cost-risk analysis plays out for reducing the SKUs and the diversity in transformer design, which will be a massive convening effort. It's fantastic to see all the work that the Office of Electricity and you all have done with the utilities. But we need to go even broader in terms of

incorporating a lot more entities into the space.

[01:12:19–01:12:47] SPEAKER 8 (Jake Westhoff):

Thanks. Yeah, from a roadblock standpoint, I would say that the voltages, the many different types of voltages out there on the grid, that's going to be the biggest obstacle to tackle, and obviously, that falls to utilities, and trying to overcome that, limiting the voltages, reducing the amount of voltages is a much larger task.

[01:12:47–01:13:07] SPEAKER 8 (Jake Westhoff):

And, yeah, going to a dual voltage or dual ratio transformer from a manufacturing standpoint doesn't necessarily make it simpler. It does increase the amount of time that it takes to wind the transformer, you have to test both voltages.

[01:13:07–01:13:22] SPEAKER 8 (Jake Westhoff):

So, and then what we typically tend to see is that, ok, now we want to design for both single voltages and then a design for the dual voltage as well. So, it's adding models.

[01:13:22–01:13:54] SPEAKER 8 (Jake Westhoff):

Right now, what we see from utility accounts is anywhere from a contract having 10 different designs all the way up to 150 different designs, and that is just for three-phase padmounts. In terms of standardizing, the biggest recommendation we could provide when looking at a specification is going to the IEEE guideline.

[01:13:54–01:14:10] SPEAKER 8 (Jake Westhoff):

That's a very, very good guideline that all the manufacturers are building to. So, if you're looking for guidance on how to standardize, go into that as the guide would be our number one recommendation.

[01:14:10–01:14:33] SPEAKER 8 (Jake Westhoff):

And then because we can standardize voltages, the kVA size is go upsizing the kVA sizes is definitely, I mean, I completely a hundred percent agree, that's the quickest, easiest way to reduce the number of SKUs.

[01:14:33–01:15:00] SPEAKER 8 (Jake Westhoff):

Which we are seeing that from customers, but then there's just there's many

customizations of parts, I think why when you say there's 3000 different utilities and every utility has their own specification. We have thousands of model numbers of what we build, and we're just doing three-phase padmounts.

[01:15:00–01:15:28] SPEAKER 8 (Jake Westhoff):

The amount of SKUs that are out there, I'm very excited about this opportunity from a manufacturer's standpoint, standardizing is what we touched on earlier. That's what the whole presentation is about. It's going to make product flow through faster, make capacity increase, so thank you for putting this on and open to any questions.

[01:15:28–01:15:30] SPEAKER 2 (Brian Rowden):

Thanks, Jake.

[01:15:30–01:15:45] SPEAKER 5 (Joe Tirocchi):

I just had something, you're right about the different voltages and stuff, as far as, you know, how many different voltages we have to set up for how many different SKUs, and our SKUs.

[01:15:45–01:16:04] SPEAKER 5 (Joe Tirocchi):

By reducing the number of SKUs is going to help us tremendously. The easy wins, the way we looked at it is the smaller ones, like I said, getting rid of 10s and 25s is a quick win. Going to converting when I talked about four kVA, if the area then projects that we could do it, great.

[01:16:04–01:16:22] SPEAKER 5 (Joe Tirocchi):

You know, if not, we'll have to keep certain primary voltages on hand. But I still think it's a win for operation if they can just, you know, take out only two or three different kinds of transformers instead of 14.

[01:16:22–01:16:43] SPEAKER 5 (Joe Tirocchi):

Operationally, I mean the roadblocks we probably see, our part is easy with engineering picking them and reducing the hard parts, probably like what Pat said with supply chain and trying to run all these numbers out. So, how long we have a bunch load of 50 kVAs and hundreds, so, you know, it might take some time.

[01:16:43–01:17:05] SPEAKER 6 (Hernan Yepez):

You got it then? Yeah, correct. So, voltage conversions, yeah, will be probably ideally, and we

probably want to have maybe one or two 15 kVA voltage classes like 13 to 13:8 or 12:70. But to get to that point, it's just going to take years, right? Electrification may be pushing that.

[01:17:05–01:17:31] SPEAKER 6 (Hernan Yepez):

We were even looking at with electrification, if a 15 kVA class feeder was going to be enough, so do we have to go to a 25 kVA or even 35 kVA class? So, I think in the progression it's going to happen at some point, but it's going to take some time. It's going to cost a lot of money, but that's probably what we're looking at in the future.

[01:17:31–01:18:07] SPEAKER 2 (Brian Rowden):

Thanks, Hernan. I think that kind of brings us into the next stop, which is how do we use some of this configuration interchangeability, and trying to get a better handle on the supply chain? How do we use that for the forecasted demand for electrification, as was just mentioned? Undergrounding and some of those areas. How do we use this to inform how to do this better moving forward, and try and get ahead of some of the game in the electrification space?

[01:18:07–01:18:29] SPEAKER 2 (Brian Rowden):

Killian, did you have some, some input on that? I know you've been looking at a lot of forecasting pieces and a lot of a lot of interesting challenges of getting information. So, you know, this might be a good spot to plug that area.

[01:18:29–01:18:46] SPEAKER 3 (Killian Mckenna):

I think this provides really good directionality for the industry. I think one of the catch-22s of this space is we can’t just have a standard SKU right now because of the huge variety and huge cost.

[01:18:46–01:19:16] SPEAKER 3 (Killian Mckenna):

But we can provide directionality to the industry of hey, if this is where we start to head towards for common design and common configurations, we can reduce some of the burden on mass customization and on the supply chain thing, even on this kind of discussion on upgrading, right? If, and the utility sector were like, hey, if we move towards these primary voltage levels across utilities. We agree that this is probably where we should move when you’re going through your next upgrading or conversion scheme.

[01:19:16–01:19:42] SPEAKER 3 (Killian Mckenna):

If you can pick what your neighbors going to pick, are we going to be in a better position? One

of the challenges for that even on this discussion of whether the size is 25 kVA or 50 kVA. I'm sure there's some rural ops that're like, hey, I don't want to put a 50 kVA on a single small, you know, residential customers out at the boon docks, right? Who doesn't need that kind of capacity?

[01:19:42–01:19:59] SPEAKER 3 (Killian Mckenna):

But I think this kind of, you know, north star for where the industry can head and starting that dialogue and getting everyone moving in a direction that can help alleviate some of these challenges is a fantastic piece to do. And then we'll probably talk more about the forecasting side later.

[01:19:59–01:20:24] SPEAKER 3 (Killian Mckenna):

It's difficult enough to try forecast electricity demand versus demand for electricity assets, right? And particularly when there's this many variations and SKUs, trying to forecast those SKUs to provide to the industry means that we're just in a constant supply and demand balance of like providing the orders that you need right now, because that's all you know as a utility. It's really hard to forecast demand for these assets.

[01:20:24–01:20:50] SPEAKER 3 (Killian Mckenna):

Particularly in some cases where you're still trying to get a handle on the digitalization of their asset databases and getting a good feel for that, and the loading of assets and the state of health for assets. I think this provides excellent direction for the industry to start to try and convene on reducing SKUs and to try and help the manufacturing side.

[01:20:50–01:21:14] MODERATOR (Celia Lane):

Brian, if I could just jump in here as well. I'll let you finish responding. Then I think we should also then turn to look at some of these questions that have been coming in from the audience on Slido the last 10 minutes of the webinar. Sorry, I cut you off. Please finish.

[01:21:14–01:21:47] SPEAKER 4 (Sherin Ann Abraham):

I just wanted to add one quick thing because one of the biggest challenges we encountered during the work on forecasting is where can you begin to capture all of these variations and distribution transformers, right? I think with standardization, that can enable forecasting for those common configurations and maybe getting a demand that can be translated to manufacturing audiences to some degree. It can simplify that forecasting process as well.

[01:21:49–01:22:17] SPEAKER 3 (Killian Mckenna):

Just briefly, within the Brian, you kind of outlined this in your last scenario, it would be great to understand 'what are the distributions?', like are there some weighted areas where there are more common SKU designs and more common primary voltages. Almost to create centers of gravity for the industry to migrate towards.

[01:22:17–01:22:33] SPEAKER 3 (Killian Mckenna):

I think everyone is looking at everyone else's shoulder and trying to figure out what everyone is doing in terms of voltage upgrading and conversion. And trying to establish primary voltages and standards. This really does help start to provide that to the industry, which is fantastic.

[01:22:33–01:22:36] SPEAKER 2 (Brian Rowden):

Excellent. Pat, did you want to?

[01:22:36–01:23:00] SPEAKER 9 (Patrick Gorman):

Just want to add one thing from a supply chain side, we know utilities have very robust 10-year plans, so you know what you're going to invest, you know where you're going, but we do also know that you don't know what you need tomorrow, right? We struggle with the hey, what do I need the configuration and the equipment level?

[01:23:00–01:23:25] SPEAKER 9 (Patrick Gorman):

If we start thinking towards what you guys just talked about and really talk about, we can change the forecast conversation too, and it's not just we don't have to think about the equipment, we can now start forecasting, maybe at the voltage class level. We can start to forecast at maybe the regional level, depending upon how this comes together, that changes the dynamic of how we make investments.

[01:23:25–01:23:52] SPEAKER 9 (Patrick Gorman):

To speak for the manufacturers, but having been in a different product class different group, if you can reduce the number of one-offs, and you will really increase the availability and give the manufacturers a little more flexibility to do maybe some last-minute configuration of units and then make some higher-level availability.

[01:23:52–01:24:12] SPEAKER 9 (Patrick Gorman):

So, you know, you can invest in different parts of it, but you in the end, we think about forecasting differently. So, I think if we continue to think about it at the SKU level, it's just going to be the definition of insanity, right? And, and so, you know, I think there's some great work that you guys are doing and that we can piggyback on as an industry.

[01:24:12–01:24:18] SPEAKER 2 (Brian Rowden):

Great, thank you. Thank you, everybody, for those questions. Celia, we will turn it over to you.

[01:24:18–01:24:42] MODERATOR (Celia Lane):

Yes, for sure. It looks like the question that's gotten the top amount of votes so far is from Russell. So, have you considered the emerging solid-state transformers that meet many of the goals of this project? Some are even claiming a path to lower cost, although this is not universal. So, I'll leave that open to whoever wants to take it.

[01:24:42–01:25:06] SPEAKER 2 (Brian Rowden):

I would say first and foremost, from the discussion so far, the discussion so far has been totally focused on oil field transformers, traditional stock, not so much solid state, there's a lot of good research work going on in that area, but the work so far has been focused on that. So, anyone else want to comment?

[01:25:06–01:25:34] SPEAKER 7 (Carlos Gaytan):

I would like to add that the efforts on transformer development are more focused on larger kVA applications, such as those for renewables or for step-up transformer operations, rather than the distribution conventional step-up transformers.

[01:25:34–01:26:09] SPEAKER 7 (Carlos Gaytan):

There are efforts in the smaller region of transformers, but we see that they are not close to becoming a competitive option for implementation with the current technology available. So, there are efforts that are close to starting implementation, but those are focused on larger-sized transformer applications.

[01:26:09–01:26:35] SPEAKER 5 (Joe Tirocchi):

I can actually talk on that, too. We’re looking at small pole-mounted dry types or padmounted solid-state. We’re starting small, maybe focusing on areas of fire mitigation. So, there's no explosion of oil, but as far as you know, we're concerned right now, that's with baby steps.

[01:26:35–01:27:11] SPEAKER 6 (Hernan Yepez):

Some of the advantages that we've seen is the environmental part, but it's a newer product. In the utility world, the standard oil-fueled transformers are very reliable. The other concern that we have is the overloading of these transformers. We can overload on an oil-fueled transformer temporarily, sometimes even at 200%.

[01:27:11–01:27:29] SPEAKER 6 (Hernan Yepez):

That's not the case on a solid-state transformer. It's new technology and may be applicable to certain situations, but not for every single and day-to-day operations. That is the way we look at it.

[01:27:29–01:27:51] MODERATOR (Celia Lane):

Great, our next question that got several votes as well is with approximately 80% of power transformers and 50% of distribution being imported, what's the plan to increase manufacturing in the U.S.?

[01:27:51–01:27:58] SPEAKER 2 (Brian Rowden):

Jake, do you want to talk about some of that balance?

[01:27:58–01:28:30] SPEAKER 8 (Jake Westhoff):

We are constantly making capital investments into the factories that we have in Missouri to increase capacity, to meet that demand. For the distribution transformers, we did open that third factory in 2021, and then we are currently undergoing a $77 million expansion for our specialty transformer factory that builds larger padmounts 750 kVA up to 10,000 kVA.

[01:28:30–01:28:55] SPEAKER 8 (Jake Westhoff):

We are seeing in headlines as well, as I mean, there's definitely a rush, a race to fill that capacity. Other companies are also expanding, so that's been the biggest move I've seen, just seems to be across the board, trying to increase that capacity, secure domestic supply for the transformers.

[01:28:55–01:29:33] SPEAKER 7 (Carlos Gaytan):

We have also finished the implementation of our expansion plans in our Shreveport, LA, facility, as well as in our Goldsboro, North Carolina, facility, so we are essentially doubling the capacity

of three-phase padmounted transformer manufacturing in Shreveport, LA. So, there are ongoing or have been plans, and there are still other plans being considered for continued with expansion projects.

[01:29:33–01:30:04] MODERATOR (Celia Lane):

Great! Thank you for those responses. We have a lot more questions but, but unfortunately, we are at the end of our time here. We want to thank everybody for attending this webinar on the distribution transformer convening group. The webinar recording and other materials will be available on the DOE's website. You can follow this QR code to the Office of Electricity's supply chain and market analysis page for more information. Thank you all for attending.