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Draft National Transmission Needs Study Webinar

WHITNEY BELL: Hello and welcome to the Draft National Transmission Needs Study Webinar. I'm Whitney Bell with ICF and I will be your host today. First, we have a few housekeeping items for today's webinar. This WebEx meeting is being recorded and may be used by the U.S. Department of Energy. If you do not wish to have your voice recorded, please do not speak during the call. If you do not wish to have your image recorded, please turn off your camera or participate by phone. If you speak during the call or use a video connection, you are presumed consent to recording and use of your voice or image. All participants are in listen only mode. If you need to view the live captioning, please refer to the link that will appear in the chat momentarily. If you have any technical issues or questions, please type them in the chat box and select send to host.

Today we'll hear an overview of the Grid Deployment Office and a background on the study before moving on to an update on the study and draft results. We will have some time for Q&A at the end. Speaking of Q&A, we're going to run Q&A a little bit differently than

we have in the past, you may submit your questions throughout the event using Menti. Please go to menti.com using your computer or mobile device and enter the code 1302994. You can then enter your questions throughout the event. We ask that you keep this open and you like any questions that are submitted by other people throughout the event, because the questions that the most likes will be where we start with our Q&A, when we get to the time at the end. The link and the code to join us is also in the chat and you can use your phone to join using the QR code that's on the screen now.

Finally, the recording of today's webinar will be available in about two weeks on the Draft National Transmission Needs Study Webinar webpage. We will notify you when that is available. To kick off today's meeting you'll hear from Maria Robinson, Director of the Grid Deployment Office for some opening remarks. Maria, welcome.

MARIA ROBINSON: Thank you so much, Whitney and welcome everyone today. My name is Maria Robinson. I lead the

Grid Deployment Office here at the Department of Energy and just want to welcome all of you to today's webinar. And we're so thankful for your interest in our Transmission Needs Study. I believe we have a slide here that shows an overview of our relatively new office, that was started back in August of last year. So we focused on three different areas, largely the Power Generation Assistance Division, which focuses on our civil nuclear credit program, which had a big announcement just yesterday, as well as our hydropower incentives, our Transmission Division, which works on commercial facilitation, planning and permitting related work for transmission, and of course today we will dig into the planning side of that fairly significantly. And our Grid Modernization Division that focuses on a lot of financial programs relating to resilience, as well as smartgrid incentives and grants, as well as a lot of technical assistance relating to all of the above topics.

So we're really excited to be here and grateful for your participation in this. And for those of you who have helped to participate in the Draft Transmission

Needs Study to date, we are particularly grateful for your contributions. So with that, I will send it back to you, Whitney, and we can get started.

WHITNEY BELL: Thank you so much. I would now like to welcome Jeffery Dennis, the Deputy Director for Transmission Development with the Grid Deployment Office to provide us with a background on this study. Jeff, the floor is yours.

JEFFERY DENNIS: Well, thank you, Whitney, and thank you, Maria. Good afternoon. My name is Jeff Dennis, Deputy Director for Transmission in the Grid Deployment Office. I'm going to provide just a couple of minutes of background on the need study before turning it over to the real experts to get into the meat. As Whitney mentioned, or I'm sorry, as Maria mentioned, when it comes to transmission, the department and the Grid Deployment Office are taking a three pronged approach to address our nation's transmission needs and the challenges to meeting those needs.

Enhanced planning of transmission and that's really where the work that you're going to hear about today fits. Siting and permitting, including support for states and local communities, and federal permitting coordination. And commercial facilitation to help resolve commercial caps to transmission. So the Transmission Needs Study is part of that enhanced planning work, as I mentioned, and it's a statutorily required. It's required under Section 216A of the Federal Power Act, a report that the department conducts that is an assessment of historic transmission constraints congestion every three years. This is what the department is has classically referred to as its triennial State of the Grid Report.

Previous iterations of this report have reviewed historic industry data. We've had previous studies published, as you see there, four times. The most recent before this one was published in draft form in 2020 and not finalized. But if we go to the next slide, you will see a little bit of a graphical depiction here of how this study has changed in

response to Congress's direction in the Bipartisan Infrastructure Law. In that historic bill, Congress amended the Federal Power Act, Section 216A in its direction to us to conduct a transmission needs study to not only consider historic transmission constraints and congestion, but also to look at expected future transmission capacity constraints and congestion in this three-year triennial State of the Grid Report, with consultation from states, Indian tribes and regional grid entities.

And so today's report, today's draft report that you will hear about looks a little bit different because we are responding to this direction of Congress to expand our analysis to look, not just at historic constraints and congestion negatively impacting consumers, but also future expected transmission capacity constraints and congestion negatively impacting consumers. So this report, taking that direction from Congress, looks not only at historic industry data, but also recent power system studies, a wide variety of studies that look at future needs

and published capacity expansion results and you'll hear a lot more about that in a minute.

We are aiming to publish a final report in 2023 following the public comment period that we have opened with the issuance of this draft and you'll hear in a minute about how we did that. So let's move to the next slide and talk about how this transmission needs study will be used. It will help inform DOE's prioritization of future funding opportunities related to transmission. And really, it's primary role is to focus the attention of federal, state and tribal policymakers, industry and other stakeholders on the most pressing national and regional transmission needs.

If we click forward one more time, we also note that this study will also help inform the designation of National Interest Electric Transmission Corridors under that same section of the Federal Power Act, Section 216. It is important to note that the need study today does not designate any National Interest Electric Transmission Corridor, completion of the

needs study is one prerequisite in order for the department to potentially designate such a corridor, but that actual designation will happen through a separate future process and that future process will consider not just the needs study, but many other statutory factors included by Congress, including included by Congress most recently in the Bipartisan Infrastructure Law, including whether the designation would promote economic vitality, diversity of supply, reduction of consumer costs and national energy security and independence.

So if we flip to my last slide, I just want to give you an overview, before you hear the details, of really what this study intends to do, its objectives, and what it should not be misunderstood as doing, what it really is not doing and what other processes will do. The objective of this study is to identify pressing national transmission needs. It does not prescribe solutions or identify any sort of master plan or major transmission plan that would solve these transmission needs, it is purely an assessment of needs and a comprehensive one.

The methods that we used are to consider existing data, that historic data I talked about, published reports and capacity expansion models. It does not conduct new modeling, new cost benefit analysis or system planning, that happens in other procedures, in industry run planning procedures, in and other planning studies that the department and others are undertaking, but that is not the Transmission Needs Study today. And what the needs study does is it organizes these needs by geographic region, but those regional designations are not synonymous with potential National Interest Electric Transmission Corridors.

As I mentioned earlier, the study does not identify corridors and does not designate corridors, that will happen in the separate process that the department announced last January, in the Building a Better Grid Initiative, will be applicant driven and route specific and the department will announce further plans on that in coming months, but today this study is about needs and not about designation of

corridors. So with that bit of background and overview, I want to turn it back to Whitney and will turn it over to Adria Brooks on our team to lead you through the details of the study.

WHITNEY BELL: Thank you so much, Jeff. We now welcome Doctor Adria Brooks, Transmission Engineer from the Grid Deployment Office, to provide the updates on the on the Draft National Transmission Needs Study. Adria, I'll turn this over to you.

ADRIA BROOKS: Thanks, Whitney and thanks, Jeff and Maria for kicking us off. Looks like ICF - Oh, there we go, I now have control. Thank you. If folks could also please submit their questions. The link was just dropped into to the chat, if you submit your questions on Menti as I'm going and then folks can upvote if they had the same question, that way we can try to prioritize questions, although we're leaving lots of time to try to get through all of them. Just a quick notice, none of the information presented herein is legally binding. Also, the content included in this presentation is intended to inform, relate or

for informational purposes relating to the Draft National Transmission Needs Study. If there's any content presentation that appears discrepant from what's in the study itself, the study language supersedes what's in this presentation.

All right, with that, I just want to give a brief overview of our outreach to date on the study. So in January of last year, the department kicked off what we called our Building a Better Grid Initiative. In this initiative we outlined several of the different programs that the department is going to be undertaking related to building a better grid, increasing reliability of the grid, to integrate more clean energy resources, to lower cost for consumers. And each study is one programmatic activity, it was announced at that time.

And then in March, we sent out preliminary notification to a handful of organizations, those organizations that Jeff mentioned that we're obligated to consult with. So we met with national and state associations and we also announced the

needs study on the DOE Tribal Consultation Webinar that happened that month. In July, we sent a formal notification letter to those same entities, that also attended a number of conferences during the summer, to announce the study and to talk to lawmakers at the state level.

Then, in October, we released what we're calling the consultation draft and, again, that went to those same entities, tribe, states, regional grid coordinators to get their feedback on the draft study at that point. So our consultation period lasted from October through November. We received plenty of comments and then staff worked to integrate those comments into the study that you all now have in front of you.

So last Friday we released the public draft version. One reason for us trying to get this out last Friday is to give us as much time as possible for the public comment period. So the public comment period is now open, that will close on April 20th, and I have instructions at the very end on how you can submit

comments. Part of the public comment period, including this webinar, we accept written comments. The e-mail address is at the very bottom of all of these slides. You can also reach out to the e-mail address if you have follow-up questions that you would like answered. Once the public comment period ends, DOE staff is going to work to revise any comments we receive, try to integrate what we can into the study, and then publish a final study in summer of 2023.

Here's just a really high level overview of the consultation comments that we received in October, November of last year. So 20 different entities submitted comments and among those entities we calculate there were about 180 unique comments that came through. Here's just a general breakdown of them. So 61 were requesting to expand discussion in various parts of the needs study. 47 comments provided edits for clarity or suggesting where we need to clarify our language so that things made some more sense. We also had 28 general comments. So for example, states letting us know about studies that

they're undertaking that eventually would be useful to include the needs study, maybe the next needs study three years from now. We had 15 comments that corrected factual errors. 12 related to concerns of the scope of the study. A handful of requests For more information and then just some small formatting suggestions, all of which we tried to resolve in the public version that you all have.

So with that, all the comments and revisions that we received, all the comments received in our attempts to revise, based on those comments, those are provided in the appendix of the draft needs study. So the last 80 pages or so of the needs study is in fact, all those comments that we received.

So now diving into the draft results of the study. Here's the outline of the needs study. So of course, there's an executive summary, there's an introduction which goes over all the background information that Jeff covered, legislative language that motivates the study, a chapter on transmission concepts, try to bring folks up to a similar page before diving into

the results. Now those last four chapters really do focus on detailed results of the study. So the first one talking about historical data, understanding the current need of the power grid. The fifth chapter reviewing existing studies, so both current and future needs. In the six chapter and final chapter, look at capacity expansion modeling to try to understand anticipated future needs on the power grid. Here's the website again, although I imagine most of you have found this already since you're the webinar, but if you need it, there is a website to go download the study itself.

Now I'm going to really just focus on results in this webinar, we're not going to go over those first three chapters. So I'll talk about high level summaries, executive summary, then I'll really dive in to some of the detailed results later on. So here are the three big takeaways from the study, when we're looking nationwide, right. So there's a pressing need for new transmission infrastructure. Interregional transmission is what results in the largest benefits, so of all the different ways to install transmission,

looking at those facilities inter-regionally is really where we see the largest benefit to the power grid.

And then finally, needs are going to shift over time. So what we need today is different than we need in 2030, which is different than what we need in 2040. So those needs are constantly evolving. So in the executive summary, we try to organize all the results, the detailed results in the rest of the report by these 13 geographic areas. So we use this for purposes of the executive summary and then it shows up a few times in the detailed report. We really wanted to understand how can we, or rather how can we make the information, detailed information understandable at just a high level when we look at these 13 regions.

So part of doing that is that we were looking for geographic areas where a transmission need exists could benefit from an upgrade or new transmission facility to do one of six things. So these are the high level buckets that we used for categorizing all

the needs that we found in the study, for the executive summary, and I'll go through them one by one so you can kind of see how these different needs fall into each region. So we look at current need, the need to improve reliability and resilience in the power grid. Also, to alleviate congestion and unscheduled power flows. Delivering low-cost generation to high price demand areas. Alleviating transfer capacity limits between neighbors. And going into the future, also to meet future demand, with interregional transfer capacity and to meet future demand within region transmission and deployment.

So here's a high level summary of the regional needs, and, again, all these that are in the executive summary are supported by the detailed findings, which I'll cover some of those in the rest of this webinar. Just going to run through each of these quickly. So it seems that nearly all regions in the U.S. will benefit from improved reliability and resilience given additional transmission investments, that showed up for almost all regions in the data that we looked at.

High congestion in the Midwest, Mid-Atlantic and New York could be mitigated by additional transmission assets. Also, unscheduled power flows in the west are prominent in California and the northwest and the mountain regions. Regions with high electricity costs, notably portions of the Plains, Midwest, Mid-Atlantic, New York and California, will benefit from transmission that delivers cost effective generation. And historically, largest benefits in new interregional transfer capacity additions are found across the interconnection seams and in the middle of the country.

So here, if we're just looking at historic data, we see these six regions in the middle of the country where we're already seeing a need to alleviate transfer capacity limits. However, once we start to look into the future, even after 2040, there's going to be a significant need for new interregional transmission between nearly all regions. So in this case, in every region there was a need to share with at least one of their neighbors in the future. So

today, middle of the country, later on, almost everywhere, so that's an example of these changing need to the grid.

And then finally, significant transmission deployment is needed as soon as 2030 in the Plains, Midwest and Texas regions. But by 2040, large deployments will also be needed in the mountains, Mid-Atlantic and Southeast. So again, we're seeing more regions, these needs changing with time. Now, having gone over that, if you were sitting here in your region thinking, "Oh, one of those doesn't look quite right for us, I'm not sure why." This is the type of feedback that we would want to get during comment periods to dive into the report, understand where we're pulling these findings from, and then please respond to us in that way.

OK, so I'm going to dive into the first chapter that has detailed results, so looking at historical data. The first section of this chapter is Historical Transmission Investments. The second section is looking at Market Price Differentials, we do that

both regionally and inter-regionally. And then also looking at Transmission Value during Extreme Events. Another section is on Qualified Paths in the West, and then finally a section on Interconnection Queues. Now because of time, I'm not going to go into detailed reports or detailed findings for all of these sections, I'm just going to focus on a handful of them.

OK, so one of the first findings is that we find that transmission investments decreased during the second-half of the 2010s. So what's plotted here is load weighted circuit miles for all the last decade, so 2011 through 2020. We present these as rolling three year averages to get rid of some of the lumpiness by which transmission lines come online. This is broken out by regions, so the number of circuit miles and that's weighted by electric load for each region. Understanding that if you have high load, you might have more need for transmission than if you have lower load.

Now the clustered bar charts all the way to the left, where it's labeled All Regions, that's the entire United States. So you can see this increase in transmission that was installed up through 2015 and then that dropped off from 2015 to 2020. So there's certainly this increase in the beginning of the decade and then decrease the latter half of the decade. And that trend was generally true for all regions individually as well, to differing degrees. So that was just something that stood out right away.

And also look at who is installing projects. So I found that non-incumbent developers share of energized projects decreased from 40% in 2013 to less than 5% in 2020. So the peach color at the top of all these bar charts, these are non-incumbent developers projects or the share of their projects. Non-incumbent developers are also sometimes referred to as merchant developers. So in 2013, there was the most even mix between non-incumbent developers and the incumbent developers, the regulated utility developers in the salmon color, but that also dropped off precipitously until 2020, where non-incumbent

developers had less than 5% of all projects installed.

In addition to looking at who was installing, we also want to look at why projects were installed. It's about the share of projects addressing reliability concerns, in purple, the bottom portion of these bar charts, concerns have increased. So in 2011, projects that were installed to address reliability concerns were about 50% of all projects, but in 2020, that increased about 75%. If we look at the share of high capacity projects, so those projects that are really high voltage meant to move generation long distances, shown here in light blue, those decreased over the course of the last decade. So they had the most installs in 2013, about 50% of circuit miles installed were for high capacity projects and then that decreased latter half of the decade, and in 2020 where there were hardly any that were installed.

So moving now to look at wholesale electricity prices, historic wholesale prices. Now these prices reveal areas experiencing congestion today, where

there's a difference between a high price region and a low price region really nearby, that indicates there's some type of congestion on the power grid. And the directions of these within region congestion that's maintained overtime. So looking back even to 2012 data, we find the same areas that had low prices and in the same areas that had high prices, that was consistent throughout all of the decade.

And in general, increased transmission capacity between these low price regions, shown here in blue, and the high price regions, in red, would help alleviate or could help alleviate those high-priced regions by offering them low-cost generation. Now it's much easier to see these congestion trends. Instead of looking at average prices, which is done here, instead, we look at where there are persistently low and high prices. So again, high prices in red, low prices in blue, this really helps us isolate areas that are strongly impacted by congestion, regardless of the average annual price, right?

So energy prices change a lot, most linked to natural gas prices, so we can get rid of that if we just look at where they're persistently high and persistently low. So each one of these red dots, these pixels, this is a place on the grid where we measure wholesale electricity prices, right? So these nodes, if they're red, that means that these were at the top 5% of electricity prices within that interconnect year after year. So really, really dark red, that means even four or five years in a row consistently the most high prices, even on an hourly basis, the opposite is true for the dark blue. These are places on the grid where the prices were persistently low year after year. This again really helps us to isolate, OK, where would additional transmission assets help improve this congestion and potentially help reduce prices for consumers in these red regions?

So here's another way to look at this, this is research that was done by Lawrence Berkeley National Lab. Actually, the last few slides were also done by

Lawrence Berkeley National Lab for us, but this section of the report was spun off into their own report and there are links in the slides. And then you can also Google and go see webinar recordings of the researchers, they're presenting their own work and I'll just give a high level overview of it here.

We found the largest congestion value of new transmission is across the interconnects and during extreme weather. So what's being plotted here on each of these black dots? We're showing the differences between wholesale prices, hourly wholesale prices over the course of the year on average. So, for example, if you were to look at that black dot in Phoenix, Arizona, that's not actually Phoenix, that's a hub price. So that would really represent the prices of all of Arizona, all of New Mexico. If you want to compare, what's the difference between the prices in Arizona and New Mexico against, for example, the prices in California to the west or go out to the east?

We see that there is a large difference in prices between Arizona and Texas. Where these high values exist, shown here by just the high number but also the darker color links, that's indicative that there would be high value in more transmission capacity between those locations on the grid to help reduce congestion. So that really shows up when we look at Texas first, with connecting with any of its neighbors, but then also connecting the eastern and the western interconnects, so shown here, connecting the west non-ISO to SPP, so highest value by connecting the three interconnects. There's also high value in this chart by connecting SPP and MISO. And that said, this is data from 2021. Right, which was an extreme weather year for ERCOT, where they experienced really high prices because of power outages in February of that year. So if we were to look at different years, these numbers do drop off for Texas, but the same trends apply even going back to 2012. We see the highest value connecting across the interconnections and then also connecting SPP to its eastern neighbors.

And then a quick look at the interconnection queues in each region. We find that power plants seeking transmission interconnection are facing increasingly long wait times. So in the 2000, 2010 wait times for power plants to connect to the power grid were a little over two years. Last decade, they were more than 3 1/2 years to connect. T there's lots of reasons why the interconnection queues are backlogged in the U.S., but one of those is that these power plants don't have adequate access to the existing transmission system or there's a need for serious upgrades on the transmission system and those costs can sometimes be cost prohibitive for the power generators versus doing that in a transmission planning setting.

So shown here is the amount of interconnection or the amount of power plants that are in the interconnection queue within each region. The majority of them are solar in yellow or blue, storage, but there's also several wind in green and

then also gas plants in gray and a handful of regions that are backlogged.

OK, so moving on from there to the next chapter, our Review of Existing Studies, this is really capturing both current and future needs. We looked at 50 different studies in this chapter, as Jeff said, there are 80 different studies in the entire report, but just in this chapter alone, we looked at 50 of them. These were studies that were national in scope, sometimes regional in scope, occasionally just looking at one state's power grid. And going through all of that information, we were trying to look for patterns that would tell us about needs of the power system. And the way that we organized the chapter is kind of how those patterns fell out. So we have a subsection on reliability needs, also on resource adequacy concerns, clean energy and some of the reliability concerns that come specifically with clean energy or the great integration concerns that are specific to clean energy.

Now I should say that clean energy in this report considers lots of different power generation technologies. So there's the obvious renewables that we think about: wind, solar and biomass, but there's also nuclear, there's also fossil fuel plants, so gas or coal that have CCS technologies or carbon capture sequestration technologies included. All those are considered clean energy here and they are in this section, but we did want to highlight offshore wind and also clean energy on tribal lands. Then there is a section on congestion and we organize that by each geographic region. Curtailment of power generators based on the needs of the grid. Resilience of the power grid. Electrification, so recognizing that the needs that we're going to have as we electrify more and more and use devices such as cars, turning those into electric vehicles, that's going to create different needs in the power system.

A section on non-wires alternatives. So I'll note that this is really the first of our previous congestion studies and now the needs study, this is really the first one that focuses so heavily on non-

wires alternatives. Throughout the report, we think of transmission as technology agnostic, so where a non-wire solution is beneficial and could support a need, then we want to bring that in. Other cases where we need a traditional wire to address the need, we want to make sure that we are calling that out, too. So we do put some information in here on non-wires alternatives and how they could help support the power grid. And then finally, there's a section on barriers to transmission development.

Here are the 50 studies that we reviewed, we had to give ourselves a cutoff point, so we stopped looking back at 2018, but the majority of these were all of 2020, ’21, and then a handful of 2022 that we included. I won't go through each study, but I'm just going to name who the authors were in these general buckets. So about a fifth of them were all a Department of Energy reports, so that's coming out of the National Labs. Another fifth were consultant reports, so those that have been doing a lot of work in this space the last several years. There's a handful of academic reports, but the vast majority of

these, almost half of them came from industry itself. So the RTO's, Burke, the National Reliability. Sorry, so NERC [phonetic] and then also the National and the Regional Reliability Coordinator, so I want to get both the national and the regional perspective there.

There's a handful of groups here as well, so like the independent market monitors that are looking at the markets specifically, but to the extent that they are tied to the transmission system, we brought that in as well. I'm not going to talk about the findings here, but did just want to show the variety of the different types of authors and reports that we were able to pull in.

OK. So finally, I'm going to talk about the last chapter, Capacity Expansion Modeling: Anticipated Future Need. So this is really what's unique about this study compared to previous congestion studies is that they weren't able to look at anticipated future need, so we did that here, so I'll spend a lot of time in this chapter. This is organized as including studies and scenarios, so with studies that we use

when we were working on this data, within region transmission deployment, interregional transfer capacity results and then also international transfers.

I'm just going to talk about the first three. I'm happy to answer questions about international transfers, if they come up, but because of time, I'm just going to focus here. OK, so data from six different capacity expansion studies were analyzed to identify future regional and inter-regional transmission needs. Four of those studies came from the National Labs, notably at the National Renewable Energy Laboratory. And then two academic reports were included, so research done by Princeton University and then also by Massachusetts Institute of Technology or MIT. There were some other consultant academic reports that we tried to work in, but because of data quality issues or data being proprietary and not available to the public, we were not able to incorporate them, so we were left with these six.

I want to say something about capacity expansion models, for those who aren't familiar with it. So these are models that optimize for a least cost power sector solutions. They're looking nationwide and they use a large range of input assumptions. So for example, how much demand are we going to have nationwide or within each region in a future year? What's the cost of energy going to be? How hard is it going to be to site different types of power plants in different places? What state or federal policies might come online that are going to impact the power system?

There are a lot of input assumptions. Once they have those inputs, they then can decide, all right, this is the optimal generation mix and the optimal amount of transmission that we're going to need to meet resource adequacy concerns to provide enough electricity to consumers. Now these model results really help identify quantities of cost effective transmission solutions, and they're used here as a

proxy for future need to meet generation and demand growth.

Alright, so of these six different studies there are 300 scenarios among them and they describe a really wide range of power sector futures in different years. Alright, OK, so each dot here, this is one of those 300 scenarios and they're plotted for three different years, so 2030, 2035 and 2040. Each color of the dot is indicative of which study it came from, so you can see the spread there by the different studies. On the Y axis this is plotted carbon emission reductions from 2005 levels. Alright, OK, so if we just focus on 2030, we can see that these dots range anywhere from 25% carbon emission reductions from 2005 levels up to 80% reductions with a lot in between.

Now today we're at about 40% on the power sector, which is to say that some of these dots that are less than 40% assume that between now and 2030 we're going to be putting more carbon emissions into the air, whereas a good majority assume we're going to be

emitting less carbon emissions, so increasing that power emission reduction level. That's a really wide range, 25 to 80% and that just grows with time. So in 2035, these scenarios assume that everywhere from 10% carbon emission reductions up to even 100% carbon emission reductions, again, in 2040 that continues to get larger with more scenarios.

So you can imagine the transmission system and the generation mix that is going to accommodate everywhere from 10% car emission reduction up to 100% is going to look very, very different. So we need to have some way to try to understand the results coming out of all these disparate scenarios. And I should also note that car emission reduction is plotted here, but there are lots of other power sector characteristics that we could and did plot as we're trying to look at this data and understand it. So total load on the grid, what type of generation gets installed, most likely wear, but there's lots of other things we could have looked at and we saw these really large spreads in these scenarios too, for all

those different characteristics. So this is a very wide-ranging group of scenarios.

OK. So with that, we needed a way to look at the different scenarios in order to understand the results. So we did that by looking at the underlying scenario characteristics. So this is just illustrative data, it's not real data, obviously I'm going to show the real data in the next slide, but just to help orient everyone. So we take those same 300 scenarios from the last slide and we put them here on this plot, where we have clean energy in 2040 on the X axis and then electricity load in 2040 on the Y axis, right, and then the location changes based on those two things.

We can focus in on this 2021 diamond, so this is the clean energy and electricity load mix in 2021. So any dot to the right of that green diamond means that there was a growth in clean energy between 2021 and 2040. Same thing, any dot that's above 2021, that means there was a growth in total electricity load between 2021 and 2040.

So with that, there were three major groups that really popped out when we plotted the data this way. The first one is this moderate load, moderate clean energy growth group or what we call mod-mod or moderate-moderate throughout the report. There are about 80 or so scenarios that fell into this group, of those scenarios, many of them were market driven, which means that the researchers took out all state policies, local policies, federal policies that were on the books at the time, just removed them and just said OK, how is the power conduction going to change over the next so many years, based on only markets alone?

So a lot of those scenarios fell here. There are also scenarios that included existing state, local, federal policies, and when I say existing, I mean what was on the books at the time the research was done, all six studies were published different years, so they all may include slightly different policies. On the opposite of the spectrum, we have these high load, high clean energy growth scenarios. So there

were not any scenarios that fell into this group that were driven by markets alone or even existing policies, new state or federal policies would have to come online, which really pushed the power sector to this high load, high energy growth scenario group.

And then finally, there was this middle category. So the moderate load, high clean energy growth. So again the load not changing a whole lot compared to 2021, but the clean energy growth was pretty substantial. There's a wide mix of scenarios that fell into this group. So both those that were driven by markets alone, those that were driven by existing policies, again, those that run the books at the time the research was done, and then also scenarios that assume new state or federal policies are going to come online to impact the power system.

I want to also provide a quick note on the impacts of the Inflation Reduction Act or IRA. All six studies were done before IRA was announced, right, or signed and became a law, because of that, none of them include the tax incentives and a lot of the things

that were in the Inflation Reduction Act. So both DOE, internal modeling and lots of external modeling has been done since IRA came out to try to understand how is that going to push the power sector in the future. And we think that the new normal, the new power sector is going to wind up in this moderate high group.

So before IRA, we might have said OK, our moderate-moderate group here is going to be our business as usual case, that's where the 2040 system is going to be. But now it seems that our new normal is in this moderate-high case.

OK, so here's the real data. Each black dot again is a scenario. We remove the color coding so all of the studies are combined together here. These red circles, these are kind of like a topographical map. It's a two dimensional histogram, so you can see these like three mountains kind of popping out of the screen towards you. That shows how many scenarios fell within each of those mountains. This is where we

got our three different scenario groups from, so our mod-mod, mod-high and high-high groups.

OK. So just to summarize. So all of the study scenarios are broken into those three groups, like we just went over, the mod-mod and mod-high and high-high group. There are between 60 and 85 scenarios that fell into each group. And the transmission results were analyzed within each group for three different years, so 2030, 2035 and 2040. So in the needs study itself, we actually present results in these nine different portions of this matrix. So you can go in and look at, OK, if I'm only interested in mod-mod transmission solutions in 2040, what would that mean for each region? So you can do that.

Today, I'm just going to talk about the mod-high results in 2035 and I'll show a glimpse also of 2030. And I'm going to provide a really quick overview of what you're going to see in the next couple of slides. So the makeup of the future power system is unknown, right? So there is a range of study results that we present. We don't assume that we're just

going to hit, one scenario is going to be correct and therefore we're going to present one number. We do provide a range of results. So all the regions are going to be on the Y axis and then the gray gar is existing transmission, as recorded by the researchers when they did the study. The green bar is going to be that range of estimated future need. So our result range there's more detail in the in the paper itself, right, but the interquartile range, IQR is what we use. That is just the fancy stats name for the middle 50% of all of the scenarios that are within this group.

But importantly, the gap between the existing transmission in gray and then the range of future need in green, that's the gap to fill between now and then, whatever date we're showing, in this case is gonna be 2035. OK, so with all the disclaimer, here is here are the results for the regional transmission expansion, again 2035 in that moderate-high group, our new normal, thanks to the Inflation Reduction Act. So you can see all the regions stacked up on the

left on the Y axis, also include a map here just to help orient folks.

And then they are arranged based on how much total transmission is anticipated to be needed in 2035. We're going to focus in on the top four. So the regions with the largest need here, going into 2035, is the Midwest, the Mid-Atlantic, the Southeast and the Plains region. Now this is absolute transmission needed in 2035, it's not necessarily how much needs to be installed between now and then. If we look at that gap to fill, then our top four come out as the Midwest, Southeast plains, then also Texas, where there's a lot of transmission need to be built there in order to get into this cost optimal range. Then, as a quick look at who has the least need for new transmission, so Florida and California and New England and New York.

OK. So that's where we need to be in 2035. And it's natural that the next question to be, how close are we to realizing these futures? This is a comparison of the utility plans against those same results. So

before those green bars, they were horizontal, would now turn them vertically. Then I also want to note that this is 2030 data, not 2035, so how much transmission do we need in 2030 on our way to get to the 2035 need? The gray diamonds are utility plans. The reason we use 2030 because the utility plans, at least for the dataset that we had, stopped at 2030, so they didn't go out to 2035.

Now we can see that in a handful of regions, in those regions over at the bottom of the last chart, New England, New York, Florida and California, the utility plans either meet or exceed the anticipated range suggested by the capacity expansion results and all of the regions utility plants are falling short. Now, I'll make a quick note here that the data set that we used was from New York's Energy Supply and Demand 2020 database. Not all utilities reported their plans, their transmission development plans through this database, so we recognize that these utility plans are likely to underestimate. This was the best data that we had to look at, look at all the regions at a national scale.

OK. And then finally we do the same thing for interregional transfer capacity. So this is again 2035 mod-high, our new normal results, and we can do the same thing, which is understand where are we today and where do we anticipate we need to be in 2035. We'll just focus on the top four. So the largest transfers that we see in the Mid-Atlantic to the Midwest, Midwest to the Plains, Delta to the Plains, and then also Mountain to the Northwest. We do the same thing of just looking also at where is the largest growth that needs to happen. And now we see Plains in Texas coming online. We're not as much of absolute total need in 2035 compared to some other transfers, but at least a long way to go compared to what's there today.

And then again, just to highlight also the bottom four regions in terms of amount of new capacity to come online, so the Plains to Southwest, California to Mountain, Mountain to Plains, and then the Delta to Midwest regions.

OK, so finally, here is how you comment on the report. So to comment on the needs study, please e-mail your comments as a PDF attachment to this e-mail address. The same e-mail address that's been the bottom of all the slides, NeedsStudy.Comments@hq.doe.gov. The deadline is April 20th, and that's assuming the Federal Register is posted as it's scheduled to be on Monday. If for some reason that's pushed back to Tuesday or Wednesday, then you all would have a couple extra days also to get your comments in. So I want to thank you all for your time and. I'll turn it back over to you, Whitney.

WHITNEY BELL: Thank you, Adria. So we now have time for Q&A. Please put your questions into Menti now, we'll put the information back here in the chat. There's also the ability to like your question, so please go in and do that because we're going to start with the questions that have the most votes. So we'll go ahead and get started here. So, Adria, what jurisdiction does DOE have to plan transmission? How does DOE's

transmission planning jurisdiction differ from that of RTOs/ISOs or balancing authorities? Who plans the transmission system?

ADRIA BROOKS: Sure. So a lot of this is going to be covered in that third chapter of transmission concepts of the study. So the RTOS, the transmission planning regions where an RTO doesn't exist, are those that are in charge of planning the system, in the real world, right? So they use a lot of really high level modeling and they understand their regional grid very well, they're the experts there. So for example, the capacity expansion models that are used here, that's often just a single step that is done, or maybe even the first step that's done doing a transmission planning process.

There would be subsequent planning models after that to really understand, OK, we generally think is how much transmission we need and this is where we think it needs to go. Now let's actually try integrating that into our existing system and then running lots of different reliability models to be sure that we

can sustain those new transmission systems and they are providing the benefit that we think they're going to. So that's being done right now also at a national level under the DOE's National Transmission Planning Study, which is a separate study from this one. And what's unique there is that they are going to -- they're not just doing the capacity expansion models, which are included here, they're also doing all those subsequent kind of downstream models as well to ensure that the grid would be reliable.

Now, the reason they're doing that is because the regions, the RTOS, they really only plan the grid for their region, for their jurisdiction as they're responsible to do, as they're required to do. So that doesn't mean they don't have great visibility into what's happening a region or two over. So by DOE looking at this, we're able to try to understand comprehensively what's happening at the national system if we were to do this type of planning at the national level. I hope that answers the question.

WHITNEY BELL: Thank you. We have another popular question here. How does this study take into account energy needs that might be fulfilled with transmission alternatives such as energy conservation initiatives, demand response, DER and other non-wire alternatives?

ADRIA BROOKS: Great. So we try to cover non-wires alternatives in a few places, or we really call them out in the way that they can help alleviate needs in the power grid. Notably, that section in chapter 5 that highlights non-wires alternatives. We talk about it a lot there, but in general when we use the word transmission in this report, we mean that technology agnostic. So transmission doesn't automatically mean a new wire, it just means anything that could serve the role of transmission, so that could be a non-wire alternatives like DERs. I think I have a slide that talks about how DERs were used in the capacity expansion models. So let me see if I can pull that up really quickly.

Great. OK. So this is that same scenario chart that you all saw with those 300 scenarios. Of those, 300, 47 of them were considered high DER scenarios, or more than 200 terawatt hours of DERs nationwide. That number came from one of the cited reports in chapter 5 that talks about the importance of DER's to support a national power grid, and they defined high DER use as 200 terawatt hour numbers, that's where we got. So there are 47 different scenarios of the 300. About half of them fell into the mod-mod group and another half fell into the mod-high group, around half and half, I don't remember the exact ratio, whereas there weren't any high DER scenarios that fell into the high-high group.

So that is to say that distributed resources are baked into the capacity expansion results that we show. We did a little bit of trying to understand how might the results of transmission need in the future change based on whether or not a scenario had high DER. I think the assumption going in is that OK, if we have lots of distributed resources then we won't need as much transmission in the future, we didn't

necessarily find that to be true when we look at the results. Even those scenarios that had high distributed resources still had pretty significant amounts of transmission builds, so that's detailed a little bit in the report, we did try to pull that out based on consultation feedback. So there's more on this chart in the report as well.

WHITNEY BELL: Thank you. Another popular question here: Transmission built to equalize energy prices leaves one region worse off to lower prices for another region. Transmission itself is very costly. Does DOE have a fair cost allocation framework in mind?

ARDIA BROOKS: Yeah. So Jeff addressed this a little bit in the beginning. We do not include cost benefit analysis when looking at transmission, that's something that the RTOs do when they're trying to plan which transmission to build and where. So with this high level, unless there was a report that included specific [unclear] of the analysis, and there were a few in there, we're not doing new modeling to try to capture what that cost map

analysis should be based on the capacity expansion results or other places. So if it was already published or was in a report, then it is included here, but it's not included perhaps in this last chapter, which maybe they were referring to for the capacity expansion model. Again, that's something the RTOs are required to do, which is something that's really important for them when they're looking about where transmission should go.

WHITNEY BELL: All right, everybody, continue upvoting your favorite questions here. Another popular one: roughly how many transmission developers is GDO speaking with about the various DOE support sources? When will the first transmission projects be selected for support?

ADRIA BROOKS: So for the needs study, this is just an assessment of what's going on on the power grid today. I don't have any information or data about the number of developers we're talking to or the other programs. So this author might be referring to some of the other kind of funding programs that we have

going on that Maria talked about and Jeff talked about a little bit in the beginning, but that's not within scope here, so I don't have those numbers.

WHITNEY BELL: Thank you. How important will this study be as opposed to other sources of information for the corridor designations?

ADRIA BROOKS: Great. Yeah, so I'll go back to the slide that Jeff showed. In the Federal Power Act, as it was amended by the Bipartisan Infrastructure Law, the secretary has a really wide range of discretion of things that she can consider and the full list is in the Federal Power Act, but I'll pull up the summary here. So the needs study is just one of many things. So the Secretary will be looking at the results of the needs study and trying to understand, OK, how would any project that is proposed for NIETC corridor alleviate the needs as found in the study? But there's also lots of other information that she's gonna be able to consider. So this is one part of several, several factors that she gets to look at.

But everything that you look at is statutorily laid out in the Federal Power Act, so that's listed there.

WHITNEY BELL: Great. This next question I can answer. So will the presentation slides be shared later? And I see it continues to be upvoted. So we will post a recording of this session up on the site and we'll share that site at the end of this webinar, just so you guys can grab it in the chat at that time. Give us about two weeks, but we will send you a note when it is available. So if we get it up sooner, you'll get it sooner, but you'll definitely get it within two weeks of today. All right, now to a question that you can answer: what steps is DOE taking to standardize the approach by which utilities and transmission operators will be obligated to share network models to ensure transparency and commitment to renewables integration?

ADRIA BROOKS: So I don't have any information on that. If there is any work being done, it wasn't included here in the needs study, so sorry that I can't answer it. That's type of thing where if that question comes

in, you could e-mail the link here and then we can try to answer that for you, if that answer exists, but I don't have it, sorry.

WHITNEY BELL: Completely fine. Sorry, they're changing on me as I'm trying to ask the question. One of the major limitations on processing interconnection queues is the lack of human resources, particularly qualified electrical engineers. Does DOE have a plan for expanding a trained workforce?

ADRIA BROOKS: Yeah, absolutely. I mean, we have heard that not just through the study, but I think the department has heard that in our work with RTOs and trying to understand their needs and what they're facing. So there are several workforce development programs ongoing at the Department of Energy. I don't necessarily know how that is specific to interconnection queues as a whole, but I do know there is a lot of funding coming through for workforce development. Again, there are some -- We have some of that information, it’s publically available on our website. So again, if you want to e-

mail us, we can try to send you to the correct links, but not something that I have here today for you.

WHITNEY BELL: Alright. Are line losses considered in the study?

ADRIA BROOKS: Good question. So line losses came up a little bit in chapter 5, I believe when we were reviewing other studies that were put out. And line losses were considered to differing degrees in the capacity expansion modeling, but some of those really detailed transmission modeling aspects, you have to go to the underlying specifics of the six studies themselves to figure out exactly how they handled it. So we didn't intentionally add any line loss data to what we did here, but to the extent that it was already included in other studies and it would be captured here.

WHITNEY BELL: All right, will the final needs study discuss major reasons why high capacity projects [unclear] decreased and why the non-incumbent share

of the projects has also decreased? If I need to reread it, let me know.

ADRIA BROOKS: So we did include a short section at the end of chapter 5, I actually don't know that it's that short. We did include a section at the end of chapter 5 on barriers to transmission development, and that was a change we made after consultation feedback where they asked us to add that in. So that is captured a little bit there, but it doesn't address why incumbent versus non-incumbent. So we didn't dive into why that might be the case, but we did just see that coming through in the data, so we wanted to capture that in the study, but we didn't try to understand exactly why that is in the study itself.

WHITNEY BELL: The quality of the reports that provide the basis of the needs study vary significantly in both their assumptions and robustness of their analytical methodology. How is this reconciled in the report?

ADRIA BROOKS: Yeah, absolutely. So part of that is our ability to try to capture lots of different studies, right? So really trying to cast a wide net is one way to try to help with that. So that was really the big thing, was looking for lots of different studies, being sure that they're ones that are publicly available, ones that have gotten attention by industry or, you know, by consultants, by academia, wherever it is that they were published. So those that were generally considered reputable and that have been shared widely and just known about, so that's what we use and, again, we do recognize that there's different levels of quality. All studies are looking at slightly different things, right? So again, trying to capture that wide net is the best we could do there.

WHITNEY BELL: This one just got upvoted here. Why is it acceptable to exclude the Southeast from your results? It may not be an ISO, but there still has to be some data available, right?

ADRIA BROOKS: OK, so this is probably referring to the section on wholesale electricity prices. So let me jump up there. So in this dataset, we were looking at wholesale electricity prices and the Southeast was not included just because they don't trade at the wholesale level, so we don't have access to the wholesale pricing the way we do in the RTR regions. Now I'll note that that is also true in the West, so the non-California West also doesn't trade all of their energy at a wholesale price, or sorry, in a wholesale market, they only trade, I think it was about 5% of their energy. That detail is in the report, so don't hold me to that, but there's a small fraction of energy that the West does trade in the markets in the West, so that we were able to capture but the same applies to the West. If the West did trade in RTO, then we would be able to have more visibilities in that data. That said, this is the only section where the Southeast isn't included. All other sections of the report the Southeast is included. It was just this particular dataset where we don't have transparency into the Southeast

wholesale prices, so we couldn't do this type of congestion analysis here.

WHITNEY BELL: That makes sense. Can you speak to international transfers, Canadian hydro, and how DOE may evaluate that?

ADRA BROOKS: Sure. Yeah, so this is again in the report, I didn't go over it, but I'll just show the results briefly here. OK, so here are the international transfers that we see between the different U.S. regions and then their Canadian or Mexican counterparts across the way. So same thing, where the -- Well, this chart is a little different than what I showed previously. So existing transfer capability is not shown here, this is only new transfer capacity that we're seeing in 2035 at your national stage. So I want to point out though that this is for the moderate-moderate scenario group.

There was only one study that even considered international transfers when they were looking at the capacity expansion models, right? So we only have one

study of the six, only a subset of the scenarios and they only looked at that lower assumption Group, that moderate-moderate, so it doesn't even capture what's going to be necessary, now under our new normal, given the Inflation Reduction Act. So with that caveat in mind, we did do our best to try to look at this data, recognizing that it was pretty limited.

Now all of these are trade-offs, right? So if a region is found that it's costing from the trade with Canada, for example, and they choose to trade more than what is suggested in the capacity expansion models, you can maybe look at the other results too and see, oh, maybe they don't need to trade as much with their American neighbors in that case, because they chose to trade more with Canada and vice versa. So all these things are trade-offs and we don't have perfect insight into what this would be. Obviously, in the moderate-high scenario group or that high-high scenario groups, so we're limited by data, but where we could find it, we tried to tease it out. And we do make some comments in the report to try to capture and caveat that appropriately. That is also something

that we got some feedback on during the consultation period.

WHITNEY BELL: Great. I love that you've got all the extra slides here to answer some of these questions. Is the DOE's position that generator interconnection customers should have their interconnection network upgrade cost subsidized by end users via transmission expansion?

ADRIA BROOKS: I can't speak to any official DOE position on that, but we have noted in other subsequent reports and again those that were brought in to this study just different reasons as to why the interconnection queues are backlogged, so can't speak to the DOE's position on what should change, but just acknowledging some of the barriers that we have seen from the data and wanted to pull that out.

WHITNEY BELL: Are future needs, like generator retirements, resource adequacy and state RPS needs tracked in the study?

ADRIA BROOKS: Sorry, Whitney, can you repeat that?

WHITNEY BELL: Absolutely. Are future needs, like generator retirements, resource adequacy and state RPS needs tracked in the study?

ADRA BROOKS: OK, great. So in terms of tracking them, we don't necessarily line those out or outline what those are going to be into the future. We didn't bring that data in, but that data is captured in the underlying reports that were used for the capacity expansion model to an extent. So the capacity expansion models do have some insight into where generators are going to be retired into the future and if they have hard numbers on that, they're able to bring that in.

Most of the capacity expansion models, I think all, but that is a good question that I would have to get back to this person, if they want to e-mail or just write a comment when they submit comments to the needs study, we can be sure that we pull that out. I believe most of the capacity expansion models they do

a quick check for resource adequacy concerns. So they don't do full detailed reliability analysis by any means, but they do do a pretty quick resource adequacy check to be sure that the transmission in the generation that they're installing would meet resource adequacy metrics. So some that is captured in the capacity expansion model, but it's not fully brought up.

And the other question was on state RPS policies. Yes, so any state policy that was on the books, at the time the research was done, should be captured in many of these capacity expansion models, but not necessarily looking into future RPS standards. I don't know that any of the studies were able to identify that, maybe if they had been announced beforehand, they're able to bring that in, but I'm not sure.

WHITNEY BELL: How is both short and long duration storage treated? Will you do a scenario assuming that the DOE Moon Shot goal of reducing the cost on long

duration storage by 90% still is met? Also, other percent reductions.

ADRIA BROOKS: Sure. So just to be clear, in this study, we're not doing any new modeling. New modeling is being done in other studies like the National [unclear] Planning Study like I mentioned, but here we're only memorializing publications that have already come out. That said, a lot of the capacity expansion models do see a lot of new storage coming online in their scenarios, so they have a range of cost metrics. Some may include some pretty aggressive cost reductions for storage in those scenarios. I don't know exactly which ones are the percentage of them. But to the extent that that's captured, there were a lot of scenarios that saw a lot of storage coming online. Now we only focus on the transmission results in this study, but you could go to the underlying studies that we consider to understand what storage generation mix that they saw looking out into future years. But we don't have that here since we were just focused on transmission.

WHITNEY BELL: Great, thank you. Burial of HVDC transmission on existing highway or rail rights of way is brushed off using old studies that apply to overhead AC lines. Will DOE use recent applicable studies in the final study?

ADRIA BROOKS: So if there are studies that you think we should have included in this that we didn't, that is certainly something you can put forward into comments. And that is something getting a lot of attention, the idea of using existing right of ways. So to the extent that that can be captured in other studies that departments are doing, absolutely. And again, if you think there are published studies that should have been included here, then we can – then please submit that to your comments for us to consider to add them into the final version.

WHITNEY BELL: We still have plenty of questions coming in. How will new transmission wires be built when no one wants them in their backyard? Eminent domain is a long and expensive proposition.

ADRIA BROOKS: Yeah. So there's a little bit on eminent domain, I believe in the barriers to transmission development. We're talking about -- And there's also some more recent reports that have come out about this just in regards to what are the barriers to transmission development. They don't necessarily find that it's just land owner, you know, not desiring them on their property, although that certainly does come up, but that's not necessarily the biggest barrier to transmission development, and that's not particularly well memorialized in this study, but that has come out more recently in some other studies.

This is, again, if this is something where there's data that we can point to that or there's a study that we can point to that really helps to try to put numbers to that or to help frame that, that would be something to submit in public conference that we can consider adding it in, but we don't address anything regarding the public wanting or not wanting transmission in the study itself, since we're really

just focusing on needs and didn't want to focus too much on the barriers or any solutions moving forward.

WHITNEY BELL: So I think this question goes back to one of your charts. Are there specific large lines that drove the large capacity expansions in such around 2013 or were the capacity increases geographically dispersed? Are there known drivers?

ADRIA BROOKS: OK, that is a great question and not one that I have a good chart for. So this section of the report, we only grouped this nationally, I'm pretty sure, but that is a great idea for something that we could include in the final. So if there was a desire to see this data broken out into the 13 regions, then noting that in your comments is something that we could consider doing, but I'm pretty sure we only looked at this at a national level. So I don't have an answer for you there.

I would expect that these high capacity projects were only in a handful of regions. They weren't shared equally across the entire U.S., but I just don't have

that data in front of me right now, but happy to consider adding that to the final report, assuming we can tease that out, the data, which I think we could.

WHITNEY BELL: We got two questions that keep going back and forth here on which one they want next. Given that there is a high value of connecting ERCOT and the West, do the high values still hold if price spikes during extreme weather are not included?

ADRIA BROOKS: They do, yes. So again, this is 2021 data. So this is where we see the highest value because of the extreme weather in ERCOT that year, but even at years where there wasn't a lot of extreme weather, or at least not in ERCOT, we still see that high value. Let me see if I have a chart lined up that covers that. I think there's one in here.

OK, so here's one going from 2012 to 2021, so 2021 data is still included here, but this also now is looking at all of the last decade or most of it to 2021. 2012, I'm sorry. So we still see the highest value in connecting ERCOT to other regions. Now the

report that we pulled this from did just submit an update, or sorry, publish an update recently with 2022 data as well. So you can go to the underlying report and to Lawrence Berkeley National Lab's website to try to pull that and look at also the 2022 data, but it's not captured. Well, no, I take that back, some that is captured actually in the needs study, we were able to get that in before we published this most recent version, although it wasn't in the previous version. So there is some '22 data also in the need setting. Anyway, answer to the question is yes, we still see that, even if we don't look at 2021, if we look at other years, we still see the high value in connecting across the interconnections.

WHITNEY BELL: All right, we've got time for about two more questions. Reliability, according to your slides, is the first reason to build new transmission. As extreme weather events and EMPs are a primary concern for society, does DOE recommend burying long HVDC lines?

ADRIA BROOKS: Well, there's no recommendations in here in terms of future solutions, so I wouldn't make a statement about whether or not we recommend burying lines. But that is a solution that I know a lot of communities are looking at, specific, so their needs, where if they know that they're particularly vulnerable to, for example, high wind events like hurricanes or something else, where burying might be safest or most reliable for them, that might be a solution at the regional level, that's not necessarily needed nationwide, right? So these are pretty unique solutions that need to be implemented regionally based on regional needs.

WHITNEY BELL: All right. And then we are coming up on time so this is the last question. What type of data/information can utilities provide to GDO in the future to facilitate studies? What is the best way to get involved?

ADRIA BROOKS: That is an excellent question and I wish I had come up with a really good answer before we

started the webinar. So as you're going through the report, or I guess I'll have two answers, as you're going through the report, if you recognize, oh, I have access to data that's not included in here, or I am aware of data that's not included here, that does point to a really important need of the power system. That is absolutely something that we would love to hear about in the comments.

The National Transmission Planning Study is doing pretty comprehensive work to try to understand what data they need access to in order to really do planning well. So that's maybe a separate question for them as to what they need in terms of new data, but for here I will just say that if you go through and you see OK, we're lacking data in this place, please suggest that, so we understand where we should be looking for data in the future or for the next version of this report. And again, e-mail address at the bottom of all of these slides is how you can get in touch with us with those types of ideas and submit as formal comments.

WHITNEY BELL: All right. Thank you so much everybody for all of those excellent questions and for up voting to get your questions asked. This does wrap up today's webinar. The recording, as I mentioned before, will be available in about two weeks on the Draft National Transmission Needs Study Webinar webpage. To find more information about the Draft National Transmission Needs Study, please visit the program web page and you can find that link in your chat now. Maria, Jeff, Adria, thank you so much for leading us through this today and thank you to all of our attendees for participating. If we did not get to a question or something like that, please reach out to this e-mail address: NeedsStudy.Comments@hq.doe.gov. Take care everyone, and we will see you next time.

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