2024 Vermont Long-Range Transmission Plan
Transcript from May 2, 2024 Virtual Public Meeting

Shana Louiselle:
Good afternoon everyone. Thank you very much for joining us today on your afternoon, lunch hour. We really appreciate all of your collective time. As we talk about the 2024 Vermont Long Range Transmission Plan – Public Review Draft, I wanted to start with some quick introductions from the VELCO team, and then give some high level overview of this process, the long range transmission planning process for, for everyone to understand why we do this plan every three years and what we're looking for from you today and then I'll hand it over to my colleague, Kerrick Johnson to provide some opening remarks setting the stage of transmission today, where we are right now and, and where we're heading. And then finally, we will jump into the results of the analysis from the 2024 plan. We want make this a, a dialogue, a discussion. So if there are questions that you have while we are presenting, feel free to jump in, take yourself off mute or you can raise your hand or even put a question in the chat box and I'd be happy to facilitate that question for you. So some quick introductions. My name is Shana Louiselle. I'm the Communications Manager here at VELCO. And I facilitate the Vermont System Planning Committee, which is a statewide stakeholder stakeholder group that was established to address grid reliability issues specific to load growth in Vermont. And the Vermont System Planning Committee played a big role in bringing this public review draft here today. They were involved with all of the forecasting work that took place over the last 12 months. They received the first draft of the plan and provided comments and their input into the plan before the public review draft was made available. And the VSPC will continue doing this long range planning process for the next time we have to update the plan.

Kerrick Johnson is here, Kerrick is our Chief Innovation and Communications Officer and I believe he has been here for almost every long range of planning process. And Hantz Presume our Director of Transmission Planning and one of the authors of the plan. Zakia Amari is joining us today. Zakia is also on the Transmission Planning team and also played a big role in the development of the long range transmission plan.

Our long range transmission planning process started in 2009. It was designed specifically to facilitate the discussion to provide full, fair and timely consideration of all cost-effective non transmission alternatives for growth related issues on VELCO's transmission system. We are required by Vermont law and by Vermont Public Utility Commission order to publish a plan every three years with updated forecasts of what we see for the next 10 and 20 years. We are required to identify any transmission issues that we see over that time frame and then propose what the transmission solution would be and then begin the conversation, proposing what the non-transmission solution would be. This year's plan is our sixth iteration. It is the first plan since 2015 where VELCO has identified transmission deficiencies on the grid as a result of the expected load growth we're seeing over the next 20 years. VELCO is required to reproduce this plan every three years to keep it updated. And that's a really important thing because things can change really quickly on the grid. And the second thing here is to make sure we're doing the associated public outreach to gather public input, get your feedback on local initiatives, things that we might not be considering in the plan that should be reflected in the plan. So your participation and input is a key component to this process. We encourage any questions and all input that you may have today or any time during the, the public comment period which will be open through the end of May. Once we have collected all the public input, we then synthesize that input and finalize our plan and we submit the final plan to the Public Utility Commission by July 1 of this summer. There are a number of ways that you can provide input. Today's meeting will be recorded, and the transcript will be provided as part of our, our filing. So if you do make a comment today, it'll be captured in that way. And if you choose to comment at another time, we do have an online form. And at the end of the slide deck, you'll see some contact information to be able to just send us your comments directly. Anyway, is fine. Thank you for joining us. I'm going to hand it over to Kerrick.

Kerrick Johnson:
Good. Thank you, Shana. You can hear me fine. Is that ok? OK. I'll try and keep this direct to the point because ideally we want to hear from you. That's the important thing here. But it's good for us to build on what Shana said and set the table. So a little but about VELCO, first transmission only company created in the United States in 1956. Two things remain incredibly important though. One is our governance and the other is our financial structure. First, we'll start with governance. We're owned and this is unique in the US. We're owned by

Vermont's 17 Distribution Utilities. Now 18, we'll see what happens with Global Foundries haven't become its own utility and a public benefits corporation, the Vermont Low Income Trust for Electricity who receive a million dollars from us every year and name three people to our board of directors. They take those dollars and invest them to advance the Comprehensive Energy Plan the state puts together and to generally try to find ways to mitigate the impacts of energy transformation on Vermont's middle and lower income communities. So that's great work. As part of our board of directors, given VLITE names three. And there's other public power voices. Really, we like to say a VELCO that our board of directors effectively serves at the, as the energy kitchen table for Vermont. So there's very robust discussion and I think you'll see that reflected in how we characterize and the results that you'll see before us today, which we'll get into couple profile points. We have about 175 employees now, which is different. We had a flat head count for about a decade but going to what Shana talked about, it's a different world. It is a different world and the prospect of data are better and integration with the region with the interregional with our distribution utility owners is all requiring a greater sophistication, greater abilities with regards to data management, as well as telecommunications and the like keeping the grid reliable is much, much more than poles and wires and substations.

There's a lot to it. So we've seen that reflected in the growth of our workforce and in the composition of that workforce. What we like to say is I should also mention the financial structure, sorry. Unlike any other transmission utility in the US, any profit we make, we retain VELCO retains no earnings. And in fact, essentially every dollar we make in profit goes back to our distribution utility owners. But they are in turn required to ascribe, allocate those funds to their customers. But another way is every dollar of profit we can manage goes directly to reduce cost pressures on every grid connected customer. So that's an incredibly powerful mission and one that we embrace because if we do a good job, everyone benefits and so is the reverse true.
So it's incumbent upon us to do that good job. We Shana talked about, I think we've done our sixth, this may be our sixth long range transmission plan. Really, I think Hantz and Shana and the rest of the team, there's so many gets we get out of this. One is it keeps us up to date as to exactly what's going on with the system. We have like day to day operations, but also in this context, given the cost and the timeliness of the operations and how we keep the grid reliable. We have to have an accurate picture of where we are and accurate projections of where we're going. If we're going to have the correct asset in the right place at the right time to keep that grid reliable, even given many of the things that are already changed, change. And really, it's the only statewide communication and platform and opportunity we have to for these conversations.

So I'll just say our entire team is grateful to you all for taking your lunch hour. As Shana mentioned, to do this. I know it, it can be kind of a, it can be an imposition, but we're grateful for the time and the interest that you're taking true. And for us this gives us the opportunity. Here's how we see the world. And although it reflects, what we'd like to say is we've had more collaboration, we've had higher powered tools and a greater amount and more accurate data than we've ever had before. And yet exactly when, where we're going to go and exactly when we get there has never been less clear. So there's a lot of uncertainty here. We have kind of set the table to the conclusions which we'll get into or the initial conclusions. But it's such a dynamic world that this gives us an opportunity. Here's what we see. What do you think about what we see? Is there something you that we've missed? Is there something you'd like to understand better? Hopefully that we will have some of that give and take that helps us to do that. Addition, I think Shana, you, you mentioned this. You may not know but within New England, VELCO and the VSPC working in partnership with Green Mountain Power, we submitted and got approval for the very first non-transmission alternative ever in New England. We took $168 million Central Vermont transmission project which was in the queue to be built. And through the great work of Hantz and his team identified, you know, what through a combination of efficient efficiency and solar, we don't think we need to build that transmission line. And again, we make a profit in that line which again benefits all customers, but we still felt consistent with our statutory requirement. But that wasn't, we couldn't do that in good conscience. And there was a better approach and I should say we interpret that statutory mandate to find non transmission alternatives. We interpret that expansively. We're aggressive in trying to find new tools and new strategies that would help us really only have to build transmission when we have to, but we may have to and when we do, we like to go, we do it cost effectively and in harmony with Vermont's working landscape, that's one of the things we take prided and are grateful to our team and to our neighbors to allowing us to do that. So that's what's happened.

As I mentioned, it really is a different world and looking at the names of the people here, I know, you know that a couple of things and probably this is review, I apologize for you. But what are we seeing one? We see the continued growth of distributed energy resources in state and the U.S. That's excellent. We want, we need

more that. But honestly, I'll foreshadow we're looking for ideally, if we can be a bit more thoughtful about where that generation goes. We want it and we need to have it. But if we can be a bit more thoughtful in the siting, there's great benefits, more resilience and lower cost, we think they are possible to be able to do that, but that's happened.

And I should say we are engaged in several projects to better integrate and get the data from those distributed energy resources to be able to more effectively manage the grid. And in fact, there's new federal requirements demanding that we get a better vision and better idea of what's going on in the distribution utility grid. So that's happening. Secondly, we have an accelerating electrification of heating and transportation. In Vermont, I think we've all heard or seen likely you've seen about cold climate, heat pumps and now they've taken off quite a bit, but there's other forms of heating and cooling that are being electrified. It has not matched the development of in-state generation. So load and electrification of load has not kept up yet with additional the generation that we see. So a lot of generation, not so much low growth yet, but Hantz and his team are predicting that could happen and potentially double under certain time frames and certain scenarios, but that is underway. And I'll just note parenthetically, as I alluded to it is a different system already, the system we're managing, for instance, we're now exporting energy a few hours and that's growing how many hours we export. But that hasn't happened for a decade. Not since about 2014. When Vermont Yankee went away, we're seeing a different or Highgate converter which is a device on the Canadian border in northern Vermont that's being utilized and posture differently relative to the grid. And that's a key connection we have with the Canadian grid.

It's different, it's a different system. There's different rules now that are emerging. There's different technologies that are raising throughout it all though VELCO's role has stayed the same. How can we keep our people and people safe in the communities in which we operate safe? How can we keep the lights on? How can we keep the system reliable? Are we serving as effective stewards? That's very important for us. And ultimately, are we helping the state and our owners accomplish the vision they have for our bright energy future. That's a big deal for us. We have as our vision. I mean, we're a transmission company, but our vision is to help create a sustainable Vermont now that can be seen as trite by some and we get challenged on that pretty frequently.
But I think if you talk to anyone who works at VELCO it's real and that manifests itself everything from safety to how we manage money to, are we effectively anticipating and embracing new technologies and new tools, new partnerships to be able to bring about the system we need.

I'll foreshadow a bit for Hantz. I will say, what are the key takeaways? What did we find in this, in this version? This iteration, this chapter of the Vermont Long Range Plan, the draft 2024 plan. So one, it has never been more important to collaborate. The system is coming together, the need to share data information appropriate. They need to identify who is building what and where is becoming more important. Giving the really one of the key factors is straight up affordability. We have the system that we have right now that we have to keep, we have to keep managing in order to keep the lights on. Even at the same time, we're having to build the system. We're going to need to take us where we want to go, which is not the system we currently have thus far. I'll just note here that for the first time we have been we have some constraints on the amount of capital we can get to secure from our owners to put into investments, do some of the larger really ambitious transmission projects, this grid enhancing technologies, the other kind of work we want to do. It's even more important for us to prioritize our work given financial constraints and giving costs coming from the region, transmission costs coming from the region. That ultimately, every Vermonter will need to pay for it. That's why we're so grateful for your time here. Because if you could help us prioritize this is what's important. That's not in terms of our analysis, in terms of our recommendations, that would be incredibly helpful. Also, I think part of this plan identified some key unknowns. Are we going to get serious and get at scale at flexible load management or some people call virtual power plants? How real is it? How effective can we get in orchestrating load? Vermont Electric Co Op, Green Mountain Power, Burlington Electric Department. Some of the Vermont Public Power Supply Authority members have all done great work. I think watching Vermont Electric Co Op is, is has some things in play and we're helping them. Can we really get better about bringing more value out of the system we have? There's we, we know there's a lot of additional capacity that's not utilized for safety reasons. And because of we simply previously didn't know with the advent of new digital tools, we have a much clearer idea of what's going on in the system. So if we can collaborate and if we can combine and find the combination of hardware and software that unlocks additional value that will add to resilience and save money.

So what can we do on a flexible load management, that's a big deal. Also, I think another big point and I noted that our friends from Light shift. Yes, Laura, I got that name right. Are here, what about storage? VELCO has been very aggressive at the regional level, pushing for transmission level storage, which we would like it to be longer duration storage. Frankly, we didn't win some of those battles. So there's a very narrow window of uses, a set of use cases where VELCO could use transmission, but that isn't to say other parties at the regional level. Because if you look at the cue of what's seeking to be connected, a lot of storage at the regional level, similarly, our distribution utility owners are all, each of virtually, each of them are doing some kind of storage play some kind of embrace of storage technologies at different paces, different scales, but it's here. But exactly how that is all going to fit the net cost, the net performance of that at the transmission level for Hantz and his team to be able to count on to have verifiable data and performance understanding and thus how we can move forward and maybe secure the next NTA on. Sure. So flexible load management storage, what happens out of that?

I had also on that thing and I mentioned this quickly was pursuing with a national entity called the Electric Power Research Institute some federal dollars for a project again to get more out of the system, we have, it's called installation of a smart valve which effectively serves as a much more refined digital control of electrons coming in and electrons going out to New York, we're going to put that there. It would save incredible dollars and logistical pain for a huge device called the phase shifting transformer. I mean, this thing is huge, massive and moving that around is a real pain if we and these devices also have a cost. But we see the net benefit versus cost is just a no brainer. It makes perfect sense, but we have to learn how that actually operates.
So we're pursuing that initial grid enhancing technology with much, much more to come. We know that will be happening. So that's out of there.

Lastly, what I would say is which would change the entire landscape. Some of you may have heard it's been around since 2014. There's two large transmission projects. One is the New England Clean Energy Link Canada underneath Lake Champlain goes into Vermont and connects in the Cavendish Ludlow area. The substation of ours, lots of benefits categories of benefit there for Vermont. As Hantz has educated me, it would drive the need for additional reinforcements in the central southern part, the state which would be great for location of additional in-state generation and it wouldn't be solely paid for by Vermonter. So there's great advantage in addition to the other categories O I from that project, so that New England Clean Power Link 1200 megawatts bidirectional line. What happens with that? Because that's under active consideration. We'll see what happens there. The, the last transmission line I'll, I'll talk about is the general category we call. It is the Alliance Transmission. It's more of an initiative. It's not a specific project yet. It's emerging some, some work to go again down from Canada again, bidirectional again about 1200 megawatts. But it would terminate right in, in in a piece of land we own in Chittenden county, there could be huge benefits given the follow on additional grid reinforcements that that would precipitate. And again, that would enable people other than Vermont to be able to join in and help pay for those things, which would have great benefits to the state grid.
So everything from what's happening with customers in aggregate to the initiatives our distribution utilities are taking to the initiative VCO are taking to try and advance this energy future. We're all trying to collaborate and build upon all of that is happening. And this plan represents our snapshot in a couple scenarios of what we see happening. And when we fuse all this and try and synthesize this all together. Again, we want to make sure.
I'm going to be quiet here now and we love sort of questions that we have, we have Hantz and his team here and Shana and others. Just any kind of questions about anything I said or anything. If you had the opportunity to look at the report. We'd be grateful for that. But Shana will tell us what the final deadline is for comments. But with that, Shana, I'll pass it back to you.

Shana Louiselle:
Great. Thanks Kerrick. That was quite the stage to have set. We really appreciate that. All right, unless there are any specific questions for Kerrick, I'm going to share my screen and hand it over to Hantz to dive into the plan's analysis. OK, Hantz, can you see my screen?

Hantz Presume:
I can see it. Yeah, thank you. OK, so I'll get the next slide, please. Sorry, my voice isn't great today. So I apologize for that. OK, let's go to the next slide, please right now. All right. So I think the first few slides and have gone over these concepts. I I'll go really quickly. So the long-range transmission plans, that provides transparency and provide information to Vermont, stakeholders, particularly regulators, policymakers. And

one key item where of this process is to be able to consider non transmission alternatives in a timely manner. And so that's what this plan is, is about. And so if you go to the next slide, please, in and this is a conversation that we're starting with you. So we secure comments and questions and input information that you have to share with us. Please do so at any time during his presentation or afterwards.

The analysis, it's really trying to figure out whether the system has enough capacity to serve peak drugs during summer peak or winter peak driven by new technologies, electric vehicles, heat pumps and other devices on the grid. And when we, when we find the efficiency, we can resolve those transmission upgrades or well non-transmission solutions. It could be energy efficiency, demand response. We can manage the load, storage and generation and other resources. So we have to do this work early enough so that we can give full consideration to non-transmission alternatives. Our next slide is our analysis starts with the ISO New England studies. ISO New England is the transmission planner for New England. But the planning horizon for ISO is only 10 years and ISO does not consider the sub transmission system, they're only concerned about the pool transmission facilities and network facilities. So we have to supplement the ISO studies with our 20 year studies extending the planning horizon from 10 to 20. And our studies also include the substation system that Green Mountain Power and Vermont Electric Co-op on with the same standards as I saw mandatory standards from NPCC.
But one critical input into the analysis is the load forecast as the Vermont System Planning Committee plays a critical role in helping us prepare such a forecast. My next slide is this slide shows the planning process at Vermont. It starts with the preparation of the long range plan. We submit the draft plan to the Vermont System Planning Committee which has 60 days to review the plan. We reflect those comments and the public review version of the plan which has been posted on our website. And so now we're in step three of the process where we're conducting outreach and seeking comments and input from various stakeholders. After this step, we reflect comments and input from the public. We publish the plan by July 1st of 2024. The analysis that we conducted identified some deficiencies in the system.
We've also determined that these deficiencies could be addressed by non-transmission alternatives. And therefore, after the publication of this plan, we'll kick off a detailed NTA study that the utilities will manage. The analysis that the utilities will perform will determine whether the non-transmission alternatives are viable and whether they're cost effective and if they are cost effective and we'll pursue the non-transmission alternatives. If not, then we'll have to implement transmission upgrades to resolve the reliability concerns.

So any study that we do depends on data and good quality data. We have our load forecast data from Itron, our forecast consultant that we use for load forecasting, but also the Vermont System Planning Committee and particularly the load forecasting subcommittee which provides direction, input and data to Itron to help us prepare this presentation that this load forecast. Two key loads that that drives the forecast is really the heat pump growth, electric vehicle growth. So VEIC was a plays a critical role in providing information to us for us to be able to forecast heat pump penetration, electric vehicle penetration under various Vermont policies. We also conduct a distributed generation hosting capability analysis as part of this work. And for this, we need data, distribution, distributed generation data which the department of public service provide to us. The distribution utilities also provide us with distributed generation information which help us understand the geographical distribution of DG and allows us to understand the patterns for growth so that we can predict how future DG will be installed in Vermont. And for our analysis, we download our study cases, our models, our outages or contain scenarios from the ISO database.

Next slide. Thank you. So load forecast is the critical component of our analysis. Forecasting 20 years out is full uncertain. So we have to kind of bracket the analysis. We look at various scenarios. The first scenario is what we call a Vermont road map or a policy scenario. In this scenario, we are assuming that Vermont is meeting its policy objectives. We are on a, on a path to meet these goals and these, these statutory requirements. And so all of the heat pumps and electric vehicles or other resources that we need to achieve the emission reductions are assumed in this, in this Vermont road map forecast scenario. The continued growth scenario is a low forecast. In that forecast, we are continuing to increase the number of electric vehicles in Vermont, the number of heat pumps at the current growth rate. And so the loads will continue to grow. But we're essentially this scenario is a modeling situation where we're just short of meeting our statutory goals. So it's, it's low but it is increasing. We studied summer peak demands, winter peak demands and this is the 20 year analysis. And so we tested sit on 10 years out and 20 years out. In the last few long range plans, we've started looking at our ability to accommodate large amounts of distributed generation in particular solar PV. And to do that work, we test the system, we test the system at low loads in that during peak and during April or, like spring time loads where there's not enough heating loads where it's sunny and windy and there's a lot of water. So all the

renewable energy is being produced at full output. So we can through this analysis, able to identify any constraints on the transmission system, we start with the current level of solar PV, which is at 500 megawatts. So we increase that to about 1300 megawatts in, in 100 MW increments. So that we can identify at what levels of solar PV, where we start to see constraints and one curricular input into this analysis is the assumption that we're not going to reduce existing resources to make room for new resources. So all of the existing renewable energy generation, whether its wind solar hydro or it's behind the meter or in front of the meter, those are all modeled at full capacity. So we add the solar PV on top of what it's already existing.

Ok. Next slide. So under the Vermont road map, we see the increase in annual sales of like of heat pumps where we're selling about 10,000 units per year. So we see that growing to about 18,000 units per year by 2029. We also see heat electric vehicles growing to a 90% penetration by 2043. And so these projections cause the winter peak to grow from 1000 megawatts to about 1600 megawatts. That's the solid blue line on this, on this graph here. Under continued growth, we're going to continue to install heat pumps at a rate of 10,000 units per year. Electric vehicles are going to be 60% by 2043 instead of 90% that is also going to contribute to load growth.

And, and so the difference between the Vermont Road map and the continued growth of numbers is that the road map figures about 200 megawatts higher than the continued growth forecast. So both are quite high compared to today. So this allows us to sort of give you a two different futures. They're very possible. And so that, that we test both of those forecasts and, and they drive different system issues at different times.
But the results that we're going to cover today, it's really about the Vermont road map which we believe from Vermont is required to achieve. So this is the any timing or system issues that we identify here are really based on the Vermont road map of the policy forecast. Next slide, please, Shana. So I just wanted to take a pause to see if there are any questions before we go on to the next slide or comments

Shana Louiselle:
Hantz, I want to take a pause to see if there are any questions before we go on to the next slide? Or comments. Ok.

Kerrick Johnson:
Hantz, I think it's good for us to specify that Vermont policy road map does not reflect for instance though the Renewable Energy Standard legislation that is currently being considered at the Statehouse and a couple other items. We have an explicit list of things that weren't considered in putting that road map together. I just want us to be clear. Sorry, Jared, just want to make sure.

Public Member:
Oh no, that's great. I should raise my hand. I can't see if others may have a question as well. I'm just wondering Hantz if this… first thank you for hosting this. This is incredibly helpful. I appreciate the context and the walk through. In the Vermont roadmap policy scenario with the assumptions around evs, can you talk about the, the difference in how you're using the definitions of non-fleet versus fleet? And can you clarify whether you're talking about total registrations or percent of new vehicle sales? And can you comment on to what extent the new rules that have gone into effect regarding advanced clean cars too and advanced clean trucks in terms of the number and share of, zero emissions, vehicles, electric vehicles, being delivered for sale was incorporated into this?

Hantz Presume:
Sure. Sure, thank you. Sure. So not fleet vehicles is what I would call passenger vehicles. Where fleet vehicles are, the, commercial entities or certain fleets like VELCO or Green Mountain Power or Federal Express or any sort of things where you have, a number of vehicles by company. So that's the difference here. And, so this forecast was completed and, believe in June of 2023. And, and so we used, data provided by, VEIC. And so I'm, I'm assuming any sort of policies or rules that were in place at the time, were incorporated into the, the EV electric vehicle forecast. But I can't say for sure, I'd have to check on that. Thanks for the questions. We'll keep going.

Ok. So we'll go into the results a little bit. So if you get the next slide, please, and we'll show a map of the showing the, the transmission overloads or constraints that we've seen on the system. This is based on the policy forecast in Vermont road map. It's the higher forecast. And so for 2043 we see that 75 miles of

transmission lines would be overloaded, meaning their capacity of these lines would be exceeded under contingency or outage conditions and they're indicated here on the map in, in blue. And we also transformers at our substations that connect to the Green Mountain Power, VEC and other utilities also overload. So about 19 transformers. So that's a kind of a summary of the analysis that we've conducted.

Next slide, please. And to give you a bit more information on each of the reliability deficiencies, we've identified, we've divided the system into five areas of concern. And I saw the map on the, on the left. It shows the area that's affected. We drew a dash black line and anything north of that is the area that we're here. All of the transmission concerns that we have identified are affected by N minus one minus one contingencies. What that means is there are combinations of outages that were we are required to test where one facility is disconnected perhaps by a lightning strike or, or, or some other reason. And while this line or transformer equipment is out of service, another line also is disconnected. So within say within 30 minutes. And so these are standards that we have to design system, all transmission planners need to design this system. And so our transmission system in Vermont is not affected by single outage. We see deficiencies as a result of N minus one minus one. In this particular case, we have we have identified areas where transmission line capacity exceeded. We call that thermal overloads. We all see voltage issues. And in another area, the voltage could collapse which would be an indication of a blackout. So it's fairly serious and to address that concern that his mission solution would be to build a second line between our substation and Williston that we show on the right here. In orange. The timing of this transmission concern is 2032 based on the, the Vermont road map winter forecast. And there is a, a non-transmission alternative to this and to avoid or postpone this, this reliability concern. We have calculated that about 75 megawatt of load reduction would be needed in this area to the north of that dash line. Load reduction could be could be by achieved by various measures. It could be energy efficiency, demand response. It could be storage where it's discharging into the system. Electric vehicles and heat pumps are flexible and so to the extent we can move these loads at different time of the day away from the peak that will essentially reduce the effects at the peak hour.

All right, you go to the next slide. Now we'll go to the, the next area of Vermont in Northwest Vermont on the next slide. And so if you look at the map on the left, you'll see that this area is a little larger than in the northern area. But also it includes Northern Vermont. And for this area again, it's in that N or minus one outage combination overloading or causing a, a line to exceed its capacity. And the solution proposed here is to rebuild our line from Middlebury to West Rutland. The timing of this concern is a little earlier 2029 and this time it's based on the summer peak condition. And this upgrade or this issue could be avoided or postponed by reducing load in North West Vermont by about 80 megawatts. Because this area includes Northern Vermont, if we're able to reduce load in northern Vermont by 75 megawatt. And we only need to reduce an additional five megawatt to address this concern.

Ok. Next slide, this is again, further south. And this area includes northern and northwest Vermont. Again, this is an N-1-1 one issue. Here, it's overloading our facilities from North Rutland to Coolidge or Cavendish. And so we would simply rebuild these lines to provide more capacity. The timing of these issues is, is 2034 based on a summer forecast. Since the timing is 2034 and the way to address this issue is to be able to manage load efficiently so that we don't exceed the low level, the 2033 load level. So we can maintain the load at 2033 and we'll, we'll not see this problem emerge.

The next slide please here Southern Vermont is, is in further south. And in this and this concern is, is again and N-1-1 one overloading facilities, these are, are not VELCO facilities, these are National Grid lines in New Hampshire, but we are in an interconnected system and these lines feed Vermont load. And so if we have an increased load in Vermont, the New Hampshire lines will see higher flows and under outage conditions will be overloaded is based on the results of our analysis. And to address this, this problem, we would rebuild the National Grid line. This would be a National Grid responsibility and we are communicating these concerns with national grid and Eversource our neighbors. And we'll certainly coordinate with National Grid to, to see what's the best way to address this, this concern that, you know, the timing is also 2034. And here again, if we're able to manage those so that the load remains below the 2033 level, then we can, we can avoid these reliability concerns.

This area, we call it the, the Vermont area of concern and it affects the entire state of Vermont and, and all and, and in fact, it also affect parts of New Hampshire. Some of the, some of these lines are New Hampshire lines they're owned by Eversource and under contain conditions and N-1-1 were exceeding capacity of New

Hampshire and Vermont lines. And to address this reliability concern, we would propose installing a second line between our Vernon Substation and, and Eversource Northfield substation to provide a level of redundancy that supports the Vermont system and Western New Hampshire. The timing is 2034. Here again, if you're able to manage load, such a way that we remain below the 2033 load level and we can avoid this future reliability concern.

So I think that's the last I think there's a summary slide that we can go to now there is a table I like to review. So this table is also in the long range plan where we summarize each of the five areas of concern. We note the contingency outage that we're concerned about, the proposed upgrade that there's transmission upgrade. The timing of the reliability concern on the on the in the first column. In the second column, we note the cost estimate. This is a high level cost estimate. The first number is for the transmission line and the second set of numbers is the transformer upgrades. So we see three transformers affected here. So each of these transformers would cost $11 million to be replaced. The third column indicates that each of those areas concerned is screen in for a detailed NTA analysis. And so immediately after the public publication of the plan, we need to initiate a detailed NTA study that the distribution utilities will manage. The lead utility is Green Mountain Power, which will manage the study and all Vermont utilities will participate as affected utilities. I don't know if you want to take a pause here. Shana, if any questions on the load related, low growth related concerns

Shana Louiselle:
All right, I'm not seeing any questions in the chat. But if anybody wants to chime in on any of those five areas, otherwise we can keep moving forward and come back at the end if that's helpful.

Hantz Presume:
All right. So, into the distributed generation hosting capability. And so we've, we've done this work several times now and we have obtained distributed generation data from the Department of Public Service and Distribution Utilities that allows us to see the growth patterns for solar PV and other and other renewable energy. And it's, it's so apparent that the distribute generation is growing mostly in the population centers, you know, Chittenden County, Addison County. And so it's not homogeneous across the entire state. There's certain parts of Vermont, they're seeing more solar PV growth in others. And so what we did is we started with this geographical pattern to when we scale generation to the 1300 megawatt, we start from this pattern and grow going forward.

And so that's the one assumption that we use in our analysis. And so the next slide would, would then show the results are of our studies. Again, we're testing at 1300 megawatt of distributed generation and we're, we're not reducing the existing resources. So this is in addition to what exists today. We are also assuming that our imports from Canada and New York are going to continue and therefore the transmission lines that are exceed the capacity are shown here in orange and the map, they're really the sort of western side of the state from Canadian border to Rutland and the Cavendish. So about 156 miles of traditional line would be affected. There's also several transformers that overload. These are Velco transformers that connect to our subs, subs subsystem that owned by Green Mountain Power and other utilities.

And so, so we've reviewed the results. And now we're going to look at load control or the ability to manage load in a way that would avoid the transmission concerns that we've been talking about and, and so in this slide, we're looking at peak load related issues or issues related to growth to load growth to by 2043 we would need about 440 megawatts of load reduction. And that can be done by whether demand response, energy efficiency, battery, battery storage or other storage or micro grids or anything that can reduce load. Could be in a perhaps a cost effective or, or, or other means of, of managing load in Vermont for summer peak. Summer peak is a little lower than winter peak. So we have a lower need here. That's about 400 megawatts of load reduction that would avoid the transmission constraints that we, we've identified in this study next slide.

So on the DG hosting the analysis at the 1300 megawatt distributed generation level, we would need about 480 megawatts of load increase. In this case, to absorb the excess energy. And that also can be done by various ways. It could be any energy storage where you're charging your batteries. Here, it could be generation curtailment, both dispatchable resources in front of the meter and potentially behind the meter resources. If we're able to do so, could be demand response. We're able to turn on certain loads to absorb the excess energy. And so all these could be cost effective measures to increase load in Vermont to be able to absorb the

energy produced by distributed generation. And, and there are going to be a, a third non transmission alternative which is to install distributed generation in a way that matches transmission capacity. So if you're able to see where the system has sufficient capacity and installs distributed generation at, at those locations, then we're able to host about 1000 megawatt of distributed generation without causing significant transmission concerns.

And on this, on the, on the map, we have sort of color coded various zones in Vermont. And so this is indicating that in the southern area, there's more capacity. So the southern area could accommodate between 200 and 300 megawatts of distribute generation. Whereas as you move north, there's very little capacity to install additional generation. So very from 0 to 25 megawatt in the Highgate or Newport area. We also provided a table comparing the optimized distribution of distributed generation 1057 megawatt by Regional Planning Commission. And that can be compared against their targets in 2035 and 2050. Clearly, the amount that the system can accommodate is, is lower than what the state would like to accomplish. And, and so perhaps we can meet these targets by not only installing solar PV and other renewable energy, in a way consistent with this map, but also use additional measures like storage or, or curtailment or load flexibility to absorb additional renewal energy. And perhaps we can use the transmission system to export excess energy to our neighbors, to Canada, to New York and New Hampshire. As Kerrick was mentioning earlier, there are projects that would like the New England Clean Power Link or Alliance project that could deliver energy to Vermont. But these same projects could also export that energy to our neighbors. These are bidirectional facilities that could help us manage excess distributed generation in Vermont. Some questions coming in through the chat. Can you read that for us?

Shana Louiselle:
Sure. So I'm actually not seeing a question. No, it is just someone letting us that they had to leave. But this is a good place to, to stop just to check in with the group and see if there are any questions around the optimization of distributed generation or any of the load flexibility, load reduction slides that Hantz has reviewed.

Public Member:
Hi, Shana, I have a quick question.

Shana Louiselle:
Hi, Laura. Go ahead.

Public Member:
Hi, this is Laura Coriell from Lights Shift for an energy storage developer. I, you know if, if you think about the way storage can operate, we've done some thinking about how a storage device would be able to both manage distributed generation and address peak load through peak shaving. You know, because you've done so much great sort of locational analysis here. Are there locations that you would want to see storage to address both of these ongoing challenges?

Hantz Presume:
Yes, there's, there's additional detail in the long-range plan where we have suggested through our analysis that their locations in Vermont that are more effective than others. And you'll see various sizes of storage that could be placed either in the transmission system or in the sub transmission system that will help us manage both the peak load issues and distributed generation issues. And I guess at a high level storage that's installed in the northern part of the state, are, are more, more effective at managing distributed generation. Because everything, it's the, the, the way that the system operates is this sort of flows from north to south with imports from Canada and New York and the wind power, we have quite a bit of renewable energy in the north. So there's a certain bias, the natural bias through the system from north to south. So if you're able to absorb the energy at the source really in the northern part of the system, well, it provides benefit throughout the system. We've provided a list of substations both well in, in all parts of Vermont. But if we had a choice, I would say start with the, the northern system as a sort of preferable location for storage.

Public Member:

Ok. Thanks. That's really helpful. And do you feel like the, I mean, I've definitely looked at the plan but just kind of wanted to get your thoughts. Do you feel like you've identified actually like the individual lines that, where this would make sense, you know, kind of at, at what voltages connecting to what specific substations?

Hantz Presume:
We have noted the substations. I, I'll have to look at the plan whether we've provided voltage levels. I don't remember, but we, we, I'm, I'm, I'm pretty sure we had substation level data with, with an amount of storage or, or load increase. I'm not sure if we call it storage but load increase or load decrease at individual substation locations of various sizes. Yeah. Ok.

Public Member:
All right, great. Thank you.

Shana Louiselle:
Thanks for the question, Laura. Any other questions? Ok.

Hantz Presume:
OK. So, takeaways so we, and this plan identified transmission concerns both with load growth and distributed generation growth. And we, we yeah, the assumptions they go into our studies are conservative. You know, we've, we've modeled the Vermont road map, which is a high forecast scenario, but it is, it is a forecast, it assumes that we are able to meet our policy objectives. And this is so this is the forecast we have to design to. And so that's leading us to, to see transmission issues within ah 10 years, ah 10 year horizon. And so for us to meet our, our goals and, and, and our targets, we, we have to design load management in a way that can allow us to meet our goals. That means all of Vermont, Vermont's stakeholders to sit together and collaborate, talk about what makes sense for storage, what makes sense in terms of load management, what is viable and what's cost effective. And, and so, in our non-transmission alternative studies that we will conduct later this year or next year, the utilities will provide information. We're, we're, we're going to seek information from other entities in Vermont that have data that have experience and knowledge. And so this is really a call to action because if we don't do this right, we'll find ourselves, we would not be able to meet our renewable energy goals and not be able to reduce emissions in the way that the Vermont Vermonters want us to. So this is really we have to start now and we can't really wait for the next plan to start this process. The planning takes a long time. From the time you do a study to the time you put a, a solution in place, it could be 5, 7 or 10 years. So we, we need to start now. We need to just think about how we can increase storage to meet our goals, how we can manage flexible loads electric vehicles and heat pumps are flexible. Perhaps we're going to need to curtail excess generation if that's cost effective and, and perhaps we'll need transmission upgrades to, to allow us to meet our goals. And so, we, we ask for your support and input and any information you can share with us to allow Vermont to all of us to meet our statutory goals. I see a hand raised. I think you had a question.

Public Member:
Yeah. So first of all, sorry, I'm late. My name is Matthew. That's all, I use he/him pronouns. I'm actually coming from a region of Grand Isle County, Vermont. Vermont Electric Co-op region of the state. Yeah, my question is, how can, you know, moving forward and thank you for the presentation that you, that I'm seeing here. How can we collaborate with Green Mountain Power, which is the leading utility that does do all this Modernization Act and work across the state that how can we collaborate together so other utilities don't fall behind. Like you said, we're trying to modernize the, the efficiency of our systems of our electrical system utilities across the state of Vermont. How can we collaborate with Green Mountain Power from other utilities, so they're not falling behind because most other utilities may not have the resources to keep up with the modernization of their electric, like electric utility poles or et cetera, equipment? And we know that. And how can, you know, we have that resource is available to every utility, you know, across Vermont. So, like you said, so the modernization of efficiency of utilities will work, go move forward hand in hand together without actually leaving those behind. Thank you very much.

Hantz Presume:
Thank, thank you for the question. I think I would invite Kerrick to respond to this, at least at the beginning to talk about Velco being the sort of kitchen table for discussions between the utilities and others, right? And we also have the Vermont System Planning Committee that Shana facilitates and there are other forums where we all work together to ensure we meet, we meet our mutual goals. And there are efforts that we're

undertaking at VELCO to bring all the utilities together. So when we develop tools at VELCO and processes, and we for instance, we're looking at ability to share data and analyze data, provide visibility to the utilities, the municipal utilities so that they understand what's happening on that grid and help them manage their loads and generation. We're, we're doing all of that and we're, and, and I'm sure Kerrick has an additional detail that can provide where, where this is really important to us and, and we want to work with the utilities to allow them to, to move at the same pace, right? We don't, we don't want anybody to be left behind.

Kerrick Johnson:
Thank you Hantz, I'll just pick it up. Matthew, thank you. Great point. I first, let me, let's calibrate expectations here. Some utilities are going to necessarily have to move a bit slower, some will go a bit faster. That's the world in which VELCO lives. And to Hantz's point, our goal is always, what we are doing to help those that might otherwise fall by and get, get ahead. But let's get really specific Matthew with regards to, as you correctly identify Green Mountain Power is going to be the lead distribution utility for two non-transmission alternative analyses. So first, I would say when Hantz talks about a call to action, Hantz and his team, we're first trying to decide how do, how can we do a better job. So first, there is an initiative we call the VX platform. Fundamentally, for the first time, we would have a common format for data that would incorporate all VELCO's data and all willing, Matthew, willing distribution utilities. And guess what, Vermont Electric Co Op has agreed to collaborate with Green Mountain Power and VELCO to try some new tools on collaboration. I have to say you're pretty blessed the leadership at Vermont Electric Co-op and look, I don't need to say this, but the leadership at Vermont Electric Co-op is really forward thinking. They have some great people. Rebecca Town sits on our board, Cyril Brunner works very closely with our team in terms of how can we better innovate to deliver value for this NTA analysis. So we have the tools that we use back in the day to do the first NTA analysis. We'll see if this, if this tool through greater collaboration, greater transparency and greater accuracy and data helps to do that. But I'm telling you what happens in the way this works under Shana's leadership is Green Mountain Power and Vermont Electric Co Op will work very closely with us to come up with some plans and test some tools. We're going to share that both through the Vermont System Planning Committee and a group called the Operating Committee, which is really people who manage the nuts and bolts. That's every distribution utility are, are there to go over that and we'll run through the results, what's working and what might not be working and every utility will have access to that. Lastly, beyond that, those specific instances, we continue to expand our fiber network, which is connecting, not just to distributed energy resources, which is a very big deal. It's like 600 miles. We're looking to expand, over 800 distributed energy resources we're going to be connected to, but we're also in the process of connecting each of the smaller utilities with each other, with their offices so they can better share data amongst themselves again to try and help them, give them a leg up to do and share best practices. So, Matthew, I hope that's responsive in the specific instance here, there's specific work that's going on. And then in general, there's fiber reliability, the VX platform Shana mentioned and Hantz mentioned, there's other things I won't go into it now, hope that's responsive to your question.

Public Member:
Thank you very much. And that sounds like an amazing idea to, you know, networking have like you know, basically a collaboration effort to make sure that all the utilities are on the same page here. Thank you for answering my questions.

Shana Louiselle:
Thank you for the question. That was a great question. OK. Are there any other questions or comments? I'm going to bring us in the home stretch on next steps regarding outreach. Velco is currently conducting our, our public input meetings. We held our first one last night in South Burlington, today's virtual meeting and we have two others on May 14th and 15th in Rutland and Saint Albans. And we did receive some feedback from Vermonters who particularly in the southern part of the state that were looking for an opportunity to participate. And so we've actually made all of the meetings virtual. So if you know anybody that would like to attend, Matthew, if you want to check the first part of the presentation out, you have an opportunity two more times if you wanted to attend virtually. But we will be up in your neck of the woods on the, on the 15th in, in Saint Albans. We are looking for, for public comments to incorporate into the, the final plan which will be submitted by July 1st, to the Public Utility Commission and then this slide here. Well, this is just again, questions for you all to, to consider in relation to the plan.

We want to hear from you and there's a number of ways to do that. As I said, this meeting is being recorded. So, Laura, thanks so much for the, the comments and questions on storage. You can also submit formal

comments on our online form on the website. You can send them snail mail to me if anybody likes to do that still. My email address is listed here and we're always open for a phone call. So if you have any questions or just want to talk through some of the details or provide comments that way, we're here to, to help and we're here to hear from you. So, I will close out our specific comments and really just thank everybody again for taking their time to join us today.

Kerrick Johnson:
One thing, Shana, maybe we could just ask if there's some group, if there's something that would be good, you know, this group should really hear about that or that group, someone we missed. There's some opportunity we're willing to, to go anywhere and talk with anyone about the long, about this long range plan. So please just let us know.

Shana Louiselle:
Great. Thank you and Matthew, I see your, your note and happy to, to send you the follow up information. OK. Well, with that, I think we'll, we'll bring our meeting to a close and thank you again, everyone for your time.

Hantz Presume:
Thank you.

Kerrick Johnson:
Bye bye. Thanks.