March 13, 2025 NJBPU EMP Update Presentation Transcribed (Video link, presentation link)

Speaker Eric Miller - 0:20

All right. Good morning everyone. My name is **Eric Miller**, and I'm the **Executive Director of the Office of climate action and the green economy.** Thanks for joining us today for today's stakeholder meeting to discuss the draft results of the 2024 Energy Master Plan. The draft results I'll be covered in today's stakeholder meeting are the product of significant work by our EMP consultants E3 and a Illume in close partnership with the New Jersey Board of Public Utilities its sister agencies, my office, and most importantly, you all the members of the public and organizations that have participated in the stakeholder process so far, we are proud to share that the EMP process has incorporated much of the stakeholder feedback that we have received, and will continue to do so following today's stakeholder meeting. Throughout the 2024 Energy Master Plan process, we have remained laser focused on creating an EMP that charts a course to 100% clean electricity by 2035, and an 80% reduction in economy wide greenhouse gas emissions by 2050, all while growing Our in state electric generation, growing our clean energy economy and providing energy affordability to our residents and businesses. **The draft results that we will cover today present an actionable and flexible approach to achieving our clean energy future that's grounded in the best data available, as the presentation today will make clear, we have modeled a multitude of pathways to achieve our climate and energy goals, and through that process, we have identified multiple no regrets, near term policy solutions that directly address many of the uncertainties we face in the energy sector, all while achieving our climate and our clean energy goals.** So we're excited to share those outputs with you all and receive further feedback that we will use to further refine the Energy Master Plan. So again, I want to thank you all for your participation in this important process. And with that, I would like to welcome **Bob Brabston, the Executive Director of the Board of Public Utilities**, for some brief framing remarks.

Speaker Bob Brabston - 2:52

Thanks Eric. Appreciate that. Good morning everybody. As Eric said, my name is Bob Brabston, and I'm the Executive Director of the New Jersey Board of Public Utilities. On behalf of President Christine Guhl-Sadovy and the board, I want to thank you all for joining us today. The President had an unavoidable conflict. Otherwise, she would have been here herself. We really just want to convey how appreciative we are for everyone's time today to review the modeling and to discuss the pathways to 100% clean energy. Most of you, if not all of you today, are aware of the challenges New Jersey and other states throughout the PJM region and the nation are facing in regard to higher energy costs. **Governor Murphy and the BPU have taken these challenges very seriously, and we're going to ensure that any path forward minimizes ratepayer impacts. The policies and initiatives that we have invested in throughout the administration have always accounted for costs and benefits. It's a core part of what the BPU does. We know that the benefits of clean air and clean energy greatly outweigh the costs, as you're going to see today from the modeling results, draft results, the economic development, cost saving, health and climate benefits of our goals cannot and should not be understated or ignored.** As Eric noted, we also understand that we have to be open minded to any and all options to get to our goals, none of these scenarios by themselves are set in stone, particularly in light of the changes being proposed here in New Jersey to the way our energy system is structured, and certainly with the uncertainty stemming out of Washington. Just to put some things in perspective from the board point of view, **the primary mission of the New Jersey BPU is to ensure reliability and affordability.** The generation-based electricity increases that we've recently seen and announced are top of mind for me and certainly for President Guhl-Sadovy every single day. And have been since the **PJM capacity auction last year, which caught the region off guard**, the **BPU has pushed PJM to make a lot of changes that will bring more generation online and limit increases going forward**, **we have supported an all-of-the-above clean-energy strategy**, and the gains that we've made in resources like solar and **soon to see in storage**, will continue to yield savings in generation costs for New Jersey rate payers. We've implemented Bill credits and proposed additional bill credits to offset pending increases. We've expanded energy efficiency and the very successful community solar programs so that customers can

reduce their energy use and see lower bills we have and will continue to work with stakeholders and members of the legislature on responsible solutions to the current capacity issues, while keeping our clean energy goals in mind. **But what we need from you today and in the written comment period to follow as input on solutions, any new generation comes at a cost, regardless of the resource, we are open to suggestions that offer immediate rate payer relief and long-term rate reductions while not abandoning a clean energy future.** Because as rate payers and residents, we cannot avoid, we cannot afford the costs of abandoning a clean energy future. So thank you again for your attendance today and for your thoughtful input, and I'll pass it back to Eric and the team to take us through the rest of the presentation today.

Eric Miller - 6:42

Great. Thank you very much, Bob for those opening remarks. With that, we'll get started with the stakeholder proceeding, and I will pass it to Emma Weaver to lay out some ground rules and get us started.

Emma Weaver (Illume Consulting) - 6:56

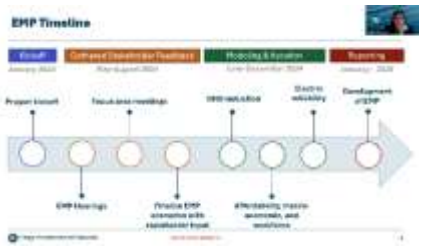
Morning, everyone. My name is Emma Weaver. I'm with loom advising one of the consultants who has been working on this study before we get into the presentation, we wanted to set some group agreements for our time today, especially for providing comment and when folks are speaking as well. A reminder for folks who have signed up to speak today, please be mindful of time. Everyone will have three minutes for comment, and our team will mute folks who have exceeded that time to make sure we have sufficient time for everyone at any time, please feel free to share your comments or questions in the chat, and then these last three, I know folks know, but just as a reminder, when sharing feedback, please focus on concepts or content, not individuals. Please assume good intent and acknowledge that we're all here with a commitment to progress, to improving our communities, and approach this discussion with openness and empathy. And again, I know folks understand and incorporate these but always like to include them as a reminder. One other note for those who are speaking, we will also have a timer to remind you of where you are in your allotted three minutes of time. There will be a small timer at the top of your screen. And my colleague Michael will also have a timer associated with his video, which will be pinned during that portion of our time today, and with that, I will hand it over to Chelsea at E3.

Chelsea Petrenko (E3 Consulting) 8:48

Thank you, Emma. Good morning everybody. Thank you so much for joining us today. My name is Chelsea Petrenko. I'm an associate director at e3 and I've been working closely with the BPU and governor's office to manage this body of research. I'm joined today by several E3 members and a Illume, and we're very excited to be here. It's been an honor to work on the New Jersey master plan. Also wanted to thank you all for taking time out of your day to engage and participate in this process. We really appreciate it. So first, we will be going through the context on the New Jersey Energy Master Plan, including progress made since 2019 we'll walk through the integrated energy plan societal impacts of decarbonization, and we'll end with conclusions and recommendations. I also want to mention that there are **several appendices to this work that provide a lot more information**, and we'll be sending this deck around after the call, so you can also review those slides as well.

The overarching goal of this study was to create New Jersey's 2024 Energy Master Plan, which outlines the state's strategic use, management and development of energy. The EMP reflects the state's accelerated goal of reaching 100% clean energy by 2035 this EMP consists of several elements, first, a progress report on New Jersey's successes and barriers toward meeting the goals set out in the 2019 EMP. It includes a policy analysis that outlines best practices, executive orders, funding opportunities and actions that can inform decarbonization scenarios. It includes the integrated energy plan based on economy wide energy system, modeling of New Jersey's pathways for meeting long term climate goals. It also includes an analysis of the impact that electrification and decarbonization will have on customer costs, and last but not least, it includes strategic stakeholder engagement and incorporation of feedback throughout the EMP process.

Just as a reminder of what this process has consisted of, we kicked it off last January through May and August 2024. We gathered stakeholder feedback through public EMP hearings and several focus area meetings. We then finalized stakeholder input and conducted our modeling from June through December 2024. This consisted of greenhouse gas reduction modeling, electric reliability modeling and affordability, macroeconomic and workforce analyzes.



Finally, we are in the reporting stage and rolling out the study.

To go a little bit more into depth, into this reporting phase and the stakeholder feedback process. So today, we will be presenting the research and we will answer clarifying questions with respect to the analysis. Please submit questions, we said in the chat, but actually use the Q and A function on Zoom to submit your questions. There should be a Q and A button on the bottom there, and if there are clarifying questions throughout the presentation, we will try to monitor the chat and or the Q and A and answer those as we go at the end of the presentation, stakeholders that register to speak will also be able to provide commentary for up to three minutes per person, as Emma discussed. We will release the slides for feedback from stakeholders, and stakeholder comments are due on May 1. Finally, by scanning the QR code on the right, you'll be able to go straight to the docket and submit your comments. You don't have to do that now. You can do that when we send out the deck later.

Okay, let's get into it. First, we'll cover progress and policy.

So New Jersey has made significant stride towards meeting its 2019 goals. I won't go through each one of these points in detail, but I will go over the items in bold. So under energy efficiency, there is the integrated home energy, health and safety upgrades for LMI programs called the whole house pilot.

Under transportation, there are over 200,000 light duty EVs on the road, partially incentivized through charge up New Jersey. That's in addition to 4200 charging stations across the state.

Under community, there's about 250 megawatts of community solar approved in LMI communities.

Under modernization, the Clean Energy Program and utility energy efficiency, building decarbonation startup programs have been established.

Under affordability and workforce, low cost green financing through the New Jersey, Green Bank and clean energy loans have been established.

Under innovation, five gigawatts of offshore wind capacity have been approved.

And under clean energy, five gigawatts of installed solar capacity exist now with over a gigawatt of planned capacity.

In addition, New Jersey has also adopted several new targets and policies since the 2019 EMP key policies influencing the 2024 EMP results are under the electricity, transportation and building sectors specifically. This is not all of the policies that have been passed since 2019 but we're highlighting the ones here that really drive the decarbonization results that we are seeing.

So under electricity, there's EO 307, which increases the offshore wind goal by nearly 50% to 11,000 megawatts by 2040. There's EO 315, which accelerates the target of 100% clean electricity to be met in 2035 instead of 2050.

Under transportation. There's the advanced clean trucks rule and advanced clean cars two rule. And both of these aim to significantly ramp up the sales of EVs with under medium heavy duty vehicles and light duty vehicles. For light duty vehicles, this ramping means sales representing 100% ZEVs by 2035.

Under buildings. There's EO 316, which targets installing zero carbon emission space heating and cooling systems in 400,000 homes and 20,000 commercial properties, and aims to make 10% of all LMI properties electrification ready by 2030.

And then finally, there is the nescom memorandum of understanding, where New Jersey pledged, along with eight other states, to have heat pumps make up 90% of residential heating, air conditioning and water heating sales by 2040. So with these policies in place, all of These are really driving electrification and clean energy adoption, and they've had a very strong impact on the trajectory of emissions that we are modeling if these goals are met.

So we wanted to summarize the stakeholder feedback that we collected this summer. This feedback is organized by frequency of mention.

Affordability and cost. Stakeholders desire to see information on upfront costs of equipment, in addition to expected impacts of climate change mitigation on utility bills, stakeholders also sought special consideration for the needs of renters, particularly those in LMI brackets, to address energy affordability concerns and improve access to clean energy.

Across all of our stakeholder sessions, affordability and cost was a common thread, and that is why this is at the very top of the list, and we acknowledge that here.

Under environmental justice and equity stakeholders expressed concerns for overburden communities such as low income or communities of color that have historically been disproportionately impacted by industrial pollution, extreme weather and other impacts of fossil fuel generation. Stakeholders called for expanded policies and programs targeting overburden communities to improve access to energy efficiency programs clean energy and job opportunities. Stakeholders emphasized that the challenges related to old housing stock disproportionately affect LMI and overburden communities and renters.

Under infrastructure and reliability. Stakeholders emphasized grid modernization and costs, prioritizing energy efficiency, peak demand management, streamlined interconnection, updated rates, energy storage and a whole host of other strategies, and those have all been documented in the written draft EMP.

Under climate change and environmental risk, stakeholders stressed the importance of acting swiftly to mitigate the impacts of climate change, and noted how adopting clean energy and transitioning away from fossil fuels could help to offset the impacts of climate change. Across all the stakeholdering that we did, we did receive broad support for addressing climate change. There were also calls for accelerated timelines and more aggressive targets for clean energy, phasing out of fossil fuel infrastructure and more holistic cost analyzes to inform statewide planning.

Under workforce readiness, stakeholders shared significant concern for the rate and scope of workforce development necessary to meet the state's goals. Particularly in relation to LMI and overburden communities, including feedback on workforce gaps, curriculum development and workforce pipeline partnerships. As we'll see a little bit later, New Jersey does have significant opportunity to increase the green economy and workforce. What we heard from stakeholders is that we really need to actively pursue training opportunities to make that happen.

Under transparency in modeling and reporting, stakeholders placed emphasis on the importance of clearly documenting modeling assumptions and analyzes used in the EMP scenario modeling. **Stakeholders desire for the state to provide more regular updates to the public detailing progress being made on the goals set out in the EMP.**

And finally, under energy efficiency program offerings and structure. Stakeholders gave feedback on the importance of expanding and improving energy efficiency programs as a core component of New Jersey's decarbonization strategy, including recommendations for a streamlined, one stop shop of all funding rebate energy efficiency and clean energy program opportunities.

So across state agencies and public stakeholders. We really got the comment a lot that there's already so much going on in New Jersey, but sometimes it can be hard to find out what all of those things are. So we are strongly recommending a one stop shop that makes it easy and accessible for people to understand all of the opportunities to participate in decarbonization.

Okay, so let's get into the integrated energy plan. First, I'll go over a bit of methodology.

This study included a current policy scenario which does not meet the state's climate goals, and three mitigation scenarios which do meet the 80% by 2050 reduction goal.

I'll explain what these scenarios are.

The current policy scenario includes finalized state and federal policies as of 2024 but excludes voluntary targets that don't have an enforcement mechanism.

So for this policy, we modeled 50% renewable portfolio standard and five gigawatts of offshore wind by 2030. We modeled heat pump adoption increasing slowly but steadily, with gas use in buildings declining 25% by 2050. We included advanced clean cars and advanced clean trucks, which do drive ZEV adoption. And finally, EPA regulations to reduce refrigerant emissions.

We included this scenario to explore how far existing state and federal policies can get New Jersey toward achieving its emissions targets. This also serves as a gap analysis to understand how much further the state needs to go.

The high electrification scenario represents the most ambitious electrification of end uses in buildings, industry and transportation, with lower reliance on hybrid heating and no decarbonized fuel use. We included the 100% clean electricity standard by 2035. It included rapid heat pump adoption and gas use in buildings declining over 80% by 2050. About 94% of New Jersey passenger vehicles are EVs by 2050 due to the advanced clean cars and trucks. And natural gas for low temperature industrial heat is electrified. So this scenario examines the impact of rapid electrification on emissions and the build out of electricity resources that are needed to meet that load.

We also explored two scenarios that have a reduced impact on the grid via peak demand reduction through various different strategies.

The first scenario is demand management. This includes ambitious electrification, very similar to the high electrification case, but it also includes increased energy efficiency measures to reduce grid demands. We also modeled the 100% clean electricity standard by 2035 here, over 60% of existing homes and commercial buildings have envelope upgrades by 2050 so that really increases the efficiency of buildings. We added five gigawatts of customer sited solar by 2050 so distributed solar is higher in this scenario. We included more managed EV charging to reduce peak load from EV charging and we included VMT reductions from urban design and public transit. This scenario explores how energy efficiency and conservation can reduce the cost of decarbonization through peak load management.

Finally, a hybrid electrification scenario, this included more hybrid heat pump systems where gas is used as a backup during the coldest hours of the year, and plug in hybrid vehicles are higher share of the EVS sold again, 100% clean electricity by 2035, this time, 40% of homes have a heat pump with a backup gas system by 2050. 94% of passenger vehicles are EVs to meet the advanced clean cars and trucks, but 20% are plug in hybrids. And then finally, advanced renewable fuels are blended in this scenario to mitigate a portion of the non-electrified fuel use.

This scenario illustrates a future where heat pumps and EVs are still rapidly adopted, but strategic fuel use lowers peak electric load.

So the IEP consisted of four key areas of research for all four of the scenarios that I just described, we went through the following research steps.

First on the left is economy, economy wide pathways to decarbonization, which answered, how can we reduce emissions from the devices and vehicles we use?

Second was electric sector growth and decarbonization, which answered, What will a decarbonized reliable electric sector look like by 2050.

Third was societal impacts to decarbonization, which answered, what are the benefits and costs of reducing carbon emissions?

And last but not least was customer energy affordability, which answered, what will residential energy and equipment costs be by 2035.

Taking a second here to look at the chat,

we have several questions about the slides being released and the study being released, and we will be sharing these slides after the webinar.

So I'll go over the key findings of the quantitative analysis, then we'll go through the results, and then we'll circle back to the key findings and recommendations**.**

So first, it's feasible for New Jersey to meet its goals, but there will be challenges**.**

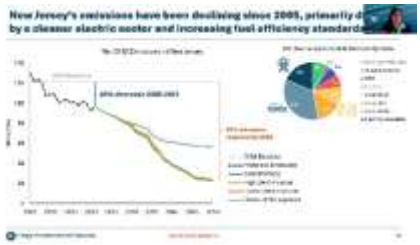
A rapid and sustained pace of low carbon technology deployment will be necessary to meet climate goals**.**

New Jersey can pursue no regret climate actions in the near term, such as building and transportation electrification, utility scale, solar and battery storage deployment. Across all of the scenarios, electrification, solar and storage are key themes, and so we identified these as no regret actions that can be taken now, no matter which future scenario New Jersey pursues to meet Its climate goals**.**

Second, if New Jersey meets its goals, there will be societal benefits. Health benefits and avoided impacts of climate change result in significant cumulative net societal benefits from 2025 to 2050. In the high electrification scenario, about 54,000 net new jobs are supported by climate and clean energy activities by 2035.

Third, energy affordability and equity must be addressed**.** Policies must ensure low-income communities' benefit from the clean energy transition, while managing cost impacts**.**

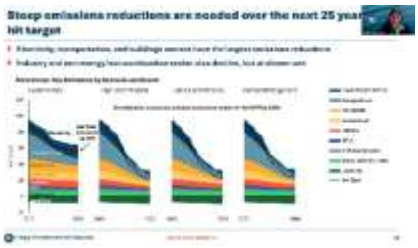
And fourth, under all mitigation scenarios, electricity demand is projected to increase considerably over the next decade, requiring new capacity additions to maintain system reliability. Data centers, building electrification and transportation electrification will drive these increases in electric demand**.** There will be a role for emerging clean firm technologies such as new nuclear, long duration storage and decarbonized fuels to maintain system reliability post 2035. And we see a role for New Jersey to really emerge as a leader in this space.



So New Jersey's emissions have been declining since 2005 primarily driven by a cleaner electric sector and increasing fuel efficiency standards**.** In the graph here, we're showing million metrics, tons of CO two equivalents, and you can see the 2006 baseline and the light gray line, and this 20% increase to 2001 levels.

After 2001 we still have a lot of work to do to get down to that 80% decrease required by 2050. The three colored lines at the bottom show the trajectory of meeting the state's climate goals, and this blue line here shows the current policy scenario that goes some of the way, but Not all of the way to meeting emissions reduction goals.

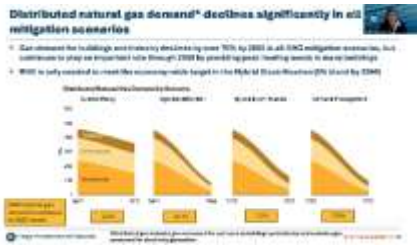
Steep emissions reductions are needed over the next 25 years to hit the target. Electricity, transportation and building sectors have the largest emissions reductions. Industry and non-energy sectors also declined, but at a slower rate.



So looking at the figures at the bottom, current policy is on the left, and then the three mitigation scenarios are on the right. That will be true for most of the figures that we're showing today. The dark blue bar and the light blue bar are wedges at the top of the figures represent the electricity and transportation sectors, and then the dark yellow and light yellow represent buildings.

And you can see that under the mitigation scenarios, these sectors have to decline significantly in order to meet the target.

Distributed natural gas demand declines significantly in all of the mitigation scenarios. And **by distributed natural gas, we are referring to gas that is distributed to homes and buildings, and not gas that is consumed for electricity generation.**

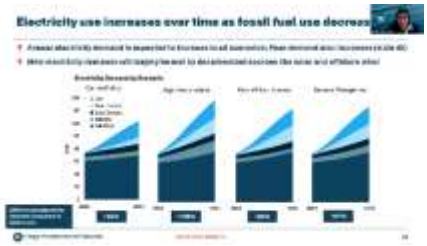


Gas demand for buildings and industry declines by over 70% by 2050 in all greenhouse gas mitigation scenarios, but it does continue to play an important part through 2050 by providing peak heating needs in many buildings.

Renewable Natural gas is only needed to meet the economy wide target in the hybrid electrification case, we are including a 5% blend of RNG by 2050.

And to draw your attention down to the figures at the bottom, under the hybrid electrification case, there's a 72% decline in natural gas use, which is less than the hybrid or, sorry, less than the high electrification and demand management cases. And that is because under that case, there are many more folks still using back up gas systems in addition to heat pumps, so more customers are retained on the gas system. But since the gas is only used during the coldest hours of the year, there's much less gas flowing through the system.

Electricity use increases over time as fossil fuel use decreases. **Annual electricity demand is expected to increase in all scenarios, and peak demand also increases.**



So in these figures, in the bottom here, we are showing overall demand by scenario. The top wedge that's bright blue represents EVs, and the lighter blue wedge is heat pumps, and you can see that much of the demand is from EVs and heat pumps increasing.

We also did work specifically on data centers for this body of research, and developed several possible futures for forecasts of data center load. In this study, we are using the medium forecast.

Under all of the mitigation scenarios, electricity demand about doubles, the hybrid electrification and demand management scenarios, although it appears that the overall usage is similar, the peak demand under these scenarios is lower, which does result in savings.

Finally, new electricity demands will largely be met with decarbonized sources like solar and offshore wind.

Meeting climate goals requires a significant level and pace of transformation. In the mitigation scenarios, residential heat pump adoption meets the targets set by the nescom memorandum of understanding that I described earlier. This is where heat pump sales shares of 65% by 2030 are adopted and 90% by 2040. These sales shares translate into roughly 85% of the installed equipment being heat pumps by 2050.

While heat pump penetration is similar between hybrid and high electrification. Hybrid has a lesser impact on the electric peak demand because of that gas backup, as I explained.

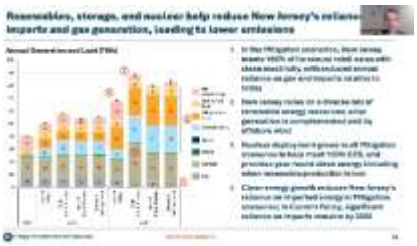
To achieve the levels of installed equipment shown here this 85% penetration of heat pumps, the pace of adoption must ramp up considerably. There's more information on this when you get the deck in **Slides 47 and 48** that show that really steep incline and adoption that's necessarily necessary to meet these targets. On the left here, we're showing the share of installed residential heating equipment in 2021 and in 2025 under all the scenarios. And you can see that now gas makes up the largest proportion of heating equipment, but by 2050 heat pumps, which are the dark blue bar and the blue hashed bars make up the vast majority of heating equipment.

This is also true in terms of the level and pace of transformation for electric vehicles and commercial space heating. In the appendix, we have much more information on that as well, in terms of the stocks and the significant ramp up required under those sectors as well.

Next slide, please.

I'll hand it over to Kevin to explain our capacity expansion modeling.

Kevin Steinberger (E3 Consulting)- 34:13



Great. Thanks Chelsea. So on this slide and the next one, I'll be walking through the results of our detailed electric sector modeling. And I'll start by walking through New Jersey's energy mix on an annual energy balance basis.

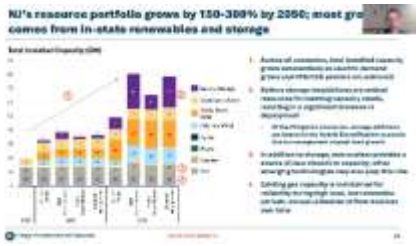
So in the mitigation scenarios as reviewed in the previous slides, demand roughly doubles relative to today's levels. And even as demand increases significantly, achievement of the 100% clean energy standard leads to a large reduction of the state's reliance on natural gas generation and imported power on an annual basis. These reductions, in turn, lead to a sharp decline in the emissions intensity of New Jersey's electric sector and clean electricity coupled with electrification of end uses in other sectors of the economy are both foundational pillars to meeting New Jersey's broader decarbonization goals.

When we look at the composition of resources that meet New Jersey's clean energy standard in 2050 we find that New Jersey relies on a diverse mix of renewable resources, including utility scale and distributed solar as well as offshore wind. Continued investments in the offshore wind industry can complement the state's growing solar capacity, in part because offshore wind offers diversity benefits and is able to provide significant amounts of power during times when solar output is relatively low.

There is also some growth in nuclear generation across the mitigation scenarios. And nuclear generation provides two benefits, both in contributing to the 100% clean energy standard and providing year-round clean energy.

Lastly, **we find that investments in clean energy also lead to New Jersey producing more of its power in state with a reduced reliance on imports relative to today.**

We move to the next slide I'll talk through the evolution of New Jersey's electricity mix from a installed capacity perspective, and this perspective helps illustrate the pace and scale of new resource additions needed to meet the state's objectives.



First, we can see that solar, battery storage and offshore wind all grow substantially, both to meet growing demand and to support achievement of the 100% clean energy standard. And significant investments in all of these resources are needed, both in over the next decade and across the model time horizon.

In the long term, battery storage in particular is a critical resource to meet capacity and reliability needs as electrification leads to a significant increase in peak demand. We also find when we compare across mitigation scenarios that managed electrification strategies, such as those pursued in the hybrid electrification scenario, can help alleviate the need for such large quantities of new battery storage capacity. In addition to storage, new nuclear provides another source of new clean firm capacity in these scenarios. However, as Chelsea noted, other emerging technologies can also play this role, and we think that the role of emerging technologies and meeting growing capacity needs is a key area for the state to explore further.

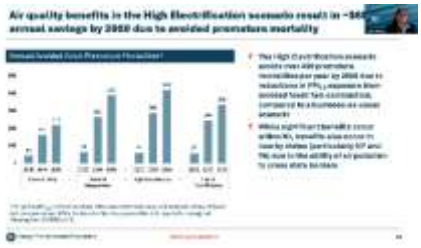
Lastly, the existing gas fleet is also maintained in order to maintain system reliability during high load low renewable periods. However, even though the capacity of the existing gas fleet remains the same as indicated on the previous slide, the annual utilization of the existing gas fleet declined significantly, leading to a corresponding decline in the emissions intensity of the grid in support of New Jersey's decarbonization goals.

I'll hand it back to Chelsea.

Chelsea Petrenko (E3 Consulting) - 38:19

Thank you, Kevin.

So now I'll walk through the societal impacts of decarbonization.



Air quality benefits in the high electrification scenario result in about 16, sorry, $6 billion of annual savings by 2050 due to avoided premature mortality.

The high electrification scenario avoids over 400 premature mortalities per year by 2050 due to reductions in PM 2.5 exposure from avoided fossil fuel combustion. That's compared to a business-as-usual scenario.

While significant benefits occur within New Jersey, benefits also do occur in nearby states, because air pollution travels. And these avoided mortalities were translated to the $6 billion figure using a formula by EPA, co benefits, risk net assessment, health impact screening.

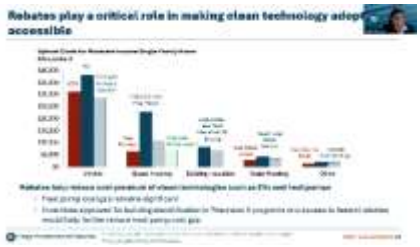
The Clean Energy Transition will create 1000s of net new jobs, primarily in the electricity and buildings industries. In 2023, New Jersey employed 63,200 workers across its clean energy workforce. In the high electrification scenario, we modeled 53,900 net new jobs that would be supported by climate and clean energy activities by 2035. This includes 77,900 gross new jobs and 24,000 jobs displaced.

The electricity and building sectors are estimated to create the most net new jobs by 2035 with 37,000 new jobs and electricity and 35,000 new jobs in buildings.

Under the electricity and buildings sectors, nuclear, commercial, HVAC and charging stations, sub sectors see the most significant growth. And the fuels and transportation sectors see job displacement due to reductions in fuel demand.

And I just want to note that this research was conducted by a VW in partnership with the governor's office, and there will be an additional report specifically on the green economy.

So now moving into thinking about customer costs, we'll cover first the cost of equipment, and then we'll move to think about the customer utility bills. Rebates play a critical role in making clean energy technology adoption accessible. So in the figure, we are showing vehicle, space heating, building insulation, water heating and other appliances, and the red bar represents the fossil fuel version of that technology. The dark blue bar represents the Low Carbon version of that technology, and the hash bar represents the cost of that technology after available rebates.



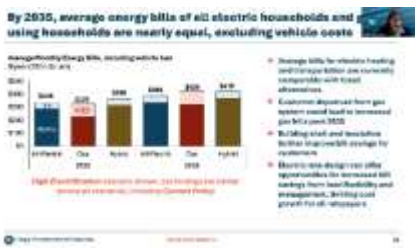
So in the case of EVs, we see that EVs do cost more than internal combustion engine vehicles. There are several rebates available for the purchase of an EV and with those rebates, the cost is brought down in parity with an internal combustion engine vehicle. So in terms of vehicles, we see these as a lower incremental cost, potentially even a savings relative to ice vehicles, depending on the vehicle. And so we see this as basically as accessible as an Ice Vehicle alternative, since the incremental cost is close to zero or zero.

In space heating, it's a different story. Gas furnaces, we have as about $5,000 in investment, compared to cold climate heat pumps, which can be over $20,000 for a retrofit. That is a huge difference and a huge incremental cost. And we acknowledge that the investment can be very difficult to make, so New Jersey has been putting significant effort into providing rebates to defray that significant incremental cost. The Blue hash bar shows the cost of heat pumps after available state rebates, and the green hash bar shows the cost of a heat pump with Ira rebates that are scheduled to go into place in 2025.

With those rebates, the cost of a gas furnace and the cost of a cold climate heat pump are on par with each other, so we see that this is the incremental cost is significantly reduced with the help of rebates. This also means that rebates are a critical tool for making these technologies accessible.

Next slide please.

By 2035 average energy bills of all electric households and gas using households are nearly equal, excluding vehicle costs. So we see that the average bills for electric heating and transportation are currently comparable with fossil alternatives. And the figure here on the left, we're showing bills in 2025 the left, blue bar is an all-electric home with an EV. The middle, red bar is a home that has a gas furnace and an ice vehicle. And the green bar is a hybrid configuration, where there's a heat pump, but gas is retained for backup.



And we can see that the all-electric home with the electric vehicle and the gas version are relatively comparable today.

What makes them comparable now is the EV operation costs being lower than an Ice Vehicle cost. So it's cheaper to run an EV due to efficiency and lower cost of fuel.

Looking out to 2035 we're showing these same configurations in terms of the home type, and we see that now the home heating bills are somewhat similar. So under an all-electric scenario, the heating bill is about equal to what it would cost to heat a gas home. That is due to the gas cost increasing over time, we're still seeing the savings between the EV cost to operate and the Ice Vehicle cost to operate.

Customer departure from the gas system could lead to increased gas bills post 2035. So this is only looking out for the next 10 years, and we see that on the whole, these technologies are relatively similar in terms of cost of operation in the long term, or until 2035.

We do want to note that if New Jersey does continue on the path of meeting its electrification goals and heat pump adoption, that does mean that less gas will be used, and that gas prices would continue to go up. We see a little bit of that here, with the dark red bar being significantly higher in 2035 than it is in 2025 that's due to the increase in cost of gas between those two points in time, and this could continue to go up after 2035 if New Jersey continues on its trajectory of electrification.

And lastly, I wanted to note that high electrification scenario is what we're showing here, but the findings are similar across all scenarios, including current policy which does not meet the state's climate objectives.

Building shell and installation further improve bill savings for customers. So what we're showing here does include some energy efficiency measures, but not any deep shell retrofits, and we do see that with a deep shell retrofit, there are much further savings to operate the home with an electric heat pump. However, obviously, a deep shell retrofit is very expensive up front.

Finally, electric rate design can offer opportunities for increased bill savings from load flexibility and management limiting the cost growth for all rate payers.

Reaching NJ GHG target Benefits - 46:46

This is our last quantitative slide that we'll go over today, and this is on the cumulative benefits of addressing climate change. Reaching New Jersey's greenhouse gas target results in significant cumulative benefits from 2025 to 2050.

So on the figure, we are showing the costs of decarbonization and the savings. The blue and the yellow bars above the x axis represent the costs. The blue bar is electricity and the yellow bar is building equipment. You can see here that these, by far, are the two biggest cost categories for addressing climate change. Under the x axis are the savings and benefits, and you can see the green bar here are the avoided fuel costs, and then the yellow hash bar represents the local air quality benefits from reduction in criteria pollutants, and the green hash bar represents the global climate benefits from reduction in greenhouse gas emissions. And we measured that using the societal cost of greenhouse gas emissions using EPA methodology.

We also note that there may be an opportunity to reduce the net costs of decarbonization through targeted electrification and strategic demand management, which would reduce the size of that blue bar cost. Overall, you can see here that the net benefits are sizable. They range between just below $100 billion to just above $100 billion in net benefits.

So to go on to conclusions and recommendations, I'll go over our key takeaways once more.

Is it feasible for New Jersey to meet its goal?

It is feasible for New Jersey to meet its goals, but there will be challenges. As we saw, a rapid and sustained pace of low carbon technology deployment will be necessary to meet climate goals. This involves a steep ramp up of adoption of heat pumps and electric vehicles, and this has to be sustained over many years in order to keep pace with the adoption targets.

New Jersey can pursue no regret climate actions in the near term, such as building and transportation electrification, utility scale solar and battery storage. So as Kevin showed, utility scale solar and battery storage will comprise a large portion of New Jersey's generation and capacity portfolios, and these are critical to be thinking about implementing now.

If New Jersey meets its goals, there will be societal benefits, as we saw, there are health benefits and avoided impacts of climate change, which result in cumulative net societal benefits between 2025 and 2050 on the order of $100 billion.

In the high electrification scenario, there's about 54,000 net new jobs supported by climate and clean energy activities by 2035.

Energy affordability and equity must be addressed. Policies must ensure low-income communities' benefit from the clean energy transition, while managing cost impacts. Under all mitigation scenarios, electricity demand is projected to increase considerably over the next decade, requiring new capacity additions to maintain system reliability. And that's particularly true after 2035 data centers building electrification and transportation electrification will drive increases in electric demand. There will be a role for emerging clean firm technologies such as new nuclear, long duration storage and generators fueled by hydrogen or renewable gas to contribute to maintaining system reliability post 2035. We see that New Jersey has an opportunity to emerge as a leader in this space.

And finally, the next steps.

So the next steps for the state are clear through 2035.

The state must stay laser focused on its no regrets, policies regarding renewable energy, generation, battery storage, transportation and building electrification and energy efficiency. Through these policies, New Jersey will achieve its mid-century clean energy and climate goals.

The partnership to plug in and clean buildings roadmap will support these efforts, and those are rolling out now. Also the New Jersey comprehensive climate action plan, which will be completed in December 2025 will include specific targets and strategies for achieving sectoral goals.

The state must continue to prioritize energy affordability through rate design, as well as continue programming to reduce the upfront cost of equipment rebates. As we saw, these rebates are critical for making technologies accessible, so that is a key role the state can play in helping provide that access. This is partially addressed in the affordability equity and

rate study, which looks at different rate designs to minimize the impact of utility bills under high electrification futures, and also in the clean buildings roadmap growing electricity usage and greater reliance on renewable electricity will require that New Jersey builds clean firm capacity in the coming decades to maintain reliability**.**

The immediate next step is a clean firm capacity roadmap that the BPU will begin after the EMP to explore emerging technologies and their ability to contribute to system reliability needs**.** This will include a consideration of long duration storage, new advanced nuclear and small modular reactors and hydrogen**.** And that study will also include a significant stakeholder component that everybody is invited to partake in.

New Jersey must determine new strategies to guide the evolution of the natural gas distribution system towards clean energy attainment consistent with EO 317.