Public Hearing

before

SENATE ENVIRONMENT AND ENERGY COMMITTEE

"The Committee will meet to hear testimony from invited guests on strategies that the State and industries could implement in order to adapt to and mitigate the effects of climate change"

LOCATION: Committee Room 4
State House Annex
Trenton, New Jersey

DATE: April 21, 2022
10:00 a.m.

MEMBERS OF COMMITTEE PRESENT:

Senator Bob Smith, Chair
Senator Linda R. Greenstein, Vice Chair
Senator Edward R. Durr, Jr.

ALSO PRESENT:

Christina Denney
Office of Legislative Services
Committee Aide

Joseph Gurrentz, Ph.D.
Matthew H. Peterson
Senate Majority
Committee Aides

Rebecca Panitch
Senate Republican
Committee Aide

Meeting Recorded and Transcribed by
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NEW JERSEY STATE LEGISLATURE

SENATE ENVIRONMENT AND ENERGY COMMITTEE

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PUBLIC HEARING NOTICE

The Senate Environment and Energy Committee will hold a public hearing on Thursday, April 21, 2022 at 10:00 AM in Committee Room 4, 1st Floor, State House Annex, Trenton, New Jersey.

The public may address comments and questions to Eric Hansen or Christina Denney, Committee Aides, or make bill status and scheduling inquiries to Pamela Cocroft, Secretary, at (609)847-3855, fax (609)292-0561, or e-mail: OLSAideSEN@njleg.org. Written and electronic comments, questions and testimony submitted to the committee by the public, as well as recordings and transcripts, if any, of oral testimony, are government records and will be available to the public upon request.

The Committee will meet to hear testimony from invited guests on strategies that the State and industries could implement in order to adapt to and mitigate the effects of climate change.

Those individuals presenting written testimony are asked to provide 15 copies to the committee aide at the meeting.

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SENATOR BOB SMITH (Chair): So welcome to the most interesting Committee in the Legislature.

Today we are not talking about specific bills; but we took the opportunity, the symbolic opportunity of Earth Day, Earth Day week, to deal with what we believe to be the most pressing, existential issue that we in New Jersey face, which is global climate change.

So we have some speakers today who are just going to blow you away, and they're going to blow you away because they're really smart people; and we've asked them all to tell us what we should be doing in New Jersey because we're clearly making some strides, but we're not doing enough.

So anyway, I thought I'd start off with a little handy work from our staff. Joey Gurrentz has a Ph.D. in chemistry, and he's been with us, now, for-- Joe, how long have you been with us?

DR. GURRENTZ (Committee Aide): So far?

SENATOR SMITH: Yes.

DR. GURRENTZ: Nine months.

SENATOR SMITH: Okay; it feels like nine *years* (laughter). But yes, he's been with us for nine months, and he's been a magnificent addition to Matt Peterson, and to Eric, and to all the staff. We really have some stupendous people here.

But anyway, Joe and I put together an article that we submitted to the New Jersey -- and Matt; I'm sorry, all three of us -- we submitted it to the New Jersey Bar Association magazine. And what we tried to do was to put what we -- kind of what New Jersey has done so far, and maybe lay the groundwork for what we need to do.

So I'm going to just read you the article because-- I don't know if you've been watching these meetings, but we have a -- there's a strategy here. We're keeping a stenographic record of all the global climate change suggestions, and we're hoping this year to have, maybe, new policy directions. Because as I say, clearly we're not doing enough.

So let me read this to you. And I hate to read stuff, but this is a very succinct summary.

All right, so we start with *Climate Change Impacts to New Jersey.*

"Often, when we read about climate change, we are inundated with messages about its catastrophic global impacts like melting glaciers, ocean acidification, and more frequent and intense storms. However, too little is shared on specific regional impacts and what has been done to combat them.

"With our over 130 miles of coastline and many low-lying inland waterways, New Jersey is particularly vulnerable to sea-level rise, flooding events, and saltwater intrusion. As highlighted in the New Jersey Department of Environmental Protection's *2020 Scientific Report on Climate Change*, rising temperatures will increase droughts, strain the State's freshwater supply, and decrease the productivity of important food crops that make New Jersey the *Garden State*.

"Each of these climate impacts can have broad ramifications on our economy, the natural environment, and our way of life. Everyone who was impacted by Hurricane Sandy or Ida, for example, knows too well how high winds and heavy precipitation can result in road closures, sodden homes, power outages, and coastline damage. What's less evident is how much weather and climate disasters impact our economy, decreasing property

values and requiring costly taxpayer-funded remediation efforts. Unfortunately, the frequency of billion-dollar weather and climate disasters is increasing.

"In a recent report, the Union of Concerned Scientists found that New Jersey will lead the nation in the number of commercial properties at risk of chronic inundation in 2045, and will be second only to Florida in the number of residential properties at risk. The U.S. Army Corps of Engineers projects that New Jersey's coastal communities could face a combined average of nearly $1.6 billion a year in damages if additional steps aren't taken to mitigate and respond to climate impacts. Other recent research has found that sea-level-rise driven changes in tidal flooding have already reduced home values in New Jersey by an estimated $4.5 billion. So the true cost of doing nothing is enormous.

"Aggressive action is necessary to reduce our dependence on fossil fuels to help avoid the worst effects of climate change. While some may argue that climate change is too big and too expensive an issue for any one state to meaningfully address, I believe that we have a moral obligation to do so. I maintain that we can get to net-zero greenhouse gas emissions, and we can do so feasibly and affordably. In fact, Princeton University's Net-Zero America study shows that the nation will return value on coordinated climate action. At the end of the day, if New Jersey does not lead the way, who will?

"Despite our state's small geographic size and relatively small contribution to total global emissions of greenhouse gases, our Legislature's actions and omissions have ramifications that extend beyond the state's borders. Our climate policies signal to carbon-intensive industry sectors,

surrounding states, and the Federal government that they need to prepare for a decarbonized future."

Now, let's talk about *Powering the Future with Carbon-Free Electricity.*

"Since the passage of the Global Warming Response Act in 2007, New Jersey has successfully reduced greenhouse gas emissions by 20 percent below 2006 levels. This is a huge win, but a coordinated, economy-wide transformation will be required to achieve our more ambitious goals: 100 percent carbon-free electricity and an 80 percent reduction in carbon emissions by 2050.

"To achieve this transformation, the Legislature is working from a variety of angles. Some of the Legislature's actions include decarbonizing the State's electric grid, transitioning to electric vehicles, and guiding market forces to incentivize the rise of products that utilize innovative, low-carbon manufacturing processes

"On the energy front, New Jersey's Renewable Portfolio Standard is one of the most aggressive in the nation. The RPS, established in 1999 and updated in the Clean Energy Act of 2018, requires New Jersey electricity suppliers to procure 22.5 percent of the electricity sold in the state from qualified renewable energy resources. This requirement increases to 35 percent in 2025, and to 50 percent by 2030. On top of that, New Jersey's Energy Master Plan calls for 100 percent clean energy by 2050. To meet these goals, the Legislature has developed several incentive programs to spur the development of clean energy resources.

"The Solar Renewable Energy Certificate, SREC, program, for example, has accelerated the development of solar energy installations. Solar

now accounts for more than 5 percent of New Jersey's total retail electricity consumption, and we're aiming to double that by 2026. This past summer, the Legislature authorized the Successor Solar Incentive Program, called *SuSI*, which includes a competitive solicitation process for at least 1,500 megawatts of large, grid-scale solar facilities. The Legislature also established the Dual-Use Solar Energy Pilot Program to authorize co-productions of solar energy and crops on unpreserved farmland.

"The State has also sought to harness the incredible power of our offshore wind by approving over 3,700 megawatts of new offshore wind energy projects, enough to power roughly 1.15 million homes in our state. With construction having recently begun on the massive wind port in Salem County and the Paulsboro Marine Terminal in Gloucester County, our offshore wind capacity is only expected to increase, eventually surpassing the State's goal of 7,500 megawatts by 2035, while creating high-paying jobs and stimulating the local economy.

"Finally, we can't ignore the importance of nuclear power plants in facilitating the decarbonization of the state's electrical grid. Three nuclear power plant facilities provide New Jersey with 42 percent of our electricity, and roughly 90 percent of our total carbon-free energy. The continued operation of these plants is critical if we're going to keep our carbon footprint low while transforming to a more reliable renewable energy grid in our future. In 2018, the Legislature established the Zero-Emissions Credit, ZEC, program to compensate the state's nuclear energy facilities for the full value of the carbon-free electricity they provide. Additionally, the State should explore the feasibility of incorporating next-generation, small modular reactors to increase resilience and the diversity of our clean energy portfolio.

"So far, about 50 percent of New Jersey's in-state electricity production comes from emission-free sources" -- mainly the nukes. "Thanks to the State's aggressive climate policies, that number is primed to increase. While this is a big accomplishment, there is much that needs to be done, obviously."

All right; how about talking about *Cleaning up the Transportation Sector*?

"The single largest source of greenhouse gas emissions in this state is the transportation sector, which accounts for 40 percent of the total statewide emissions. The Legislature has taken several meaningful steps toward decreasing transportation emissions, including enacting the extremely successful light-duty electric vehicle incentive program, requiring electric vehicle charging stations in new construction, and using RGGI -- Regional Greenhouse Gas Initiative -- proceeds to electrify public transportation and build out the State's EV charging infrastructure. Still, more aggressive action is needed if we are going to clean up our transportation sector in a substantial and lasting way.

"One meaningful way in which theLegislature can decrease transportation emissions is through the electrification of public transit. This is a public health and an environmental justice priority. Urban centers are often the most dependent on public transport, while being disproportionately impacted by the negative health effects of toxic air pollution from combustion engines.

"Unfortunately, air pollution is endemic across our entire state. To address the broader issue of transportation emissions, the Legislature has its eyes on the lowest hanging fruit: New Jersey's medium- and heavy-duty

vehicles. These account for only 4 percent of the vehicles on the road, while generating approximately 25 percent of the transportation greenhouse gas emissions. I applaud the DEP, the Department of Environmental Protection, for implementing the Advanced Clean Trucks Rule, which would increase the proportion of electric medium- and heavy-duty vehicles sold in the state, but I will continue to advocate for additional legislation that would further incentivize the conversion of commercial automotive fleets to zero-emission vehicles."

So what comes next? The answer is, your testimony makes the difference and gives us the good ideas. But what comes next?

"Moving forward, we need to shift the way the State conducts business by considering more seriously the costs associated with climate change impacts. If the State intends to meaningfully address climate change, we must 'practice what we preach.' We cannot continue to tout our commitment to environmental protection, while simultaneously perpetuating and profiting off the actions of climate-polluting industries.

"To this end, last session I introduced S-330, which would prohibit the State pension fund, valued at more than $76 billion, from investing in 200 of the largest publicly traded fossil fuel companies. I also co-sponsored SCR-18, which would prohibit the construction of new fossil fuel power plants, thus requiring retiring fossil fuel plants to be replaced with renewable energy generation. For now, at least, renewables remain our least expensive and least polluting energy resources, so it makes environmental and fiscal sense to support them.

"Of course, these policies don't constitute an exhaustive list. We are continuing to work on measures to mitigate the effects of climate change

and aid the transition to a zero-emission future. These include programs that would incentivize the deployment of energy storage systems, streamline the interconnection of renewables to the grid, establish an electric school bus fleet conversion grant program, and more. This session, the Senate Environment and Energy Committee will take testimony at each meeting from interested stakeholders on what more the State can do."

And that's what today is a part of, obviously.

"Climate change may be the single greatest threat we face this generation; but not 'looking up' and 'sitting back and reassessing'" -- if you saw the movie, you know what I'm talking about -- "is not acceptable in New Jersey."

So that's something Joey, Matt, and I sent to the *Ledger* (*sic*), and I don't know if they printed it yet. I think we only sent it about two weeks ago. But that's where we think we are. We're not doing enough, and we hope to hear from people today who are smart enough to give us a little guidance on what we should be doing.

We have a list of witnesses. Our first witness is the retiring President and Chairman of Public Service Electric and Gas. And as Ralph is coming up -- Ralph Izzo, of course, is the person I'm talking about -- and we thank him and his company for their many efforts over these years to try and help New Jersey to deal with climate change. You've been a real leader, Ralph, and your company has as well.

So with that, take it away.

R A L P H I Z Z O, Ph.D.: Thank you, Mr. Chair.

SENATOR SMITH: By the way, just for the record, can we take a roll so that everybody knows we actually had a meeting and a quorum?

Go right ahead.

MS. DENNEY (Committee Aide): Senator Durr.

SENATOR DURR: Here.

MS. DENNEY: Vice Chair Greenstein.

SENATOR LINDA R. GREENSTEIN (Vice Chair): Here.

MS. DENNEY: Chairman Smith.

SENATOR SMITH: And I am also here.

Ralph, take it away.

DR. IZZO: Well, thank you for your leadership on this vitally important topic, and allowing me to speak with you today.

Earlier in April, the United Nations released its latest report from the intergovernmental panel on climate change, indicating that carbon emissions from the year 2010 to the year 2019 had never been higher in human history. The report states that we're on a path to global warming of more than double the 1.5-degree Centigrade limit that was agreed upon in Paris in 2015.

That is why it is so important that we are convened here today to talk about actions we can take to limit global warming and reduce the related impacts of climate change -- sadly, impacts that we in our state have already seen all too well.

The good news is that we can battle climate change, and we can do it in a way that's planned and purposeful, keeping energy affordable, while creating jobs and growing our economy. For our part, PSEG continues to support New Jersey's transition to a clean energy future, and to further the goal of reaching 100 percent clean energy by 2050.

During the past several years, PSEG has moved decarbonization to the forefront of our overall business strategy. And we've demonstrated this in a number of ways. Last year, we accelerated our Net Zero climate vision by 20 years, setting a new goal of achieving net-zero emissions in our operations by 2030.

We've also reshaped our business in several ways. We've closed over 4,000 megawatts of fossil generation. Then we divested nearly all of our remaining fossil fuel plants, working towards becoming a 100 percent carbon-free generator. I should be clear, however. The plants we close do result in the planet breathing easier. The plants we sold are still operating, but someone else is operating them and we don't own them.

We've been helping our customers to use less power through energy efficiency, a topic I will return to repeatedly today. We've been supporting the switch to electric vehicles by preparing the grid to ensure it is ready for electric vehicles. And we've been increasing resiliency, investing to ensure that aging energy infrastructure, right down to the individual neighborhood level, is able to withstand the challenges of extreme weather.

And in October -- something I'm most proud of -- we signed on to the United Nations-backed Race to Zero Campaign, which enlists organizations in the effort to achieve economy-wide decarbonization by mid-century. As part of the Race to Zero, PSEG is committed to setting science-based targets which will help us provide clearly defined and objectively measured targets.

For the last few years, I've talked about a five-point list of actions we can all take to mitigate the most damaging impacts of our changing climate. All of these are immediately actionable. The five things include,

first and foremost, enabling greater energy efficiency. Secondly, preserving our existing nuclear fleet. Third, developing renewable energy resources at scale. Fourth, electrifying the economy, starting with transportation. And fifth, enacting an economy-wide price on carbon; or, at the least, viewing the first four items I mentioned through an economic lens that maximizes the environmental benefit while minimizing customer costs.

So let me begin with energy efficiency. According to the United States Department of Energy, Americans spend $100 billion every year on wasted energy from buildings, heating and cooling units, and more. And currently, residential and commercial buildings account for more than one-third of the carbon emissions America releases each year, while consuming 40 percent of the nation's energy and 75 percent of its electricity.

The technology to save energy without sacrificing lifestyle exists today in the form of high-efficiency appliances, insulation, and even the lowly light bulb. We also have smart thermostats and smart meters being deployed by the millions. We recently launched clean energy programs at PSEG, including the largest energy efficiency investment in New Jersey's history. This is a win-win-win. The program is designed to cut carbon emissions by up to 8 million tons, help customers save on their monthly energy bills to the tune of an estimated $1 billion, while also creating 4,000 jobs. Let me be clear: With energy efficiency, jobs are created, customer bills are lowered, and carbon emissions are reduced. It's not pixie dust. There is a loser in this. The loser in this are the fuel companies -- the ones that are mining for coal and fracking for gas. But otherwise, everyone else comes out a winner.

As for the second of the five things we've been advocating, we need to preserve our existing nuclear fleet. It is our number one source of

carbon-free power generation in New Jersey and throughout the United States. Preserving existing nuclear energy for the coming decades is critical to keep us from backsliding on our nation's emissions reductions achievements. In numerous reports, including the most recent one from Princeton, researchers have found that supporting continued operation of New Jersey's nuclear generation is consistently the lowest-cost option for in-state carbon-free generation. Federal support would help ensure the nation's nuclear plants don't prematurely retire and also alleviate some of the burden New Jersey bears. But sadly, the likelihood of enactment of needed legislation at the Federal level is uncertain, despite bipartisan support. And I personally have had numerous conversations on both sides of the aisle in support of such programs.

Let me turn to item number three, renewable energy. We absolutely need to deploy renewable energy. Renewable energy holds great promise; but like each of the five things, it does not come in a one-size-fits-all. Densely populated New Jersey simply doesn't have the same unoccupied space as West Texas. So large-scale wind on land doesn't make sense here. However, thanks to our state's long, mid-Atlantic coastline, we do have a great opportunity for offshore wind energy. PSEG is eagerly supporting New Jersey's goal of developing 7,500 megawatts of offshore wind by 2035. And we're heartened by the Biden Administration recognition of the opportunity for offshore wind in the U.S., setting a goal of 30 gigawatts, or 30,000 megawatts, of offshore wind by 2030. PSEG is investing in offshore wind and plans to continue to enable this exciting new industry to grow on the East Coast, including our agreement to host the New Jersey Wind Port on land adjacent to our nuclear facilities.

Separately, New Jersey is a leader in rooftop solar. But for many reasons, chiefly the cost of rooftop and the lack of universal access to rooftop, we need to revisit the advantages of grid-connected solar.

Let me move on to the fourth item, electrifying the economy, starting with transportation. No discussion of reducing carbon emissions and tackling climate change would be complete without hitting on the number one source of greenhouse gas emissions in New Jersey, and now in the United States: transportation. Electrifying the transportation sector has the potential to have the greatest impact on reducing carbon emissions by reducing the number of vehicles powered by gasoline, a fossil fuel. This is especially true as the profile of power generation on the grid evolves in coming decades to include more megawatts of clean energy. To support this, we've begun developing New Jersey's EV-charging infrastructure to help people get over their range phobia.

Now, lastly, to unleash the creativity of the market we need to talk about a price on carbon. We need a mechanism for putting a price on carbon emissions to allow the most cost-effective carbon reduction solutions to rise to the top. Now, a nationwide price on carbon would be optimal. It would allow us to do away with today's confusing collection of prices and State subsidy programs that are applied haphazardly to the various sources of energy in this country. A nationwide price on carbon is vital if we want to pursue that carbon-free future in the most economically efficient way possible.

However, in the absence of such a program, we in New Jersey should consider the cost-per-unit of energy to support each of our programs so as to prioritize investment decisions.

In conclusion, as the primary sponsor of the Clean Energy Act in 2018, Senator Smith, you are instrumental in setting a path for the expansion of energy efficiency renewables and electric vehicles in this state. That legislation paved the way for PSEG to create our Clean Energy Future programs, bringing New Jersey to the energy efficiency and EV infrastructure programs we are deploying today.

In addition to the five steps I've mentioned, a key opportunity across the transition to a decarbonized clean energy future is ensuring that we create an environment where entrepreneurs can develop the new products and solutions that form the foundation of tomorrow's carbon-free economy. Smart, forward-thinking policies can facilitate this. I'm heartened to read that the North American venture capital and private equity investment in new businesses targeting the energy transition hit a 10-year high last year.

Tomorrow, I'll be speaking at the TechUnited: BetterX Summit, where I'll talk about how corporations and entrepreneurs can come together to find innovative solutions to help decarbonize.

So if we're serious about tackling climate change, it's time to act in an economically intelligent manner. By that I mean the need to maximize the environmental benefit with every dollar spent. Let's make energy efficiency our top priority and put it on steroids. Let's keep our existing nuclear fleet viable for decades; let's turn to grid-connected solar so all customers can enjoy universal access. Let's make use of the robust wind resource off our coast, and let's tackle the number one source of carbon in New Jersey by electrifying transportation.

Thank you for your attention. I'm happy to answer any questions you may have.

SENATOR SMITH: Thank you, Ralph, for your comments.

Senator Greenstein.

SENATOR GREENSTEIN: Thank you.

Hi; good morning.

DR. IZZO: Good morning, Senator.

SENATOR GREENSTEIN: I wanted to find out your sense of how other states around us are doing; and are we working together with them on some of -- specifically on some of your five points.

DR. IZZO: So in some regards, we are. Clearly, the RGGI states have tried to set a price on carbon. Candidly, it's far below what the National Academy says is the social cost of carbon.

The problem with that is that the RGGI states don't align with what we would call the *PJM states.* So you have a power market that is separate and apart from the carbon market. So as a result, the price of carbon doesn't get into the number one state from which we import electricity, that being Pennsylvania.

So while there's some cooperation there, it's not optimized in terms of the two markets overlapping each other.

You're also seeing some independent activities as it relates to offshore wind. There are eight states, each of which wants to be the center of the offshore wind industry in the future. And if we remember our high school geometry, there's only one center whenever you define a certain geography. So that's probably sub-optimizing the development of the supply chain that's going to be instrumental in bringing the price down.

Candidly, Senator, there's only one way to optimize the kind of cooperation we need, and that's action at the Federal level. But we seem to be somewhat stuck there at getting programs approved.

SENATOR GREENSTEIN: Do you see any hope for things to begin to start at the Federal level and move us--

DR. IZZO: I do. There is discussion about a climate-only bill that could pass the U.S. Senate under the Reconciliation Rules. And I'm sure you're familiar with them; I won't go into details. My concern is that while that could pass the Senate, I'm not sure that a climate-only bill would pass the House. Because, as you know, the Climate Plus Provisions passed the House by a very modest margin. And the ability to maintain that margin if you pair -- if you take away everything other than climate -- is not obvious to me.

There are certainly people in the Congressional Delegation who are far more astute on these matters than I am. So I never say never, but I'm not wildly optimistic of us being able to get that through.

SENATOR GREENSTEIN: And my last question for the moment is, are there Federal or regional rules, regulations -- any specific ones that you can mention that are hindering the timely decarbonization? Are there things we need to get rid of, or things we need to add?

DR. IZZO: So there are no specific items. Clearly, with offshore wind, we have a brand-new regulatory regime that's in its infancy. And I give credit to the Bureau of Ocean Energy Management for what it's able to accomplish under this brand-new situation we find ourselves in.

There are challenges at the Nuclear Regulatory Commission to try to pave the way for advanced nuclear. Which, by the way, I think under

the current market structure, does not have a likely home in New Jersey, just because of the absence of this price on carbon. And I would simply go back to the fact that the number one gap in coherent national policy that New Jersey could piggyback on would be a price on carbon.

SENATOR GREENSTEIN: Thank you.

DR. IZZO: Thank you.

SENATOR GREENSTEIN: Thank you.

SENATOR SMITH: Any other questions? (no response)

It's still a way to go, but we're going to wish you a happy retirement. And I hope, I really hope that you stay active in this for our State. I think you have a lot of great policy ideas to bring to the table.

DR. IZZO: Thank you, Senator.

My wife hopes I stay active too. She's terrified of my retirement at this point. (laughter)

SENATOR SMITH: Well, my wife retired six months ago from my office. And I can tell you that I think she may be changing her mind. (laughter) But I don't know that, and I'm not going to bring the subject up.

But anyway, stay active, please.

DR. IZZO: Thank you very much.

SENATOR SMITH: We appreciate your input.

Our next witnesses will be from Rutgers University, and I'd ask that you come forward.

And neither of you is Jeanne Herb. I see Jeanne in the back. That means we'll need you to tell us who you are and your specific area of expertise.

A N T H O N Y J. B R O C C O L I, Ph.D.: Thank you, Chairman Smith and Committee members for inviting us to appear today.

My name is Anthony Broccoli, and I'm a climate scientist in the Department of Environmental Sciences at Rutgers University, where I serve as Co-Director of the Rutgers Climate Institute and a Faculty Advisor to the New Jersey Climate Change Resource Center.

The New Jersey Climate Change Resource Center recently issued a *State of the Climate* report for New Jersey, which focuses on changes in temperature, sea level, precipitation, and extreme events. I'll briefly summarize some of the findings from this report.

Global average temperature has risen about 2 degrees Fahrenheit since 1900. According to data compiled by NASA, the period from 2014 to 2021 has the warmest eight years in records of global temperature going back to 1880. The primary cause of this warming has been an increase in greenhouse gases, mainly carbon dioxide, in the atmosphere. Carbon dioxide concentrations now exceed 415 parts per million, which is about 50 percent higher than they were during the Industrial Revolution.

To put this in perspective, most of that increase has occurred during my lifetime.

Here in New Jersey, average annual temperature has risen about 4 degrees Fahrenheit since statewide records began in 1895, or roughly twice as fast as the global average. This amounts to an average warming rate of just over 0.3 degrees Fahrenheit per decade. But the warming has been more rapid since 1970, averaging 0.66 degrees Fahrenheit per decade. Of the 20 warmest years on record in New Jersey, 15 have occurred since the year 2000.

Further increases in temperature are projected to occur, the amount of which will depend on future greenhouse gas emissions. As temperatures continue to rise, there will be many consequences, including for human health. Extreme heat events will become more common, increasing the potential for heat stress. Because a warmer atmosphere can contain more water vapor, humidity will also increase, adding to the heat stress burden. Increased heat stress can cause greater incidences of heat-related illnesses, hospital admissions, and deaths among vulnerable populations.

Sea-level rise along the New Jersey coast has been more rapid than the global average because the land is sinking, while water levels are rising. The tide gauge at Atlantic City has registered an increase in sea level of almost 18 inches since it began operating in 1911.

As the ocean continues to warm, and glaciers and ice sheets continue to melt, sea-level rise has accelerated; and this acceleration is expected to continue over the next century.

Relative to a 1991 to 2009 baseline, sea level is expected to rise by 0.9 to 2.1 feet by 2050. By 2100, the amount of sea-level rise will depend upon the rate of future greenhouse gas emissions, with 1.7 to 4 feet expected under a low-emission scenario; the 2.3 to 6.3 feet expected under a high-emission scenario.

The most serious impacts of sea-level rise will be felt when strong onshore winds from coastal storms, both hurricanes and wintertime nor'easters, push water towards the coastline. There is high confidence that coastal flooding from future storms is likely to be more frequent and more severe as rising sea levels raise the baseline for flooding events.

It has been estimated that human-caused sea-level rise was responsible for about 12.8 percent of the total property damage from Hurricane Sandy in New Jersey, because it made a larger area susceptible to flooding. A coastal storm affecting New Jersey in the future will cause more flooding damage than the same storm would have produced in the past.

Tidal flooding occurs when unusually high tides cause flooding in the absence of storm surge. Such flooding events, sometimes called *nuisance flooding* or *sunny-day flooding*, have also become more frequent, with their number increasing from less than one per year in the 1950s to about eight per year from 2007 to 2018. Under a moderate emission scenario the frequency of nuisance flooding events could reach 240 days per year -- in other words, more often than not -- by 2100.

Sea-level rise can also lead to saltwater contamination of freshwater resources used for crop irrigation. And it can also adversely affect freshwater ecosystems by pushing saltwater further upstream in estuaries. Higher sea levels can also elevate the water table in coastal areas, adversely affecting low-lying farmland.

Total rainfall in New Jersey has increased by about 7 percent since the early 1900s. There are also indications that there has been more year-to-year variability in rainfall recently, with an increase in the range between the wetter years and the drier years. Modest increases in annual rainfall of about 5 to 8 percent by the century are projected by climate models. But because summer precipitation is not projected to change substantially and will be accompanied by higher temperature and evaporation rates, the duration of summer dry spells is expected to increase. These more frequent dry periods -- or *flash droughts,* as they're sometimes called -- could

lead to increased irrigation and water use by homes and businesses. New Jersey's water supply can be susceptible to such dry spells, which can lead to restrictions on water use even if they are not part of a prolonged drought pattern.

The changes in precipitation resulting from a warming climate can also have implications for flooding. The frequency of heavy precipitation events has been increasing in New Jersey, with individual events of 2 inches or more happening as much as 50 percent more often than the long-term average in recent years. In the United States, two-day rainstorms that had a 1 chance in 5 of occurring during the year in the first half of the 20th century, the so-called *5-year storm*, have happened 20 to 40 percent more often since the 1990s. This trend is expected to continue, with implications for the frequency of inland flooding along New Jersey's rivers and streams.

We were reminded of the devastating impact of intense rainfall events just last year, when the remnants of what had been Hurricane Ida arrived in New Jersey, unleashing excessive rainfall in a swath that extended from Mercer and Hunterdon counties in the west, to Hudson and Bergen counties in the east. More than 9 inches of rain fell in Hillsborough in Somerset County and Flemington in Hunterdon County. This is more than twice the normal rainfall for the entire month of September, and most of it fell in a span of six hours. Tragically, the flash flooding that resulted killed 30 people and displaced many, many more from their homes.

The flooding from Ida provides insights into the hazards that New Jersey communities will face over the decades to come as rainfall events become more intense.

I'll close by pointing out that research has shown that the adverse effects of climate change grow roughly in proportion to the amount of future warming. Although this information is sobering, it also means that actions taken to reduce the amount of future warming will also reduce the most severe impacts.

Thank you for giving me the opportunity to share my perspectives on this important issue that faces the citizens of New Jersey.

SENATOR SMITH: Thank you, Dr. Broccoli.

One point I would emphasize by asking a question concerns the Ida scenario, where heavy amounts of rain fell in New Jersey. It had no necessary relationship to where our wetlands are, where our floodplains are. It was -- I don't want to say *random,* but the distribution of the heavy rainfall was at places where people would not expect it to be flooded.

So what are the implications for flood insurance as a concept, and is there anything New Jersey can do about these vast amounts of the vast quantities of water that can fall anywhere?

DR. BROCCOLI: Yes, I think that's a very good point -- that what we see when we have that kind of intense rain, many inches of rain falling in a period of just a few hours, is that even places that aren't necessarily stream corridor or river flood plains get flooded.

I think one of the big implications is for public safety. Among those 30 people who died, many of them were trapped in their cars in places where they didn't realize they would be vulnerable.

So looking forward, I think it is going to be important that as events like this become more common, we're better prepared to get people out of harm's way.

The implications for property are, as you mentioned, also very severe. And in that case, we may want to learn from Ida that there are places that are vulnerable that perhaps we didn't realize were as vulnerable beforehand.

SENATOR SMITH: Thank you.

Any questions for Dr. Broccoli? (no response)

Then the lady next to Dr. Broccoli -- if you would introduce yourself.

J E N N I F E R S E N I C K, Ph.D.: Sure thing.

Good morning, everybody. I am Jennifer Senick, and I'm the Executive Director of the Rutgers Center for Green Building at the Edward J. Bloustein School of Planning and Public Policy.

I'm going to share some ideas and pathways to building decarbonization in New Jersey, including those that are regulatory, incentive- and information-based. And I'm going to start by providing a depiction of New Jersey's existing building stock.

We know that New Jersey buildings are responsible for a combined 62 percent of the state's total energy consumption, which is led by commercial buildings at 26 percent, followed by residential buildings at 25 percent, and the industrial sector at 12 percent.

End-uses in buildings -- for example, space heating and cooling, and water heating; as well as other appliance end-uses, such as clothes drying and cooking; and industrial uses -- combined count for 28 percent of New Jersey's greenhouse gas emissions. Many of these same end-uses and associated activities of daily living additionally degrade indoor air quality, which is important for its impacts on health.

New Jersey has in the neighborhood of 2.9 million residential, commercial, and multi-family buildings. This includes approximately 2.4 million residential buildings. That's single-family and two-to-four unit; another approximately 18,000 multi-family buildings of five units or more; and approximately 516,000 commercial buildings.

New Jersey's residential stock is relatively old. Approximately 80 percent of those buildings were constructed prior to 1989, split about equally prior to 1959, and built between 1960 and 1989; whereas 19 percent were built from 1990 onwards.

Commercial building stock is a little bit newer. Sixty-seven percent of those buildings were constructed between 1920 and 1999, 16 percent before 1920, and approximately 18 percent after 1999.

Multi-family buildings have a bit of a more uniform distribution across these vintages, with 39 percent built after 1990, 35 percent between 1960 and 1989, and 22 percent prior to 1929. These vintages matter because they have implications for the energy performance of the buildings in terms of their envelopes, things like insulation in each window, and also the equipment or appliances that are installed.

Specifically, residential buildings in New Jersey -- again, approximately 2.5 million -- 67 percent of them use natural gas as their primary heating fuel, 17 percent use fuel oil, 8 percent electricity -- again, for their primary heating fuel -- 4 percent propane, and 4 percent a mix of other fuels.

In commercial buildings the primary heating fuel is 49 percent electricity, 39 percent natural gas, 5 percent propane, 1 percent fuel oil, and 6 percent a mix of other fuels.

In multi-family buildings -- again, those of five units or more -- the predominant primary heating fuel is natural gas, at 87 percent; electricity accounting for approximately 12 percent; and much smaller percentages for fuel oil and mixes of electric and gas.

Of the approximately 2.4 million residential buildings that comprise our existing building stock, 66 percent have furnaces, most of which are going to be ducted. This has implications for the ease with which they can be replaced with heat pump technology. Twenty-six percent use boilers, 6 percent electric baseboards for primary heating equipment, and 2 percent heat pumps -- so a relatively low rate of penetration for heat pumps in our existing residential building stock.

In commercial buildings, 45 percent use packaged heating units; 26 percent use individual space heaters; 11 percent use heat pump technology already; boilers, 8 percent; furnaces, 9 percent; district steam, 1 percent; and some other smaller percentages.

In multi-family buildings -- again, five units or more -- 41 percent use furnaces; 45 percent use boilers; 8 percent, electric baseboards; 2 percent heat pumps; packaged heating units and individual space heaters also at 2 percent.

For primary cooling equipment in existing residential buildings, 54 percent have central air, ducted. Thirty percent use room air conditioners, and 16 percent actually have no air conditioning, which has implications for human health and safety, and resiliency as the climate warms.

In commercial buildings, 39 percent use packaged air conditioning units; 32 percent, residential-type central air conditioners; 12 percent, heat pumps as their primary cooling equipment; individual room air

conditioners, 11 percent; and some other smaller percentages. In multi-family buildings the majority use room air conditioning units -- 52 percent; 27 percent, approximately, are accounted for by residential split systems; heat pump penetration is minimal at 0.57 percent.

Both the Global Warming Response Act and Energy Master Plan, as this audience well knows, identify strategies for building decarbonization, including electrification. And these do include a mix of regulatory incentive-based and information-based strategies, such as the development of a building's electrification roadmap with strategies and concrete timelines for achieving widespread electrification.

I'm pleased to share that this has since come to life as the New Jersey Zero Energy Emissions Building road map, comprising a year or more of stakeholder process facilitated by NEEP, the Northeast Energy Efficiency Partnership, and the Rutgers Center for Green Building, and which is continuing into Fiscal Year 2023.

Another strategy is prioritizing near-term conversion of buildings relying on propane and heating oil. In New Jersey, as elsewhere, the economics for this are very strong.

Studying and developing mechanisms and regulations to support net-zero carbon new construction; and EV ready and demand- response ready building codes; partnering with private industry to establish building decarbonization demonstration projects. And, additionally, I would mention that New Jersey now has an energy and water benchmarking disclosure requirement, which goes into effect next year, for commercial buildings over 25,000 square feet. Building benchmarking programs are well proven to result in significant resource savings, as the market uses these data to compare

performance and reward efficiency through the more informed decisions of building owners and tenants. It's an example of an information-based strategy.

I'm going to return to each of these in turn.

While much national emphasis is on building decarbonization in the new construction sector, New Jersey has a unique opportunity to address existing buildings through the New Jersey Rehabilitation Subcode and its associated triggers.

So to be clear, the way this works is that a building owner -- he or she decides to undertake a renovation, an addition, an alteration, a reconstruction, and, accordingly, there are requirements that pertain to that in the New Jersey Rehabilitation Subcode.

It is possible within the requirements of the code -- fair and proportional, meaning cost-effective -- to add both requirements and supplemental or voluntary requirements for building decarbonization. That would be triggered by these actions: renovation, alteration, reconstruction, addition alteration; probably not repair. In order to explore those scenarios and leveraging the existing building stock of New Jersey that the Rutgers Center for Green Building recently built -- and I just shared an overview with you -- we analyzed 720 cases, or scenarios, through energy modeling and cost estimating, representing three different building types -- mixes of building types -- residential, multi-family, commercial; the three vintages that we just spoke of -- prior to 1959, 1960 to 1989, and 1990 and newer; different sizes of buildings; four different heating fuels -- natural gas, propane, fuel oil, and electricity; two distribution technologies, mainly, ducted and non-ducted; and five replacement strategies. Again, we're talking about existing buildings.

Replace in-kind -- meaning, replace the appliance or the equipment with what was there before; replace in-kind efficient -- something that is more efficient than required by the building code; replace with an air-forced heat pump; replace with a ground-source heat pump; replace with a heat pump, plus integrated weatherization measures to improve the building envelope at the same time.

So we looked at 720 cases that map to New Jersey's existing building stock so we could, sort of, figure out the answer to what's cost-effective and, really, where should we be focusing our attention.

I'm not going to get into the details of the simple paybacks for each of those 720 scenarios now, but suffice to say that the efficiency is almost always cost-effective. Meaning, in existing buildings now it is almost always cost-effective to replace equipment with more efficient equipment than is required in New Jersey's Rehabilitation Subcode. By *cost-effective* here we mean many things pay back between 0 and 2 years; some things pay back in less than 10 years. We never call something *cost-effective* that has a longer payback period than the expected life of the equipment that's being installed.

Replacement of propane and oil is always cost-effective, ranging from an immediate payback to two years. And integrated weatherization interventions are often cost-effective, which is really nice because it means we could possibly associate heat pump replacement with improving the performance of the building envelope at the same time, which would--

SENATOR SMITH: So how much of an advantage is a heat pump versus other sources?

DR. SENICK: Versus--

SENATOR SMITH: Take anything.

DR. SENICK: Natural gas boiler versus other technologies?

SENATOR SMITH: Yes.

DR. SENICK: The energy savings are greater. And it really sort of depends on, like, what building in which we're installing this, whether it's a large multi-family building, a complicated commercial building. But the energy savings are very significant. You actually get more energy out than you put in. But what we have to look at very carefully in these scenarios is the relationship of the incremental cost and the operating cost when we're trying to, sort of, figure out a measure of a simple payback. And we're using simple payback because New Jersey has a statute, 52:27D 123b, that stipulates that building code amendments for new construction -- there's no such requirement for existing buildings -- must satisfy a threshold of cost-effectiveness determined by the 10-year energy price projections provided by an institution of higher education; along with measure specific added costs recoverable through energy conservation over a period of not more than seven years. So for the most part, we adopted that same rule and applied it also to existing buildings.

SENATOR SMITH: Do heat pumps generally meet that standard?

DR. SENICK: I'm sorry, Senator?

SENATOR SMITH: Do heat pumps generally meet that standard -- the seven-year payback standard?

DR. SENICK: It depends on what you're replacing. If you replace propane and oil -- yes. It depends on the vintage of the equipment you're replacing and, again, it sort of depends on the building. So these energy models looking at different vintages of New Jersey buildings -- these

are models that are produced by the Department of Energy. And they produce them for every state, multiple climate zones, and different building code versions. But then, you can sort of make adjustments to them based on the estimation we've built in New Jersey's building stock, to add more or less insulation, or so on.

There are some scenarios where it is difficult to reach a cost-effective outcome; although, in many cases, adding those integrated interventions, bundling weatherization measures, a heat pump replacement can get you over that hurdle.

I guess just a quick--

SENATOR SMITH: The answer is, it's complicated.

DR. SENICK: I'm sorry. (laughter) Yes; but that's true.

I went out of my way to mention furnaces and ducts. If we're looking at buildings that already have the ductwork -- for heat pump replacement, there are ways to do it without ductwork. But if there's already ductwork and you don't have to put that into your construction cost, that's a favorable scenario. So it really kind of depends on what that building comprises.

And then you sort of prompted me, though, to just I guess give a quick 30 seconds on the data. How did we construct this estimation of New Jersey's existing buildings, which now can be-- We're going to build out a bunch of decision tools for policymakers so they can simulate lots of different scenarios with it, right? "What if we do this? What if we do that?" Because we run 720 scenarios, but we're not going to sit here and run 7 million. We want to get it out to the public.

These data come, for the residential data, from a tool built by NREL, National Renewable Energy Lab of the Department of Energy called *ResStock.* And what ResStock does is, it takes specific data based on every-three-year surveys -- representative statistically significant samples of New Jersey residential buildings -- and it associates it with other data sources -- like American Community Survey census data, and so on -- and kind of runs lots of different scenarios to what's called *synthetic population technique* until it reaches the scale of the population. So it's based on actual data, and it's scaled up.

At the time that we built this estimation of New Jersey's existing building stock, the corresponding tool NREL had and completed was called *ComStock.* So we went back to the same source they used for the original data, called *CBECS, Commercial Building Energy Consumption Survey,* the companion to the Residential Energy Consumption Survey, and we used that technique ourselves.

For the multi-family data -- five units or more -- fortunately we recently completed -- Rutgers Center for Green Building, with a subcontractor, ADM Associates, funded by the BPU -- a multi-family baseline study of New Jersey. And so that comprised a collection of survey -- quite a bit of on-site verification visits -- to understand New Jersey's existing multi-family building stock. So that's where the data came from. It is actual data and, in some cases, scaled up through these various data analytic techniques.

SENATOR SMITH: So if you had-- Looking up the broad spectrum of the state of our buildings, residential and commercial, if you have one recommendation to us to try and make our buildings more energy-efficient, help us to reduce energy consumption, what would it be?

DR. SENICK: Well, first of all, it would be to focus on existing buildings, because the model code community is kind of taking care of this for new construction. So the model code community has a pathway to net-zero energy buildings by 2028. So what we did in our work, and actually the result of this particular project -- also funded by BPU -- is a series of draft proposed code amendments that still need to be socialized with the relevant stakeholders.

We focused 80 percent of our effort on existing buildings and, therefore, the New Jersey Rehabilitation Code. And we would-- You know, again, this is sort of like replace-on-failure scenarios. Somebody's boiler, or furnace, or whatever stops working; or somebody who has oil or propane, particularly in a territory not served by natural gas, now needs something new for space heating, cooling, possibly hot water heating. We would require a heat pump replacement at that point. We would like to require heat pump replacement with weatherization measures, at least where it makes sense.

The way one sort of starts this journey with making amendments to an existing building code is, you sort of identify the things that are like the low-hanging fruit that make the most sense. And it's not just a matter of pairwise technology replacements; it's also a matter of -- for which building occupancy codes does it work. So for example, in many of our scenarios, it's easier to make things work in a smaller, multi-family building than a larger one. My suggestion, a little further in, for large multi-family buildings, corporate and academic campuses, and residential subdivisions is community- or network-based geothermal heat pump technology. And I think that that bears study, bears looking at much more closely.

SENATOR SMITH: When do you think you'll have the socialization of the proposed changes to the building code completed?

DR. SENICK: Yes. So the study is under review right now, with a bunch of briefings scheduled to three State agencies and your staff starting about July 1, which corresponds with our next BPU contract, Fiscal Year 2023. We'll be sort of releasing them into the energy code collaborative that, again, is facilitated by NEEP, the Northeast Energy Efficiency Partnership, that does a lot of this work through the Northeast Region. They're funded, presently, by the Energy Foundation and partnered with us.

And so this summer, fall.

And so the idea is obviously to vet our proposals, make changes to the proposals, build support for the proposals. And then, likely, the various stakeholders participating in the energy code collaborative will kind of tee up to bring the changes.

SENATOR SMITH: All right; so I would hope you'd keep us in the loop, and let us--

DR. SENICK: Absolutely. I will offer to share all the data that I'm talking about -- the report -- as things are sort of released. The multi-family baseline study I mentioned is on the BPU website under *Evaluation.*

SENATOR SMITH: At the end of 2021, the charge was leveled against the Energy Master Plan -- that the Master Plan was going to require -- and laws that we might pass-- We had a bill last term and it would say, "Energy Master Plan goals would become statutory." So the charge was laid that we, the New Jersey Legislature, if we passed that, would be increasing the costs of renovation to New Jersey citizens' homes and businesses, by a minimum of $20,000 per building unit. You'd think the charge was

ridiculous, but, that being said, in your review I think one of the things you need to do is to be sensitive to the issue of cost.

DR. SENICK: Of course.

SENATOR SMITH: All right? But that's going to get the greatest microscopic review.

DR. SENICK: Understandably. I appreciate that comment, Senator, and that's why we've kind of given ourselves fairly stringent kind of guidelines for what comprises cost-effectiveness. I mean, sort of another comment on that-- Again, when we're talking about existing buildings and triggers in the rehab code, this happens when somebody undertakes to do something to their building.

It's my guess -- speaking about cost pressures, increased housing prices, and higher cost of borrowing -- that we're actually going to see more people choosing to make renovations to existing homes. And so I think, again, New Jersey has a real opportunity. We have a unique bespoke existing building code. It's not a model code, it's our own code, it's a smart code, an award-winning code. It can be amended administratively. This can move relatively quickly. And while higher home prices and borrowing costs may not be a welcome thing, it probably does mean that we have an inflection point for more rapidly upgrading buildings.

SENATOR SMITH: Right.

DR. SENICK: Though that, of course, is through regulatory means. But for things that seem, perhaps, or are deemed not cost-effective by the stakeholders who will ultimately vet these proposals, of course, there's a role for program design and incentives.

And, generally speaking, I think that there is a real need in New Jersey to establish something like a New Jersey Building Decarbonization Institute. I would volunteer New Jersey's universities, colleges, nonprofits like Sustainable Jersey, the Heldrich Workforce Center (*sic*), and many others, to do that. We would be replicating or adapting the efforts that have already been made by states like California and Massachusetts to do this--

SENATOR SMITH: Right.

DR. SENICK: --to be able to communicate some of this information to building owners, building contractors, provide the workforce training, and so on. So that is something that I'm keenly interested in discussing.

You asked what measures -- what would I recommend. I mean, the other thing I would recommend -- which seems very low-hanging fruit, particularly in new construction, but doable also in existing buildings -- is electric readiness. There's already a bill that's addressed, I guess, EV Readiness in New Construction. But electric readiness could be triggered for existing buildings when somebody's doing electric panel work anyway, for example, right? And so it becomes a matter of circuitry and outlets for household ranges, clothes dryers, water heaters, and space for a heat pump water heater.

The model code community is now working on demand response readiness in energy codes. And so if New Jersey is ready to move forward and adopt some of these already-existing proposals and amendments from the IECC, that would be great. If New Jersey's not ready to do it or is ready to do it in some instances and not others, I would propose that they could become part of a stretch code that could be a pilot in New Jersey

municipalities, where, again, the State would, therefore -- and its citizens, therefore, gain some experience with some of these provisions. And these are all like, kind of, infrastructure-ready provisions. And so by the time they become required, as they will in the next version of IECC, for example -- as far as the International Energy Conservation Code, which we use for new residential buildings -- then there will already be some experience with that. And sort of some of the -- any fears or misgivings perhaps will be allayed between some kind of pilot program with municipalities, and also by having something like a New Jersey Building Decarbonization Institute.

I have spoken with-- Actually, Sustainable Jersey approached me on this, and I have agreed to help them develop such a stretch code that would be inserted into the green building toolkit and provide points to municipalities that would participate.

So some next steps -- as we discussed -- socializing, vetting some of the proposed code amendments, getting this building data out there. We're going to develop some decision support tools, put it up on a website so that policymakers and other interested parties can run their own simulations. Taking, I think, a much deeper look at the potential of community or networked heat pumps in New Jersey. And that Building Decarbonization Institute.

So that's what I prepared to share today, and I thank you very much for the opportunity.

SENATOR SMITH: Well, and we thank you for sharing.

Are there questions from Senators?

Senator Greenstein.

SENATOR GREENSTEIN: Thank you, Chairman.

Just one question I wanted to ask, I guess, Dr. Senick. I can't see you too well with this light. (laughter)

DR. SENICK: I need to grow.

SENATOR GREENSTEIN: I wanted to ask -- on that decarbonization issue. How well does the State's current path toward decarbonization align with projected best or worst case scenarios? How do you think we are, at this moment in time, in terms of decarbonization?

DR. SENICK: The best- or worst-case scenarios as shared by my colleague?

SENATOR GREENSTEIN: Either one of you, really.

DR. SENICK: I mean, my understanding of the climate science -- and we'll see how right I get this -- is that there's a certain level of global warming that's already baked in, unfortunately. So what we're really doing by transforming the market towards decarbonized buildings is trying to prevent future emissions.

The new construction codes will get us there for new buildings by 2028, if New Jersey adopts them without weakening amendments. That is not what's happening now.

So New Jersey, the last couple of rounds, has been adopting model codes with what are called *weakening amendments;* so not everything that's in the code. So I think currently, now, the discussion is about not adopting all of the insulation requirements. If we adopt the model codes, then there are those really great projections by the Department of Energy that sort of show us where we'll be. And so that would handle the new building sector; but, of course, what we really need to deal with is the existing building stock.

Based on the work that we've performed, if some of these kinds of code amendments could go forward, we'd make a dent. But we're dealing with sort of a natural rate of replacement in these buildings. And so I have to admit, I'm like a little challenged about how to think about that. I've been starting to try to pull as much permit data as I can to understand what that natural rate of replacement is. I think it's going to increase. If we rely only on that one measure, we're probably not going to be where we want. So that's why I think we need to bundle regulatory measures with incentive-based measures, with informational strategies -- the so-called *toolkit* of policymaking -- to try to avoid some of the worst impacts.

And I don't want to lose sight of the other reasons for building decarbonization. The Senator, earlier, mentioned air pollution. I don't know if we've talked about environmental justice communities yet or not. Full disclosure, the Rutgers Center for Green Building -- probably 50 percent of our work is on indoor air quality. And we will benefit health by having cleaner buildings.

I mean, there's also, I guess, another answer to this, that the esteemed Ralph Izzo was providing, which is, what's the grid supply side that you leave of this look like -- right? -- and, sort of, the investments in the grid.

And I guess, finally, I would be remiss, as an urban planning professor, if I didn't mention that land use strategies belong in this mix, and certainly could be a part of the New Jersey Building Decarbonization Institute, right? So if we really, kind of, focus on creating, sort of, sustainable walking communities -- that so-called *15-minute community* -- this will be amenable not only to some of these district energy solutions -- either new or retrofit -- but also to vehicle miles traveled being reduced. And so, I think

that if we really also give it our all in land use planning, then perhaps we can get to where we need to be. There's a lot of work to be done.

SENATOR SMITH: So you really -- you hit a button on that one.

What land-use policies are necessary, or do you believe would be helpful, toward solving some of these global climate change issues?

DR. SENICK: Well, the one in particular that I was reminded of by the Senator to mention, is really community design that supports and encourages the creation and retrofitting of these, sort of, tighter end neighborhoods and communities -- that compact, mixed-use community, right?

SENATOR SMITH: So you're talking about higher density.

DR. SENICK: Higher density, with 15-minute neighborhoods, right? You know, so where-- Yes, higher density so that community scale, energy infrastructure makes sense, and so that people do not need to drive as much. My colleague, Jon Carnegie, from the Voorhees Transportation Center, is really interested in this topic and also willing to testify at any time. He was sharing with me a lot of studies that show what's happened in the increasing switch to electric vehicles is that vehicle miles traveled have not gone down, right? It's just, sort of, in some ways, mode-- Well, it's not mode-switching. We're switching the technology, where what we really need to do is to diminish the amount of vehicle miles traveled.

And it seems to me that a silver lining, if one could even say that, of this pandemic is that more people have learned to work from home. I do realize many people are going back to the office, but to a certain extent, some people will stay at home more often. We may not need the same number of

commercial office buildings. In my dream scenario, besides learning to manage them better for partial load conditions -- which is a real challenge, especially if there are not enough zones in the building. So like, maybe all of Bloustein is up and running at low occupancy; but if we really learn to do with fewer commercial office buildings, we could upcycle them, perhaps, to affordable housing.

SENATOR SMITH: Thank you for those comments.

Any other questions from Senators? (no response)

Okay, thank you very much.

DR. SENICK: Thank you.

SENATOR SMITH: It was very helpful.

So we have New Jersey Resources and South Jersey Industries, who have agreed to split their time.

Are you here? Come on up.

So we're going to have a panel; let's do a panel. Then you're going to have to arm wrestle who's going to go first.

R O B E R T P O H L M A N: Chairman Smith, Committee members, it's good to see you. Thanks for having us today.

My name is Robert Pohlman, Vice President of Corporate Strategy, Communications, Government Relations, and Policy at New Jersey Resources, the parent company of New Jersey Natural Gas.

On behalf of New Jersey Natural Gas, thank you for the opportunity to provide comments today.

And first, I'd like to say that NJR strongly supports the State's climate emissions reduction goals. Our company is committed to playing a

leading role in our State's clean energy journey and has proven this through real actions through the years.

We've invested significantly in our system. It's now 99 percent plastic or protected steel, zero cast iron. This focus on sustainability has led to a reduction of operational emissions by over 50 percent since 2006, and we are targeting net-zero operational New Jersey emissions by 2050.

Since 2010, our clean energy infrastructure group has invested over $1 billion in New Jersey solar, becoming the largest commercial owner-investor in the state.

We lead with action and continue to do so as New Jersey drives towards its 2050 clean energy goals. However, affordability, reliability, and redundancy for all New Jersey's residents need to remain top priorities for this transition.

This Committee meeting and dialogue come at a beneficial time, given that the three-year anniversary of the Energy Master Plan is upon us. Technological advances happen quickly, and decarbonization strategies at the Federal and international level now recognize that low-carbon gaseous fuels, paired with existing infrastructure, will play an important role as we drive towards 2050 emission reduction goals. Momentum is building behind technologies like hydrogen and RNG in a way that no one could have imagined at the time the EMP was constructed.

A path exists for New Jersey to reach its climate goals more quickly, more reliably, and more affordably by leveraging our already-built, highly reliable underground infrastructure to deliver increasing percentages of low- and zero-carbon gaseous fuels, paired with energy efficiency.

Some important points to keep in mind. New Jersey has more than 35,000 miles of existing infrastructure; $17 billion of ratepayer investment has gone into this high-quality existing infrastructure to build and maintain.

More than 75 percent of the state's residents depend on this infrastructure for home heating. This deep reliance can be leveraged as an early enabler to decarbonization, delivering an increase in percentages of low- and zero-carbon fuels with little disruption to customers.

SENATOR SMITH: Let me interrupt, if I might, because you stimulated the question.

What do you see as the role of hydrogen in your company's future?

MR. POHLMAN: So we see hydrogen-- Right now, the technology and the recognition by the DOE right now -- we see hydrogen as an early enabler to decarbonization; it's been recognized internationally as such. We've gone out and we've built what is now the first green hydrogen blending project on the East Coast. There are more coming right now.

SENATOR SMITH: Here in Jersey?

MR. POHLMAN: Yes, sir; here in Jersey.

SENATOR SMITH: So send us an invite. We'd like to see it.

MR. POHLMAN: We look forward to having you out.

SENATOR SMITH: All right. And how do you-- The hydrogen facility, or the role of hydrogen with natural gas -- how do you see that reducing the emissions? What specifically are you going to do with the hydrogen? How does it play out?

MR. POHLMAN: Sure. So, right now, we are using renewable energy to electrolyze. We have a 170 KW electrolyzer being served by renewable electricity. We are creating a 100 percent green hydrogen blend system, systematically blending that into our system to serve customers.

SENATOR SMITH: So can that be done without the gas itself becoming more "explosive"?

MR. POHLMAN: Yes. The explosive characteristics of hydrogen -- this gets very technical--

SENATOR SMITH: Right.

MR. POHLMAN: --but it's a lighter molecule. So it actually disperses and raises into the atmosphere more quickly than natural gas.

Right now our project is a -- it's a very small project. We're blending less than a percent based on our total infrastructure. But it was an important first step to get comfortable with the technology and to get policymakers and ourselves comfortable. And we saw ourselves in a unique position to be an early actor. That high-quality infrastructure that I spoke about earlier -- plastic-protected steel -- works well with these low-carb and gaseous fuels. We took a look at that, and we saw the state's renewable targets. We see hydrogen as a real complement to the state's renewable target of 7.5 gigawatts of offshore wind, 16 gigawatts, or 13 gigawatts by 2035, of solar. There are going to be intermittent resources there. Green hydrogen can be leveraged as a long-duration storage mechanism for renewable energy. And we felt, given our strategic location along the coast, in a state with progressive targets, we were in as good a position as any to get out there and learn this project and lead with action.

SENATOR SMITH: So as I understand it, you're saying that when our windmills start generating surplus energy, surplus to what the grid needs at that particular time, you'd have the electricity used for electrolysis of water, generating hydrogen and oxygen; and then you would store the hydrogen but then use it as a complement to the existing natural gas fuel that's in your lines.

MR. POHLMAN: We would blend it systematically with existing natural gas. But we see a future where--

SENATOR SMITH: Right.

MR. POHLMAN: --you blend higher and higher percentages of these low-carbon gaseous fuels, no different than the electric wires are blending--

SENATOR SMITH: So the point of this is, you're becoming a battery. You're storing the surplus electricity in the form of hydrogen gas.

MR. POHLMAN: Yes, and we can do so because our system is an inherent storage mechanism. We are built for peak demand days, and serve heating load on the very coldest of winter days. We are an inherent storage mechanism.

SENATOR SMITH: Good.

All right. I interrupted you, I apologize.

MR. POHLMAN: No, that's okay, that was great, that was great. Thank you.

And I was about to just get up to that part. We see our infrastructure as a complement to the state's renewable targets.

And all of the above approaches and collaboration across industries will enable New Jersey to reach its 2050 decarbonization goals in the most efficient and affordable manner possible.

There's been a real shift at the international and Federal level. The U.S. Department of Energy, as part of their bipartisan infrastructure plan, directed $9.5 billion to green hydrogen technologies. That's more than any other green technology in that plan.

They've also announced the Hydrogen Shot initiative. It's worth noting that this is the first shot initiative since their SunShot Initiative. That was their initiative a number of years ago to drive the cost of solar down. We all know what a success that has been; I believe they hit their goal two years early on that. So for them to step out and make hydrogen their next shot initiative speaks to the value of these low-carbon gaseous fuels in the existing infrastructure.

The United Kingdom has taken the same approach: their Ten Point Plan to decarbonization. They list existing infrastructure and hydrogen as central pillars, and blending with the natural gas system as an early enabler to decarbonization. They have a similar penetration as New Jersey of reliance on existing infrastructure -- over 83 percent of their residents. So they see it as immediately touching the energy needs of their customers in an early fashion.

NJNG recognizes the important role our infrastructure will play as we drive towards 2050 goals. And just as we've done in the past, we've led with action -- and we've already hit on this, Commissioner Smith -- we've built the first green hydrogen project on the East Coast, and we'd love to have you out to see it and talk through our strategy.

SENATOR SMITH: Yes; where's it located?

MR. POHLMAN: It's in Howell, New Jersey.

SENATOR SMITH: Okay.

MR. POHLMAN: So it's an exciting project and we'd love to have you out there.

New Jersey Natural Gas urges New Jersey policymakers to ensure that all pathways that lead to decarbonization remain open, and that our state's existing, paid for, and reliable infrastructure will be leveraged as an asset to attain a zero-carbon future in the most affordable way, while leaving none of the state's residents behind.

Thanks very much for your time.

SENATOR SMITH: Thank you.

And Team Two. (laughter)

R I C H A R D D e R O S E: Good morning, Chairman and Senators.

Rich DeRose, representing SJI, old South Jersey Gas and Elizabethtown Gas.

In the interest of time, I'm going to turn it over immediately to our subject matter experts to discuss green hydrogen and renewable natural gas.

SENATOR SMITH: Go ahead.

D O N N A S C H E M P P: Good morning, Chairman Smith and members of the Committee.

My name is Donna Schempp, and I serve as President and Chief Operating Officer of SJI Renewable Energy Ventures, and Senior Vice President of SJI Energy Enterprises Group.

Thank you for the opportunity to appear before this Committee today to talk about the many exciting investments that SJI is making to advance our clean energy and decarbonization initiatives.

As the leader of SJI's non-regulated, clean energy-focused business entities, I am fortunate to help drive our organization's contributions to meeting the long-term environmental goals of our State and nation. One of the most important ways that SJI is helping to bring about our clean energy future is through investments in, and development of, renewable natural gas projects. Renewable natural gas, or RNG, is methane that is derived from landfills, sewage treatment plants, and agricultural activities; and is chemically identical to and fully interchangeable with conventional natural gas.

SENATOR SMITH: So let me, also, interrupt.

The "renewable natural gas" is somewhat controversial. On the other hand, we did pass legislation two years ago with regard to food waste. And what we basically said was, we want to get food waste out of landfills, even landfills that have gas recovery systems, because no matter how good the operators say they are, they're leaky, leaky, leaky. And methane, which is the leaked gas from anaerobic digestion, has 80 times the impact, or 20 times -- I forget what the factor is -- of carbon dioxide as a greenhouse gas.

So by renewable natural gas, you're talking about the products of anaerobic digestion of an organic substance.

MS. SCHEMPP: Yes.

SENATOR SMITH: So how are you going to do it? Are you going to do food waste? What's your source of fuel?

MS. SCHEMPP: We are currently investing in dairy farms, where we're solving--

SENATOR SMITH: Manure.

MS. SCHEMPP: --renewable-- Yes, we're solving for the methane issues on the dairy farm. We will also be looking at sewage treatment plants and landfills. We have several shut-in landfill gas and electric projects that we're looking to convert to RNG.

SENATOR SMITH: Now, are these already in operation?

MS. SCHEMPP: They are not.

SENATOR SMITH: They are not; okay.

MS. SCHEMPP: We are in the middle of construction.

SENATOR SMITH: Otherwise, I was going to request a tour; you know that. (laughter)

MS. SCHEMPP: I'm happy to give you a tour of the construction that's happened so far.

SENATOR SMITH: But there is construction actually?

MS. SCHEMPP: Not here in New Jersey, but in the Northeast and the Midwest.

SENATOR SMITH: Okay. Well, you know--

MS. SCHEMPP: I'll keep it in mind.

SENATOR SMITH: To be more credible, we'd like to see you doing something in New Jersey.

MS. SCHEMPP: Yes.

SENATOR SMITH: The food waste bill says that if you do 52 tons of food waste or more a year -- which is restaurants, institutional settings, hospitals, schools, whatever, whatever -- that you have to take it to a-- If

there is a food waste processing center, you have to take it there or you have to get it there as long as it's within 25 or 35 miles -- I think it's 35 miles. So if you want some real credibility, set up a food waste collector--

MS. SCHEMPP: Yes.

SENATOR SMITH: --because when it goes to landfills, it's not in our best interest, global-climate-change wise.

So you're thinking in the right direction, but we'd like to see you build something.

MS. SCHEMPP: And I will talk about that in a minute.

SENATOR SMITH: Go for it.

MS. SCHEMPP: Across the country, RNG production, distribution, and consumption is growing every year. The production of RNG relies on digesters, which extract methane -- a powerful greenhouse gas -- from various waste products, using a proven membrane upgrading process. This methane gas would otherwise escape into the environment and contribute to climate change.

RNG technology repurposes this methane gas for any end use that is typically fueled by traditional natural gas. For example, RNG can be utilized for electricity generation, building heating and cooling, industrial applications, transportation, and gas appliances such as kitchen stoves and ovens.

Ramping up RNG production and distribution will reduce the need for geologic natural gas, which is important because RNG is far less carbon-intensive than geologic natural gas and can be carbon negative depending on its source. SJI fully embraces RNG and seeks to displace as much geologic natural gas with RNG as reasonably possible.

As states across the country continue to set aggressive decarbonization goals and strategies, a growing number of jurisdictions are looking to the natural gas industry for solutions. In 2019, Oregon enacted sweeping legislation setting RNG goals for the state's natural gas utilities, thereby charting a course for RNG to become an important part of Oregon's future energy supply. And just this year, California became the first state in the nation to adopt a renewable natural gas standard, requiring gas utilities in that state to replace a certain percentage of the traditional natural gas they deliver to their customers each year with renewable natural gas.

SENATOR SMITH: So you recommend that for New Jersey?

MS. SCHEMPP: Yes.

SENATOR SMITH: Okay, and what's the California standard?

MS. SCHEMPP: The California standard is the low carbon fuel standard. And it is looking to decarbonize the transportation sector there. So we are encouraging the bill that is actually before this Committee today in the Senate, Bill S-1366.

SENATOR SMITH: Somebody make a note; I don't remember S-1366. Well, I don't remember most bills, but-- (laughter) We definitely want to look at S-1366 and see what that renewable natural gas standard is.

And how about Team Two; would you guys also be supportive of a renewable natural gas standard?

MS. SCHEMPP: Yes, absolutely.

SENATOR SMITH: No, no, I know *you* are, but-- (laughter)

MS. SCHEMPP: I'm sorry.

SENATOR SMITH: New Jersey Resources?

MR. POHLMAN: Having the ability to blend renewable natural gas is part of our strategy as well.

SENATOR SMITH: Okay, good.

MR. DeROSE: And--

SENATOR SMITH: Yes, sir.

MR. DeROSE: Chairman, that Bill is Senate President Scutari's and Minority Leader Oroho's Bill.

SENATOR SMITH: So why haven't we put the Bill up? We have to get that one going.

` All right, thank you very much.

The Senate President has not asked me to post it, but we're going to -- we'll tap on his shoes and see where he stands on that.

MS. SCHEMPP: Thank you, we'd appreciate that.

SENATOR SMITH: But getting part-- You have two things going on here. Hopefully, you're reducing the impact of natural gas on global climate change, but the food waste thing is just horrible in this world. We're wasting 50 percent of our food. It would be great to see that taken out of the methane production stream that goes into the atmosphere, as opposed to actually using it for fuel and not letting it get in the atmosphere.

So that's terrific; it's very progressive.

MS. SCHEMPP: We would love to use our expertise that we're learning on the dairy projects to bring that here to New Jersey. Unfortunately, we don't have dairy farms that are large enough. And so we would be looking at landfill waste and sewage treatment plants, food waste; and would be happy to invest in that if the legislation would support it.

SENATOR SMITH: Yes. And listen, if you are taking sewage sludge and converting to methane -- God bless you there, too. But we have a disposal problem with that as well.

MS. SCHEMPP: Yes.

SENATOR SMITH: So anyway, any questions from Senators for our representatives of the gas industry in New Jersey?

SENATOR GREENSTEIN: Well, I guess--

SENATOR SMITH: Yes, Senator Greenstein.

SENATOR GREENSTEIN: I want to just follow up -- although we've somewhat talked about this -- just really one question.

Do you have any concerns that, as we're expanding this renewable natural gas infrastructure, that it will also expand the other type, the not-as-good type -- in other words, the fossil fuel type -- and will help sort of keep us relying on fossil fuels? Is there that hidden aspect to it as we look at renewable natural gas?

K Y L E N O L A N: I can take that.

And good morning. I'm Kyle Nolan, Vice President of Strategy at SJI.

Truly the RNG, and also the green hydrogen, is really meant to start mitigating our reliance on conventional natural gas. As my colleague shared, leveraging the infrastructure -- that exists. This isn't about building more infrastructure or larger infrastructure. It's truly looking at the fuel source that flows throughout it. So the RNG build-out and green hydrogen complementing the renewables actually just lets us leverage that in a different way, and start to mitigate our reliance on conventionally fracked natural gas.

SENATOR GREENSTEIN: Well, I realize the intention is to get rid of that reliance. I just wondered if there was something in the process of expanding the renewable natural gas that would somehow enable the other type. But obviously, is something built in to make sure that doesn't happen?

MS. SCHEMPP: Well, I would say that, right now, we're using natural gas boiler fuel to heat up the digester. But in the future, as these new renewable technologies come into play, then we would naturally switch over.

So as Kyle said, we would actually be displacing natural gas, fossil fuel.

SENATOR GREENSTEIN: Okay, thank you.

SENATOR SMITH: Thank you for your contributions today. We appreciate it.

Our last group, with a very important point of view, Empower New Jersey. We have Ken Dolsky, Co-Founder of Don't Gas the Meadowlands Coalition; and Anjuli Ramos -- who I'm sure she's tired of hearing it -- is the new Jeff Tittel. (laughter)

And let me point out, too, that we're running a little late, but it's okay. You have your half-hour; we'll stay, all right?

So Ken, Anjuli -- arm wrestle who's going first.

K E N D O L S K Y: Yes, I will start off.

SENATOR SMITH: Yes, sir.

MR. DOLSKY: So first of all, Senator Smith, members of the Environment and Energy Committee, Empower New Jersey thanks you very much for the opportunity to testify today. We very much appreciate this Committee, especially the Chair's focus on tackling the existential threat of

climate change. And we were very heartened by the words that you used when you opened this session.

My name is Ken Dolsky; I'm a member of the Empower New Jersey Steering Committee, and also the Co-Leader of the Don't Gas the Meadowlands Coalition.

I'll be joined today by Anjuli Ramos-Busot, Director of the New Jersey Chapter of the Sierra Club.

Empower New Jersey is a coalition of more than 135 environmental, civic, faith, and progressive organizations committed to, one, the overwhelming scientific evidence that we must reduce global greenhouse gas emissions by at least 50 percent, from 2010 levels, by 2030 to avoid climate catastrophe that's called for by the IPCC. And second, prohibiting major new fossil fuel expansion projects that are inconsistent with that goal, particularly environmental justice communities.

The overwhelming scientific consensus, most recently documented by IPCC reports, stresses the fact that the window to limit warming to 1.5 degrees is rapidly closing; and that overshooting 1.5 degrees Centigrade and planning to reduce warming later in the century is not an option because certain harms, such as positive feedback loops, could not be undone. And even just what we have today in the atmosphere is continuing to warm our planet.

Therefore, reducing greenhouse gases in the limited time we have left is the issue; it is the only issue Our message today is that New Jersey is going, unfortunately, full speed in the opposite direction. Despite all the benefits and positive actions that have been taken, we are increasing greenhouse gas emissions. And neither the Legislature nor the

Administration has had the political will or used the tools available to them to change this.

The EMP and GWRA have specific, although insufficient, goals. But when you read them, they're really just lists of suggestions and potential actions -- they are not implementable plans -- that require strong rules and regulations to back them up, as well as human and financial resources, and milestone objectives.

The NJ PACT process is far too slow. It is not meeting its own timelines, and has yet to have any impact on greenhouse gas emissions. We have a State policy to cut greenhouse gases by 50 percent by 2030, but nothing in the way of even a DEP, DOT, DCA, or BPU recommendation as to how we will do this, let alone a real plan. Not only have we not made any significant reductions in greenhouse gases, but we are increasing emissions at an accelerating pace. Our 2019 report predicted a 30 percent increase in greenhouse gases based on 13 new fossil fuel projects at that time. Our report -- which we just published in early April, that we are distributing here today -- shows that 6 of those 13 projects completed under this Administration have potentially already increased greenhouse gases by 19 percent, and the DEP had concurred in the methodology that we had used at the time to compute that.

And now there are seven more projects in various stages of development that could increase greenhouse gases by another 38 percent, mostly in the next few years, for a total increase of about 57 percent. Putting that in terms of volume, the State's policy to reduce greenhouse gases 50 percent by 2030 requires a cut of 60 million metric tons. Yet, we are on track to add 57 million metric tons to our total, which would therefore require a

total reduction in annual greenhouse gases of the 57 that we add, plus the original 60 million, for a total of 117 million metric tons, in order to make the 2030 target. That's more than our total greenhouse gas emissions in 2019. The incongruity of the State's actions versus its policies demands immediate corrective action.

Now, some of you may be scratching your heads and asking how 13 projects can increase total State greenhouse gas emissions by over 50 percent. And frankly, so are we. We are confident in our estimating process, leaving the only remaining explanation to be significant undercounting from the DEP's estimating process when they do their greenhouse gas inventory -- something that we intend to investigate.

SENATOR SMITH: Ken, something that would be helpful -- because I'm also interested in whose numbers are correct -- if you could do, after the Committee, send us exactly how the calculations were performed, all right? And then we could have our staff take a look at it and try to do some comparisons and see where the rubber meets the road.

MR. DOLSKY: We'd be delighted to do that. We would love to have a meeting with whoever and we can walk through it. There are a lot of different methods, depending upon the type of information.

SENATOR SMITH: Joey and Matt do all the hard work. So those are the guys you want to meet with.

MR. DOLSKY: Okay, we'd be happy to do that.

Do you have any improvements for us, or suggestions -- that's great.

However, the situation with pending new projects is not hopeless. Five of these projects are unnecessary and would provide no benefit

to New Jersey residents. And their rejection will not add to residents' costs or reduce energy availability. The other two, the New Jersey Transit project and the PVSC power plant, can accomplish their goals with very high percentages of clean energy. However, that requires action on the part of the Administration to force those entities to make this happen.

So the good news is that we can largely avert this disaster if we have the political will to do so. And it will not harm anybody in New Jersey by doing it. The largest of these projects is the Williams Regional Energy Access Expansion, which is meant to replace the unnecessary and recently defeated PennEast project. The REAE project will have 75 percent of the capacity of PennEast, and alone will generate between 16.8 million and 18 million tons of greenhouse gases from gas combustion. Williams is looking to start construction in the third quarter of this year. We need to act now.

Another project worth mentioning -- because the Governor has total control over it -- is the New Jersey Transit power plant. Transit has published a Request for Proposal, which claims to be unbiased regarding energy technology, but it's clearly favoring a gas plant. The RFP does not even ask for bids based on renewable energy. It only asks for a transition plan to get to carbon neutrality by 2050, not tomorrow. There seems to be no sense of urgency on their part.

At a recent Transit board meeting, several members publicly demonstrated their bias by declaring that renewable energy was not available or up to the task, yet failed to provide any details to support their claims. Our Coalition, having worked with a well-known expert on solar, has said otherwise. Unless the Governor steps in and forces Transit to rewrite the RFP to remove the bias, they're going to have a new 140 megawatt fracked

gas power plant in the Meadowlands in 2028, two years before our 2030 deadline.

Another project of no value to the residents of New Jersey is the proposed Gibbstown LNG liquid natural gas export terminal on the Delaware. Its transportation infrastructure delivers nothing but peril for those who live along the LNG trail and truck routes, or within the impact zone at the terminal and its ships. The risk of catastrophe, should there be a release of the highly flammable LNG, would be borne by New Jersey and Pennsylvania communities, and the environment. And what do we get along with all those risks? A potential project capable of potentially emitting 12 million metric tons of greenhouse gas.

We also have to make it clear that five of these polluting projects will be sited in or near low-income and/or communities of color. The Gibbstown project, New Jersey Turnpike Authority highway expansion -- which I'll talk about in more detail later -- the Keasby gas plant, and the New Jersey Transit gas plant, and the Passaic Valley Sewerage Commission gas plant -- so these are all violating at least the spirit of the new EJ law. We should use that law to stop these projects or force them to use truly clean energy.

And also, when I sum up, I'm going to say we really need to focus at least on the EJ communities and focus very heavily on what they are going to have to endure if these projects go through.

And speaking of clean energy, we also call on you to not allow the use of so-called renewable natural gas solutions to the greenhouse gas problem, as some recent bills have proposed. At least two of these new projects are planning to start with natural gas and migrate, by 2050, to RNG,

or hydrogen, or other fuels. This will allow them to claim reduced greenhouse gas emissions through an accounting gimmick, while still emitting the same volume of greenhouse gases and possibly even more toxic pollutants in the EJ communities. RNG does not reduce greenhouse levels in the atmosphere. New sources of methane will only increase the possibility of leakage, and locks in for gas and makes it harder to transition to renewables. How are we going to transition all those buildings off of gas? They're now being told, "No, use RNG and stick with gas."

A recent report prepared for the BPU shows that reducing energy demand and improving energy efficiency are far more effective than increasing the supply of gas, such as RNG, LNG, and hydrogen. The Legislature must reject the proposal to subsidize these false solutions.

So I've spent some time discussing the energy production sector. I also want to talk briefly about the transportation and building sectors.

We can spend the entire hearing talking about reducing greenhouse gas emissions from the transportation sector -- by far the largest source of greenhouse gases in the state. The DOT and Turnpike Authority are doing little or nothing to address this issue, despite being required to do so by Executive Order 274. We will shortly provide this Committee with proposals, supported by a PTL fact sheet, on how to turn this situation around and make some other needed reforms in the transportation sector.

But let me highlight one of our proposals. A new buzzword in Trenton -- and we heard it today -- is *affordability*. The Senate and this Committee can immediately make substantial progress in addressing all of these issues, including affordability, with one simple action: stop spending billions of dollars -- and that's billions, with a *b* -- on unneeded highway

expansion projects. For example, the Turnpike expansion project of Exits 14 to 14a. The expansion will tear through the heart of Jersey City, over the opposition of the Mayor and the people of Jersey City. This project makes no sense under any metric, starting with its cost. When first proposed in 2020, the cost was $4.3 billion. It has now ballooned to $4.7 billion, and only preliminary design work has started. The project would be an environmental disaster. You'll see more greenhouse gases and more pollution. Our report conservatively estimates that the current plan to widen 124 miles of Turnpike and Parkway will increase greenhouse gases by 1.5 million metric tons annually.

The project will not even accomplish its goal of reducing traffic congestion. It's a fundamental rule of highway planning that expanding highways in urban areas results in induced demand, where the highways quickly fill to their increased capacity, leaving traffic congestion the same as it was before.

This is certain to be the case in Jersey City, where there is an immovable bottleneck at the end of the Turnpike, known as the Holland Tunnel. This project, and the others like it, are lose-lose-lose propositions for the State. The DOT Commissioner and the entire insular Turnpike Authority Board operate without oversight as if we are still in the 1950s, when the climate crisis did not exist, and before we learned, through one example after another, that highway expansions are enormously costly to build and counterproductive.

The Senate and this Committee should stop these projects and use their oversight powers to have the DOT Commissioner testify about not only the highway projects but, more generally, what DOT and the Turnpike

Authority are doing or, more accurately, are not doing to reduce greenhouse gases.

Let me wrap up with a few words about the building sector.

We are working with the building electrification team that I liaise with from Empower New Jersey. And we're very consistent, of course, with the words that you heard from Jen earlier, from Rutgers.

The building sector's greenhouse gas emissions -- about 26, 27 percent of total New Jersey emissions -- are the second-largest segment in the state; and reducing them is of critical importance to achieving the 50 by 30 goal. Given the highly disaggregated nature of this segment -- and the numbers that we have are 3.5 million distinct housing units, 800,000 separately owned businesses; and the significant capital cost of replacing existing fossil fuel appliances -- it will be one of the most difficult to address. Therefore, time is of the essence. The efforts to reduce greenhouse gas in this segment must be put in place immediately.

Unfortunately, the Global Warming Response Act 2020 plan only calls for a building electrification roadmap sometime before 2030. I was very encouraged to hear Dr. Senick say that she is working on that. We will certainly speak with her.

Unfortunately, unlike the specific goals for EVs, solar storage, offshore wind, and energy efficiency, New Jersey has no specific goals for building electrification. Instead, we seem to be paralyzed by the disinformation campaign from the gas industry. This sector can be electrified with residents' support if we try. Cold climate heat pumps work, even at minus 15 degrees Fahrenheit. Electrification has significant long-term financial and health benefits for residents, while creating many good jobs.

New Jersey needs to set specific building electrification goals and provide the support needed to achieve them, including appropriate incentives to purchase electric appliances. Remove, in fact, what exists today as substantial incentives to buy gas appliances, like furnaces, and change the building codes for new developments, and provide effective and highly visible consumer support programs.

So I will sum up. If nothing else-- Let me just sum up this way.

Time is of the essence and, unfortunately, in some ways, we seem to be wasting it. Because we are allowing all these new projects to overwhelm all the good work that you've already talked about. We have to stop these projects, and we have to move forward.

And with that, I'll turn it over to Anguli.

A N J U L I R A M O S B U S O T: Thank you, Ken.

Chairman, Senator Smith, and members of the Senate Environment and Energy Committee, thank you for the opportunity to testify today, and for all the work that you do to protect the environment.

My name is Anjuli Ramos Busot; I'm the new New Jersey State Director for the Sierra Club. As Senator Smith calls me, the *new Jeff Tittel.*

And today, I'm speaking on behalf of the Empower coalition, to which I am a member, as well as on behalf of the New Jersey Sierra Club.

Affordability, as my colleague previously mentioned, is the new buzzword in town, and we understand the reasons why. We're going through a period of record inflation. Our markets have all been impacted, our supply chain is suffering, and the prices for gas at the pump are record high. Of course, I cannot miss the opportunity to say, *record-high prices at the pump,*

while oil companies are reporting record-breaking profits by utilizing the Russian invasion of Ukraine as their excuse.

This is all to say, yes, we understand the focus on affordability. We're all going through it. I believe we all here agree that the ratepayers should not be impacted by the cost of our inability to be energy independent, and of most importance, should not be impacted by the urgent and necessary energy transition from fossil fuels to renewables. This is why we need your help.

The longer we allow for the construction of new fossil fuel infrastructure and for the modernization of the existing one, the longer we will be hooked and dependent on a volatile and geopolitical fossil fuels market.

I'm not going to preach to the choir here, because I'm very much aware that you all understand the environmental and health impacts of climate change. We see it with our own eyes. However, what I will mention is the economic impact of climate change to our State. The National Oceanic and Atmospheric Administration, otherwise known as *NOAA*, recently, released a report on billion-dollar weather and climate disaster events. Last year, New Jersey was hit by four different billion-dollar weather and climate disaster events, and by a total of 71 severe weather events. This data indicates that last year, New Jersey's total cost from these events was $10 billion dollars, with more than $5 billion dollars in property damage. Last year was the most expensive year in terms of weather and climate disasters, after 2012, the year we got hit by Superstorm Sandy. How does this fit under affordability?

New Jersey is losing a lot of money, and the data shows that the cost of inaction, as you mentioned, Senator, is higher than the cost of actually investing in climate change mitigation, as well as being proactive about it. Thus, when I asked for your help, I specifically asked, for example, to not allow for the usage, let alone the construction, of new infrastructure for the incorrectly marketed renewable natural gas, or RNG, especially while subsidized by the ratepayer.

My colleague Ken spoke briefly about this. However, I would like to go into details because the greenwashing of dirty fuels, like RNG, is one of our most significant challenges. Members of this Committee, as introduced by the Legislature this past session, RNG can be one of any of the following options.

Number one, biogas upgraded to pipeline quality, which is still burning of a fuel made out of carbon, and still contributes to significant leakage of methane to the atmosphere.

Number two, hydrogen gas derived from Class 1 or Class 2 renewable energy, which I will further explain why it is not a good use of our resources.

And number three, methane gas, which, again, is just simply burning carbon.

RNG is highly expensive to make because it depends on the supply of biological sources, one that is limited. Costs can range from 4 to 17 times higher than natural gas. Investing more money in constructing and prolonging the so-called *Transition to Renewables,* or low carbon energy, no longer passes as a smart or efficient idea. It's a waste of resources that will

lock us into the burning of carbon beyond 2050. That's time that we don't have.

Now, going back to hydrogen. As a chemist, I can inform you that this type of energy source is a technology that we can truly say, as of today, is not ready to be scaled up in a clean way. In order for us to be able to use hydrogen produced in a clean way, it needs to be generated in an electrochemical or fuel cell environment, which does not include any form of carbon. Unfortunately, this technology is not yet scalable to our energy demand levels. And, as of today, it has a high cost. If not done this way, hydrogen, otherwise generated with the usage of biogas, ends up producing carbon monoxide and carbon dioxide.

Additionally, if we combust or mix hydrogen with RNG or natural gas, in order to be able to use our existing pipeline infrastructure and reduce the usage of gas, we end up generating the deadly and potent climate pollutant black carbon, and up to 6 times more emissions of nitrous oxides, or NOx, than if we just simply burn natural gas, or RNG.

It is also worth mentioning that there are numerous studies in scientific literature about the difficulties of controlling NOx emissions from hydrogen combustion in various industrial applications. Emitting NOx and the creation of ground-level ozone -- which, as many of you know, is considered smog, and you're very much acquainted with -- we understand the health impacts and the unnecessary toll it takes on public health, especially our communities overburdened with pollution. However, it is especially important to mention that the entire state of New Jersey -- it's currently under non-attainment by the U.S. EPA for ground-level ozone, an extremely toxic pollutant, which is produced in the atmosphere at ground level by high levels

of NOx; and volatile organic compounds, or VOCs -- yet another co-pollutant of fossil fuel combustion, regardless of the source.

The key takeaway from all of this is that there is no fossil fuel transition solution to reaching renewable energy. And these "solutions" are costly, a waste of resources, and will continue to harm our health and exacerbate the impacts of climate change.

The solution is to systemically invest in more renewable energy, while incentivizing its incorporation and usage; and protecting the ratepayer from the economic impacts of climate change.

Members of the Committee, I would like to explain further why we need your help.

As New Jersey DEP Commissioner Shawn LaTourette explained to you when he previously testified to this Committee on the impacts of climate change to New Jersey, time is of the essence and we need to urgently do more. However, the Administration's progress on implementing the Governor's vision has been painfully slow. To be specific, the revision of the Energy Master Plan took longer than expected, which then resulted in a further delay in rulemaking by the DEP that took the Governor's entire first term. All PACT or Protecting Against Climate Threats rulemaking deadlines have been missed, and thus far, only one rule has been adopted.

The goal was to adopt those rules by January 2020, a huge subset of rules under PACT that focus on a resilient environment -- right? Mitigation of climate change and landscapes are still at least months away from being proposed.

Additionally, we have yet to see the establishment of entering benchmarks under the Global Warming Response Act, and the 20-year time

frame for all greenhouse gas computations by the DEP, as enacted into law by the Legislature and Governor Murphy in July 2019, and January 2020.

The 20-year timeframe is of special importance, because not all greenhouse gases have the same global warming potential as carbon dioxide, as you were mentioning, Senator. To be specific, those short-lived climate pollutants like methane and black carbon, which are present in the atmosphere for a shorter period of time, have a significantly higher warming potential than carbon dioxide.

All of these delays speak volumes to the fact that the New Jersey DEP is understaffed and underfunded, something that you can all help with during this Budget season. New Jersey DEP has had flat funding since 2005; not a cut, but also not an increase. When considering inflation, this results in a 40 percent cut in funds and a 30 percent cut in staff. Personally, prior to me joining the New Jersey Sierra Club, I used to work for the New Jersey DEP; to which I attest to the goodwill and the hard work the staff puts forward in order to protect our environment and public health -- good people trying to accomplish a lot with not a lot of resources. More funding is essential.

In regards to the actual rules that have been proposed and undergone public comment, one of the most important rules which targets the electric generating sector does not truly contribute to significant reductions in greenhouse gas emissions. It doesn't even acknowledge, let alone is informed, by the Governor's Executive Order 274, despite being drafted concurrently. This proposed rule would only contribute a 4 percent reduction in greenhouse gas emissions, and this is only after full implementation by 2035.

This is in direct contrast to Governor Murphy's climate goals and Executive Order 274, which states that, by 2030, we are supposed to achieve a reduction of 50 percent of greenhouse gas emissions. Yes, the proposed rule only considers the electric generation sector, thus it is not expected for this rule alone to reduce all 50 percent of emissions, or even close to that. However, the most up-to-date data reported by the DEP shows that the electric generation sector is the third-highest contributing sector in the state, and it comprises 20 percent of all greenhouse gas emissions. What we do expect is that this proposed reduction at least comes close to 20 percent.

The proposed rule is packed with loopholes that bypass many greenhouse gas-emitting electric generating sources. The most egregious ones are the sources that burn 50 percent or less of fossil fuels and the sources that contribute less than 10 percent of its annual gross electric output to the grid -- like all backup generators or self-powered facilities in the state, as well as co-generation units and incinerators. All those sources would be exempt.

There is so much more than these proposed rules can cover and enforce. And a stronger political will from the Murphy Administration, as well as the Legislature, can get this done.

In order to holistically reduce greenhouse gases, there needs to be broad government action. As previously mentioned by my colleague Ken, we need more concrete action from the BPU, DCA, DOT, EDA, and NJ Transit, and any government agency that may play a role in reducing emissions, developing the market, and creating clean jobs. We ask ourselves, "Where are the good and efficient climate plans and actions by these agencies?" The BPU currently refuses to include a cost analysis that includes the true social, health, and climate costs of greenhouse gases in their *Ratepayer*

Impact Study of clean energy policies, presented in the most recent Energy Master Plan; let alone frame the analysis around them. Additionally, the DCA and DOT, for example, have not even developed policies to reduce greenhouse gas emissions from the transportation and building sectors, as explained by my colleague, as required by Executive Orders 28 and 274.

And the Senate hasn't made things easier with its passage, a few months ago, of a Bill that would undermine DCA's consideration of electrifying buildings and plays into the extremely misleading campaign of the fuel merchants concerning affordability, mandates, and the climate emergency we face.

Moving forward with this rate of implementation of regulations. and the potential increase in greenhouse gas emissions as described by my colleague, it is impossible to see a clear path to achieve our climate goal of 50 percent reduction by 2030. For these reasons, we call on the Administration and the Legislature, as well as individual legislators, to do everything in your power to, number one, prevent the current seven pending fossil fuel projects from being approved and built. Number two, to

direct all State agencies, especially New Jersey DEP, DCA, BPU, New Jersey Transit, and DOT, to urgently provide written executable roadmaps and rules by the end of 2022, to implement Executive Order 274 and achieve our existential goal of reducing greenhouse gases by 50 percent by 2030. Number three, to oppose the usage and the creation of new infrastructure for renewable natural gas, or RNG. Number four, to help with the cost-effective electrification of our buildings. Number five, to give the DEP the funding to do the job. And number six, to empower all of the markets, businesses, and individuals through this energy transition.

We also urge the Legislature to pass budget resolutions that restore the raids of more than $83 million from the New Jersey Clean Energy Fund so we can more fully fund clean energy and energy efficiency programs.

In conclusion, we ask the Legislature to be proactive instead of reactive. Do not leave New Jersey behind. Just two weeks ago, New York State adopted a budget that, number one, includes a $4.2 billion environmental bond act to protect against climate change. And number two, requires all new school bus purchases be zero emissions by 2027, and all school buses on the road be zero emissions by 2035. And number three, funds electrifying an additional 50,000 homes.

Climate change, regardless of current political and economic situations, is society's true existential threat. Action is required now. At this point, we are and will continue to suffer from the imminent and irreversible impacts of climate change.

There is no more time for planning, we are already so behind. We ask the Legislature to recognize the urgency to mitigate the impacts and protect the public. So many are already suffering and dying due to overburdening pollution, by floods, drought, fires, tornadoes, and tropical systems.

The list of environmental, health, and economic benefits of fully transitioning into true renewable energy is endless. Promote climate mitigation and renewable energy bills, and stop those who do not push New Jersey forward.

And we understand how difficult this is going to be for legislators. It is going to require heroic action to stop new fossil fuel projects, shut down existing sources, and develop programs to replace them with renewable energy

ones. Some of these actions may not be popular in the near term, and residents may not see the benefits until some of you are gone from office. But this is reality.

Factoring all the social costs of carbon, accelerating the transition to clean renewables and not delaying it, not the business-as-usual fossil fuel approach -- that's how you make New Jersey more affordable.

Again, thank you for the opportunity to testify.

SENATOR SMITH: Ms. Ramos, that was very illuminating. And we appreciate everybody's input today. A lot of very good ideas were discussed and hopefully will become legislation.

So thank you so much for your contribution, and that concludes our agenda for today.

Senator.

SENATOR DURR: I actually just have a statement, not a question.

And I don't want you to take this the wrong way. I'm kind of an older guy; I don't know if you're familiar with the gentleman named Ed Begley, Jr. He's an actor and he's a real environmentalist-type.

But he not only talks the talk, he walks the walk. He bike pedals everywhere.

Do you drive a car?

MS. RAMOS BUTOS: I do drive a car, sir.

SENATOR DURR: Is it an electric car?

MS. RAMOS BUTOS: Not yet.

SENATOR DURR: Okay. Is your home electric heat?

MS. RAMOS BUTOS: Just bought a home for the first time this last summer, so we'll get there.

SENATOR DURR: So I just feel that -- there's an old statement that says *lead by example,* all right?

MS. RAMOS BUTOS: Okay.

SENATOR DURR: Thank you.

SENATOR SMITH: Well, I-- You know, we would not want to get into it too much. But the moral of the story, all of us are working hard to have more environmentally sustainable lives. And it's not easy, and you work your way toward it. So please don't feel personally--

MS. RAMOS BUTOS: Oh, no, that's-- I mean, it's a fair point, absolutely.

SENATOR DURR: No, I'm not trying to personally attack you. But, you know--

MS. RAMOS BUTOS: No, I know.

SENATOR DURR: --don't tell me what I need to do if you're not going to do it yourself.

SENATOR SMITH: Which is why we have a bill to have our State capitol and our State buildings -- to walk the walk as well. Because, quite frankly, if you look at our State facilities, we're telling everybody to do all the right things and we're not showing it by example. So that's a shame on us.

But I think all of us are trying our best to make those changes in our lives.

When does the bag ban start?

UNIDENTIFIED MEMBER OF COMMITTEE: May 4.

SENATOR SMITH: May 4. So in a week and a week, we're going to see the impact of changing culture and how hard it is. I mean, I expect every one of us to get calls. And, right now, if you wanted to go out and buy an electric vehicle--

SENATOR DURR: I'm already getting those calls about the bags.

SENATOR SMITH: Yes.

SENATOR DURR: That aren't single-use bags.

SENATOR SMITH: Yes.

SENATOR DURR: So I kind of am against that.

SENATOR SMITH: And if you wanted to buy an electric vehicle, our subsidies for this year are already wiped out. When we talk about putting more money into the program, the comment from the auto industry is, "We can't supply EVs to New Jersey as quickly as you might want."

So it's-- And that's actually a huge part of this debate. Is this going to be evolutionary or revolutionary? Do you say to citizens, "All right, turn out the light switch" or "Don't heat your homes with natural gas" I think the number was 1.6 million; I forget who -- the gas company reps, who were talking about how many homes are heated by natural gas. What if we said, "Tomorrow, no more natural gas. What are you going to do?" Where, likewise, "We're not going to allow the sale of gasoline." I mean, they all sound very extreme. But it's the point of view, or the position-- You need an evolutionary approach that gets us the fastest way we can get to where we're not going to be a ball of fire. And unfortunately, the ball of fire is looking more and more probable, because we're not getting there fast enough.

So on that happy note, thank you very much for coming today, and the meeting is adjourned.

Thank you.

(MEETING CONCLUDED)