Preliminary Transcript

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POWER STRUGGLE: EXAMINING THE 2021 TEXAS GRID FAILURE

WEDNESDAY, MARCH 24, 2021

House of Representatives,

Subcommittee on Oversight

and Investigations,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 11:30 a.m., via Webex, Hon. Diana DeGette [chairman of the subcommittee] presiding.

Present: Representatives DeGette, Kuster, Rice, Schakowsky, Tonko, Ruiz, Peters, Schrier, Trahan, O'Halleran, Pallone (ex officio), Griffith, Burgess, McKinley, Long, Dunn, Joyce, Palmer, and Rodgers (ex officio).

Also Present: Representatives Castor, Fletcher, Veasey, and Crenshaw.

Staff Present: Mohammad Aslami, Counsel; Kevin Barstow, Chief Oversight Counsel; Jeff Carroll, Staff Director; Austin Flack, Policy Analyst; Waverly Gordon, General Counsel; Tiffany Guarascio, Deputy Staff Director; Perry Hamilton, Deputy Chief Clerk; Judy Harvey, Counsel; Anne Marie Hirschberger, FERC Detailee; Chris Knauer, Oversight

Staff Director; Mackenzie Kuhl, Press Assistant; Jon Monger, Counsel; Elysa Montfort, Press Secretary; Kaitlyn Peel, Digital Director; Peter Rechter, Counsel; Chloe Rodriguez, Deputy Chief Clerk; Nikki Roy, Policy Coordinator; Benjamin Tabor, Junior Professional Staff Member; Sarah Burke, Minority Deputy Staff Director; Diane Cutler, Minority Detailee, O&I; Theresa Gambo, Minority Financial & Office Administrator; Marissa Gervasi, Minority Counsel, O&I; Brittany Havens, Minority Professional Staff Member, O&I; Nate Hodson, Minority Staff Director; Olivia Hnat, Minority Communications Director; Peter Kielty, Minority General Counsel; Emily King, Minority Member Services Director; Bijan Koohmaraie, Minority Chief Counsel; Clare Paoletta, Minority Policy Health Analyst; Alan Slobodin, Minority Chief Investigative Counsel, O&I; Michael Taggert, Minority Policy Director; and Everett Winnick, Minority Director of Information Technology.

Preliminary Transcript

Ms. DeGette. The Subcommittee on Oversight and Investigations hearing will now come to order.

Today the committee is holding a hearing entitled, "Power Struggle: Examining the 2021 Texas Grid Failure." Today's hearing will examine the causes and consequences of Texas' electric grid failure last month due to severe winter weather.

Due to the COVID-19 public health emergency, today's hearing is being held remotely. All members, witnesses, and staff will be participating via video conferencing. And as part of our proceeding, microphones will be set on mute for the purpose of eliminating inadvertent background noise.

Members and witnesses, as we've seen already in the presession, will need to unmute your microphone every time you want to speak. And if at any time during the hearing I'm unable to chair the hearing, the vice chair of the subcommittee, Mr. Peters, will serve as chair until I return.

Documents for the record can be sent to Austin Flack at the email address we've provided to your staff. All documents will be entered into the record at the conclusion of the hearing, and the chair now recognizes herself for the purposes of an opening statement.

Last month an extreme weather event in Texas triggered a crisis of an enormous scale and took a staggering toll on the State. While State and local and Federal officials are trying to decide exactly why the electric grid failed, some of the contributing factors are already becoming clear. For instance, we know that the power sources were not adequately winterized. This caused the power supply to falter just as constituents were demanding more electricity to counter the cold as the storm swept across Texas.

To preserve the stability of the system, the grid's operator initiated power

short -- power outages to reduce energy demand, reportedly avoiding a cascading blackout by Mayor [inaudible] unfortunately, it lasted for 5 days.

As many as 4 million customers lost power, and many more struggled to get food or access to safe drinking water. At one point an estimated 14 million people were under boil water notices. Even hospitals had to do -- make do with limited water and power. Tragically people resorted to dangerous and sometimes fatal methods to stay warm.

At least 57 Texans lost their lives, some dying from carbon monoxide poisoning or hypothermia in their own homes. And though power has been restored, life has not returned to normal for many in the State. Many Texans are now confronting the extensive damage caused by water pipes that froze, ruptured, and flooded homes and businesses.

Adding further misery, the crisis also wreaked havoc on the price of electricity with prices soaring to the maximum permitted under state law. This left many Texans with sky-high power bills, some totalling in the thousands just for a few days of power.

And while the storm impacted millions, this event appears to have been particularly harmful to low-income individuals. Sadly, people with the least are often hit the hardest by disasters as many even lack basic financial safety nets to endure the events that they ever can recover from.

The massive scope of economic harm to Texas, while still coming into focus, could be as high as nearly $300 billion dollars which is more than Hurricanes Harvey and Ike combined.

Unfortunately weather events like this are no longer a surprise. Every year we seem to break new climate records and see more extreme weather events. Catastrophic storms, floods and fires, once considered rare, have now become the norm.

The Houston region, as Mayor Turner will tell us, has faced multiple catastrophic weather events over a very short period of time including Hurricane Harvey which inundated the city with more than 51 inches of rain.

In the mountain west, wildfires are larger, and the wildfire season goes even longer. In California, wildfires have resulted in widespread power outages, a topic on which this committee held a hearing in January 2020. In Puerto Rico and the U.S. Virgin Islands, Hurricanes Irma and Maria in 2017 caused unprecedented devastation and the longest electricity blackout in U.S. history.

Mr. Griffith and I traveled to that region, along with Mr. Pallone and many of our other colleagues, to examine the impact that those storms had on the islands' healthcare system and electricity grid, an issue that this subcommittee held a hearing on in April of 2018. These are just some of the most recent extreme weather events.

As the Energy and Commerce Committee, it is our duty to examine crises like these and to try to explore ways that we can prevent the massive damage they're causing. Hearings like what we're having today are essential if we're going to learn to adapt to a changing climate and to increase the resiliency of our Nation's grid.

What happened in Texas makes clear that extreme weather events can affect all forms of energy including coal, wind, natural gas, and even nuclear. And while the focus today is greatly on Texas, the testimony we will hear will also provide insights applicable to reliability risk in all parts of our country which brings me to my broadest point.

The key lesson from what happened in Texas is that extreme weather events are devastating and happening more frequently. We need to accept this fact and prepare. We need to stop kicking the can down the road. Adapting and confronting to a changing climate will not come cheap and it will not come easily. But if we don't do anything, we will continue to incur huge losses in human lives, property damages, and threats to our

power supply. Climate change is here, and we need to recognize this reality by taking action to ensure our electric grids are designed with the resiliency and reliability that we need in a climate-changed world.

So I want to conclude by thanking our witnesses for being here, because I know all of you are just up to your eyeballs in dealing with this crisis, and it means a lot to this committee that you took the time.

I also want to thank the leadership of two of our colleagues, Representatives Fletcher and Veasey, who have been tireless advocates for their constituents in this time of crisis.

I'm looking forward to hearing from our witnesses today. And with that, I'm pleased to recognize our ranking member, Mr. Griffith, for 5 minutes for purposes of an opening statement.

[The prepared statement of Ms. DeGette follows:]

******** COMMITTEE INSERT ********

Mr. Griffith. Thank you very much, Chairwoman DeGette.

And I would be remiss if I didn't recognize our Texans on the committee. We have Dr. Burgess, who I'll yield to in a few minutes, and Dan Crenshaw who are going to participate in today's hearing. And they have been working very hard for the people of Texas in this disaster situation as well.

I appreciate you holding this hearing on the challenges that we're facing in our power grid, both in Texas and nationally. I also want to thank the witnesses for taking the time to join us today, and I want to extend my condolences to all those who have suffered or died due to last month's tragic winter storm.

Given the recent extreme weather event in Texas, it is critical for us to examine the problems and discuss solutions to prevent another crisis. However, it would be a mistake to focus only on Texas when electric grids across the country have shown vulnerability to a variety of issues and hazards.

First, other States have been and continue to be threatened by widespread power outages due to extreme weather, the extreme cold that brought blackouts to Texas, who brought them to Oregon, Oklahoma, Kentucky, West Virginia, and Louisiana around the same time. These outages followed the extreme heat of last summer which led to rolling brownouts in California. Valuable perspectives would be gained by studying these types of failures across the country, especially as we discuss weatherization and other ways to make our grid more resilient. I believe the lessons to be drawn from these examples may be numerous, which is why we should be inclusive in looking at them.

Texas' problems occurred, despite the State's leadership in achieving a diversified, all-of-the-above energy mix which includes coal, natural gas, nuclear, renewables, and

storage and indicates a need for better weatherization. The need for proper planning and preparation of all hazards emphasizes the need to broaden our scope to vulnerabilities affecting the grid nationally and stemming from other causes such as cyber attacks or even physical attacks.

Our colleague, Representative Soto, mentioned at one of our hearings earlier this week that a cyber attack targeted a Florida water system in his district. And that could happen to any of our necessary utilities.

These are all issues we should be looking into, and I know we will. As more events occur across the country, the importance of grid resilience is further highlighted. We must address the energy emergencies that millions of Americans have faced across our country, not just those in Texas. I hope that we can look for solutions in a bipartisan way to prevent blackouts for all Americans since these energy resource interdependency issues are not unique to Texas.

I now yield the rest of my time to Dr. Burgess from the great state of Texas.

[The prepared statement of Mr. Griffith follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. The gentleman is recognized.

Mr. Burgess. Thank you, Mr. Griffith, and a special thanks to our Texans who've agreed to be on the panel today. I know this is not an easy task and certainly want to welcome Mayor Turner, as well as Bill Magness from the Electric Reliability Council of Texas, and Commissioner Christi Craddick who made a special effort to be here today and look forward to hearing from all of you.

So our crisis in Texas, although it was nationwide, in Texas it was tragic. There were blackouts. And it impacted over 5 million Americans across Texas, Oklahoma, Louisiana, and other States. Lives were lost, livelihoods were ruined, and our faith in the electric system was shaken. Americans, Texans are angry and deserve answers.

Unfortunately, we cannot overlook the fact that this is only the latest in a number of tragedies. In recent years similar events have occurred in California and the Northeast and indeed Texas. While the causes of each blackout are unique, the results are the same, suffering and economic disruption. This committee has direct jurisdiction over much of the energy sector and has a responsibility to address many of the shortcomings in the electrical system.

I would like to express my support and appreciation for the work done at the State level of Texas. This is our first hearing. The events occurred 5 weeks ago, but the State house in Texas, the State senate in Texas has been very active in that timeframe. Significant criticism has been levied against Texas, criticism against the grid operator, Public Utility Commission. But the State legislature has already held no less than six hearings to find answers and to bring accountability and to make the necessary reforms.

Texans can and will solve the problem within its borders. Let me say that again. Texans can and will solve this problem within their borders.

Finally, I'd like to voice my strong concern about the politicization of this crisis. No one single policy, no one single energy source caused this crisis, and no one policy could have prevented it. I ask my colleagues to use this hearing to study the crisis in full. The reliability of our country's electric supply is not a partisan priority. It is a national priority.

Thank you for that, and I yield back.

[The prepared statement of Mr. Burgess follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. I thank the gentleman, and I agree with you, too.

The chair now recognizes the chairman of the full committee, Mr. Pallone, for 5 minutes for his opening statement.

The Chairman. Thank you, Chairwoman DeGette.

Today we are examining the causes of the recent widespread power outages in Texas and how to fortify the electrical grid against extreme weather events and climate change.

The enormity of this disaster and its aftermath can't be overstated. At one point almost half of the generation capacity of Texas' electricity grid was lost, causing more than 4 million homes and businesses to lose electricity. And Texans struggled to get food, medical treatments, and safe drinking water.

This storm resulted in extensive property damage, unprecedented energy bills, and, most tragically, loss of life. And the challenges brought on by this storm were particularly acute for low-income communities which often lack the resources to prepare for or quickly recover from the effects of extreme weather disasters.

So today I look forward to hearing from our witnesses, particularly from the President and CEO of the Electric Reliability Council of Texas, or ERCOT, which functions as the air traffic controller of the Texas energy grid, about what went wrong and why it happened and also look forward to hearing from the North American Electric Reliability Corporation, or NERC, on why its recommendations to weatherize the Texas grid were not sufficiently implemented following another major storm there 10 years ago and how we should prepare nationwide for extreme weather events.

Indeed, these extreme weather events are becoming more and more frequent. They're unmistakable signs that the climate is changing and creating extreme risks.

Life-threatening weather events are happening more frequently, and we can no longer afford to delay action. Much of today's discussion will be about what went wrong in Texas and how to make the grid more resilient, but we need to go one step further and tackle the climate crisis. We need to really get our arms around these catastrophic events.

And that's why I recently introduced the CLEAN Future Act, comprehensive climate legislation, which would achieve net-zero greenhouse gas pollution no later than 2050. The bill also empowers American workers and creates million of homegrown jobs in a climate-resilient economy. The CLEAN Future Act, along with our LIFT America Act, will modernize our electric grid for the future. On Monday, we held a full committee hearing on the LIFT America Act and this afternoon our Energy Subcommittee will hold a legislative hearing on the CLEAN Future Act and these hearings, along with this oversight hearing, are critical as we discuss solutions to help make the grid more reliable and resilient.

And with that, I'd like to yield the remainder of my time to two of my colleagues from Texas who have been leading from the front lines on this -- during this crisis, 1 minute each or maybe even a little more to Representative Veasey and Representative Fletcher. And I'll start with Mark Veasey.

I yield to you, Mark.

[The prepared statement of Chairman Pallone follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. The gentleman's recognized for 1 minute.

Mr. Veasey. Madam Chair, thank you very much.

Mr. Chairman, thank you for yielding some of your time to me.

I want to talk with you today about something that was very serious and just want to remind everyone that we were literally 5 minutes, less than 5 minutes away from the entire grid crashing. I want you to think about that, 25 to 30 million people, the second most populus State in our Union without any power, and how -- and how it could have been so much worse had certain actions not been taken.

We had people that were literally sleeping inside of their kitchens next to their stoves so they could stay warm, people that were trying to sleep inside of their cars. We had a record number of individuals that had to be checked into hospitals across the State. People died because of carbon monoxide poisoning. It was serious.

And this happened because of the neglect that the Republicans in Austin have shown towards the grid for a very long time now. The lack of oversight, the lack of planning, just the approach on how this entire system is ran has been neglected for far too long.

Look, we have 57 people that died including a little boy that got to see snow for the first time in his life and he wanted to go outside and play and 24 hours later he was dead.

The Chairman. Mark, I've got to --

Mr. Veasey. We have to do something about this, Mr. Chairman. I apologize for going on so long.

[The prepared statement of Mr. Veasey follows:]

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******** COMMITTEE INSERT ********

The Chairman. We just got 30 seconds left. We want to go to Lizzie Fletcher. Thank you, Mark.

Mrs. Fletcher. Well, thank you so much, Chairman Pallone, for yielding to me and Chairman DeGette and Ranking Member Griffith for holding this hearing today.

As one of the members of this committee who lived through the Texas winter storm without power and water, like millions across our State, I cannot overstate the seriousness of the cascading failures before and during this event from the physical markets to the financial markets, from communications to legislation or lack thereof and nor can I overstate the importance of making sure that we don't fail to respond now.

I agree with my colleague, Mr. Veasey. You know, the scientists have told us repeatedly that severe weather events will continue to occur more frequently and more intensely in our changing climate. And we have to be prepared. As Mr. Veasey noted, you know, there was a little boy not far from where I live who froze to death in his own bed. We have to learn exactly what happened, why it happened, and what we need to do to make sure it doesn't happen again in Texas or anywhere else.

So I thank you for holding this hearing, and I yield back.

[The prepared statement of Mrs. Fletcher follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. I thank the gentlelady.

The chair now recognizes the ranking member of the full committee, Mrs. McMorris Rodgers, for 5 minutes.

Mrs. Rodgers. Thank you, Chair DeGette, Leader Griffith for this hearing to examine the power failures in Texas from the winter storm last month. I want to join in thanking the witnesses for bringing your expertise, your advice. I want to express my sorrow to all the families and friends who lost loved ones during this terrible event.

It's my hope that we will focus on solutions today so that this tragedy never happens again, not just in Texas but in other States with dangerous energy-reliable problems, too. There should be a full accounting of what went wrong with Texas's grid failures. We have a good idea generally of what went wrong, but we still lack the specifics of what caused the failures.

The freezing conditions and record winter power demand in Texas and the South Central U.S. were extremely rare. For the sake of the Nation's energy security, the subcommittee should be looking at what happened in Texas and, more broadly, at all issues that threaten the resiliency of the energy grid.

Recent trends show a transition away from coal and nuclear power plants designed to function as baseload capacity toward variable renewable energy sources with just-in-time natural gas backup. States like California that rely more on weather-dependent renewables experience energy failures on a regular basis. Indeed California residents experience blackouts on an ongoing annual basis as the State fails to imagine summer electricity demands and wildfire risk. These events suggest that replacing nuclear plants with variable renewable energy sources could make energy grids less resilient. Policies that drive renewables at the expense of firm baseload put lives at

risk.

People are suffering, not just from power loss but devastating storms. The frequent public safety power shutoffs to prevent wildfires from being started by electrical equipment during strong winds and dry weather impact people on a regular basis. Power failures interrupt healthcare, transportation, public safety, and the welfare of individuals, especially seniors and those with disabilities.

We should review these events across the country with unity and urgency on what this committee can do to strengthen the power grid reliability and resilience. The recent crisis in Texas is a wake-up call. While our country moves towards integrating renewables, integration must be achieved through diverse energy sources that include nuclear, hydropower, natural gas, clean coal, and wind and solar.

A resilient power grid is not a one-size-fits-all operation, and it shouldn't be imposed by D.C. Texas has the most integrated renewable energy sources of any State, but it still didn't prevent the power failure.

The United States of America has reduced our greenhouse gas emissions more than any other country in the last 20 years, but this progress and the resiliency of our power grid will be put at risk without assuring the bulk energy supply and not overestimating the contribution of weather-dependent renewables.

With that, I look forward to today's testimony. As a part of this securing cleaner American energy agenda, I'm leading on hydropower clean energy. And I've introduced legislation that would expand this clean, renewable, reliable, and affordable production of hydropower in America. It's part of the solution. We could double hydropower and save billions in avoided greenhouse emissions. This is just one part of a diverse energy mix that we need in the United States of America to keep the lights on and keep our citizens safe.

With that, I'd like to yield to another Texan on our committee, Dan Crenshaw.

[The prepared statement of Mrs. Rodgers follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. The gentleman is recognized.

Mr. Crenshaw. Thank you, Mrs. Rodgers. Greatly appreciate it. Greatly appreciate everyone for allowing me to be a special guest on this hearing.

And, look, I own an apartment here in Houston. We had to go scoop water out of the community pool to get water for a few days. It was a little rough. Luckily I'm used to cold water.

Look, I hope that this will be an informed and objective conversation about what problems we need to fix. So far I've heard some extremely partisan rhetoric, for instance, Mr. Veasey. That's not helpful. It's also not smart. And we're going to spend the rest of this, what, next couple of hours, I think, debunking some of the myths. Look, there was a baseload problem here in Texas.

I hear about environmental justice a lot. I think we should also talk about energy justice and reliability for that energy. The only way you get that reliability is through baseload energy -- coal, gas, and nuclear.

Now we can make that cleaner. We can look at carbon capture. We could invest in nuclear, and yet none of those investments are in any of the bills that we've seen or debated in the last couple of weeks. We're on the same page when it comes to reducing carbon emissions and I hope everybody here understands that but we also need to talk about energy justice. And I think that's a lot of points that get missed sometimes in these discussions.

Thank you for having me on. I look forward to the discussion.

[The prepared statement of Mr. Crenshaw follows:]

******** COMMITTEE INSERT ********

Mrs. Rodgers. I yield back.

Ms. DeGette. I thank the gentleman and the gentlelady.

The chair now asks unanimous consent that the members' written opening statements be made part of the record and, without objection, so ordered.

I now want to introduce our witnesses for today's hearing.

And to introduce our first witness, I'd like to yield to my colleague, Representative Fletcher, who represents Texas' 7th congressional district.

Mrs. Fletcher. Well, thank you so much, Madam Chairwoman.

I am proud to welcome and introduce my mayor, Mayor Sylvester Turner, a lifelong Houstonian, a graduate of the University of Houston, "Go Cougs," and Harvard Law School. Mayor Turner has put his passion for our hometown and his skills as a leader to work for Houstonians for decades, first, in the Texas legislature for more than 25 years and now as our mayor.

He has led our city through some of the greatest challenges we've ever faced from Hurricane Harvey to Winter Storm Uri and, of course, the coronavirus pandemic. His experience with both the legislative and regulatory matters, as well as the on-the-ground impacts of this power disaster, make his insights particularly useful today. And I'm so glad to welcome him to this hearing and to introduce him to all of you.

Thank you so much. I yield back.

Ms. DeGette. Thank you so much, Congresswoman.

Our additional witnesses for today's hearing are Bill Magness, the President and Chief Executive Officer of the Electric Reliability Council of Texas, ERCOT, the Honorable Christi Craddick, Chairman of the Railroad Commission of Texas, Michael Shellenberger, founder and President of Environmental Progress, and James Robb, the President and

Chief Executive Officer of North American Electric Reliability Corporation, or NERC.

I want to thank all the witnesses for appearing before the subcommittee today and I know you're all aware the committee is holding an investigative hearing and, when doing so, we've had the practice of taking testimony under oath.

Does anyone here object to testifying under oath?

Let the record reflect the witnesses have responded no.

The chair then advises you that under the rules of the House and the rules of the committee you're entitled to be accompanied by counsel.

Does anyone wish to accompanied by counsel today?

Let the record reflect the witnesses have responded no.

And so if you would, please, raise your right hand so I may swear you in.

[Witnesses sworn.]

Let the record reflect the witnesses responded affirmatively. And you're now under oath and subject to the penalties set forth the Title 18, Section 1001 of the United States Code.

The chair will now recognize our witnesses for 5-minute summaries of their written statements. As you can see, there's a timer on your screen that counts down the time and it turns red when your 5 minutes have expired and so now I will turn first to Mayor Turner.

Mayor, you're recognized for 5 minutes.

TESTIMONY OF HON. SYLVESTER TURNER, MAYOR, CITY OF HOUSTON; BILL MAGNESS, PRESIDENT AND CHIEF EXECUTIVE OFFICER, ELECTRIC RELIABILITY COUNCIL OF TEXAS; HON. CHRISTI CRADDICK, CHAIRMAN, RAILROAD COMMISSION OF TEXAS; MICHAEL SHELLENBERGER, FOUNDER AND PRESIDENT, ENVIRONMENTAL PROGRESS; AND JAMES ROBB, PRESIDENT AND CHIEF EXECUTIVE OFFICER, NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

TESTIMONY OF HON. SYLVESTER TURNER

Mr. Turner. Thank you, Madam Chair, and members of the Energy and Commerce Committee and thank you, Congresswoman Fletcher, for your introduction.

In the last six years Houston has faced four 500-year storms and an unprecedented winter storm. Without question, these extreme weather events are coming with greater frequency and greater intensity, with rising costs in damages and the loss of life.

After the winter storm of 2011, I filed House bill 1986 that specifically would have authorized the Public Utility Commission to mandate ERCOT have sufficient reserves to prevent blackouts like what occurred in 2011 and 2021. That bill was not given a hearing. I also wrote a letter to the PUC in 2011, specifically saying that allowing power generators to increase their charges from a few hundred dollars per megawatt to $9,000 per megawatt when demand exceeded supply would be very costly to the entire system.

The Texas grid was designed and constructed for the summer heat, and policymakers bet on the belief that what happened in 2011 was an anomaly. ERCOT, the PUC, and the State leadership intentionally chose to be dismissive of climate change

and the science associated with it. As a result, in February 2021, there was massive statewide system failure. There was no power for several days. Local water systems, specifically water pressure like Houston, fell below the regulatory requirement. Boil water notices were required. The combination of no power and low water pressure affected hospitals, police stations, dialysis clinics, people with special needs and the ability of firefighters to fight fires.

When power was restored and water pressure started to return, we estimate 50,000 homes and 400 apartment complexes in Houston had busted water pipes. Fifty-seven people in Texas died from hypothermia, carbon monoxide poisoning. Some people faced very high electricity bills.

Madam Chair and members, the magnitude of the damages was foreseeable and preventible. The Texas grid must be designed with a full appreciation that climate change is real and extreme weather events can occur throughout the year. We must build a system that is resilient and sustainable. The current infrastructure is outdated, and any claim that this systemwide failure was caused primarily by the use of renewable is blatantly false. If the Texas grid covering 90 percent of the State remains closed, then Texas must take the necessary steps to ensure the availability of power in times of peak demand to have a reliable system with affordable prices to the end user, the consumers.

On the local level, Hurricane Harvey was a game changer that impacted the energy capital of the world, our refineries, the Port of Houston, and our families. Putting things back where they were would have been a failed plan. We chose a forward-looking strategy.

In February 2020, the city adopted its Resilient Houston plan, underwritten by Shell, 18 goals, 62 action items. On Earth Day 2020, the city announced the Houston Climate Action Plan and formally adopted it in December with the support of community

leaders, environmentalists, and some in the energy sector like BP, NRG, Shell, and CenterPoint.

We are not trying to move away from the energy industry, but we are working with them to move the energy industry forward and for Houston to be the world leader in energy transition. A part of the plan is to create 50 new clean energy 2.0 companies by 2025. And we are well on our way, working directly with Greentown Labs, the Nation's largest climate-tech incubator.

Working with NRG as of July 1st, 2020, all of the city's facilities are 100 percent powered by renewables. And the city is the largest municipal purchaser of renewables in the country.

During the 1930s the city of Houston placed a 240-acre landfill in the middle of Sunnyside, one of our oldest African-American communities. The landfill closed in 1970, leaving a toxic hole in the heart of Sunnyside. Working with energy partners, there are plans to turn the former landfill in into the largest urban solar farm in the United States, estimated to generate 50 megawatts of power, enough to power 5,000 homes, offset 120 million pounds of carbon emissions annually, create green jobs, and revitalize the neighborhood.

And to minimize any future blackouts, the city is adding even more redundancy to its water and wastewater systems, priority assets, and exploiting pilot initiatives using micro grids which tie in directly to the Texas grid and stays on 24/7, never turns off.

Local governments are on the front lines but we must have action by all levels of Government in order to address our shared challenges or we risk being overwhelmed.

[The prepared statement of Mr. Turner follows:]

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Ms. DeGette. Thank you so much, Mayor.

I'm now very pleased to recognize Mr. Magness for 5 minutes.

TESTIMONY OF BILL MAGNESS

Mr. Magness. Thank you, Chairwoman DeGette, Ranking Member Griffith, and distinguished members of the subcommittee. My name is Bill Magness. I'm currently President and Chief Executive Officer of the Electric Reliability Council of Texas, commonly known as ERCOT.

Last month's winter storms had a devastating affect on Texas. The extended disruption of electric service to millions of Texans during this extreme cold weather event resulted in impacts to health and safety of many. Texans suffered enormously during the winter storm. We can't afford for it to happen again, and ERCOT is committed to working on solutions to the problems we identify that led to the February outages.

Let met give you a bit of background to explain ERCOT's role in the provision of electric power in Texas. We manage the flow of electric power to more than 26 million Texas customers. That's about 90 percent of the State's electric load and about 75 percent of the land mass of Texas. ERCOT does not own power plants. We do not own poles and wires. We are the grid operator like air traffic control for the grid. We're also the settlement agent for the market. We do the bookkeeping and billing. We don't participate in the financial side of our market. Our number one job is to see that supply and demand on the grid are in balance at all times.

As the independent system operator for the region, ERCOT schedules power on their electric grid that connects more than 46,500 miles of transmission lines and over

680 generating units. It also performs financial settlement for the competitive wholesale bulk power market and administers retail switching for 8 million premises in the competitive areas at ERCOT. We are a membership-based 501(c)(4) nonprofit corporation, governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas legislature.

Our members include consumers, cooperatives, generators, power marketers, retail electric providers, investor-owned electric utilities, transmission and distribution providers, and municipally-owned electric utility.

ERCOT's not a policymaking body. We implement the policies adopted by the Public Utility Commission and the Texas legislature, and we operate under reliability rules adopted by the North American Electric Reliability Corporation, or NERC.

Generators produce power from a variety of sources in ERCOT such as gas, coal, wind, solar, and nuclear. These are private and public entities, subject to regulation by various state and Federal agencies. Transmission and distribution providers own the wires and transport the power to consumers, subject to their own sets of Federal and State regulation.

Twenty-four hours a day, 7 days a week ERCOT monitors the entirety of the system to make sure that when transmission lines go down, we can work around them. We talk to generators, instructing them to bring load onto the system or to back it down as needed. We oversee the scheduling of maintenance and more.

The work is done with one purpose, to maintain the 60 hertz frequency that's needed to ensure the stability of the grid. It's a constant balancing act to manage the supply and demand to ensure a stable frequency.

During the week of February 15, the Texas electric market experienced more demand than available supply. At its worst, the storm took out 48.6 percent of the

generation available to ERCOT to balance the grid. We always keep reserves. But when you lose nearly half your generation, you're going to have a problem. As supply quickly diminished, the frequency of the grid dipped perilously low. Many generators stayed off for days, and this left the system unable to serve that high demand. We used the last tool in our toolkit, planned outages, calling for load shed to manage the stability of the grid.

This crisis required ERCOT using procedures established for emergencies like this to call on transmission providers to use controlled load shedding to balance the system and prevent a devastating blackout for the entire grid. Avoiding a complete backout is critical. Were it to occur, the Texas grid could be down for several days or weeks, while the damage to the electrical grid was repaired and the power was stored in a phased and highly controlled process. The cost of restoration of the system, the economic loss for Texas, and the personal cost to the well-being of Texas citizens would be unfathomable.

As terrible as the consequences of the controlled outages in February were, if we had not stopped the blackout, power could have been out for over 90 percent of Texans for weeks. The steps we took were difficult but they had to be taken and when power was able to be fully restored, the Texas electric delivery system immediately returned to its pre-emergency conditions.

That's why, when demand for power exceeds supply, ERCOT must issue directives to all electric transmission providers to shed load, to take those measures to reduce power consumption. In severe cases these brief directives result in outages. The rotating outages that we managed by the trans -- managed by the transmission providers are managed according to plans and protocols determined by the transmission providers themselves who know their local areas much better than ERCOT ever could. ERCOT issues the directive to reduce power consumption under a predetermined formula

necessary to maintain the integrity of the grid and avoid a catastrophic blackout. Based on their plans and protocols, it is the transmission providers who decides whose power stays on and who's interrupted during the outages.

And the Texas legislature and our Public Utility Commission are currently engaged in an effort to determine what changes in law and regulations are needed in order to avoid a repeat of the events in the week of February 15. Bills are moving in the Texas House and Senate under an emergency declaration from Governor Abbott that takes on key issues -- winter preparedness, public safety communications, and the various grid and market issues brought to life by the storm.

We at ERCOT are working day and night to provide policymakers with the information they need to ensure that Texas electric supplies remain sufficient going into the future. Within the next few days we anticipate completion of a survey sent to all power generators and end suppliers, requesting information on when, where, and why the power supply failed during the week of February 15. This information will be helpful to the Texas legislature and policymakers in seeking solutions.

We look forward to working with our stakeholders, State leaders, and with you to implement improvements to Texas' grid resiliency and the ERCOT wholesale market.

Thank you.

[The prepared statement of Mr. Magness follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. Thank you so much, Mr. Magness.

I'm now pleased to recognize Chairman Craddick for 5 minutes.

You're recognized.

TESTIMONY OF HON. CHRISTI CRADDICK

Ms. Craddick. Chairwoman DeGette, Leader Griffith, and members, thank you for having me here today. For the record, my name is Christi Craddick and I'm the chairman of the Railroad Commission of Texas and -- excuse me -- West Texas dirt has blown into Austin. So it's caught my allergies today.

The Railroad Commission has primary regulatory jurisdiction over oil and natural gas production, pipelines, natural gas utilities, alternative fuels such as propane, and coal and uranium mining activity. The Railroad Commission does not have any regulatory jurisdiction over electricity.

In February, as we learned of the severity of the winter storm that was heading our way, my fellow commissioners and I convened an emergency meeting to prioritize human needs customers above all else for natural gas delivery. Safety is our number one priority at the commission. So homes, hospitals, schools, and churches were granted priority status under our emergency amendment to the gas curtailment order.

As the situation developed and further need was identified, we waived transport requirements for out-of-State alternative fuel haulers to allow expedited access for Texans, should our State supply need to be supplemented. We authorized local distribution companies, or LDCs, to track and account for extraordinary expenses as a result of the storm including but not limited to gas costs and transportation costs.

This agency is committed to preventing undue financial burden on LDC customers and this instruction will allow us to collect the data we need to help prevent that from happening and we provided alternative options for saltwater disposal companies, while maintaining our environmental safety standards to prevent wastewater from becoming a hazard in the freezing weather.

The commission continues to communicate with both operators and legislators. We are working with stakeholders to collect and analyze data in an effort to prevent high consumer gas bills. We've been in constant communication with legislators at the State capital to offer reasonable and responsible recommendations.

These include, first, formalizing TERC, the Texas Energy Reliability Council, an ad hoc group made up of industry professionals, agency leaders, and key agency staff. The council's purpose is to streamline communication during an event, and this organization should be formalized.

Second, the Railroad Commission has proposed a mapping committee to overlay critical natural gas production infrastructure with the ERCOT and PUC grid to ensure that power is not cut off at critical facilities.

Third, the Railroad Commission will hold a hearing to update the 1972 natural gas curtailment order to reflect the modern-day needs of the State.

The final recommendation would require natural gas-fired power plants to secure firm gas contracts from their suppliers. When reliability is crucial, allowing interruptible supply contracts at power-producing facilities should be reevaluated by the legislature. The Texas legislature's currently deliberating these proposals, among many others.

As the storm sat over Texas, wind, solar, coal, nuclear, oil, and natural gas all experienced challenges. Through numerous conversations with the oil and gas industry and operators, we learned of frozen roadways preventing crews from accessing the fields.

But the number one problem we heard reported from operators was the lack of power at the production sites.

As outages spread across the State, operators were unable to keep their systems functioning as power was cut. Some operators did need to preemptively shutter their wells for safety and well integrity purposes prior to the storm beginning as early as February 9.

Starting on Tuesday, February 16, as it was safe to return to the oil fields, crews arrived to find that their facilities were experiencing electricity outages. The oil fields simply cannot run without power, making electricity the best winterization tool.

Working along with industry partners, we were able to directly communicate with the chairwoman of the PUC, as well as electric transmission and distribution companies, and provide specific coordinates for areas and facilities to have power restored and get gas flowing again. As operators got back online, storage capacity across the State was depleted to keep supply up. Continuous communication with our partners at TERC served to expedite solutions. Daily communications between regulators, operators, and providers was critical to understanding storage withdrawals, supply needs, and infrastructure capabilities.

And for just one moment I'd like to highlight the overall success of our LDCs, our local distribution companies. They are the companies that provide gas directly to residential customers. If you have a gas-powered stove, fireplace furnace, heat, you're an LDC customer. As millions of homes lost electricity in Texas, only 2,153 LDC customers experienced service disruption. That means that 99.95 percent of all customers did not lose gas. 4.6 million households in Texas utilized natural gas in their homes, representing about 13 million Texans. And these families were able to continue to heat their home.

We look forward to continuing to work with the Texas legislature as we find real solutions to the challenges, and thank you for having me here today.

[The prepared statement of Ms. Craddick follows:]

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Ms. DeGette. I thank the gentlelady.

The chair's now pleased to recognize Mr. Shellenberger for 5 minutes.

Mr. Shellenberger, you're recognized.

TESTIMONY OF MICHAEL SHELLENBERGER

Mr. Shellenberger. Thank you and good morning, Chairperson DeGette, Leader Griffith, and members of the committee. I'm grateful to the committee for inviting my testimony.

In the past some have argued that variable renewable energies would make electricity service more reliable. This argument was that the distributed and localized production of renewable energy, the build-out of additional required transmission networks, and increased storage to smooth out fluctuating production would all make electricity service more reliable than depending on a small number of large, centralized power plants connected by a few major transmission lines.

But the recent power outages in Texas and California have challenged that argument. Adding more weather-dependent sources to electricity grids, all else being equal, might not in itself make electricity less reliable. But all else is not equal.

The significant integration of variable energies has led to the loss of traditional power plants and the construction of new transmission lines to weather-dependent energy projects that are unreliable in extreme weather events.

The policy interventions required to ensure friendly investment conditions for variable renewable energies, including the lowering of acceptable reserve margins or the counting of average contributions, even if reduced from variable renewals, are interfering

with grid resiliency. The roughly $50 billion spent on wind energy by Texans is 50 billion that did not go to winterizing equipment.

Weather dependency matters. When a continent-sized mass of freezing air moved all the way into Texas in February and remained there for several days, different energy sources performed differently, both absolutely and against expectations.

Consider the average performance for the different fuel types over all 4 days of the blackouts in Texas. During the 4 days of emergency operations during the cold snap from early February 15 to midnight, February 18, output levels of nuclear, natural gas, coal, and wind to the grid were 79 percent, 47 percent, 52 percent, and 14 percent respectively of winter-rated total installed capacity.

ERCOT in its pre-winter 2020 report on winter power availability for the 2020/2021 season expected some of the coal and gas fleet to experience winter outages, along with the loss of some capacity in normal winter high-demand periods with further losses in extreme weather. ERCOT also expected during peak demand events in winter to have power from wind represent about 27 percent of installed capacity. In its most severe appraisal of the loss of wind capacity, ERCOT expected 8 percent of wind power compared to capacity.

Therefore, here's the performance of nuclear, gas, coal, and wind over 4 days of emergency as compared to normal expected winter peak conditions: Nuclear, 79 percent, gas, 54 percent, coal, 58 percent, and wind, 50 percent. When examined this way, the issue of low wind and solar output during many hours of the emergency becomes more severe than previously reported. If ERCOT actually modelled simultaneous extreme loss of thermal generation, along with extreme low wind, it did not add the scenario to its winter adequacy report.

For nuclear, the lowest hourly value of production was 73 percent output

compared to installed capacity which is also 73 percent of expected based on winter adequacy reporting. For coal, it was 41 percent of total or 46 percent of winter adequacy expectations. For natural gas, it was 40 percent or 46 percent based on winter adequacy expectations. For wind, it was 2 percent or 9 percent of winter adequacy expectations.

The main implication of this reality has been left unsaid. Efforts to expand transmission for the purpose of increasing the use of variable renewable energy cannot be justified as a means of preventing power outages like the ones that occurred in Texas and California.

In a conference call with reporters last August that I was a part of, the main grid operator, the CEO of California's grid operator, said very clearly that the shortfall of power was due to lack of reliable power sources. It was not due to inadequate transmission or batteries. In fact, the grid operator said very clearly that those were not -- those would not have solved the problem.

So there's -- I think this is an issue that, chairperson and members of the committee, that has been the victim of a lot of mystification over many years. There is no emergent resiliency or reliability after making more parts of the system less reliable or less resilient.

More unreliable parts makes for a less reliable system. There is no -- nothing magical occurs from adding all of that variable renewable energy to having a reliable system.

So with that, I would thank the committee again for the time and for the opportunity to offer some of these, I hope, new facts into the conversation.

[The prepared statement of Mr. Shellenberger follows:]

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Ms. DeGette. Thank you so much.

The chair now is pleased to recognize Mr. Robb for 5 minutes.

TESTIMONY OF JAMES ROBB

Mr. Robb. Good morning, Chair DeGette, Ranking Member Griffith, and members of the committee.

And, Chair DeGette, I want to send my company's heartfelt condolences on the senseless events in Boulder earlier this week.

The recent tragic loss of lives and human suffering in Texas and the middle south States starkly demonstrate the essentiality of a reliable electric system. I appreciate the opportunity to be here today to put the recent events in Texas in a broader context.

Insufficient and inadequately weatherized generation in Texas and the middle south States has been a growing concern for us since 2012. After a cold weather event caused load shedding for 3 million customers in Texas in 2011, we developed a winter preparation guideline to focus industry on best practices and started conducting significant outreach on winter preparedness. We monitored performance, noted performance improvements, and made further recommendations after the 2014 polar vortex.

However, after another cold snap in the middle south resulted in unplanned load shedding in 2018, we concluded that severe cold in the south could no longer be treated as rare and that a mandatory and auditable approach to weatherization was required. As a result, NERC began the process of adding mandatory weatherization requirements into our mandatory reliability standards.

As you know, the FERC chairman and I have initiated a joint inquiry into the root causes of this most recent event. We're committed to quickly getting to the facts as to what actually happened, implementing appropriate measures within our authority, and communicating other implied actions to policymakers in industry.

Extreme weather, coupled with the growing reliance on variable and just-in-time resources, is stressing the electric system in new and different ways. As a result, we are developing more advanced ways to study energy supply risks.

NERC's reliability assessments are one important way we evaluate the performance of the grid, identify reliability trends, anticipate challenges, and provide a technical platform for important policy discussion. Along with Texas, our assessments consistently identify California and New England as regions particularly exposed to these dynamics.

Last August, a massive heat wave across the west caused an energy supply shortage in California in the early evening. Solar energy was ramping down, and the grid operator was unable to import power as planned due to high demand throughout the west. CAISO was forced to cut power to approximately 800,000 customers. This event reaffirms the increasing need for reliable ramping resources to balance variable generation and improve decimation of resource availability when the system is under stress.

In New England, cold weather exacerbates its dependence on limited pipeline capacity in a handful of critical fuel assets. An early January cold snap in 2018 led to natural gas shortages, and fuel oil was burned to preserve reliability. Had that cold snap not abated when it did, the fuel oil inventory would eventually have been exhausted. And ISO New England almost certainly would have needed to shed load. It was a classic near-miss event.

These issues that we've seen in Texas, California, and New England are the result of three major trends that are transforming the electricity industry. First, the system is decarbonizing rapidly. And this evolution is altering the operational characteristics of the grid.

Policies, economics, and market designs are resulting in significant retirements of traditional generation. New investment is increasingly focused owned developing carbon-free generation with variable production profiles. And in this resource mix, natural gas-fired generation is becoming ever more critical, both for bulk energy to be able to serve load, as well as balancing energy to support the integration of variable resources.

Second, the grid is becoming more distributed. The improved economics of solar is the key driver of this dynamic. And grid operators need more control of and visible into these resources than they have today.

And, third, the system is becoming increasingly digitized through smart meters and advanced control systems. These investments greatly enhance operational awareness and efficiency but at the cost of heightened exposure to cybersecurity risk.

In addition to the weatherization requirements that NERC is now proposing, I would like to leave this subcommittee with four main points to consider.

First, more investment in transmission and gas infrastructure is going to be needed to improve the resilience of the grid.

Next, the regulatory structure and oversight of natural gas supply for the purposes of electric generation needs to be rethought. The natural gas system was not built and operated with electric reliability first in mind. Policy action and legislation will likely be needed to assure reliable fuel supply for power generation. And as the critical balancing resource, gas is the fuel that keeps the lights on.

Third, the electric and natural gas systems need to plan for and be better prepared for extreme weather conditions which are, frankly, becoming more routine. Regulatory and market structures need to support this planning and a necessary investment to assure reliability.

And then, finally, investment in energy storage or alternative technology needs to be supported to have a viable alternative to natural gas for balancing variable resources. A technology which can be deployed cost effectively and at massive scale with adequate duration to deal with supply disruptions that could last for days, rather than hours, will be required.

Thank you again for the opportunity to be here today.

[The prepared statement of Mr. Robb follows:]

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Ms. DeGette. Thank you so much, Mr. Robb. I appreciate your testimony.

And I want to again thank all of the witnesses for being with us today.

It's now time for members to ask questions of our panel, and the chair will recognize herself first for 5 minutes.

I did appreciate the testimony of all of our witnesses and also the comments of our colleagues on both sides of the dais this morning. This is a complex issue and, as is often the tendency when something like this happens, people look at one thing to blame and I saw in the press a lot of people were blaming only renewable energy. But it's clear from the testimony today and the evidence as it's coming out this is a very complex issue.

And I want to start with you, Mr. Magness, because ERCOT has stated publicly that the recent extreme weather in Texas, quote, "caused many generating units across fuel types to trip offline and become unavailable." Isn't it true that during the extreme weather event natural gas, wind, coal, solar, and even nuclear power were forced offline?

Mr. Magness. Yes, Chairman, we did see --

Ms. DeGette. Thanks.

Mr. Magness. -- time where each one of those types of generation tripped offline.

Ms. DeGette. Thanks.

And, you know, as devastating as this was, I guess a lot of people were surprised because, Mayor, you were in the Texas legislature for more than 25 years and you said in your written testimony the magnitude -- and also today -- the magnitude of damages was foreseeable and preventible. The Texas grid must be designed -- that the full appreciation that climate change is real and extreme weather events can occur throughout the year.

Is it your view that Texas ignored these warnings and missed several opportunities to fortify the grid against the threat of extreme weather?

Mr. Turner. Madam Chair, the answer is yes. I was in the legislature when the winter storm occurred in 2011. In fact, I filed House bill 1986 that specifically would mandate the Public Utility Commission to have ERCOT have a sufficient reserve to prevent blackouts. That was in 2011. The bill was not --

Ms. DeGette. Thank you.

Mr. Robb, I understand that NERC has issued a series of recommendations in recent years, warning about reliable risks to the Texas grid including after the same storm that hit Texas in 2011. Now I know NERC's inquiry's ongoing. But based on the information you have, did Texas winterize its power infrastructure to the degree NERC had recommended after the 2011 storm?

Mr. Robb. Well, the inquiry will affirm this. But evidence would suggest absolutely not.

Ms. DeGette. Absolutely not.

Now, Mayor Turner, what do you think Texas needs to do going forward to make sure that it's prepared for the inevitable next storm?

Mr. Turner. It must build in resilience. I do agree, for example, infrastructure needs to be improved. It is outdated. I do agree we need to rely more on technology, and I do agree we need to have energy storage. But you have to factor into the equation that the storms are coming with greater frequency and greater intensity.

Ms. DeGette. Well, and, you know, that's my question is: What do cities need to do to and communities need to do to sort of harden their preparation for these coming storms?

Mr. Turner. And I will tell you we're not just relying on generators. We had a

number of generators at water waste facilities. When the grid failed, some of those generators didn't kick in. What we are doing now is looking at piloting micro grids that actually tie into the Texas grid, and they're always on. They never turn off. They're on 24/7. And so we are looking at power, utilizing that for our key infrastructure projects within the city facilities, as well as the low-income communities in the city.

RPTR ZAMORA

EDTR SECKMAN

[12:27 p.m.]

Ms. DeGette. Thank you.

And, finally, back to you, Mr. Robb, as extreme weather events become more common, the energy market is in the midst of a significant transition to cleaner and more renewable energy sources. I think several of the witnesses mentioned that. So, recognizing that reality, how can we account for the transition, particularly the increased use of renewables, as we consider how to make the grid more reliable and resilient going forward?

Mr. Robb. Well, the key to integrating large amounts of renewable resource is the balancing resource that picks up generation when the renewable resources can't perform because of weather conditions or what have you. And to date, the only real resource we have that can do that would either be hydro, as was mentioned earlier, or natural gas. And natural gas of those fuels is the most easily transported to where it is needed, so gas is the answer to making this transition work.

Ms. DeGette. Thank you.

And, you know, for all of you, we've experienced some of the same issues here in Colorado, and, as several people said, we've had them in California and many other places. It's a national issue with the grid that I'm hoping, as we develop an infrastructure bill, we can start to think about how we can harden the grid because we know the weather is getting more extreme.

With that, I'm delighted to recognize the ranking member, Mr. Griffith, for 5 minutes for his questioning.

Mr. Griffith. Thank you, Madam Chair.

Mr. Shellenberger, in your testimony, you highlight that significantly expanding variable renewables requires significantly expanding the size and complexity of the grid to make up for both variable energy supply and low-power density. You also note that the National Academies of Sciences has clearly and repeatedly said that complexity will make electricity grids less resilient, all else being equal, than simpler grids. How can we maintain grid resiliency while also building a diverse energy supply?

Mr. Shellenberger. Well, thank you for the question, Congressman. I think the first obvious thing is that we need a diversity of supply. I think it would be very risky and radical to depend entirely on natural gas and variable renewable energy sources. You know, the final comment I made was that, at their lowest, wind was 2 percent of Texas' electricity grid. Not all energy sources are the same. The fact that there was some failures among power plants is not the same as the essential weather dependence of some energy sources.

And I interviewed the authors of the three National Academies of Sciences reports. They stressed emphatically that complexity reduces resiliency, adding microgrids reduces resiliency, that these things have consequences. The more complex the grid, the more people are involved, the higher the costs.

I just will also mention, this talk, this idea that there is some inevitability to a transition towards variable renewable energy sources is incorrect. It is not shared by most energy experts. It is a consequence of policy choices. And if we want to have affordable, reliable, resilient electricity sources, we need reliable sources of electricity produced in large, efficient power plants, whether nuclear, natural gas, or coal.

And if we want sustainability, I think it's clear too that you need to have nuclear because, every time we shut down a nuclear plant, it's replaced by natural gas, carbon

emissions go up, prices go up. This has been proven now in California. It's been proven around the world. And now we have many nuclear plants across the United States that are at risk of shutting down prematurely and being replaced by natural gas, which would reduce resiliency and reliability, reduce affordability. And, in fact, I think this push to just continue to expand variable renewable energy sources would accelerate the premature and unnecessary closure of those power plants.

Mr. Griffith. All right. I appreciate that.

Madam Chair, I would like to insert into the record at the end of the hearing a chart on renewable generation in Texas from March 2021 from the Texas Synchrophasor Network created by Professor Mack Grady and Dr. Andrew Mattei -- if I spelled that correctly -- at Baylor University.

This chart shows how renewables in you ERCOT can swing from 10 to 60 percent of the total electricity generation. This huge variation exemplifies the challenge of integrating renewables onto the grid. One of the major issues that contributed in both California and Texas are blackouts.

Given, Dr. Shellenberger, or Mr. Shellenberger, given that more States are continuing to increase the percentage of renewable energy sources in their power grid systems, can you discuss the predictably -- unreliable -- but predictably unreliable properties of some renewables, especially during extreme weather?

Mr. Shellenberger. Well, sure. I mean, we saw in the power outage in California last summer, part of the reason it was such high demand for electricity was because it was so hot and demand for air-conditioning was so high. Those were the same conditions that meant the wind was not blowing. So we did not have wind energy resources available during that heat wave, and that means that more transmission lines to more wind farms would not have made any difference whatsoever.

Similar story in Texas, those very -- you have to look at the lowest output levels because that's the levels at which you are ultimately dependent on to avoid the cascading failures that everybody fears. So we saw in Texas, it reached 2 percent of its capacity whereas nuclear only went down to 73 percent. And the only reason we lost one of those reactors is because they had a sensor that was unnecessarily triggered by cold water and could actually be prevented in the future whereas the weather-dependent nature of wind, meaning it only produces electricity when the wind is blowing, is not fixable. You can weatherize the turbines, but they still depend on the wind energy.

Mr. Griffith. Yeah, I appreciate that. I read your book over the weekend. I was doing it an audio. I loved it so much I bought the hardback. And I appreciate you being here to testify today, and I look forward to chatting with you in the future.

And I yield back, Madam Chair.

Mr. Shellenberger. Thank you, sir.

Ms. DeGette. I thank the gentleman.

The chair now recognizes Chairman Pallone for 5 minutes.

The Chairman. Thank you, Madam Chair.

I'm going to try to get in three quick questions to three of you, but I wanted to say that while it's clear that the Texas electric grid was unprepared for the extreme winter storm last month, it's also evident that Texans were not adequately warned about the storm's potential impacts and were dangerously vulnerable to the storm's effects. I just got a text from Sheila Jackson Lee, Congresswoman Jackson Lee, mentioning how her low-income constituents are still suffering.

So, if I could ask, Mr. Magness, Texas Governor Abbott contends that ERCOT failed to adequately sound the alarm about the potential seriousness of the storm and how it might impact the public's power supply. You told the Texas legislature, and I quote, "We

weren't talking enough to those impacted by the outages."

So, Mr. Magness, what could ERCOT have done to better communicate with the public, and how can communication be improved in future extreme weather events? You've got about a minute to answer that.

Mr. Magness. Okay. Thank you, Mr. Chairman. And I think, you know, ERCOT communicates at, I'd say, three levels everyday we're talking, whether through our control room or through other mechanisms with the generators, with the transmission owners where we're doing the air traffic control. There was certainly a lot of communication going on with the industry about expectations, getting ready for the storm, knowing what we needed to do.

The second level is sort of more public communications from ERCOT the company. And we issued a press release the Thursday, I believe, about the 11th or -- the 11th, regarding the storm, calling out that it was -- you know, looked like it was going to be one of the most powerful winter storms we've seen in years and the concerns we had for the system.

We worked with the Governor's Office and the State Operations Center, appeared at the press conference with the governor this Saturday before the storm came in, so the warning that we were starting to see supply get outstripped by demand. And we issued a conservation notice the following day to try to urge Texans and, you know, amplify that as much as we could to conserve.

Now, the third level, I think, is the real challenge for us and where we need to see some change, which is when this became a public safety issue, when -- once the outages happened and then it became clear that we were not going to be able to get that generation back up as quickly as we'd anticipated, as quickly as it's always happened when we'd have these kind of rotating outages, understanding that there was a strong

need to get a public safety communication out very, very broadly to Texans to understand that this could go on for a while, and that's something that, you know, frankly we're going to need to work and the legislature has -- the House I know and Senate have filed bills in Texas to have some sort of weather amber alert or other, you know, broad notification when this becomes a public safety issue.

Because that's sort of well beyond the communications capabilities this company has, and it's a system that we think would be wise to set up so if we have these kind of weather emergencies in the future, that public safety word can get out a lot faster to supplement everything we're doing along with the company and with the media.

The Chairman. Thank you.

Let me go to Mr. Robb. I know you recommend in your testimony rethinking how we regulate and oversee natural gas use for electric generation, and is this even more important in light of what we saw recently in Texas? In a minute of less.

Mr. Robb. No, I think so. The natural gas system is designed primarily to meet the LDC load, as Commissioner Craddick mentioned, and it does that incredibly well. Natural -- power generation is not its first priority or has not been its first priority. Yet, at this point, the power generation is the fuel that keeps the lights on, as I have said.

There are multiple policies at multiple levels that need to be rethought. For example, when gas gets scarce, power generation is typically the first load to get interrupted to, again, to protect the LDC customer. The gas system is designed primarily to focus on high utilization of its assets, whereas the electric industry needs tremendous flexibility to meet increasingly rapid power plant ramp rates to accommodate generation.

Environmental policies typically preclude dual fuel use to have an onsite fuel to make up for any shortfall that the gas system can't deliver. Siting is really difficult. And we see places like New England, which desperately needs more pipeline or pipeline

infrastructure, they can't be built, they can't be sited, and they can't -- the public resistance is too great.

And the operational planning between the electric and gas system is not coordinated. For example, it's surprising that the TDSPs in Texas didn't know that they were shutting off power to compressor stations, if that indeed happened. Again, we'll find that out through our inquiry, but these are the examples of coordination that needs to happen because the systems are so inextricably intertwined at this point.

The Chairman. Thank you so much.

Thank you, Madam Chair.

Ms. DeGette. Thank you.

The chair now recognizes Mrs. Rodgers for 5 minutes.

Mrs. Rodgers. Thank you, Madam Chair.

NERC's written testimony examines bulk power system reliability through the lenses of recent extreme weather events, including a central U.S. cold weather event and the Western heat wave event of August 20, 2020. Mr. Robb, why is it important to examine bulk power system reliability through the lenses of recent extreme weather --

The Chairman. I knew we weren't going to get to the mayor. There was no way.

Mrs. Rodgers. Mr. Chairman?

Ms. DeGette. He's on mute now.

Mrs. Rodgers. Okay. And -- so just why is it important to examine that bulk power system reliability through the lens of recent extreme weather events and not just the Texas power failure?

Mr. Robb. Well, because I think this is a broader issue than just Texas. Texas may be the most dramatic recent example of extreme weather overwhelming the system,

but these extreme weather events are happening more frequently and more regularly and across the country. As you said, we've seen them in the middle South, we've seen them in the Northeast, we've seen them in Texas -- or in California.

And we need to expand our -- the range of scenarios that we plan for and operate to because, you know, as we found out in Texas, right, when the power is out for an extended period of time, that's a really bad period of time for the people who live there.

Mrs. Rodgers. Thank you. Yes.

Recent articles on the Texas power grid crisis point to insufficient weatherization across the entire energy systems supply, and this wasn't just a Texas problem. It's happening in neighboring States. Everything froze up, from the wind turbines to natural gas to the compressor stations. It seems there needs to be a discussion around what types of energy equipment are weatherized and to what extent. We have to balance the cost and reliability and to take into consideration all the potential hazards and operating conditions.

Ms. Craddick, the Federal Government has no role over energy production on State and private land. That's the responsibility of the Texas Railroad Commission. Given your jurisdiction over natural gas supply, what did you hear from those companies about the difficulties in weatherizing the production wells and processing equipment?

Ms. Craddick. Well, the bottom line has been when the power went off, it is difficult to weatherize, right. You -- we've heard about putting a heat strip on. Okay, a heat strip requires electricity to run. We've heard about compressors being off in the field. You require electricity for those compressors.

So we had a whole conversation, and I think that was where the challenge has been for our State and where we as an agency believe and already have a lot of the system online available that mapping so people will know where critical infrastructure is

would be very helpful.

We had a conversation with ERCOT and PUC on the 16th in a phone call that they said they didn't realize how integrated we all were, and that they didn't know they needed to turn back on the oil fields for us to flow gas.

So I think that's a -- something we've learned that is going to be very important long term for us to make sure that we've identified better critical infrastructure, even ERCOT's form that nobody knew to fill out, that we didn't know until that Tuesday, Wednesday, did not put oil fields and specs specifically precluded oil fields and oil from being in the -- and natural gas fields from being on that list. So hopefully they're --

Mrs. Rodgers. Thank you.

Ms. Craddick. -- going to prioritize. Thank you.

Mrs. Rodgers. Good. Would you speak to how energy producers coordinate with the gas power plants, and what's the role of the Railroad Commission?

Ms. Craddick. Actually, we -- it's a private contract, so we do not -- don't have those conversations between a power producer versus our gas operators. Those are private contracts.

Mrs. Rodgers. Okay. Thank you.

Mr. Shellenberger, with all the new capacity being added in Texas, do you believe it makes it easier or harder to prevent blackouts?

Mr. Shellenberger. Well, unfortunately, it will make it harder because we're just -- the Texas is just planning on adding more variable renewable energy sources and natural gas, so it increases -- anytime you increase your over reliance on a single fuel, which is what you're effectively doing when you rely on gas, because we saw wind and when it goes to 2 percent of capacity, it's effectively unavailable at the time that you need it most.

So that is what concerns me about the situation is just the inadequate amount of reliable baseload capacity and this just growing reliance on unreliable sources of energy, which you can compensate for, but the only way to compensate for it is by keeping around baseload power plants. So the reason that Germany has been able to keep its electricity reliable is just -- while it's doing a lot of renewables is just by keeping its coal plants operating.

Mrs. Rodgers. And what about the impact on nuclear plants in Texas?

Mr. Shellenberger. Well, we're very concerned about all nuclear plants because they don't get the heavy production subsidies that renewables get.

Mrs. Rodgers. Okay. Thank you.

Thank you, everyone. I yield back.

Ms. DeGette. I thank the gentlelady.

The chair now recognizes Ms. Kuster for 5 minutes.

Ms. Kuster. Thank you, Madam Chair, and thank you for holding this important oversight hearing. Excuse me. Oh, dear. My apologies. Oh, I'm sorry, Madam Chair. I am going to have to pull up my remarks, I apologize. If you'd like to go to the next person, Madam Chair, I'll come back. I apologize.

Ms. DeGette. Okay. Miss Rice, are you prepared?

Miss Rice. Yes. Thank you, Madam Chair.

Ms. DeGette. Okay. We'll recognize you for 5 minutes.

Miss Rice. Okay. Extreme weather events pose significant challenges across the country not just in Texas. But in the case of Texas, what's particularly troubling to me is the fact that warning signs were missed, and there were opportunities to avoid the worst effects of the recent catastrophe.

Mr. Robb, in 2011, we talked about a prior severe winter storm that hit Texas

which caused extensive power disruptions. And after that, NERC and FERC issued a report offering recommendations on cold weather preparedness including winterization best practices. It was notable that the report concluded the single largest problem during the cold weather event was the freezing of instrumentation and equipment.

So, Mr. Robb, it sounds like this same problem may have persisted 10 years later in this most recent storm that we're talking about. So did Texas miss opportunities to make its grid more resilient to extreme winter weather?

Mr. Robb. Yeah, I think the answer is yes. The report that we put out in 2011 called for very clear freeze protection on the generating plants and raised the issue as to whether that should extend into the natural gas supply as well. And what I understand Texas did was to put in place legislation that required weatherization but not to a specific level, and it was not an aggressively enforced standard. I think it was spot checked, and enforcement against that was relatively modest, is my understanding.

Miss Rice. Is there --

Mr. Robb. That's one of the reason why we're -- I'm sorry.

Miss Rice. No, no, go ahead.

Mr. Robb. No, I said that's one of the reasons why, after the 2018 event, we concluded that we needed to move to a mandatory freeze protection standard for equipment and to have that be monitored and enforced by us.

Miss Rice. Well, had they made those -- taken those recommendations, the specific ones that were recommended post-2011, would that have -- what would that impact have been last February, this past February?

Mr. Robb. It's hard to say. I think it clearly would have mitigated what we would've seen in Texas, but our inquiry will shed some light as to, again, why wasn't the generation there, and had it been winterized to the level that we had talked about in

2011, would it have been? That's the core question that we need to answer in this inquiry.

Miss Rice. Okay.

Mr. Magness, in its most recent winter reliability assessment, NERC warned of the potential for extreme generation resource outages in ERCOT due to severe winter weather, which is precisely what happened last month when nearly 50 percent of Texas' power generation was forced offline at one point. In light of these warnings, what more could ERCOT have done to prepare?

Mr. Magness. Well, certainly, every winter, we have -- we undertake efforts, and some of these are based on the recommendations in the 2011 NERC report. While the mandatory winterization was not authorized by our legislature, as has been pointed out, a number of the actions that ERCOT has taken, that our market has taken, including having winterization workshops, having spot checks for winterization issues at power plants and, you know, making recommendations for things they can be doing, including changes that we made internally to make sure that everyone is trained for emergencies in the winter context, changes in our ancillary services and other sort of technical components, making sure that the temperature limits on units are baked into our models, a lot of these things have been undertaken, as well as looking at severe weather scenarios in our seasonal assessment of resource adequacy.

So a number of steps are taken each winter to get ready. One of the things is, our meteorologist reported in November, we expected to see at some point in the winter, a very harsh storm. We couldn't predict exactly the nature of what it would be. But, certainly, the activities that generators have undertaken over the past few years, based a lot on performing many of the recommendations of the 2011 report, have shown some progress.

For example, the second coldest day after February 2nd of 2011 in Texas was in December of 2018. I think Mr. Robb mentioned the 2018 South Central event. And we saw outages, forced outages dramatically lower than we had seen in 2011. Similarly, in 2014, when the polar vortex hit Texas to some extent, we saw dramatically lower outages. So there appeared to be some evidence that these winterization efforts were, you know, taking effect and having an impact.

Now, that said, we did not anticipate, and we certain -- the generators who told us what to plan to have available in mid-February did not anticipate the kind of outages that we saw. And as Mr. Robb said, that merits, you know, very deep investigation into what happened. And if the things that we have done on winterization so far have not had the impact that are needed, I think that's why our legislature is looking at something else, some other approach that can ensure that we don't see this sort of impact again.

Miss Rice. Let's hope that that can be done in a nonpartisan way because this is an issue that must be addressed, and we all have to put the politics aside. I'm over my time, Madam Chairwoman. Thank you very much.

Ms. DeGette. Thank you so much.

The chair now recognizes Mr. Burgess for 5 minutes.

Mr. Burgess. Thank you. And just to -- this is a nonpartisan issue because deregulation of the electricity market in Texas actually was passed by the State legislature in 1999 when Democrats were in control of that body.

Mr. Magness, you've actually just answered most of the questions that I had for you that basically were the question of, what -- did weatherization occur following the 2011 blackouts? I think the evidence is that more can be done, more should be done, but we mustn't forget that, in Texas, most of our extreme weather is summer weather. It's hot weather. In fact, most of us don't move to Texas because of the cold weather.

We move to get away from the cold weather.

I remember very well in August of 2006, there was a high demand period at the end of April. It was kind of early in the summer season, and that put an extreme strain upon ERCOT to the point where Governor Perry at the time recommended building, I forget the number, but it was a substantial number of new, modern coal-fired power plants, and of course he was rebuffed in that effort.

Mayor Miller of Dallas, Mayor Bill White of Houston, Mr. Turner's predecessor, strongly objected to the creation of any more coal-fired power plants in Texas. But it's just that diversification and that resiliency that Mr. Shellenberger has talked so much about that I think might have prevented some of the problems that we encountered. You know, you can only winterize so much and for so many storms.

Madam Chair, I am going to ask unanimous consent to insert into the record a Texas Tribune article that outlines the work being done in Texas in the legislature, along with several bills that would address this crisis at the State level.

Ms. DeGette. As the ranking member said, we will consider all of these requests at the end of the hearing.

Mr. Burgess. Very well. And let me just ask, Mr. Robb, do the Federal grid reliability standards apply to ERCOT?

Mr. Robb. They do.

Mr. Burgess. And would more interconnection between ERCOT and the Eastern or Western grids have prevented the problems that we saw last month?

Mr. Robb. That question is complicated and would require a fair amount of study. What I can say is what I understand, is that the interties between the -- the small interties between Texas and the Eastern and Western grid were closed with very little power was flowing over them. But I think Mr. Magness can probably confirm that view.

Mr. Burgess. Well, in fact, I do recall Mr. Magness' organization putting on a statement on Saturday -- this crisis, of course, began at 1 o'clock in the morning on Monday -- but on Saturday that ERCOT was purchasing power from the Southwest Power Pool as well as some power from northern Mexico. The problem is those areas got extremely cold as well Sunday night, and, as a consequence, I imagine that there was no further power available for purchase. Is that basically correct, Mr. Magness?

Mr. Magness. Yes, Dr. Burgess. We had some minor imports from Mexico and from the Eastern interconnection, but you're connect, the other grid operators that operate in Texas, the Southwest Power Pool and the Mid-Continent Independent System Operator, both ended up experiencing rotating outages during some point of the winter storms.

So there was just -- that storm was of a size and scope that there was just no available power to be imported or exported during that time. So, for this particular one, both Mexico and the U.S. grids, there wasn't a lot of relief available.

Mr. Burgess. Right.

And, Mr. Robb, let me just ask you as a final question, are there any electric grids around the country that are invulnerable to extreme weather events, whether hot or cold?

Mr. Robb. I would say, no.

Mr. Burgess. Yeah, I think that's right. So -- and maybe this is a question for Mr. Shellenberger. You know, we talked about this being an unprecedented event, but, in fact, we had a very bad event, cold weather event in 2011, one in 1983. We had the hot weather event that I referenced in 2006. And, in fact, going back and looking at some of the writings of meteorologists, there was actually a very similar occurrence in Texas in the 1890s. So it's not new that it gets that cold in Texas. What's different is

we have so many more people living in Texas and so many more people depending upon the grid. But could you speak to that, Mr. Shellenberger?

Mr. Shellenberger. Yeah. Thank you, Congressman. You know, of course, if there had been bigger connections between Texas and those other places, all of that cheap Texas wind and that solar would have ended up undermining the economics of those plants during the good times that would've been needed in the emergency; important to understand that, I think.

But, yes, exactly, your point is well taken. I don't think we know whether or not climate change played a role in these extreme events. There's just so few of them. No good scientist would look at an N of 3 or an N of 4 and try to suggest a trend.

Mr. Burgess. Excellent answer. Thank you.

I yield back, Madam Chair.

Ms. DeGette. I thank the gentleman.

The chair now goes back to Ms. Kuster for 5 minutes.

Ms. Kuster. Thank you very much, Madam Chair, and I apologize. Great to be with you. This is an important hearing about the Texas grid failure, a tragic event resulting in the death of over 40 -- 30 fellow Americans.

The blackouts that occurred across Texas and much of South Central United States were extreme in many ways, most notably because they were entirely preventable if precautions and preparation had been prioritized. The power didn't just go out; it went out for days during one of the coldest weeks of the year. When millions of people go this long without power in subfreezing temperatures, there's no disputing that things went seriously wrong.

In New Hampshire, we had more than our fair share of subfreezing days in the winter, and, yes, the power does go out from time to time when there's high wind or ice

storms. But the failure of Texas' deregulated energy grid poses serious questions that the subcommittee must examine going forward. I think I speak for many people when I say simply, how could this have happened in the United States of America?

So, Mr. Magness, 5 days before the storm began hammering Texas, ERCOT held a board meeting, during which you stated, and I quote, "We're ready for the several days of pretty frigid temperatures to come our way." But, clearly, Texas was not ready. Why were ERCOT and the State's power generators so unprepared for this storm?

Mr. Magness. From ERCOT's perspective, we were beginning a process on the 8th, actually, the day before that board meeting, of talking with the generators, talking with the transmission providers to make sure as much as we could that they knew this storm was coming and to be ready. And by the time the storm came in, they certainly did.

Sunday night we had the highest winter peak we had ever had, breaking a prior peak by a few thousand megawatts, and the system was there to serve it. We had told everyone to anticipate -- and I mean at, you know, at our State Operations Center and elsewhere -- to anticipate there could be rotating outages Monday morning and Tuesday morning based on the demand we saw and the supply we expected to have.

But what we saw later in the evening, after we got over that peak and served more power in Texas in the winter than we ever have, was an enormous drop in generation as the storm came into Texas. So the root causes of why that generation came off and stayed off for as long as it did are the subject of some data that we're gathering that we hope to be able to finalize the data gathering effort and get it out to the public hopefully next week.

To answer that why question because these were power units that told ERCOT we're going to be there for the highest load that you expect. There may have to be

some rotating outages but not the kind of loss of almost half the generation fleet that we saw. So it's an analysis of that root cause of why the problem was as large as it was that we need to investigate. But, certainly, coming into the storm, we saw that we were facing something like we had never seen, and it may cause shortages that would require some outages, just nothing like the loss of generation that we experienced.

Ms. Kuster. And can we ask that you provide that to this subcommittee as well for our further investigation?

Mr. Magness. I certainly will, yes.

Ms. Kuster. Mr. Turner, Mayor Turner, I understand you were in the command center during winter storm. Can you describe for us what issues you were seeing in the command center and exactly what went wrong?

Mayor Turner. And let me just say what we were told even on Sunday, we were told that there would be rolling blackouts that would last no more than 1 to 2 hours. And at a press conference at 5 p.m. on Sunday, that's what we told the people in the Houston region. That information was provided to us from the power companies, rolling blackouts, 1 to 2 hours.

On Monday morning at 2 o'clock, when the power went out, for most Houstonians they thought it was only going to be out for 1 to 2 hours. These were not rolling blackouts. These were power outages that lasted for 3 to 4 days. You cannot prepare for this sort of winter storm in 5 days. The State of Texas failed to do it over 10 years.

And the system that we have in Texas is a market-driven system, and they were hoping that by allowing the power generators to increase their charges per megawatt over the last 10 years, that they would have built in resilience into their system. That did not happen. There was not enough supply, and in Texas, it's ERCOT.

It's -- 90 percent of our Texas grid is a closed system. The only city in a sense that didn't

experience what the rest of us experienced in Texas was El Paso because they upgraded their system, and they were able to pull power from another source.

And last thing, and I have to say this, because I oversaw the electric utility market in the State of Texas for 23 of my 27 years in the legislature, okay: Your natural gas plant, your coal-fired plants, and your nuclear plants went offline. That represents well about 65 to 67 percent of your electricity market, your power. You cannot blame this on renewables. You absolutely cannot. That's a false issue.

Ms. Kuster. Well, thank you very much, Mr. Mayor. I've gone over time, and I yield back to the chair.

Ms. DeGette. I thank the gentlelady.

The chair now recognizes Mr. McKinley for 5 minutes.

Mr. McKinley. Thank you, Madam Chair.

And to, Mr. Shellenberger, I'm going to address my questions to you, but I wanted you to know upfront, I just ordered your book this week. I've heard some great raves about that, so I wanted to see what's in this.

So, listen, my point is to lead in the questions is that these recent extreme weather events across Texas and the Midwest have highlighted this need to focus on grid reliability and resilience. But keep in mind, other areas of the country share these same concerns, so this is not -- we want to take what we learned from Texas and apply that elsewhere.

Keep in mind, one, a 2020 National Security Council memo stated that secure, onsite fuel supply, specifically coal and nuclear, are essential to the Nation's critical energy infrastructure. A 2018 report from the National Energy and Technology Laboratory, NETL, without the resilience of coal, the eastern U.S. would have suffered widespread blackouts during the 2018 bomb cycle. And ISO New England said their

most significant -- the most significant resilient challenge is fuel security, and coal and nuclear power plants are needed to maintain reliability.

So trying to apply this lesson we have seen in Texas, and all these other reports I want to go down because there is a statement that has been -- there's a general consensus that we can't get to net zero in this country without having carbon capture.

So my question to you, Mr. Shellenberger, do you expect that we'll get carbon capture by 2030 in a commercial grade technology?

Mr. Shellenberger. Thank you, Congressman, for the questions. You're absolutely spot on. You must have fuel availability. This is essential for any kind of disaster and resilience, which is recovery from power outages and extreme events. You know, if you're going to shut down all of our -- if we're going to shut down all of our nuclear plants, which are 20 percent of our electricity, then we better keep our coal plants around. And I say this as somebody that has long advocated the transition from coal to natural gas and nuclear, but nonetheless, when --

Mr. McKinley. Thank you. I've got a couple more questions to you on this thing.

Mr. Shellenberger. Sorry.

Mr. McKinley. So, obviously, you understand the 80 percent by 2030 and 100 percent by 2035. So the power that was generated that coal provided during the cold snap, that saved Texas. I think in your testimony you said the electricity that coal provided during the cold snap saved Texas from more widespread blackouts and lowered fatalities. I thank you for that.

So, if we don't have carbon capture by 2030 and the Democrats and President Biden are successfully in decarbonizing our power grid by then, could America be experiencing -- should we experience more -- plan to experience more blackouts and

fatalities?

Mr. Shellenberger. Yeah. I mean, the risk of becoming over dependent on natural gas, I think, is very real. That's what would be occurring if we phased out our nuclear and coal plants, so, yes, that would be a significant concern.

Mr. McKinley. Okay.

Mr. Shellenberger. The alternative is much more expensive electricity.

Mr. McKinley. The RTOs, the regional transportation organizations, are enduring all these severe weathers are becoming increasingly more using coal during these -- like in 2019, MISO increased its use of coal by 50 percent, PJM by 40 percent. In 2018, coal increased in MISO by 51 percent, PJM by 40. So how are they going to respond if we don't have -- if these coal-fired power plants are shuttered and the nuclear plants are no longer available? How is RGOs going to respond?

Mr. Shellenberger. Well, what they're saying is that they're going to -- they're encouraging a significant purchase of batteries, but most people don't think that that's going to provide any significant quantity of seasonal storage, so it just means we're becoming more dependent on gas.

Mr. McKinley. Well, let my chat on that. So the battery storage, we're going to be relying on battery storage for our utilities, but yet we're also trying to move over to electric vehicles by 2035. We're trying to get to all our cars are being driven by batteries.

So my question, if we've got these two competing forces, the auto manufacturers trying to find the critical ingredients, the lithium, cobalt, lead, nickel, that's needed in the battery and the utilities are trying to find it, isn't that going to drive up the price of batteries in this country? So, for car owners, they're going to pay more for it, or utilities are going to pay more for utilities? Isn't that going to put competition between the two

for the higher price? So didn't we learn anything from PPE when we were competing for the plastics?

Mr. Shellenberger. Absolutely, sir. I mean, I think most experts agree that significantly increasing electric vehicle and battery consumption would significantly impact materials, demand, and prices. And, of course, if we do move either to fuel-cell vehicles or electric vehicles, we're talking about something close to a doubling of total electricity demand.

Mr. McKinley. And that opens up a whole other can of worms. So I thank you for that, and I yield back my time.

Mr. Peters. [Presiding.] Madam Chair, are you --

Ms. Schakowsky. Well, I could call on myself.

Mr. Peters. I'll recognize as vice chair Ms. Schakowsky for 5 minutes.

Ms. Schakowsky. Thank you, Mr. Vice Chair. I appreciate it.

So, Mayor Turner, I just want to express how sorry I am that your city is once again reeling from an extreme weather event, and it looks like, as you said, that it's almost every year over the last 5 years. And it appears that this one was entirely foreseeable and preventable if action had been taken earlier.

So I want to ask you, in the time that has elapsed, which is only really a little over a month now, but yet only 11 months until next winter or even earlier next winter, that problems are going to occur. And I want to know what you are hoping to see between now and next winter? And what are the things that are happening now, right now, and what needs to be happening right now, and tell us if it is?

Mayor Turner. Well, one thing, and I think -- and Mr. Magness I know will agree, and that is the Texas grid is designed for the summer heat. It is not designed for winter storm. And I am hopeful that before the Texas legislature ends, that unlike 2011 and

the years in between, that there will be substantive reform made to our system, that we will build in resilience.

Having said that, what we are doing locally is that we are focusing on resilience and redundancy, that just in case this should happen, a winter storm comes again, that on the local level we're making sure that we protect our water and wastewater treatment facilities, our police stations, that we make sure that we maintain water pressure so that our firefighters can fight fires.

And in this particular storm what I do want to note, there were hospitals throughout the city of Houston that did not even have enough water for their chillers to keep their patients warm. Our fire departments were having to take waters to the hospitals just to keep the patients warm in the hospitals.

So we are building in redundancy within all of our major facilities. And then, at the same time, in our communities that are very at risk and vulnerable, we want to make sure that we are doing everything we can to build some redundancy into those key assets in these communities. We're doing that now.

Ms. Schakowsky. Thank you so much.

Mr. Magness, in recent testimony that you had before the Texas legislature, you suggested that you didn't think you would have done anything different during the crisis. And so I'm asking now that you've had more time to reflect, do you think there is anything that ERCOT could have done differently, and what lessons have you learned on how to do better in a similar situation?

Mr. Magness. Thank you, Congresswoman.

And I regret if I didn't mention this to the Texas legislature, but I think the communication during that time, and Mayor Turner mentioned it, when it became clear that these outages could not rotate because they were so large and so extensive, the

communication and the understanding that that's the situation people are going to be in and the public safety communication that could've come from that is something that I think will be critical in the future, and something that I, as I look back, those times when we saw how large this would be and began to understand how long it would last, the communications around that I think we certainly could've done better and hope to advance that in the future.

Ms. Schakowsky. Well, I thank you for that and that you do find some things that could be done better.

Chairman Craddick, Craddick, I'm sorry, in your testimony, you contend that natural gas production and the frozen transmission pipes, quote, were not the problem that was caused. Do you still think that, that there was no problem with that?

Ms. Craddick. I believe that transmission pipes are in the ground, and that's natural insulation. Where we do have some challenges when you had the electricity roll off into fields and across the State, then we did have problems with compressors that are electric compressors and/or natural gas compressors. Look, you can't move stuff in a pipe if you've got -- in a compressor without electricity, so, but the pipes themselves did not freeze, and I think that's been a miscommunication across the -- when you've looked at the press communication.

Ms. Schakowsky. But there were some problems. And I just wanted to end with this in saying I think everyone has to fess up to the ways that it can be done better and to get to work right now to make sure that we don't have another situation next year.

And I thank you, Madam Chair, and I yield back.

Ms. DeGette. [Presiding.] I thank the gentlelady. And I'm back too. Thanks for carrying on without me.

I'm now going to recognize Mr. Long for 5 minutes.

Mr. Long. Thank you, Madam Chair.

And thank you all for being here today. I don't know how many of you the name Kohlberg, Kravis & Roberts means anything, but Mr. Turner said earlier -- my question is for Mr. Shellenberger, but Mr. Turner said a while ago that you cannot prepare for an event like this in 5 days. You might have been able to prepare for it in 14 years, though, and that's kind of my question today, Mr. Shellenberger.

In your testimony, you emphasized that efforts to expand transmission for the purposes of increasing use of variable renewable energy cannot be justified as a means of preventing power outages like the ones that occurred in Texas and California.

Take you back to 2007, Texas Pacific, and Kohlberg, Kravis & Roberts, the famous KKR, purchased Texas Utility Corporation and agreed to terminate 8 of 11 proposed coal-fired power plants. And I bet a lot of folks in Texas would have loved to have those extra eight coal-fired power plants on during this latest event that you were not able to prepare for within 5 days. But they did that in Texas due to pressure from environmental groups. The agreement also included the company's pledge to double the purchase of wind power.

How effective are wind and solar resources during storms like we've seen in Texas and California, Mr. Shellenberger?

Mr. Shellenberger. Well, thank you, Congressman, for the question. I think it's a very important one. I think we're hearing -- I heard from the mayor of Texas -- the mayor of Houston, rather, that they're focused on deploying solar and wind but also very concerned about power outages. Well, you can't have it both ways. You can't -- we can't rely on solar and wind.

We saw that at its lowest level -- and this effort to conflate weather-dependent energies and non-weather-dependent energies I think is deeply misleading and troubling

and creates risks. At its lowest level, wind was producing 2 percent of its installed capacity. At nuclear's lowest level it was producing 73 percent, and that's due to the nonexistence of wind.

So, yes, to your point, sir, I mean obviously, you know, weatherization and winterization needed to occur with all of the power plants. But this essential question of the weather-dependent nature of these technologies cannot be waved away. This idea that they're sort of -- it's like a minor thing or something or the idea that there's some sort of -- that it's a matter of quantity rather than of quality, that's not a view shared by any major energy experts. The essential variability is what makes it so dangerous to rely on those energy technologies alone.

Mr. Long. Before I got on this Zoom hearing I was on a Zoom call with our Missouri utility co-ops, and they did not have any blackouts, brownouts here in Missouri in our utility co-ops, and we got down to 13 to 15 below. One report said 13; one said 15. I know that it was colder than anything I've experienced in my 65 years in southwest Missouri. Some of our city utilities, municipal-owned utilities did have rolling blackouts.

And, Mr. Shellenberger, with you again, I spoke with a lot of my utilities in my district over the last couple weeks because the storms also brought, as I mentioned, the 13-below temperatures here at our State. They said on a normal day they receive 25 percent of their energy from renewable resources, but during the cold streak, that number went from 25 percent to 3 percent. How did the wind power generation in Texas compare to that of baseload generation like nuclear and coal during the storm?

Mr. Shellenberger. Thank you, Congressman. It's absolutely right. You know, I pointed out that, as compared to normal expected winter peak conditions, nuclear performed at 79 percent, coal at 58 percent, and wind at 50 percent, but you have to look at the lowest hourly output, the lowest output, because if you don't look at that number,

then you're not paying attention to the major issue, which is that you just lacked sufficient supply. And so the lowest level, what wind went to, was 2 percent of its total capacity, 9 percent of winter adequacy expectations; nuclear was at 73; coal was at 40; natural gas was at 40 or 46 under winter adequacy.

So I think this is what -- I mean, I -- civilization depends on reliable electricity. I think everybody agrees with that, but then you need -- people need to explain how it is that variable renewable energy sources, which are weather dependent, are -- somehow add up to being reliable and resilient at grid levels. They don't. It actually just adds up to less reliability and less resilience, all else being equal.

Mr. Long. I have no doubt that someday we'll get there with all the renewables, but today is not the day. And like I say, I think the folks in Texas would have loved having eight extra coal-fired power plants on during the latest event.

And, Madam Chair, I'm a few minutes -- few seconds over my time, and I yield back.

Ms. DeGette. Thank you.

The chair now recognizes Mr. Tonko for 5 minutes.

Mr. Tonko. Thank you, Madam Chair.

One factor frequently cited by experts for why the recent storm was so devastating is the lack of winterization of the Texas power plants, natural gas pipelines, and other power infrastructure. Winterizing these assets would better protect them from potentially failing during extreme cold weather and would make the grid in Texas more resilient overall. The Governor of Texas has now called on the State legislature to mandate the winterization of its power system.

So, Mr. Robb, NERC has long recognized the risk that inadequate weatherization can pose to grid reliability. NERC is currently developing nationwide standards for

addressing cold weather events. So why did NERC choose to develop mandatory reliability standards for cold weather events rather than issue voluntary guidelines which had been NERC's previous approach?

Mr. Robb. Yeah, I think it became clear to us after the 2018 event, which is also in this part of the country, more in the Arkansas, Louisiana area, and east Texas, when we peeled that event apart in a joint inquiry with FERC we concluded that many of the precepts of the voluntary guidelines that we had in place were not being adhered to, and that's what motivated us to pivot to a mandatory structure.

Mr. Tonko. Thank you.

And, Mayor Turner, there are different estimates of what it would cost to fully weatherize the grid and energy sources, but failing to invest in the protection of these systems would also be costly. In fact, an early economic analysis projected that the total cost of this storm alone could be as high as $295 billion, more than Hurricanes Harvey and Ike combined.

So, Mr. Mayor, do you agree that it's long past time to make the necessary investments to better weatherize Texas -- the Texas grid?

Mayor Turner. Absolutely. And I will tell you that, when you track all of these storms, we've talked about the storm in 2011, the one in 2018, and now the one last month in 2021, and I do have to emphasize again, it is important to weatherize the grid, the system, because when you look at the plants that went offline, your natural gas plants went offline, your coal-fired plants went offline, and your nuclear plants went offline. As much -- we can talk about renewables. That's a red herring. But if everything was coal-fired and natural gas, they went offline.

Mr. Tonko. Well, that's an interesting point. Thank you.

Chairman Craddick, in your testimony, you assert that natural gas producers, and I

quote, were not the problem behind the power shortages. However, multiple natural gas producers reported to State authorities that their own equipment failed during the storm because of cold temperatures.

So, Madam Chair, given the devastation we've seen in Texas, isn't weatherization something that natural gas generators and operators need to at least consider?

Ms. Craddick. Well, we don't get involved with the generators, natural gas generators, so you'll have to ask NERC I think would be the appropriate person to ask as far as generators. Natural gas operators have advised us 82 percent of the people we have received information back from as we continue to analyze data, 82 percent of the operators who are drilling and work in the field with natural gas tell us that their biggest problem for not -- for going offline was no electricity in the field.

Mr. Tonko. Well, to protect the grid, we can and I believe we must ensure that our power infrastructure can withstand all types of extreme weather, including winter storms.

So, Mr. Magness, you recently said that Texas legislature should consider weatherization mandates and called the Texas Governor's decision to add that item to the emergency legislative session a good idea. So do you agree that it's finally time to better prepare the grid of Texas and energy infrastructure for severe cold weather conditions?

Mr. Magness. Yes, and there are bills going through the Texas House and I believe the Texas Senate currently that include increased weatherization mandates, and I think they certainly took up the Governor's call and are looking at that right now.

Mr. Tonko. But do you agree that it's finally time to better prepare the grid?

Mr. Magness. I think that the steps that have been taken so far, we saw progress in previous winter storms. But certainly what we saw this time as we learn what the

causes are, taking stronger steps to make sure those causes don't create additional problems in the future, yes, that would certainly help the grid reliability.

Mr. Tonko. So there is a need for better steps going forward?

Mr. Magness. I believe there are, yes.

Mr. Tonko. Okay. Well, I thank you.

And, Madam Chair, I yield back.

Ms. DeGette. I thank the gentleman.

The chair now recognizes Mr. Palmer for 5 minutes. Mr. Palmer, we can't hear you. We still can't hear you. Mr. Palmer, I'm going to go to Mr. Dunn, and then we'll come back to you. Okay.

Mr. Dunn, you're recognized for 5 minutes.

Mr. Dunn. Thank you very much, Chairwoman DeGette.

The Texas energy crisis should certainly serve as an important example for policymakers for years to come. In this hearing, we've spent time already focusing on what didn't work, and there is certainly plenty of material to work on there. I'd like to talk about one thing that largely did work, and that's nuclear energy.

During this crisis, three out of four nuclear reactors in Texas were able to remain online the entire time running at 100 percent capacity. And, ultimately, the problem that caused the one unit to fail was identified, solved, and it too was able to get back up and running while the freeze was still ongoing.

Further, during the historic 2011 freeze, none of the reactors experienced any interruption. We should all note how much worse these events would have been without the presence of nuclear energy in Texas. A firm and resilient baseload energy generation must be a priority for every State in the Union. We need to make it easier to keep our existing nuclear reactors online as well as construct new ones.

Mr. Shellenberger, briefly, can you explain how much worse this crisis could have been had Texas not had the benefit of its fleet of nuclear reactors?

Mr. Shellenberger. Thank you, Congressman, and you are absolutely correct.

And just to correct the mayor of Houston, no nuclear plant failed. A single reactor at one of Texas's nuclear plants tripped. And I would add something important I think for policymakers to understand is that the Nuclear Regulatory Commission has in its power to change the regulation so that that automatic tripping does not occur during such cold weather events, that it was a sensor that was triggered by cold water in tubing. It needs to be changed so that there would be a human to investigate whether there's a real problem or whether it was just unnecessarily tripped.

Each of these reactors provides electricity for somewhere around 1 million, 1.5 million Texans. So, if you consider having lost all four reactors, you're talking somewhere between 4 million to 6 million people additionally without power, and that would have obviously been catastrophic.

So I do think that you're right to point out that there is a significant difference here between weather-dependent energy sources and energy sources that are fundamentally not weather dependent. You can weatherize --

Mr. Dunn. Thank you for clarifying --

Mr. Shellenberger. -- a wind turbine, but you can't make the wind blow.

Mr. Dunn. I want to thank you for clarifying what happened there. I actually was -- that was a little fuzzy to me. I knew there was a sensor problem. I didn't know exactly what it was. Thank you for that.

Are you aware of any energy source that is more resilient than nuclear, particularly in the face of extreme weather events?

Mr. Shellenberger. No, sir. Coal obviously could be made weather -- much

more weather resilient. But nuclear overall is our -- by far our most sufficient source of energy. It's --

Mr. Dunn. We're going to run out of time, so I'm going to keep asking you questions if I could. As States begin to shift their energy portfolios to favor renewables, do you think that goal can be met without a strong presence of nuclear energy generation, particularly if you're concerned about carbon emissions?

And let me say, I count nuclear as a renewable too. I mean, we have massive quantities of nuclear waste that could and should be reprocessed and used for fuel as well as massive untapped radioactive minerals, not to mention the steam that's the principal product of the heat produced is renewable.

Mr. Shellenberger?

RPTR WARREN

EDTR HUMKE

[1:29 p.m.]

Mr. Shellenberger. Yeah, that's absolutely right.

If we lose 20 percent of our nuclear electricity, we're going to suffer affordability, reliability, sustainability. And also our national security will suffer.

So I think it's urgent. I think it's very risky to be -- for the -- to do legislation that would accelerate the closure of those plants, which is what some legislation proposed in the House would do, by so heavily favoring variable renewable energy sources.

So I think there's serious risks that could actually be exacerbated towards national security, affordability, reliability, and resiliency if some of this headlong push without a lot of thinking in advance continues towards greater weather dependent energy sources.

Mr. Dunn. I can't tell you how much I enjoy you choosing that term, "weather dependent" and "weather independent." That actually gets to the bottom line of our discussion on resiliency and security and, you know, baseload energy production. So thank you for your comments.

With that, Madam Chair, I yield back.

Ms. DeGette. I thank the gentleman.

The chair now recognizes Vice Chair Peters for 5 minutes.

Mr. Peters. Thank you, Madam Chair.

I wanted to direct questions to Mr. Robb. You know, in California we have seen a rash of devastating wildfires. And this year the committee held an important hearing on how these wildfires affect our power sector.

According to the most recent National Climate Assessment, the primary cause of

power outages in the U.S. is extreme weather -- wildfires, hurricanes, intense cold periods. And many of the events are expected to become more intense and frequent due to changes in our climate.

The Texas energy market has received a lot of praise for its deregulation, the simplicity of its reliance on price

singles in competition to provide power cost effectively but those market mechanisms never accounted for the possibility that the pipelines would freeze and it's pretty clear that market incentives didn't generate the investment needed to provide the necessary resiliency.

Mr. Robb, you indicated in response to Mr. Tonko's questions that you agree that there's a need for government to impose basic standards for resiliency on the electric and gas providers since the market forces themselves don't induce it.

Can you tell us what actions utilities and regional transmission organizations need to take to address climate change? Can you flesh that out a little bit for us?

Mr. Robb. Well, I -- sorry. Yeah, I guess I would say from a grid operations perspective is to have a very broad view as to the range of climate scenarios that you have to be prepared to serve, whether that's extreme hot weather in the summer, extreme cold weather in the winter, making sure that you have the resources lined up to be able to serve your customers during that period of time. That's where the main -- that would be the main thing I would focus on.

Mr. Peters. And any specific one or two things that Texas should have done in advance of a cold weather snap?

Mr. Robb. Well, I think the weatherization that we've talked about, both of the entire fleet of resources, because every resource had issue. Even the coal plants had issues with frozen coal piles. So coal is not the only way out of this box.

What I'm very concerned about though is the fuel side of this equation. One of the things that I think we've come to learn is that resources as we thought about them traditionally, we think about capacity being required. We haven't spent as much time thinking about the fuel behind them and the energy that they can produce.

I think one of the things that the grid operators need to start shifting their operating paradigm to, is to starting to think about, you know, seasonal energy planning and operating planning that takes into account fuel variability and fuel availability as well.

Mr. Peter. It's pretty clear to me that leaving that to the market alone isn't going to generate the incentive to give those investments. That's got to be -- that's got to come from some industry and government consensus. Correct?

Mr. Robb. I would leave it to market design experts to decide whether the markets could invent that kind of planning on their own.

Mr. Peters. Well, it's been ten years. And the market hasn't done it, despite knowing that this was coming.

Let me turn to Mayor Turner. The severe storm in Texas can't be classified as once in a century, and you've led Houston through multiple major storms including Hurricane Harvey in 2017. In your statement you say, quote, "The Texas grid must be designed with the full appreciation that the climate change is real and extreme weather events can occur throughout the year."

Mayor, what investments do you see that are necessary to improve Texas grid resiliency in the face of a changing climate? And when we think about investing in good resiliency more broadly, are there lessons all of us can learn from Texas?

Mr. Turner. And when I was in the Texas House back in 2011, what I said to the Public Utility Commission and to ERCOT and to our State leaders, I said, if we -- Texas was going to hold on to its closed grid, then we had to make sure that we had an adequate

reserve, an adequate power to meet these extreme weather events.

I agree with you over the last 10 years Texas simply relied on market incentives. There were no mandates. The hope was that the market incentives would incentivize the power generators to weatherize their system.

At this point the system -- the mandate must come in place. The system has to be weatherized and then we have to make sure to do everything we can to build in as much redundancy throughout our power generators, all the way to the end users, and that's what we're doing even on the local level. We have to make sure that we build in redundancy at the local end as well as from the State end.

Mr. Peters. And I agree. Mayor, I want to say I think that the Texas market, I like the way their market -- I understand their markets allocate resources in an efficient way and I think it's terrific that Texas has employed that power but that's only as far as it goes. And it hasn't -- it hasn't built in the need to do this resiliency investment and then --

Mr. Turner. And one other thing is that the hope was there was market incentive, the power generators would do it. But they're not going to produce power that people are not going to pay for. They're not going to do it and that was the hope and it did not happen.

Mr. Peters. Right. I agree.

Thank you, Madam Chair. I yield back.

Ms. DeGette. Thank you.

Mr. Palmer, let's try you again for 5 minutes.

Mr. Palmer. Am I on?

Ms. DeGette. Yes. Thanks.

Mr. Palmer. Great. I don't know what happened with my technology. It's not

working. It's kind of like the Texas power grid.

Mr. Shellenberger, some of my Democratic colleagues argue, if we don't convert to 100 percent renewables to get to zero CO2 emissions that we're going to face a worldwide climate catastrophe in 10 years. Is there any reasonable expectation that we can replace power generation in that -- and go completely to renewables in that timeframe?

Mr. Shellenberger. Absolutely not.

Mr. Palmer. Is there any reasonable expectation that -- is the fact that there's 1 billion people with little to no access to reliable power -- and that numerous people back that up -- could these people have a reasonable expectation that they will one day soon have access to reliable power generated entirely by renewables?

Mr. Shellenberger. No, sir.

Mr. Palmer. So they wouldn't have a reasonable expectation that they could only --

Mr. Shellenberger. In fact, the process of human development is moving from unreliable renewables mainly in the form of wood but also some amount of wind and water towards reliable energy sources. That's what the industrial revolution was all about.

Mr. Palmer. I'm not totally -- for the record, I'm not against renewables. I just want to make the point from an engineering and technological perspective that it's not possible to provide all of our energy through renewables. I agree with Bill Gates that our best solution is through nuclear.

We had a hearing I think it was yesterday. It may have been the day before yesterday. Former Secretary of Energy Ernest Moniz talked about the need to expedite our permitting for new construction. I pointed out that Pennsylvania's trying to build a

new rapid transit system, and it took them 8 years just to do the paperwork. Well, according to the climate catastrophe folks, that's 2 years short of the worldwide calamity just to do the paperwork.

I'd also like to point out. In regard to a number of people who attribute the polar vortex to climate change, it is a form of climate change. But this is not new. This was actually predicted in early January, as has been pointed out, but it -- the prediction was based on observation of atmospheric conditions that were very similar to the last major polar vortex on this magnitude that occurred in 1929. There was one that occurred in nine -- in 1887 in which the temperature in Lafayette, Louisiana -- Indiana, Lafayette, Indiana, went down to 33 below. It was first designated a polar vortex in 1843 and showed up in a English magazine, Household Words, which one of the editors was Charles Dickens, in 1853. These are not new.

You know, prior to coming to Congress and running a think tank, prior to that I worked for two engineering companies. And when we would -- when our structural engineers did engineering, for instance, they took into account earthquakes, for instance, or hurricanes and they designed the buildings to withstand certain seismic events or wind events. That's just part of understanding the history of weather, the history of natural disasters.

And we get into these brand new deal type things that really don't make a lot of sense in terms of, first of all, mitigating against the climate change that we know is going to occur without doing irreparable harm to the economy.

I'd like for you to comment on that, Mr. Shellenberger.

Mr. Shellenberger. Yeah, absolutely correct. May I point out Texas spent $50 billion on renewables rather than weatherizing its power generation sources. California spent $80 billion, rather than clearing the brush from around the electrical wires, which is

the main cause of power blackouts in 2019. And in 2020 it was energy shortfall.

So if you -- if we really think that extreme weather events are becoming more frequent, then why would we be moving towards weather -- more weather-dependent energy sources and shutting down our most efficient forms of energy including nuclear which also happens to be our largest source of zero carbon power?

So I think if we're going to be consistent here and if we're saying that we're committed to action on climate change, then you can't have it both ways. You can't be shutting down our nuclear plants and also preventing the building of new ones.

Mr. Palmer. I thank the gentleman for your work.

And, Chairman DeGette, I appreciate your indulgence with my technical difficulties.

I yield back.

Ms. DeGette. We're all having them today. So no worries.

The chair now recognizes Ms. Schrier for 5 minutes.

Ms. Schrier. Thank you, Madam Chair.

First, based on my colleagues' recent comments, I just feel compelled to clarify for the record that we Democrats do understand the importance of baseload for which hydropower and nuclear are critical. And it is misinformation to state otherwise. However, it is also misinformation to suggest that wind energy was primarily to blame for the outages.

So, Mayor Turner, your testimony makes clear that blaming renewables for the failure is blatantly false. Mayor Turner, isn't it true that all -- during storms all types of power generation underperformed in Texas?

Mr. Turner. Absolutely. Natural gas, coal, fire, what is it, new tripped? It didn't provide power. You can call it's failure, tripping. It doesn't matter. And

renewables in Texas account for only about 30 percent of our total energy portfolio.

Ms. Schrier. That's right. And during the winter, even less than that. Thank you very much for that clarification.

Mr. Robb, in your testimony you explained the diversification of our energy grids with more reliance on natural gas as we introduce additional renewable resources. And I know that in States like my State, Washington, we have been proactively thinking about weatherization and energy reliability requirements as we aim toward net zero by 2045.

You also highlight that extreme weather events are no longer rare, and they're no longer just in one area. They're everywhere. So it is clear that Texas will continue to experience cold snaps, hurricanes and other extreme weather events. We should expect this everywhere in the country.

And so as efforts are made to fortify our grid in the face of increasing extreme weather events, we have to be cognizant of our diverse and changing energy mix. Contingency plans currently in place like load shedding are not really sustainable as evidenced and don't ensure sustainable, diverse electric grids.

So, Mr. Robb, can you elaborate on the impact of this energy transition on grids' resiliency and reliability and also the importance of I'll call them beefy transmission lines that connect to States and what role NERC will play as Texas and our country fortify our energy grid?

Mr. Robb. Well, there's a lot in there. I'll step back and say that, as NERC, we are resource -- agnostic's not the right word but, you know, we don't select resources and we don't own assets. We don't own -- site transmissions and so forth. So our main focus is making sure that as this new mix of energy resources and transmission lines get developed that the system works, integrates well, maintains frequency, maintains voltage, and has the energy and the capacity to be able to serve load. That's where our

focus is going to remain, on the technical operability of the system.

Ms. Schrier. Thank you very much.

Now, Mayor Turner, Houston is known as the energy capital of the world and is also leading in the transition to cleaner energy. So, Mr. Turner, Mayor Turner, Mr. Shellenberger seems to imply that renewables only make the grid more unreliable and yet Texas has made a significant investment in renewables, getting nearly a quarter of its supply from that class of power generation, looking forward, understanding the future, knowing what we need to do and thinking about decarbonizing.

Do you agree with Mr. Shellenberger's assertion that renewables only make for a less reliable grid?

Mr. Turner. I disagree. Let me cite to you Houston is the fourth largest city in the country. 100 percent of our city facilities are powered by renewables, 100 percent. We purchase more renewables than any other city in the United States.

We are the energy capital of the world and we're proud of it and we are seeking to lead in energy transition and we are working with our energy industry partners like BP and Shell and NRG and CenterPoint. They underwrote our Resilient Houston plan, as well as our climate action plan.

Now we're focusing on climate tact and climate energy. Renewables are the way to get us to net zero. And bear in mind, the planet is getting warmer. The science is clear that these storms are going to continue to come unless we take proactive steps.

Ms. Schrier. I appreciate your comments there, because industry sees this as well. And they are getting in on this and understanding that we need an energy mix.

So given that, Mr. Magness, given the changing energy mix, what is ERCOT doing to ensure that Texas' power generation assets are reliable and can perform under extreme weather conditions? And then could you just comment on whether some

power sources are easier or cheaper to weatherize?

Ms. DeGette. If you can be brief, sir, because the gentlelady's time has expired.

Ms. Schrier. Apologies.

Mr. Magness. Sure. I guess the key thing for resilience I would say is having a diverse mix. The market in Texas has attracted a lot of wind, a lot of solar. But we have a lot of gas. We're led by gas. We have nuclear and coal. And I think overall having a mixture that can deliver in different types of weather situations, in different kinds of grid situations is the most important factor.

Ms. Schrier. Thank you.

And apologize for that indulgence.

I yield.

Ms. DeGette. I thank the gentlelady.

The chair now recognizes Mr. Joyce for 5 minutes.

Mr. Joyce. Thank you, Madam Chair. And thank you for convening this important hearing today.

Mr. Shellenberger, the recent event in Texas highlights the importance of natural gas for the grid. For example, certain renewables like wind power are not necessarily going to be there when you need them the most. And while I personally support clean energy on every level, given how much of the baseload is comprised of fossil fuels, because you can call on it whenever you need it, would you agree that we cannot transition away from fossil fuels without reliable backup power?

Mr. Shellenberger. Thank you, Congressman.

Yeah, absolutely I would agree. And just to correct something, if Houston were 100 percent reliable on solar and wind, then there would have been mass power outages, deaths, loss of hospitals, everything during that period. So the only way -- I'm not sure

what that even refers to but the only way you can have solar and wind is if have significant quantities of hydro, natural gas, or some other source of firming power.

Mr. Joyce. And continuing with natural gas production, if natural gas production was to drastically be reduced in the next several years, based on what you've personally seen in California, would you please describe the impact that you estimate that this would have on utility prices?

Mr. Shellenberger. Well, we've seen what's happened in California. And it's the same thing that's happened in Germany and everywhere else in the world that has done a significant deployment of weather-dependent energies. Our electricity prices went up eight times more than the rest of the United States since 2011. We spent about $80 billion on renewables and all of the accompanying equipment and personnel, rather than doing the work to reduce the risk of fire hazard and the risks of extreme weather events.

You know, obviously, you see the same thing in Texas. If you don't have sufficient amount of baseload reliable front power supply, you're going to have power outages. In California, we shut down our nuclear plant which was about 2,200 megawatts. It was about that amount of electricity that we had to load shed in California in order to avoid the cascading failures.

Mr. Joyce. Madam Chair, I ask unanimous consent that a recent article in the Wall Street Journal entitled, "Texas Blackouts Blew in on the Wind," be included for the record.

Ms. DeGette. And as with the other submissions, we will consider it at the end of the hearing.

Mr. Joyce. Thank you.

According to this article, during the storm in Texas, energy generated from wind

and solar decreased 52 percent, while the electricity generated from natural gas increased by 72 percent. Given this information, Mr. Shellenberger, would the situation in Texas have been prevented if the State solely relied on renewable sources?

Mr. Shellenberger. Absolutely not. I think the two numbers you have to keep in mind is at the lowest levels of production, wind produced 2 percent of its capacity in Texas. Nuclear produced 73 percent. This is not just a difference of quantity. This is a difference of quality. These are qualitatively different power sources.

One depends on when the wind is blowing or the sun is shining. The other one simply depends on weatherize equipment. If you weatherize all the wind turbines in Texas and the wind still doesn't below, you don't have wind energy.

This has been mystified, I think, by some ideas that somehow you can find solar and wind somewhere at some point. It's not true. It's also been mystified by the idea of batteries. They do not provide seasonal storage which is what Texas needed in order to get through the crisis.

So on the fundamental questions of the need for non-weather-dependent energies, there's no debate. I mean, nobody -- there's nobody that -- of major energy analytical significance who denies that.

Mr. Joyce. Could you summarize finally for the take-home message: Is the variability that we are reaching for in energy supplies, at this point in time does that variability lack reliability?

Mr. Shellenberger. It does. And I did want to mention that there is a way to maintain the grid's resilience and reliability, while adding a lot of variable renewable energy sources. And it's to do with what Germany has done which is to keep their coal power plants online, in part so they don't become overly dependent on imported Russian natural gas.

So you don't have to have an increasingly unreliable grid when you add a lot of weather-dependent renewables but it seems you have to keep some of the source baseload power on and, if it's not going to be nuclear, then it has to be coal and natural gas.

And I think it's just obvious to everybody that becoming over dependent on natural gas is extremely risky and very radical when it comes to the direction of electricity production.

Mr. Joyce. I see my time has expired. I thank you.

Madam Chair, I yield.

Ms. DeGette. I thank the gentleman.

The chair now recognizes Mrs. Trahan for 5 minutes.

Mrs. Trahan. Thank you, Madam Chair.

Many Texans have indicated that they were unprepared for this storm and the resulting disruptions, in part because they were not adequately warned of what was coming their way.

Mayor Turner, even as ERCOT was telling the public to conserve energy in a statement released hours before the outages began, ERCOT was still maintained. It had, quote, "the tools and procedures in place to maintain a reliable electric particular system," end quote.

I'm worried this statement may have provided a false sense of reassurance. So Mayor Turner, can you describe just how unprepared your constituents were for the storm? Do you think they were adequately warned about what to expect?

Mr. Turner. And the answer is no.

Let me just give you a personal example. Okay. We were told by our transmission distribution company that to expect rolling blackouts anywhere from 1 hour

to 2 hours maximum. That's what we were told. When the power at my house went out at 2:00 a.m. in the morning, I assumed this was going to take place and in an hour or 2 the power would be restored. I didn't even worry about it. But at 4:00, 5:00, and 6:00 when the power didn't return, I was on the phone, asking my transmission distribution company what is the problem. They were not rolling blackouts. They were power outages that lasted 3 and 4 days. No, they were not prepared. And we were not forewarned.

Mrs. Trahan. That's helpful.

You know, I'm duly concerned that communication between those responsible for the grid's reliability came up woefully short. You know, as I know from what is happening in New England, many parts of our country are relying more on natural/ gas to generate electricity, making coordination between the natural gas and electricity systems even more necessary during extreme weather events.

Chairman Craddick, you testified before the Texas Legislature that there was, quote, "a lack of communication from ERCOT." You further testified that ERCOT, quote, "didn't understand that they needed a continuous gas flow to be able to put gas into power plants."

So, Chairman Craddick, nearly half of the electricity generated on ERCOT's grid comes from natural gas which you regulate. Why didn't you communicate with ERCOT proactively to ensure they were aware of this issue and could plan accordingly?

Ms. Craddick. So we had not been involved with their planning about natural. Gas but what we did do and were asked to do on the Thursday before, so the 11, by the Public Utility Commission was prioritize natural gas for gas-fired power plants which we did. They became the second in priority.

We did an emergency order February 12 at 6:30 at night based on questions and

recommendations from the Public Utility Commission to prioritize those natural gas power plants. Before that, we had not had a conversation about that at all. We'd always focused on summertime weather.

So that has become a priority for us to again go back and relook at our curtailment orders for natural gas, which we will do, and see where the priorities need to continue to be.

Mrs. Trahan. All right. So with my remaining time, Mayor Turner, you also chaired both the Resilient Cities Network and Climate Mayors organization. And under your leadership Houston developed an ambitious plan to mitigate climate change.

Can you explain how climate adaptation and mitigation efforts go hand in hand and why what we must do both to reduce future climate catastrophes? You know, what role does renewable energy play in trying to achieve that goal?

Mr. Turner. It plays a vital role in order to reduce greenhouse gas emissions, and I will tell you that many of our energy companies recognize that. We recognize -- and just from a factual point of view for myself, becoming mayor, I faced a 500-year storm. That was in 2016.

2017 was Hurricane Harvey. 2019 was Tropical Storm Imelda. Last month was this winter storm. They're coming with greater frequency and greater intensity. Unless we take steps to mitigate our risk, unless we take steps in order to bring down greenhouse gas emissions, it's only going to get worse, more frequency, and greater loss of life.

Fifty-seven people -- and I want to underscore that -- 57 people died in Texas from this winter storm, hypothermia, carbon monoxide poisoning, hospitals, police stations, dialysis clinics. So the system failed, and it was a systemwide failure.

By addressing resilience and also by putting in place renewables, we can make this

a better situation for our businesses, for our energy companies, for moms and dads, you name it, across the board. And we can get to net zero. And the city of Houston, its facilities are 100 percent renewable, its facilities and we're moving forward and I think we're heading in the right direction.

Ms. Trahan. Couldn't have said it better myself.

Madam Chair, I yield back. Thank you.

Ms. DeGette. I thank the gentlelady.

We're now pleased to have several members of the full committee join us, and I am delighted first to recognize the chair of the Select Committee on Climate Change, Ms. Castor, for 5 minutes.

Ms. Castor. Well, thank you very much, Chairwoman DeGette, for focusing our attention on the energy system failures and the catastrophe in Texas.

Mayor Turner, it's very good to see you again. Thank you very much for your insightful testimony.

You know, climate change will continue to fuel these unpredictable and costly events. So we all have a responsibility to act now to make our communities more resilient and incorporate modern American-led innovations into our energy systems.

I think, Mayor Turner, I've heard you loud and clear. You've been very direct that Texas failed to address this issue after a similar event in 2011.

And I want to thank Representative Rice and others who have pointed out how Texas has dropped the ball. They've failed to respond to make the grid more resilient after 2011 but the testimony that I've heard today largely has been in defense of the status quo and that's a recipe for more climate-fueled disasters, pollution, and loss of life.

Thermal power plants, the primary technology that went offline, and wind and scholar performed as well or better than expected. Renewable resources are reliable.

For example, at times wind energy provides 60 percent or more of the total electricity in the southwest power pool.

It's a system that includes parts of 14 States and stretches from Texas to North Dakota. And when you look across the globe, wind turbines function well in extreme cold but they have to be weatherized and all technologies struggle in the face of severe conditions and we just have to prepare for this.

So here are a few ways. Grid enhancements and expanded transmission are going to be critical to preventing outages like this in the future. And as we head into what is going to be a very hot summer, we believe, we need to focus on protecting people from the consequences of these outages.

And I want to thank Rep. Veasey, Rep. Fletcher for working with me to implement a number of the recommendations from our Climate Crisis Action Plan out of the Select Committee -- one, improving planning for the resilience of the bulk electric system to climate impact and, two, expanding the deployment of distributed energy resources to provide backup power.

We recommend that FERC direct NERC to develop reliability standards, anticipating climate impacts, with the understanding that these threats will vary by region from wildfires to floods to cold snaps and hurricanes. So Congress also needs to provide the funding to DOE to evaluate climate threats to the grid and help share that information widely.

So, Mayor Turner, thank you very much for your testimony today and congratulations for your very forward-looking climate action plan there in Houston. I'm sure many of the residents who lost power would have loved to have had distributed energy resources and micro grids and grid-connected storage.

Is this something that you envision as part of your climate action plan, something

that other communities around the country should be considering?

Mr. Turner. Absolutely. We're looking at increasing resilience, and we've done this within our city facilities but as well as in our assets in these communities, because it wasn't just the city that hurt in terms of the facilities.

But you have a number of people who have faced these seasonal storms over and over again, operating on the margins and we need to do everything we can to put them in a better position so these climate action resilient strategies are important for our at-risk and vulnerable communities even more so.

Ms. Castor. Well I think that's right. And that's one of the reasons, as we move forward to Build Back Better, we want to provide these kind of resources to communities on the front lines.

Mr. Turner. Absolutely.

Ms. Castor. So I'm looking to you for your partnership and your leadership. You come highly recommended from the Texas delegation, and we're going to need all of us to work in a bipartisan way.

Really making our electric grid more resilient should not be a partisan endeavor. We know we've got to modernize it. It's going to take all of us working together to do that.

So thank you, Madam Chair, and I yield back.

Ms. DeGette. I thank the gentlelady.

And I'd like to welcome Mr. Crenshaw to our full committee and to our subcommittee.

And you're recognized for 5 minutes.

Mr. Crenshaw. Thank you, Madam Chairwoman. I really appreciate you letting me come on and talk about my home State here.

I want to get a few things straight. Okay. There's been a lot of misconceptions in this hearing. First, the Texas market design is deregulated just like California, just like New Hampshire, just like many others. Our market design is more similar to California than it is to Georgia.

Second, the Texas grid is not the Wild West. It is indeed regulated by Texas.

Third, Texas energy market is not a free market. It's not some Wild West free market, as many have insinuated. There's actually enormous subsidies that have been eroding the market for the last 30 years.

I'm going to submit an article for the record that talks about the eroding effects of the PTC on natural gas investment, for instance.

And really quick, Mr. Shellenberger, you're good at putting out facts like this. By orders of magnitude, how much more does wind and solar get in subsidies than, say, nuclear?

Mr. Shellenberger. The last estimate that was done I believe by either Congressional Research Service or GAO was 98 times in the last year that they looked at it.

Mr. Crenshaw. And that's right. I think gas is probably even more and so by far not a free market.

Okay. Next fact check. No, thermal power didn't fail the most. Okay. Because a lot of people simply refused to believe that during the storm electricity generated from wind and solar decreased by 52 percent, while the electricity generated from natural gas increased 72 percent. It wasn't enough.

Everything failed to an extent, weatherization being a huge part of that. We've heard that ad nauseam. But let's stop building this straw man argument that Republicans are blaming wind. We are not blaming wind. In fact, no one in this

hearing has said that, because you can't blame something that's inherently unreliable. Okay.

Next, next thing, Mr. Mayor, your city facilities are not powered by renewables when the wind isn't blowing and the sun isn't shining. They just aren't.

Now during the storm, 20 percent of the city's generators would not start. Mr. Mayor, why were these generators not maintained? Do you think it's the Federal Government's responsibility to maintain those, or can you take responsible for that?

Mr. Turner. Well, Congressman, several things. I'm not asking the Federal Government to assume responsibility for a generator that did not perform. But what I will say to you is that 100 percent of our city facilities are powered by renewables. And No. Two -- No. Three, what I would remind you is that over 67 percent of the power in the State of Texas is natural gas, coal fired and nuclear. Renewables count for a 1/4 smaller percentage of gas. And, fourth, I voted to deregulate this market in 1999.

So generation is deregulated. Our retail electric providers are deregulated. Transmission distribution is regulated.

I'm quite familiar with --

Mr. Crenshaw. Mr. Mayor, I've given you enough time there. If you want to respond to memo, you can actually text me back every once in a while. I've got a lot of long list of nonresponses from you on my phone.

But, no, again, it is not true that your city is getting power from solar when there's no sun shining. Okay. Now you buy into a specific kind of market that allows you to pay a little bit extra so that you can say you're buying those electrons but, in reality, they're not. This is the point. When you're talking about a reliable source of energy.

You don't want your hospitals being powered by just wind and solar. Right? You have to have backups. And so it would be good to look into those generators when

20 percent of them failed because that's when what we rely on when things go bad.

Mr. Shellenberger, you know, there's this talk about storms happening more and more. Can you talk about the data on that, the frequency and intensity of storms?

Mr. Shellenberger. Yeah, I mentioned -- thank you, Congressman. I mentioned before you joined us that the number of these severe cold snaps is just too low for anybody to make any claim about increasing frequency, and you don't need to. We need to be resilient no matter what's happening.

Mr. Crenshaw. Right. And if we completely decarbonize the grid, will this lead to zero extreme weather events? Is there any evidence of that, or is the weather going to look like San Diego?

Mr. Shellenberger. Of course not. And I would like to correct something that was said earlier around hurricanes and frequency and intensity. The best available science from the National Oceanic and Atmospheric Administration finds, concludes that the intensity of Atlantic hurricanes will rise 5 percent but their frequency will decline 25 percent. So sometimes the data -- sometimes the science doesn't go in one direction.

Mr. Crenshaw. Interesting.

Ms. Craddick, this committee and these witnesses have asserted time and time again that natural gas is key to the reliable grid. But recent administrative and legislative actions would indicate that's word on the committee don't meet the actions. Can you tell us some the impact of some of the recent actions, the recent proposals on the production of this very critical resource, natural gas?

Ms. Craddick. Well, if you look at where the Federal Government is today, we're blessed to be in Texas and not in a State that is -- has Federal lands because there's no production or lack of production or limiting production of natural gas, first and foremost.

And the other thing that's happened in Texas that we now recognize, when you're

talking about compressors, we are now moving to electric compressors because Texas is a non-attainment State. We wanted to make sure in this State that we were continuing to use natural gas for air emissions quality.

So those two things have led us to shift from natural gas and to look at other opportunities, electricity being one of them.

Mr. Crenshaw. Thank you. I yield back.

Ms. DeGette. I thank the gentleman.

The chair now recognizes Mrs. Fletcher for 5 minutes.

Mrs. Fletcher. Thank you, Chairwoman DeGette.

These issues are so important for Texans and for all of us across the country, as this hearing has shown. And as we're getting toward the end of hearing, I just want to thank the witnesses for their time and their testimony. This is a conversation that will continue certainly in this Congress and in my home State of Texas. There's simply not enough time for me to ask all the questions that I have in these 5 minutes, but I do hope to touch on a few things.

First of all, I think it's important to understand that all of our sources of electricity supply underperformed at the same time we had record demand. And that is just critically important to understand that we have and need a diversity of fuel sources.

But we also have to be prepared for both having variable sources of energy and also having firm sources and being able to come up with a plan to structure our power supply that way.

What we do know is that there are a lot of warnings that this could happen, that it might happen, ample warnings from FERC and NERC about how the Texas grid was vulnerable to winter resilience issues. And those have been documented. So I want to try to address a couple of things here quickly.

Mr. Magness, you testified earlier that the transmission providers prepare plans and protocols to shed load and that those decisions are made by the providers, not ERCOT. That's correct. Right?

Mr. Magness. Yes, it is.

Mrs. Fletcher. Okay. And are those plans provided to ERCOT as the transmission providers?

Mr. Magness. That's a good question, Congresswoman. I'm not sure that we -- we don't have any role in reviewing or improving those plans. I can check and see if we received copies of them but essentially we issued the directive and say we need this much load shed and then they implement those plans out of their communities.

Mrs. Fletcher. Do you know -- oh, I'm sorry. I lost audio.

Mr. Magness. Can you hear me?

Ms. DeGette. We can hear you.

Mrs. Fletcher. I can hear you now.

Mr. Magness. Okay. Okay.

Mrs. Fletcher. I think I caught most of that answer. So that would be great if you could get back to us on that question and whether in general, you know, they are provided for review to any reviewing agency as more than our priority or whether the PUC or any other Texas agency reviews those would be very helpful. And if you could, if you have copies, if you could provide those to this committee or let us know who can provide those plans to this committee, that would be very helpful.

Mr. Magness. We can get back to you.

Mrs. Fletcher. That'd be great. Thank you.

Preliminary Transcript

[The information follows:]

******** COMMITTEE INSERT ********

Mrs. Fletcher. There's also some testimony earlier about requirements for weatherization, and I just want to be clear. As I understand it, neither Texas or ERCOT have requirements for weatherization except in certain limited circumstances for the power generators.

Instead, as I understood in a call, during the storm with ERCOT, the generators rely on best practices, industry practices shared amongst themselves. Is that correct?

Mr. Magness. Yes. That's correct currently, yes.

Mrs. Fletcher. Okay. So would you characterize the failure of what we saw in this winter storm as one of market design?

Mr. Magness. I wouldn't characterize it as market design in the sense that, when we saw the generation go off, it was related directly to the winter storm. Now how much of that was winterization or other impacts, we will find out.

But I think the actual loss of generation that caused the outages was primarily had to do with the winter storm.

Mrs. Fletcher. Thank you, Mr. Magness. I appreciate that.

I want to ask my next few questions to Mr. Robb. Thank you very much for your testimony today as well.

I want to follow up on the 2011 Texas winter storm report. You made numerous recommendations for ERCOT how to be better prepared going forward. To your knowledge did ERCOT adopt those?

Mr. Robb. I think most of our recommendations were aimed at the generation and utility segment of the business, not to ERCOT itself.

Mrs. Fletcher. Okay.

Mr. Robb. So the one thing that I think is important that I'd like to underscore is

that what's really important for the grid operator, for Mr. Magness and his organization, he needs to know what the state of play is out on the grid. He needs to know which recourses are going to be there or not.

And I think one of the problems here is that they were counting on resources to show up that didn't, and that's a communication failure that needs to be addressed.

Mrs. Fletcher. Yes. And I agree there are a lot of communication failures, and I think that that's an important part of the study across the board for everyone who's reviewing this.

I have really limited time. So I'm going to submit a couple more questions to you for the record at the conclusion. But I do want to hear you talk briefly to this committee, while we have time.

In your testimony you talked about how additional frontline infrastructure, including gas storage, is needed for reliability within the transmission system. Why are additional pipeline systems so key to maintaining reliability?

Mr. Robb. Well, I think, as we've heard, right, the gas system and the electric system are like this, now. Right? They're not two systems that can coexist separately with just, you know, touch points. Right? The gas reliability and electric reliability are inherently connected.

One of the issues that we see -- and we see this most clearly in California, because we have the most solar build-out in California -- is the ability of the gas system to support very rapid power plant ramps.

So in the -- particularly in the afternoon when solar comes off, the power demand continues to grow and natural gas is currently the only resource that can meet that peak and the amount of gas and the volume of gas that those power plants suck out of the gas system is extraordinary. And storage turns to be one of key assets to be able to

maintain pressure in the gas system in that scenario.

Mrs. Fletcher. Well, thank you so much for that. 5 minutes goes very quickly.

Chairwoman DeGette, thank you for giving them to me, plus a little extra. I appreciate it.

And I yield back.

Ms. DeGette. I thank the gentlelady.

Mr. Veasey, are you -- there are you. I recognize you now for 5 minutes.

Mr. Veasey. Thank you, Madam Chair.

In last months's winter storm we had more than 4.5 million Texans that didn't have power during one of the coldest weeks really in our State's history. We are obviously blessed in Texas with a lot of natural resources, but what we saw can happen when proper steps aren't taken to prepare.

And so I want to start off and asking questions to my former colleague and dear friend, the mayor of Houston, Sylvester Turner. When we served together in the legislature, this was -- this area was Sylvester's wheelhouse. He knew the area of power probably more than any other legislator that I've served with.

And because you're known in this area and we know the report from FERC and NERC that detailed the need for action following the 2011 outages went largely ignored, in your opinion, Mayor Turner, is did the PUC do enough to address the these issues with the information that they had?

Mr. Turner. And the direct answer, Congressman Veasey, is no. And these issues were discussed in 2011, in 2012, and subsequent years. So the answer is no.

Mr. Veasey. What do you think the legislature needs to do this session to prevent this from happening again? As you know, we're getting closer and closer to sine die. It's going to be the end of May before we know it. What do they need to do more

than anything else to prevent this from happening again?

Mr. Turner. I think, one, there needs to be a full acknowledgement that climate change is real. And once you acknowledge it, then you build it into your strategies.

No. Two, you can no longer -- we can no longer rely just on a market incentive system. There will have to be requirements to weatherize our system. That's a must. And if we're going to continue to be a closed grid, ERCOT, 90 percent covering the State of Texas, then we have to take every necessary steps to make sure there's adequate energy supply in peak demands.

Mr. Veasey. Yeah. No, Mayor Turner, thank you very much.

We know it's possible to maintain reliability in much more extreme weather conditions, but, unfortunately, no fuel source of perfect during the storm. In the cooing months we're going to learn more about unweatherized wind turbines, unweatherized thermal power plants, or frozen pipes.

One thing that we do know had a significant impact was the inability to produce natural gas from frozen wellheads and a loss of electricity at production and process and infrastructure. After similar blackouts in 2011, 2014, 2018, Federal investigators said that freezing of natural gas pipelines and compressor stations was one of the causes for the blackout. The Railroad Commission has failed to take action on that.

We also know that many natural gas producers and processors failed to file the necessary paperwork with the electric utility to be listed as critical infrastructure. That meant that when we had rolling blackouts and when they were initiated, these natural gas companies didn't have the electricity necessary to pull gas from underground which, in turn, led to a natural gas shortage of power plants and created a downward spiral of more blackouts.

Right now it's optional for these companies to file this paperwork but Charlie

Geren, also from Fort Worth, he has a bill, Commissioner Craddick, that he is going to file that will answer some of these concerns that I just laid out. And I want to ask you, Commissioner Craddick, should these energy producers, who we all know are critical to keeping the lights on so we won't have a repeat of what we saw, should they be required to file this paperwork? And should it be included on the electric utilities critical list?

Ms. Craddick. I think it's an important piece that, frankly, my agency hadn't been communicated from ERCOT that this existed. But, two, if you look at for these forms the second -- the time when we finally realized this form existed, because it was based on summertime, not wintertime, but when we realized that, we've now sent it from our agency, sent a letter to every single operator that we regulate, suggesting that they file this form.

Mr. Veasey. But you don't think it should be required?

Ms. Craddick. The challenge we still have though is ERCOT today doesn't prioritize gas fields. It's only gas processing plants forward. So we'd like to encourage ERCOT to remap the system and understand that the whole system needs to be included, not just part, because we had operators who told us they would have been happy to file the form had, one, they known about it and, two, had they been included in the form and they were not.

Mr. Veasey. And see and, Madam Chair, as I yield back my time, as it has expired, that's the problem is that we are literally going to get to tend of May and the Texas legislative session will have begun and Republicans just want this problem to go away.

They don't want to deal with this. Though don't want to require anybody to have to do anything, which means we're going to be sitting in the cold again and that is -- and that is the problem. They're running out the Clark. They are literally running

out the clock as I am 40 seconds over my time.

Madam Chair, I give you back the gavel. Thank you so much.

Ms. DeGette. I thank the gentleman and our other members from Texas for helping illuminate this and I hope that this -- that this hearing will help bring some light and bring some changes to Texas.

I also really want to thank every single one of our witnesses today. As I said, particularly those of you who are operating in Texas, your plates are full right now. And you really gave us a great overview on what's happening and what we need to do. We can use that as guidance as we look at national policy. So I really want to thank you.

I will ask you, Mr. Griffith. Do you have anything else?

Mr. Griffith. Well, Madam Chair, I would just say that it's my understanding from the Texas delegation that there are six bills that are moving through the process and they're bipartisan bills to try to make things better in the Texas Legislature and I just wanted to make sure that was in the record. I appreciate you --

Ms. DeGette. Thank you. I thank the gentleman. I thank the gentleman.

The chair will remind members that pursuant to committee rules they have 10 business days to submit additional questions for the record to be answered by our witnesses who have appeared today, and I hope that the witnesses will respond promptly to any questions if you would receive any.

There have been a number of references to documents for the record in this hearing, and at this point we will insert them in the record by unanimous consent: Represent -- a letter from Representative Pallone and others to ERCOT, dated March 4, 2021, a letter from ERCOT responding to Representative Pallone and others, dated March 18, 2021, a letter from Representative Pallone and others to Governor Greg Abbott, dated February 19th, 2021, a letter from the office of the governor of Texas to

Representative Pallone and others, dated March 19th, 2021, a presentation from ERCOT reviewing the February 2021 extreme cold weather event.

A graphic detailing ERCOT's 2020 energy generation mix, three charts showing ERCOT's grid frequency. All of those by the way are offered by me. There's three charts showing ERCOT's grid frequency, total generation, and generation source between March 1 and March 18th by Mr. Griffith.

An article from the Texas Tribune, dated March 18, 2021. Texas House bill 10, 11, 12, 13, 16, and 17, all of those documents are offered by Mr. Burgess. An op-ed from the Wall Street Journal dated March 19th, 2021, offered by Mr. Joyce, and an article from RMI dated September 30th, 2020.

Without objection, these documents are all ordered.

[The information follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. And, again, thanks to everybody. And with that, the subcommittee is adjourned.

[Whereupon, at 2:23 p.m., the subcommittee was adjourned.]