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THE ROLE OF ARTIFICIAL INTELLIGENCE IN POWERING AMERICA'S ENERGY FUTURE

THURSDAY, OCTOBER 19, 2023

House of Representatives,

Subcommittee on Energy, Climate, and Grid Safety

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:30 a.m., in Room 2322 Rayburn House Office Building, Hon. Jeff Duncan [Chairman of the Subcommittee] presiding.

Present: Representatives Duncan, Latta, Guthrie, Griffith, Johnson, Bucshon, Walberg, Palmer, Curtis, Lesko, Pence, Weber, Balderson, Pfluger, Rodgers (ex officio);

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DeGette, Matsui, Tonko, Veasey, Kuster, Schrier, Castor, Sarbanes, Cardenas, and Pallone (ex officio).

Also present: Representative Obernolte.

Staff present: Kate Arey, Digital Director; Sarah Burke, Deputy Staff Director; David Burns, Professional Staff Member; Sydney Greene, Director of Operations; Nate Hodson, Staff Director; Tara Hupman, Chief Counsel; Daniel Kelly, Press Assistant; Sean Kelly, Press Secretary; Peter Kielty, General Counsel; Emily King, Member Services Director; Elise Krekorian, Professional Staff Member; Mary Martin, Chief Counsel; Brandon Mooney, Deputy Chief Counsel; Kaitlyn Peterson, Clerk; Karli Plucker, Director of Operations (shared staff); Carla Rafael, Senior Staff Assistant; Emma Schultheis, Staff Assistant; Olivia Shields, Communications Director; Peter Spencer, Senior Professional Staff Member; Dray Thorne, Director of Information Technology; Waverly Gordon, Minority Deputy Staff Director and General Counsel; Tiffany Guarascio, Minority Staff Director; Kris Pittard, Minority Professional Staff Member; Kylea Rogers, Minority Policy Analyst; Medha Surampudy, Minority Professional Staff Member; and Tuley Wright, Minority Staff Director.

*Mr. Duncan. So the subcommittee will come to order. The ranking member and I both agreed not to enter our _ not to give our opening statements; we are going to enter those in the record.

Without objection, so ordered.

[The prepared statements of Mr. Duncan and Ms. DeGette follow:]

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

*Mr. Duncan. And so I want to thank all the witnesses for being here today, taking time to testify before the subcommittee. I want to respect your time. I appreciate you traveling this far. I think you _ the committee will get more benefit from hearing from you than hearing ourselves talk because we really don't know a lot about this subject, and I think that is important.

We have got the Honorable Paul Dabbar, Former Under Secretary for Science at the Department of Energy. Dr. Jeremy Renshaw, Senior Technical Executive at the Electric Power Research Institute. Mr. Sreedhar Sistu. Sistu? Okay. Vice President for Artificial Intelligence at Schneider Electric. And Mr. Edward Abbo, President and Chief _ the Chief Technical Officer at C3 AI.

We appreciate you being here. I am going to ask the Chairwoman if she would like to give a _

*The Chair. Yes, I am going _

*Mr. Duncan. _ opening statement?

*The Chair. Yes. Yes, thank you.

*Mr. Duncan. She is going to give a real quick one. And when Frank gets here _

*The Chair. Yes. I will shorten my opening statement in the understanding of our time constraints.

But I would like to say thank you, Mr. Chairman, that this is a _ this is part of series of hearings that the Energy and Commerce Committee is convening right now on artificial intelligence. And certainly artificial intelligence has advanced significantly over the last several years and now many provide _ and provides many potential applications across a wide range of sectors. AI has beneficial uses in each of the sectors under Energy and Commerce Committee's jurisdiction, from innovation, data and commerce to healthcare to applications in energy.

Today I am looking forward to learning about and examining AI's uses in the energy sector, the importance of a national data privacy and security standard, and the ways it can foster innovation to strengthen America's energy leadership and energy security.

I am keeping my remarks short today to make sure that we can hear from our witnesses before we have to recess, but just a big thank you to everyone for being here and being dedicated to this issue.

[The prepared statement of The Chair follows:]

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

*The Chair. I yield back.

*Mr. Duncan. The gentlelady yields back. I now go to the ranking member of the full committee for a brief opening statement, please.

*Mr. Pallone. Thank you, but my remarks will not be brief. I intend to take the entire five minutes.

It is now Day 17 of the House being paralyzed without a speaker and we are 29 days away from another potential government shutdown. This hearing comes at a time when House Republicans' dysfunction is hurting the American people, weakening our economy, and undermining our national security.

All year House Republicans have caved to the extreme elements in their party who have no interest in governing. They have forced severe cuts to critical federal programs in spite of a funding agreement between the former Speaker and President Biden. And they came dangerously close to a government shutdown that would have cost our national economy upwards of 13 billion dollars a week and forced our troops to work without pay. I just think the American people deserve better.

Democrats have repeatedly stopped this chaos and dysfunction from hurting everyday Americans, but it is long past time for House Republicans to reject the extremists in their party. We should be working together to lower costs for American families and to grow our economy and the middle class. It is time for the chaos to end.

Today the subcommittee is meeting to explore artificial intelligence tools and how they might help boost efficiency and reliability in the energy sector as tech _ AI technologies have a potential role to play in the energy sector, particularly in our ongoing efforts to lead the world in the clean energy transition. AI capabilities could help ease the transition to a net zero grid allowing grid operators to better forecast weather patterns that will drive electricity consumption and wind and solar generation.

These tools could also allow greater deployment of distributed resources such as demand reduction and virtual power plant technologies. There is also great potential to use AI tools to help detect methane leaks and other sources of emissions from the oil and gas sector. These are all promising opportunities but there are also a number of risks

that we must monitor.

AI models are currently trained on specialized computer chips that consume tremendous amounts of electricity and consume large amounts of water for cooling needs. The specialized computer chips necessary to train AI models could also become an additional choke point in the energy sector if supply chain issues start to make them scarce or if cyber vulnerabilities are introduced into models.

More concerning is the fact that AI models are effectively black boxes. We simply lack the ability to explain how and why these models make decisions. And that problem will likely continue to get worse in the short term as models continue to scale in size and complexity. If an AI model changes its output, right now it is nearly impossible for a human to know exactly why.

Given the vital role the electricity grid plays in our everyday lives, I have concerns about integrating technologies that we do not understand into this critical infrastructure. We need to make sure that humans remain key decision makers in energy systems and retain the ability to intervene in a timely fashion. We simply cannot automate

away critical human expert oversight and accountability.

And finally, I remain deeply concerned about the data privacy implications of AI technologies. I strongly believe that the bedrock of any AI regulation must be privacy legislation that includes data minimization and algorithmic accountability principles. Last year Chair Rodgers and I worked in strong bipartisan fashion to pass the American Data Privacy and Protection Act out of our committee by a vote of 50 to 2, and I will continue to push for a comprehensive national federal privacy standard.

So with that, I am looking forward to this hearing and understanding the challenges and opportunities of integrating AI technologies into our energy system. However, I must note, if we want the House to truly perform the oversight that the American people desperately need with regards to AI and other technologies like it, the House needs strong and stable leadership. Right now it is without a Speaker, and I urge my Republic colleagues to work together with Democrats in a bipartisan fashion to help the entire country move forward.

[The prepared statement of Mr. Pallone follows:]

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*Mr. Pallone. Thank you, Mr. Chairman, and I yield back.

*Mr. Palmer. Would the gentleman yield for a question?

*Mr. Duncan. The gentleman yields back.

*Mr. Pallone. I will not.

*Mr. Duncan. We will now conclude with the member opening statements. The chair would like to remind members that pursuant to the committee rules, all members' opening statements will be made part of the record.

I want to jump right into the witness testimony. As I said, thank you guys for being here. We are going to try to get through all of you before we have to break. It is an unfortunate situation. So I will start with Mr. Dabbar, and welcome, you have five minutes for your opening statement.

STATEMENT OF THE HON. PAUL DABBAR, FORMER UNDER SECRETARY FOR SCIENCE, U.S. DEPARTMENT OF ENERGY, DISTINGUISHED VISITING FELLOW, CENTER ON GLOBAL ENERGY POLICY, COLUMBIA UNIVERSITY; JEREMY RENSHAW, SENIOR TECHNICAL EXECUTIVE, AI, QUANTUM, AND INNOVATION, ELECTRIC POWER RESEARCH INSTITUTE; SREEDHAR SISTU, VICE PRESIDENT, ARTIFICAL INTELLIGENCE, SCHNEIDER ELECTRIC; AND EDWARD ABBO, PRESIDENT AND CHIEF TECHNOLOGY OFFICER, C3 AI

STATEMENT OF THE HON. PAUL DABBAR

*Mr. Dabbar. Thank you, Mr. Chair, Chair McMorris Rodgers, Ranking Member Pallone, Chair Duncan, and Ranking Member DeGette, and members of the subcommittee. I am honored to again be before this committee this time on the important topic of AI and energy.

Under the leaderships of Secretary Brouillette and Perry, the U.S. built the first high-performance super computer, built specifically for the AI revolution. That computer named Summit was built under the authorization of this committee at the Oak Ridge National Lab. DOE developed

the computer to integrate GPU and CPU chips to build a first of a kind super computer designed for AI. That commission _ that commissioning also allowed the U.S. to regain its number one super computer position from Communist China. I would like to thank the committee for its leadership on that.

Subsequent to the first AI super computer, the AI revolution has accelerated and AI applications for the energy sector grew rapidly. Let me summarize a few of those applications.

AI is accelerating energy technology discovery. AI can process data to guide researchers to higher likelihood options before taking efforts to the lab stage, significantly reducing cost and time to discovery of new energy technologies. Generative AI is beginning to remake energy operations. By analyzing operating data and allowing AI to manage operations, significantly improving efficiency is beginning to occur.

Here are a few examples. AI is allowing significant improvement to wind operations. AI _ GenAI is able to monitor every gear, every turbine blade, hour-by-hour

weather for thousands and thousands of wind turbines all of the country, and that is happening today. As a result, GenAI is able to predict maintenance needs, automatically create daily work orders, and order supply parts for maintenance, significantly improving performance.

Storm recovery can be significantly improved. AI-driven drones are able to fly down the streets and image capture the poles that are down with their videos, and the GenAI is to _ is able to automatically identify pole-by-pole recovery efficiency needs automatically ordering the parts and create work orders for the line workers to go fix it.

Oil and gas and geothermal companies are able to use AI to better evaluate 3D seismic data and optimize drilling operations, increasing development prospects, driving down costs, and increasing energy production. AI is able to identify when to dispatch power plants, driving energy availability, resiliency, and reducing emissions.

AI can better predict weather, design infrastructure projects affected by weather, and direct exact day when to plant crops, improving crop yields. Generative AI also has the opportunity to accelerate legal and regulatory efforts,

including accelerating permits. Parties looking to submit a siting or a regulatory filing to build energy infrastructure can feed a GenAI with the last approved filings, and it will write a filing based on what was previously approved, accelerating projects.

Regulators at EPA, FERC, and the NRC should be able to use GenAI to more quickly review and approve requests. It could even help write legislation. I would recommend that this committee direct the departments under this jurisdiction to implement this in government, just like the private sector is.

There are two challenges, however, that I see from the AI revolution. Manufacturing of semiconductors and operating of AI-enabled data centers will take a massive amount of power. In Loudoun County, about 3,000 megawatts of new power will be needed every year for the foreseeable future for _ just for the data centers. That is the equivalent of needing three new nuclear power plants every year just in Loudoun County.

In New York, the new micron semiconductor plants will require 2,000 megawatts. That is equivalent to the total

power demand of Vermont and New Hampshire.

Secondly, the national security situation is certainly going to be placed at risk with this new hardware and software. Communist China can place backdoor physical ability and chips to break into systems that they ship to us as well as AI algorithms could have backdoors. Security challenges are acute, and I would recommend that we ban all chips, software, electric vehicle components, and power grid controls from Communist China today, and I would also look at deploying enhanced and resilience _ resilient networking systems like quantum networks to prevent malign nations from going after America's energy.

Thank you very much.

[The prepared statement of Mr. Dabbar follows:]

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

*Mr. Duncan. The gentleman yields back. I will go now to Mr. Renshaw for five minutes.

STATEMENT OF JEREMY RENSHAW

*Mr. Renshaw. Chairman Duncan, Ranking Member DeGette, and members of the subcommittee, thank you for the opportunity to testify today.

I am Jeremy Renshaw, Senior Technical Executive for AI Quantum and Nuclear Innovation at EPRI. EPRI is an independent nonprofit global energy research development and deployment institute organized under Section 501(c)(3) of the Internal Revenue Code. EPRI's experts collaborate with more than 450 companies in 45 countries driving innovation to support clean, safe, reliable, affordable, and equitable access to electricity for the public across the globe.

AI, a technology that emulates human style reasoning and problem solving, is gaining prominence across various sectors. EPRI's experience with AI in the energy sector spans well over 10 years, While AI holds the potential to augment human productivity, it also presents risks when misused.

Today EPRI has executed over 70 AI projects for energy industry applications. Several examples include, one,

wildfire risk evaluation. Many parts of the world suffer from droughts and wildfires. AI tools can help address this challenge, either preemptively by analyzing satellite data to identify areas of higher risk or in real time by analyzing data from observation station cameras to monitor for smoke and initiate faster responses to deal with fires at earlier stages when they are easier to contain.

Second, cyber security. This has become an increasingly important concern due to the potential loss of data, functionality of systems, and resulting societal impact. AI offers the opportunity to be both positive _ both an offensive and defensive force multiplier for cybersecurity applications to protect against various forms of cyberattack.

Third, grid management. Electric grids are operated with high reliability today which is an important foundation for a modern society. However, power grid optimization is one of the most complex computational problems in the world today and would benefit from improved optimization. The optimal power flow challenge is exponentially more complicated than even today's most powerful supercomputers

can handle, especially for real time optimization, though future quantum computers show promise with helping with this challenge.

Reinforcement learning methods have shown capability to run a power network as effort _ evidenced by the EPRI and RTE-led Learning To Run a Power Network Challenge. While automated grid operation may be years away, current models could be useful in assisting grid operators as decision support agents to provide recommended actions to maintain greater reliability.

Fourth, enhanced efficiency and reduced emissions. AI tools can improve the efficiency of energy generation through optimized use of generation assets by finding losses or inefficiencies. In parallel, AI can be used to improve how and when consumers utilize electricity for optimal time of use and total energy use to utilize clean energy sources, thus reducing emissions.

Fifth, load forecasting. Improving load and weather forecasting can help to balance supply and demand of energy on the grid and improve usage of clean energy sources. Other use cases include predictive maintenance, equipment

degradation, automating work, and storm recovery, among others. AI has already benefitted the energy industry and its impact is expected to grow offering a promising future with the potential to revolutionize energy industry operations.

AI has the potential to contribute to safe affordable and reliable energy generation delivery and use. However, EPRI has found it also poses new challenges, such as cybersecurity risks, ethical considerations centered around bias and explainability, and data privacy and security. These challenges must be proactively addressed to maximize the benefits and minimize risks.

In summary, EPRI's research shows how AI allows humans and computers to work together more effectively by allowing computers to do what they do best, which is rapid, accurate calculations, and humans to do what humans do best, which is creative thinking and implementation. Thank you again to the subcommittee for the opportunity to share insights and comments on this important topic, and I look forward to answering your questions.

[The prepared statement of Mr. Renshaw follows:]

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395 **********COMMITTEE INSERT**********

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*Mr. Duncan. I will now go to Mr. Sistu for five minutes.

STATEMENT OF SREEDHAR SISTU

*Mr. Sistu. Chairman Duncan, Ranking Member DeGette, Chairwoman McMorris Rodgers, Ranking Member Pallone, and members of the committee, thank you for the opportunity to appear before you today.

I am Sreedhar Sistu, Vice President of Artificial Intelligence Offers at Schneider Electric. Schneider Electric is a manufacturer of connected products and solutions that help ensure more safe, resilient, and energy efficient homes and businesses. We employ more than 19,000 Americans and have more than 40 facilities and offices across the U.S.

Currently our products are in one billion buildings worldwide, including half of hospitals and over 36,000 water and wastewater installations. We also hold the largest market share in providing secure, uninterrupted, and sustainable power to data centers. In fact, you cannot be online for more than four hours without traveling through one of the data centers that Schneider Electric powers. We appreciate the opportunity to testify as leaders in

automation and digital energy transformation.

Today I want to focus my attention on three main themes for the committee's consideration: grid security, decarbonization, and AI power consumption needs. On the first point of grid security, our modern grid is facing mounting demand that it was not built to meet. The combination of an increasingly complex grid coupled with the aging and analog infrastructure is resulting in power outages and grid disruptions contributing to rising energy costs and decreasing grid security.

While it may have been easier to track, forecast, and manage power consumption two decades ago, new variables have made the grid more diffuse and difficult to manage without the help of digital tools like AI. The renaissance of digital and clean energy transformation has spurred development and adoption of smart devices and renewable energy that enables transition from consumer to consumer, an evolution that has also increased grid complexity.

Additionally, rising instances of extreme weather events and natural disasters have the potential to knock power out for days or weeks and the grid must be prepared to

respond to those crises. And finally, more Americans are adopting a hybrid work schedule after the COVID pandemic making it more difficult to forecast the energy consumption needs.

Existing air technologies can better forecast and optimize energy consumption at local level, allow microgrids to island themselves from the grid in response to great disruptions and give consumers the power to keep their lights on. Paving the path for AI to bring our grid into the 21st century is crucial to the future of our Nation's energy landscape.

On the second point of decarbonization, while maintaining grid resiliency and security will help maintain power in a time of disruption, increasing energy efficiency and sustainability on the front end will reduce cost, reinforce the grade, and encourage consumers to use more clean energy wisely. AI can support energy efficiency, sustainability, and decarbonization goals in a variety of use cases including industrial plants, data centers, transportation, schools, homes, and buildings. Efforts to encourage the adoption of digital technologies at the

federal and state levels will get the U.S. closer to its climate goals and save taxpayer dollars.

On the third point of energy demand, it is critical the committee consider the power consumption needs of America's AI future. We estimate that AI represents 4.3 gigawatts of power demand today and we project that to grow to 13.5 to 20 gigawatts by 2028. With a grid that is already straining to meet existing demand, it is imperative this committee consider how strategic future investments in physical infrastructure can support the growth of AI in America which will in turn support the future of our grid.

I would like to end my testimony by addressing the major risks and vulnerabilities posed by AI. Cybersecurity of AI, and data protection, and privacy are the foremost risks Congress should consider. As a technology provider, we take cybersecurity risks and data protection extremely seriously and apply the highest standards towards solutions. As industry develops and adopts standards for AI, government should work alongside us to both ensure these standards support the government's goals and a reference in the policy to ensure alignment across all AI deployments.

The role of industry in supporting American innovation and leadership in AI cannot be understated and we appreciate the opportunity to continue this dialogue with each of you. Thank you for having me today and I look forward to our discussion.

[The prepared statement of Mr. Sistu follows:]

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

*Mr. Duncan. Thank you for your statement.

Mr. Abbo, you are recognized for five minutes.

STATEMENT OF EDWARD ABBO

*Mr. Abbo. Super. Thank you, Chairman Duncan, Ranking Member DeGette, and distinguished members of the subcommittee.

My name is Ed Abbo, and I am President and Chief Technology Officer at C3 AI. Thank you for the opportunity today.

C3 A1 designs, develops, deploys, and helps operate some of the large-scale predictive analytics for enterprise AI applications for some of the largest organizations such as Coke Industries, Shell, Exxon, Con Edison, Duke, NYPA, New York Power Authority, and the Department of Defense. As a company we started in the energy sector looking to harness advancements in cloud computing, and sensors, and AI to help unlock efficiencies across the value chain, including for those that produce energy resources and those that generate, transmit, and consume power.

I refer to AI as computer software that can identify patents difficult for humans to discern and be trained to reason and solve specific dedicated tasks at precision

levels and velocity previously unattainable. Unlike traditional algorithms that require a software programmer to specify a series of logical steps, AI algorithms learn and finetune themselves based on data within designated operating boundaries.

AI algorithms are applied in the energy sector today to accurately predict potential critical equipment malfunction and advance the catastrophic failure, increase production yield, and throughput accurately forecast grid load and distributed generation capacity, integrate renewables, detect grid disturbances that can be precursors to failure, and secure the energy infrastructure from cyberattack.

One of our customers deployed AI-enabled predictive maintenance across onshore, offshore, and refining assets as part of a reliability program and improved availability and production by five percent. In that case, the AI algorithms continuously correlate and analyze equipment sensor readings from over 10,000 pieces of equipment, and combined with maintenance records, weather conditions, and imagery from drone inspections, proactively identify potential reliability and safety issues to be mitigated in advance of

unplanned downtime and safety incidents.

AI smart energy solutions are being increasingly deployed to secure the supply of cleaner, cheaper, more reliable energy and accelerate the adoption of renewables in a manner that is resilient to cyberattack. This fundamentally transforms the value chain of energy production, delivery, and consumption.

Now there are noteworthy breakthroughs in generative AI using advances in natural language processing including LLMs, large language models, that according to Goldman Sachs could lift productivity growth and drive a seven percent increase in global GDP. Employed properly, these generative AI systems can help less experienced workers to quickly troubleshoot complex operations and maintenance issues as effectively as more experienced operators. Now the implications of this application, the challenges related to employee turnover and talent shortage is significant.

I conclude by noting a few best practices and safeguards for secure and responsible use of AI. First, deploy these mission critical systems into secure, compute infrastructure, and compliance with industry security

standards such as NERC CIP and NIST's cybersecurity framework.

Second, establish AI model governance and review processes to ensure ongoing AI model monitoring against expected performance. Second (sic), ensure use of AI models to provide recommendations to the action by human operators and semiautonomous use that is subject to strict guardrails. Finally, ensure use of generative AI models in ways that are secure and reliable.

We applaud the committee's focus on AI and how it can be leveraged to secure our Nation's energy future. The responsible use of AI across the entire value chain presents a unique opportunity for U.S. competitive advantage. Thank you.

[The prepared statement of Mr. Abbo follows:]

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

*Mr. Duncan. I thank the _ all the witnesses for your opening statement. We are sort of in unprecedented times here, and I apologize that we are going to have to break. What I would like to do is I am going to ask questions, I am going to let the ranking member ask her questions, and then we are going to recess, pending call of the Chair, and hopefully we can come back. So I am going to ask you guys to work with staff.

And anyway, so the committee has had a series of hearings this Congress examining the current state of our electric grid. We have heard from FERC commissioners, grid operators, and other experts on the looming grid reliability crisis. I believe we need to bring more reliable baseload generation online. There is no replacement for reliable energy, but I am interested in the role AI can play in grid management.

So, Mr. Renshaw, how can AI be utilized to optimize grid operations and improve reliability?

*Mr. Renshaw. That is a great question. Thank you, Chairman Duncan. So there are a number of things that AI can do. One of the things I would point out is that the

grid is the most complicated machine that has ever been developed by humans, so it is extremely complicated to optimize and utilize. Our grid operators do an excellent job today of maintaining grid reliability. However, we know that we are not in a fully optimal state, and that is where AI can come in.

So we can utilize reinforcement learning, which is essentially a series of you utilize a gamified physics-based simulation where you put in different sets of inputs and evaluate what the reinforcement learning model will do and what the impact that would have, whether you have brownouts, blackouts, power sags, power surges, different things like that, and all of those would result in penalties to the reinforcement learning model.

On the contrary, if it is able to adapt to these different scenarios, then it gets rewarded. And through millions and millions of different simulations, the model is able to get trained on what types of situations work and what don't, and so EPRI, RTE, University College London, and various other global collaborators combine together for the Learning To Run a Power Network Challenge over the last

several years and have identified a number of promising methods where AI can be utilized for running a power grid.

Now we are not proposing that we would automate an entire power grid, but use this more as a decision support agent in the future.

*Mr. Duncan. So I visited a utility provider and watched how they manage their distribution network and about every 30 minutes they were looking at whether they were generating more power and could sell it across state lines or buy power. It was almost _ AI could do that in real time, right, and it would be more efficient on inter-transfers?

*Mr. Renshaw. Absolutely.

*Mr. Duncan. Yeah, that is great.

On the energy production side, AI is already helping to advance operation and increase production while driving down costs and emissions. Mr. Abbo, can you walk us through in a high-level way, you touched on this a little bit, how producers in the oil and gas industry are utilizing AI to optimize their operations?

*Mr. Abbo. Sure. In the oil and gas industry,

basically the area that is easiest to get is _ to apply AI is for reliability, and so this is improving the availability of and throughput of oil and gas and reducing nonproductive time, which can be as high as 30 percent in the industry. So that is the first I would say lowest hanging fruit.

And then AI can be applied to production optimization, so increasing production, whether it is in refineries or whether it is in managing wells and reservoirs, increasing production, increasing yield, and actually reducing the amount of energy used to basically deliver oil and gas.

And then thirdly, in the area of safety. So using AI to basically do _ use drones and to look at the asset health or asset integrity. Using aerial surveillance rather than sending people out to do that, so that is another area.

But essentially, AI can be used across upstream, midstream, downstream, and ten _ potentially hundreds of applications or use cases, and the objective is to lower the break even price of oil and gas and improve the safety and sustainability footprint of the industry.

*Mr. Duncan. Even pipeline inspections and downstream,

midstream delivery, of course, as well?

*Mr. Abbo. Correct. That is right. Really across the entire oil and gas valley chain.

*Mr. Duncan. One last question to former Under Secretary Dabbar. I understand AI has great potential to enhance the decision making process in the nuclear industry. How can AI improve nuclear reactor performance?

*Mr. Dabbar. So by installing sensors in each of the turbines and each of the breakers, you know, each kind of component associated with any power plant including nuclear which is on the complicated end. It can collect data on how the pumps are operating, and how they are wearing, and when they fail. And over the course of time _ once again, you can do this at any power plant, you can figure out better than Westinghouse or GE on the original because you have got more data, real operations for that particular power plant.

And you can predict when to go do the preventative maintenance on that breaker, or on that pump, or kind of any operating system. And as a result, you are able to drive up availability by making more power for a cheaper cost. It is more reliable. And so it is already being deployed on

certain types of power plants.

*Mr. Duncan. Thank you for that.

My time is up. I will yield to _ I recognize Ms. DeGette, the ranking member of the subcommittee.

*Ms. DeGette. Thank you, gentlemen, for coming today. I am learning a lot just sitting here, so I really appreciate your presentations.

One of the things that I think AI has the potential to do is to help the U.S. in reaching our climate goals. And the Chairman talked about grid security and grid sufficiency, and I think that is a really important issue. A couple of other things I want to talk about.

One of them, Dr. Renshaw, is AI currently being used to evaluate satellite data to assist with wildfire detection and vegetation management?

*Mr. Renshaw. So we are running some proof of concept studies of utilizing satellite data. We have also made this _

*Ms. DeGette. So is it being used now or are you studying it?

*Mr. Renshaw. We are studying it.

*Ms. DeGette. Okay.

*Mr. Renshaw. It is not being utilized in the field.

*Ms. DeGette. So it is not being used right now?

*Mr. Renshaw. Not yet.

*Ms. DeGette. When _ what is your timeline? How soon do you expect that?

*Mr. Renshaw. We anticipate it will be very soon. We have purchased large amounts of satellite data and made it freely available to the public so that others in addition to EPRI and our staff can utilize this for various use cases.

*Ms. DeGette. Okay, great. A second issue that I think AI could really help us with is methane, is detection of methane leaks. So I am wondering if AI could be used, Dr. Renshaw, to apply to satellite data to identify methane leaks.

*Mr. Renshaw. I believe that would be possible if you combine multispectral or hyperspectral data that is able to see in addition to visual UV, infrared, and wider wavelengths of light because the methane spectrum would show up differently. So we have looked into this briefly, and I believe that there is some promise there, and potentially

also as Mr. Dabbar has said, combining with drone data where you could get more fine resolution data.

*Ms. DeGette. Did I see you nodding there, Mr. Sistu?

*Mr. Sistu. Yes, Chairwoman. Yeah. I think this is something that is in the realm of, you know, possibility using the, you know, computer technologies. As Dr. Renshaw was saying, using the spectral [indiscernible] of methane leaks and being able to identify them with grid position.

*Ms. DeGette. Great. Anyone else want to add to that?

[No response.]

*Ms. DeGette. Okay. Mr. Sistu, I have another question for you. AI's power consumption is projected to grow to be between 13.5 to 20 gigawatts by 2028. Is that right?

*Mr. Sistu. That is correct.

*Ms. DeGette. And so our current infrastructure is not prepared to handle that level of demand, is that right?

*Mr. Sistu. That is correct.

*Ms. DeGette. So what action do you suggest might be taken to ensure our grid can handle an increase in demand from AI? This is sort of related to the Chairman's

question.

*Mr. Sistu. Yeah. So I think it is going to be a multi-pronged, you know, approach to addressing the energy needs of data centers. So first and foremost, data centers will continue to grow because, you know, consumers are going to demand, you know, more capabilities, you know, from computing and, you know, new data centers will continue to be built.

But data centers have also _ they pose _ they present a very unique opportunity. They are like factories, you know, where you don't have to have lots of people so you can maintain temperatures at levels that are highly optimized for computing. And they are also large-scale that we can really optimize the airflow and the environment inside to reduce the energy consumption.

*Ms. DeGette. Thank you. If you want to supplement, that would be great.

I have one more question and that is to you, Mr. Dabbar. You mentioned, and I can't disagree with you, that as we increase reliance on chips, we should ban chips from China, but I think it is a little impractical to see how you

could _ by just passing some law you could completely ban chips from China. Is that right?

*Mr. Dabbar. Yes. No, I agree. However, I am _ I have seen examples of things that we should all be worried about. Let me just give you one example. In a piece of power electronics that go into a car, it could be any sort of car, you could wire into the chip a backdoor, and if someone is driving it, you can cause it to crash, so _

*Ms. DeGette. Totally. I mean, we all _ we all recognize _

*Mr. Dabbar. Yeah.

*Ms. DeGette. _ the danger. Last year Congress passed the CHIPS Act, and what this bill did is it said we are going to incentivize domestic development. We are also working with some of our allies around the world, places like Japan, Europe, other places to get chips. I would think that would be a place we should really focus on.

*Mr. Dabbar. I agree.

*Ms. DeGette. Okay, thank you.

I yield back.

*Mr. Duncan. So we are going to take a break. I have

no idea how long it will be. So the subcommittee will stand in recess, subject call of the Chair.

[Recess.]

*Mr. Duncan. So Subcommittee on Energy will come to order, and I appreciate everyone waiting. I now recognize the ranking member of the full committee, the gentleman from New Jersey, Mr. Pallone, for five minutes.

*Mr. Pallone. Thank you, Mr. Chairman.

It is clear that AI will likely be a part of our energy future, and with the adoption and coordination of distributed resources, in addition to the increasing need for monitoring grid and weather conditions, AI can help us transition to a clean energy future as well as monitor the threats of the worsening climate crisis. With that being said, we must proceed with caution. Guardrails need to be put in place to ensure the adoption of AI is responsible.

So I want to ask Mr. Sistu, what are the processes you rely on to ensure that while we adopt AI, ultimate decision making, especially during times of critical events, is in the hands of human experts?

*Mr. Sistu. Thank you, Congressman, for the question.

So there are several ways of looking at, you know, building the necessary security and control into the AI systems that we build. So first and foremost, we believe today the AI systems are always with human in the loop. They are not autonomous systems, nor should they be, in the near term. They have to have human in the loop as well as have some guardrails in their code to protect from unwanted behavior.

You know, for example, if you have, you know, controlling temperature in a room like this, we want to make sure that, you know, the temperature doesn't drop too low or go too high, even if the AI system is continuously adjusting the [indiscernible] for that. So that is on the human in the loop side.

And secondly, about the security and the quality of models, I mean, really AI systems are advanced operating systems. We have, you know, a long history in building software systems with high quality. We have some standard practices that goes from NIST that we follow. And then should have good governance in place to validate the security and the quality of these models that are being put _ before putting into production.

*Mr. Pallone. Well, you are hinting I think that _ about the protecting data, and so let me ask about that. How is Schneider Electric thinking about data privacy and protecting customer's information?

*Mr. Sistu. Sure. So we at Schnieder Electric take great pride in, you know, adherence to all the regulations and having the right governance and processes, so we at Scheider Electric, we have a chief data officer and we have an extensive data organization with representatives from various lines of businesses who participate in that. And specifically for the AI, we have a dedicated risk management team that is in place to make sure that the models that we build and the risk associated with data is managed adequately, which I think we would recommend for everyone who wants to build AI at scale.

*Mr. Pallone. All right. Let me go to _ thank you. Let me go to Dr. Renshaw. I understand that AI can enhance cybersecurity. It also seems like there is an opportunity to introduce inputs which could result in unintentional outcomes that may be hard to identify or explain. So, Dr. Renshaw, how do we ensure that the models used for critical

infrastructure like the electric grid are actually safe to use and don't introduce new concerns like cybersecurity vulnerabilities?

*Mr. Renshaw. So that is a great question. Thank you, Congressman. And I agree with what Mr. Sistu said in terms of we utilize these systems with a human in the loop in many cases, and it is kind of like having training wheels as you go forward. So as we train and develop these models, we don't want to just unleash them in the wild, so we do lots of training, testing, and validation. And as we increase our confidence in the outputs of the models, it helps us to be able to remove those training wheels in the future to allow the system to do more and have more freedom while still having a human in the loop.

*Mr. Pallone. Well, thank you.

Let me just say, Mr. Chairman, I think there is a lot of work to do in this space, and I hope it can be bipartisan in order for it to accomplish the goal. I thank the panel. Thank you, Mr. Chairman.

*Mr. Duncan. I thank the ranking member for his time. And coming back, I will now go to the gentleman from Ohio,

Mr. Balderson, for five minutes.

*Mr. Balderson. Thank you, Mr. Chairman. Thank you all for being here today. Good to see some familiar faces.

My first question is for Mr. Dabbar. As you know, the National Energy Technology Lab is using a super computer to develop optimal reactor designs. Just recently I visited the Department of Energy's Portsmouth Gaseous Diffusion Plant in Piketon, Ohio. And last week, Centrus Energy announced it had begun enrichment operations at a facility in Piketon and expects to begin withdrawing HALEU product later this month. And earlier this year, Oklo announced it will build new microreactors at the Piketon facility.

Can you discuss how AI is currently helping or could help in the future the production and the development and operation of these microreactors?

*Mr. Dabbar. So, Congressman, I will start with the enrichment point that you raised about Piketon. You know, any sort of operational _ energy operational system can be optimized with AI, and obviously there is gas flows inside the centrifuges inside the plant in Piketon, and how do you optimize operation of all those centrifuges, and how the gas

is produced, and how it is taken off can be adjusted, you know, live. And an AI system to optimize that uranium production in Ohio is absolutely something that could be done.

On the power plant side, as you asked, once again putting sensors at like every pump and, you know, every part of a new reactor to monitor real time what is going on, at a minimum trying to identify trends going on in said plant to try to take a look at what is going on and then, you know, optimize, as Dr. Renshaw said, first having humans in the loop. It is nuclear, so you really want to make certain humans are in the loop, and then over the course of time can be used to optimize a production.

*Mr. Balderson. Thank you. You mentioned that generative AI has the opportunity to accelerate legal and regulatory efforts including accelerating permits. Permitting reform has been a top priority for myself, and the chairman, and many members of this committee. Can you expand on how AI can allow regulators such as the EPA, FERC, and NRC to accelerate their review and approval for different requests?

*Mr. Dabbar. So if you are a filer now, you can, for example, pull the last 10 approvals that that administrative law judge actually approved, and you could feed it into a GenAI and actually it can do a first draft of the approval. And as a result, it is a much higher likelihood that the filer asking for whatever the approval is, FERC, EPA, whoever, that they know that it has been approved before, and the last 10 deals, which ones you pick, so that is the data aspect.

And then I would recommend that EPA or FERC, actually for themselves to use generative AI to evaluate the proposals, to compare it against what they have already approved to get them to accelerate their approval process.

*Mr. Balderson. You also mentioned one of the major challenges from the AI revolution is the massive amount of additional generation and power that we will need for the manufacturing of semiconductors and data centers, and I think you all talked about that, but I believe you mentioned, as an example, the micron semiconductor plants in New York will require almost 2,000 megawatts. Is that correct?

*Mr. Dabbar. Yes, Congressman.

*Mr. Balderson. Thank you. Ohio's 12th Congressional District, which is where I am fortunate enough to represent, has been uniquely impacted by this also. Intel is currently investing more than 20 billion dollars to build chip factories in Licking County, while Google recently announced two additional data centers in Central Ohio, Licking County for that matter, most of it, and a couple other facilities, one of which will help power their AI innovations.

In February, the PJM Report released a report showing that 40 gigawatts of existing generation in the PJM footprint are at risk of retirement by 2030. And, unfortunately, EPA's New Clean Power Plant 2.0 will only accelerate the retirement of these existing generation. We need data centers to build the United States and we need to onshore the manufacturing of semiconductor chips to the United States, but we must be realistic about the increased demand this will have on our electrical grid.

I think this is a great opportunity to reiterate that we must unleash the abundant natural resources available here in the United States. Renewables and weather-dependent

resources simply won't be able to meet demand if reliable existing generation is shut down. I thank you all again for being here today.

And, Mr. Chairman, I yield back.

*Mr. Duncan. Great questions. I will now go to the gentlelady from Florida, Ms. Castor, for five minutes.

*Ms. Castor. Well, thank you, Mr. Chairman. This is a very interesting hearing. I really appreciate you organizing it. I think AI in the energy sector holds tremendous promise for just lowering consumer's energy bills and boosting productivity and efficiency in helping businesses become more innovative, and then for storm recovery. Coming from the State of Florida, I see a lot of promise there.

I want _ I need a little more information about virtual power plants, though. It is _ Mr. Sistu, I understand _ I have been learning about virtual power plants where you have the number of smaller-scaled distributed sources that can come together, maybe it is the _ just the plain smart meter along with your electric vehicle with the battery packs, with different appliances, and solar arrays. I understand

the Department of Energy just released a report estimating that tripling virtual power plant capacity by 2030 could save the U.S. about 10 billion dollars a year in grid cost and help us just modernize our _ the way we produce energy.

Give us some examples of what is working. Are you familiar with this deal, report, do you agree with it? What should we be focused on there with virtual?

*Mr. Sistu. Thank you, Congresswoman. So Schneider Electric and AutoGrid, which is the leader in the virtual power plants, contributed, you know, to the recent DOE Liftoff Report, you know, on virtual power plants, you know, recently.

So going back to your first question about, you know, VPPs in general, I think VPPs are a great technology that allows us to aggregate, you know, energy resources available within a certain geographical area. People can opt in. And the benefit is, I mean, the _ today everyone might have a little bit of energy available, a little bit of storage available, a little bit of production, and using technologies, you know, such as VPP that is powered by AI, we can really convert it into massive sorts of energy, you

know, that can reduce the impact on the grid.

So it is a tremendous opportunity I think to skill these VPPs. Some of the challenges, of course, in, you know, making sure that the regulation is in place and, you know, the regulation helps proliferation of these VPPs, in addition to, you know, microgrids which is another great way of aggregating and building some resiliency in the energy system.

*Ms. Castor. So this _ they are going beyond just the more efficient kind of appliances and things like that to do _ to bring in all potential energy sources. Can you give us some examples? Is there a business or a state that has put some resources into this and demonstrated it?

*Mr. Sistu. I don't have one right with me. If you don't mind, I can get back to you with a return response on that.

*Ms. Castor. I know that Microsoft deployed an AI-driven energy management system in _ at its Redmond Campus, designed just in their _ to optimize the energy usage, and they reduced energy consumption at Redmond by 15 to 20 percent. I am not sure if they are producing power or if

they just _ that was an energy efficiency play.

But it also seems like the whole business model in the energy sector, electricity sector is so outdated for the challenges of today because it is built on sell as much electricity as possible, often make capital investments that don't make a lot of sense. It is a good return for the utility, but it is not a great return for the customer.

So what _ are there some examples of states or local communities that have taken on this challenge? That question is for anyone.

*Mr. Sistu. Maybe I will just, you know, tee off the answer to that. So the first one, you referenced the Microsoft Campus, and I would like to highlight that Schneider Electric has a campus in, you know, Boston area that has a microgrid facility with, you know, solar panels that, you know, really allows us to have resiliency as well as reduce the, you know, energy consumption dramatically.

And then in terms of the, you know, examples you were talking about. We have many new sites that are coming up. I think there is the opportunity in the new construction to incorporate, you know, solar PV as well as, you know, VIN

and having these storage systems is tremendous. So any new construction that can _ regulation that can favor incorporating these into new construction is going to be helpful. And I will let others chime in.

*Mr. Duncan. The gentlelady's time is expired.

*Ms. Castor. I yield back, thank you.

*Mr. Duncan. I will now to go to Mr. Latta from Ohio for five minutes.

*Mr. Latta. Thank you, Mr. Chairman, and thanks for our witnesses for being with us today.

Under Secretary Dabbar, in your testimony you voiced your concerns, of which I share, with the challenges surrounding power generation and the need to maintain the operations of data centers that would be utilizing these new AI technologies. You also pointed out that new semiconductor plants will need immense source of energy to power these operations, and Ohio is going to be one of the states to be home to one of the new chips plants.

I have long raised this issue with the officials at DOE, especially given the recent regulatory actions that the Biden administration has taken that would result in a

decrease in power generation for reliable sources. And in this committee not too long ago, we had DOE and FERC in here, and I asked them each one simple question. Do we need more power or do we need less power in this country? And after a little silence they both said more.

So what must Congress do to push the administration to reverse course on their efforts to stifle domestic energy generation?

*Mr. Dabbar. Yes, Congressman. So we are shutting down more power plants than we are building this country, so if we want to electrification, that is kind of contrary, and that is actually what is practically going on in PJM, in the New York ISO, and elsewhere around the country. I think that a large part of that is because of FERC regulation and the ISO rules that do not give proper value to baseload, actually encouraging it to shut down, and that is where the decommissioning is, that is why we are shutting down more.

So I would recommend to this committee that there needs to be some sort of FERC Natural Gas Act, Federal Power Act reform to give direction to FERC to require ISOs to set up structures that don't encourage power plants from being shut

down.

*Mr. Latta. Let me follow-up. In your opinion, what sources of energy would be the best and most reliable to provide the necessary power for growing the AI industry?

*Mr. Dabbar. So to _ most of the data centers are baseload, right, there are constant power demands, so you need to get power that is constant, as compared to some customers that go up and down, like residential. So if you want to have baseload really nonstop, you know, the best ones are nuclear, hydro if you happen to live in those areas of the country that have _ you know, that have that sort of run of river aspect. Natural gas combined cycles.

Those are the ones that can produce, you know, dispatch no matter what the weather is and whether the sun is shining or not. Hopefully some of the new battery technologies like Form Energy and others can drive the cost down because lithium-ion is not good enough to do that cost effectively yet. So that is kind of the sources.

*Mr. Latta. Well, you know, just to follow-up again, on the grid reliability, you speak to AI's ability to increase efficiency and operations by predicting weather

patterns and maintenance needs. One area that is harder to predict obviously is when the grid is threatened by non-natural incidents. How can AI technologies help grid operators respond to emergencies that are man-made in nature or deliberately caused?

*Mr. Dabbar. Yeah. So AI has the ability to do sensing of what is going on in the grid, you know, significantly all around and can see any small changes that kind of happen. But there are technologies, I will give one that is quite interesting in which some of the quantum fiberoptic systems were actually able to detect footsteps at the substation before an incident happened recently.

That is not widely known, but there is actually ways for some of this data, some of the quantum networking data and artificial intelligence to detect minor vibrations and actually detect human interaction that should not have been at the location.

*Mr. Latta. Interesting. Thank you.

Mr. Sistu, are there opportunities for companies like Schneider to collaborate with the public sector to incorporate AI technologies into grid modernization efforts?

*Mr. Sistu. Thank you, Congressman for the question. And the answer is a resounding yes. I think we have a significant opportunity in front of us as a company who focused on energy and also as a company that has invested heavily in artificial intelligence because we believe this is, you know, key to transforming the energy in future. So we will be very happy to participate in the collaboration.

*Mr. Latta. Thank you.

My time is about to expire. Mr. Chairman, I yield back.

*Mr. Duncan. The gentleman yields back. I now go to Dr. Schrier for Washington State for five minutes.

*Ms. Schrier. Thank you, Mr. Chairman. Thank you for your comment about hydropower.

Thank you to all of our witnesses for being here today. I enjoyed your testimonies today.

As a member of the new Democrats Artificial Intelligence Working Group, I am really glad to see this subcommittee considering AI in the context of the energy sector. I think it is something really important to think about.

Utilities in my district, and we have PUDs, lots of hydropower, are already using the technology to our benefit using AI modeling to predict when distribution systems might fail, some of you talked about this, how many customers are expected to be impacted. They even have plans now, and this _ these are related in my district, to use the application of artificial intelligence to salmon restoration efforts, just to see how many are going to make it down, how many make it back, and where _ you know, where demise is happening.

So while we are seeing just a glimpse of these promising applications ahead, we just have to be really careful and thoughtful when integrating this quickly evolving technology into our systems. And many of you talked about some of those dangers and how to make them safer.

In the workforce, Americans in every sector of our economy are reasonably wondering how AI might impact their own job and AI, I believe, can and should be a way of optimizing jobs, of putting the mundane tasks on the shoulders of the computers and opening up workers to what

one of you described as sort of intuition, and judgment, and decisions. And, of course, it is essential that we as lawmakers implement AI policy that provides guidance on best practices and incentivizes and enforces those behaviors.

Dr. Renshaw, I had a question for you first. As we transform the grid toward a more complex mix, so more intermittent energy like wind and solar, balancing the grid is going to require a lot more advanced decision making, and I was wondering how we could use the power of AI to balance the grid and maybe where _ like where AI stops and human decisions begin. If you could comment on that.

*Mr. Renshaw. Yeah, so that is a great question, thank you. So one of the things that we have seen is that, as you mentioned, the grid is extremely complex, the most complex machine built by humans. So balancing this new world of prosumers, as Mr. Sistu mentioned, who are consumers who also produced electricity, combined with this grid, we see AI as a key instrumental piece as a decision support agent. So, again, allowing humans to do what humans do best with their intuition, and creativity, and implementation; and computers to do what computers do best with fast, accurate

processing of data and calculations.

So in this way, we see the combination for grid reliability of allowing the computers to make a number of decision recommendations for humans to then implement. So this could be in terms of demand response systems where HVAC systems are turned off periodically due to high demand, or televisions are dimmed 10 percent, or different programs like that where you can curb demand but also utilize the grid more effectively.

*Ms. Schrier. That is really interesting. Thank you.

And, Mr. Sistu, I have a question for you as well. In my home state, we have Pacific Northwest National Labs, PNNL, and the are doing research into batteries, which you just mentioned, battery development, which can be a lengthy process, and I was wondering if you could talk a little bit about the role that artificial intelligence can play in accelerating some of that research and development into new battery storage technologies.

*Mr. Sistu. Thank you, Congresswoman. So I think AI has _ probably, you know, will have one of the most impactful roles in increasing the speed of innovation. You

know, some of the colleagues here talked about generative AI, and I think the generative AI's application is going to be very critical, especially when we think of research. You know, research if always built on something that has happened before that is volumes of information that people have to refer back to and can glean insights from to build new ones.

And the second is, running multiple simulations. You know, if you have to run, you know, by hand, you know, maybe 10 times, 20 times and using computer so you can do millions of iterations of the same experiment. So I think there is a tremendous opportunity, particularly for generative AI and improving research and development.

*Ms. Schrier. Go ahead.

*Mr. Dabbar. So when I was at DOE, Stanford SLAC did an analysis, you know, of the lithium-ion battery discovery time, and they figured out that if you had today's AI and supercomputing capacity at the time that they were spending the effort to develop the lithium-ion battery, that took 11 years from the initial idea to the first commercial topic, with today's AI and supercomputing, they are to have

accelerated where to go do research in the lab, they could have done it in three years. So that is the exact example _ quantitative example of your _ to your question, Congresswoman.

*Ms. Schrier. That is incredible and inspiring because we are going to need other minerals that we can mine right here at home, so thank you very much.

I yield back.

*Mr. Duncan. The gentlelady yields back. I now go to Mr. Walberg for five minutes.

*Mr. Walberg. Thank you, Mr. Chairman, and thanks to the panel for spending your day with us.

We have had a lot of successful applications, we have talked about that today, of AI and the energy sector, which is encouraging. Some of these applications involved enhanced safety measures. My district has a nuclear plant on the east coast, Lake Michigan, and a nuclear plant on my west coast, Lake Erie. Other large energy facilities as well in the district, so safety and security are extremely important to me.

Mr. Renshaw, I understand AI tools use data to identify

early stage trends to notify plant operators, utilities, et cetera, ahead of potential equipment failures. We just had a 8400-gallon premium gas spill geyser coming out of a pipeline in a farmer's field in my district yesterday. Can you give some examples of how AI is being used by the energy sector for predictive maintenance?

*Mr. Renshaw. Yes. So there are a number of examples. I think _ I will actually stray away from nuclear to one that is deployed today. It is through our WinNER, Wind Energy Network, where we are looking at wind turbine gear boxes, so looking at combining the data that is coming in from all of the different wind assets, they're _ have lots of different sensors in them, to identify early stage degradation in the wind turbine gear box so that you can either take it out of service for a time when maintenance is optimal or in some cases run it for a little bit longer to then do maintenance on a small subset of components before you have to respond and deal with a wind turbine failure, which is upwards of $350,000 to repair or replace.

So it is those kinds of things where as we accumulate the data, we can do more with that data for predictive

maintenance.

*Mr. Walberg. Having a facility that builds those gear boxes in my district as well, I have heard early on that was a significant problem, so that is a major savings. Can AI better enhance worker's safety as well?

*Mr. Renshaw. Absolutely. So one _ and this is one of the areas where we see a merging of different technologies, so combining AI with things like augmented and virtual reality, we can improve the training that we give to people to help them identify what training they need to have to operate in their jobs more effectively. And what I mean by this is an AI system that helps to train you can learn how you learn, which may be different than how I learn, and optimize each of our training so that we can get better training in less time, do our jobs safer and more efficiently.

*Mr. Walberg. Okay. We are already in a massive transition to a smarter grid, I want to shift over to that area, but will continue to rely more and more on technology and AI. As we have discussed, this can be a very good thing, but I am also concerned that in the rush to green and

increased energy efficiency, we may not be talking _ taking adequate time to build out our domestic technology supply chain, and as a result, increasing our reliance on China.

Many green or clean technologies are fully digitized and yet the vulnerabilities that they can open up always seem to be an afterthought. At least they have been. Solar invertors, wind invertors, distributed energy, resources like the electric vehicles, smart meters, and rooftop solar panels all rely on internet connectivity to the grid. All of these new connections open up more entry points for cyberattacks, and that is my concern.

Under Secretary Dabbar, thanks for being here. As our grid gets smarter, how do we ensure that cybersecurity protections are baked in throughout the entire life cycle of the technology and infrastructure?

*Mr. Dabbar. So there are many reasons, but one of them is I think that every single energy company needs to understand their own supply chains, and I know several of them where they _ before they go to Schneider Electric or they go to GE, and they actually survey like exactly where the individual components are, so all the individual chips

and understand it. Every company has to have their own view of what those specifics are, but I think the best in class I have seen is that the customer, so the electric utility or whoever, power plant owner, feed that back into the suppliers, and the suppliers understand it is important to the customers.

And I will leave it obviously to Congress to see if there is some sort of authorization language that might require some of those things.

*Mr. Walberg. Okay. Well, I appreciate that, and this is an area that _ it is hard to fully understand yet, but we are seeing that it is a reality that we have got to contend with, and it will be for our good if we do it right, so thank you.

My time is expired, I yield back.

*Mr. Duncan. The gentleman's time is expired. I will now go to Mr. Cardenas for five minutes.

*Mr. Cardenas. Thank you very much, Mr. Chairman.

Over the last decade, artificial intelligence, otherwise known as AI, has seen an acceleration and breakthroughs across sectors of critical importance, not

only to our Nation but to the whole world. AI is an immensely powerful tool with the potential to help address pressing global challenges, for example, like the climate crisis. As AI development skyrockets, congressional Democrats and the Biden administration will not only continue to support and incentivize the clean energy transition but also look at ways to leverage new technologies and innovations.

If done right, AI can support our work to build out a clean, equitable energy economy. The key here is if done right. In addition to its promise, AI also comes with a host of risk factors that we need to address before integrating it before _ fully into the energy sector. The current AI boom has proven increasingly energy intensive and there is a growing body of research that points to its significant energy and water consumption and the carbon emissions that are caused.

Meeting our ambitious climate targets will require decreasing emissions across every sector including those associated with AI development and deployment. To do this, we need transparency from stakeholders in the industry on

the environmental impacts of utilizing AI.

Questions for Mr. Sistu, Vice President of Official _ Artificial Intelligence at Schneider Electric. Are there any steps being taken by AI developers to mitigate energy consumption and reduce their emissions? And also, are these concerns something that can be addressed through innovation?

*Mr. Sistu. Thank you, Congressman. So there are several ways in which we address the challenge of carbon emissions contribution from AI. So first and foremost, we have a program where there is an assessment of the carbon impact of the AI models, you know, while we are building them before we get into production we have estimates of the cost of, you know, running those models, which can be translated into cost _ you know, cost of the carbon dioxide.

But fundamentally I think, you know, what we can also do is there is a tradeoff between the complexity of models and, you know, the models that are good enough to do the job, and I know that can _ that also, you know, by extension have less carbon footprint. So I think there is a move towards making models that are more, you know, simpler that can still do the good job, and they also have the benefit of

being explainable, because one of the things that we also need to take into account is how to make the AI models explainable so that other people trust them, and then they get the _ they also have the benefit of reducing the carbon footprint.

So simpler models and making sure that we account for the carbon footprint of these models is something that we are doing.

*Mr. Cardenas. It is good that you are explaining to us that you actually assess that ongoing in your innovation. However, does that remain proprietary information or do you disclose that to your users or to agencies, et cetera?

*Mr. Sistu. So as a company, you know, we take pride in, you know, [indiscernible] goals and, you know, our environmental impact. We have _ we are taking steps to start to make this more visible, the AI cost of _ to the environment.

*Mr. Cardenas. Well, again, does that information come out to the public or does it remain proprietary with you on what you just explained to the committee?

*Mr. Sistu. So this is the aggregate impact that, you

know, we manage, you know, Congressman, not at the each individual model level because, you know, it is highly variable and dependent on the use case.

*Mr. Cardenas. So the answer is, yes, you do divulge that information based on the products that you produce?

*Mr. Sistu. That is correct.

*Mr. Cardenas. Okay, thank you. And also in addition to that, when it comes to your goals and your carbon neutral goals, et cetera, how are you doing with that so far? Because it is one thing to have a goal, it is another thing to say, wow, we are being incredibly successful at meeting the demand of a product. For example, you know, combustion vehicles have met the demand for many, meany years, but we are starting to realize that all in 360 degrees that is not the best thing for the environment as a whole, the world as a whole, the community as a whole. But for that individual who wants to go to Point A to Point B in a combustion vehicle, they are happy.

So how are you doing so far when it comes to your success of meeting your own objective goals?

*Mr. Sistu. So we publish our sustainability report,

you know, on a regular basis and it is available on our website for everyone to see how we are meeting our objectives. We are quite transparent in how we are meeting the goals. And we not only take into account _

*Mr. Cardenas. What time is that, is that quarterly, annually, every five or 10 years?

*Mr. Sistu. I believe it is annual, yeah.

*Mr. Cardenas. Annual report, okay. My time having expired, I appreciate your cooperation to my questions.

I yield back.

*Mr. Duncan. I thank the gentleman, and I will now go to Mr. Palmer from Alabama.

*Mr. Palmer. I thank the Chairman.

Mr. Renshaw, AI models could have a broad range of biases. I was reading your testimony and you made that point. What I would like to know is considering that we are already in a situation where the grid is not meeting energy needs in certain areas of the country and the projections from the North American Electric Reliability Corporation that the Midwest all the way down to Louisiana could be facing those.

Is it possible that if AI is being utilized heavily in our _ on our energy grid that those biases could come into play and determine how much power a household could use or a business?

*Mr. Renshaw. Yeah, so that is a very germane question to this discussion. So what we often are referring to in biases, looking at all forms of AI, whether it is advertising, marketing, banking, different things like that, in addition to energy. So often what we are concerned about is biases in say a bank not providing a loan to someone because of the data that has been trained on or furthering racism, sexism, things like that.

*Mr. Palmer. Yeah, I got that.

*Mr. Renshaw. Fortunately with _

*Mr. Palmer. Yeah.

*Mr. Renshaw. _ energy data, we have much less of that. I don't see, to your question, an AI model limiting the amount of energy into a household.

*Mr. Palmer. Well, it is not what could be now, it is what could be later, because your AI information is based on modeling.

*Mr. Renshaw. Mm-hmm.

*Mr. Palmer. And depending on how the model's constructed, you could have built-in biases that would limit power to certain regions of the country. It could also be used, for instance, in climate models, and there _ we already know that there are biases in the climate modeling, and that is one of my concerns is how bias could impact, as you called it, explainability.

*Mr. Renshaw. Yeah, so that is a great question, and let me pull the thread a little bit further on that. So I think it comes down to how you train the model, and so the way that you train the model is if you give it rewards for safe, affordable, reliable energy so that as customers are turning on the lights, turning on their HVAC units, turning on their TVS, that the power flows into the household reliably. And when it doesn't is when the model is penalized for not providing that safe, affordable, and reliable energy. So in that way we are able to train the model so that it does provide reliable power to everyone.

*Mr. Palmer. But see _ and Mr. Sistu's testimony, reading that, he made the point that AI could be problematic

in regard to personal data. So when you are creating these models and the model will reward good behavior, as AI advances, it could also punish bad behavior. So that is one of the things that I think we got to take into account when we are thinking about this stuff.

And then you have got the whole issue, as Mr. Cardenas pointed out and I appreciated him bringing this up, about the amount of emissions. But that is a function of the amount of power that it takes to run an artificial intelligence system. It is also going to be _ emissions will be a factor in the amount of infrastructure that has to go to support it, including water.

And I just wonder how we are going to manage this, and particularly in places that are arid, and what it might mean in terms of tapping into aquifers and things like that. I know there were some solutions that have been discussed, you know, treated water, things like that, but I don't think people fully appreciate the amount of power and the amount of heat that is generated in these systems.

And if you would like to, I _ Mr. Dabbar, if you would like to respond to that because you _ I think you probably

see this a little bit in a broader perspective, not just the energy sector but also in terms of what it means to the Nation as a whole, national security, economic policy.

*Mr. Dabbar. Yeah. So I do think that as the digitization, of which AI is at the front end of growing, is going to take a tremendous amount of energy. It actually generates a tremendous amount of heat, right. If you have ever been at the bottom _ one of the super computers in the basement, it looks like a power plant in terms of the cooling systems, it is very, very large, got big cooling systems.

And I will give you an example of how much this eats up, and a few questions about this. So there has been five number one super computers at Oak Ridge. If the power demand required for the chips in the _ five times ago, number one super computer at Oak Ridge was the same amount of power needed per chip, per flop, or per calculation at Frontier, which is the current number one super computer in the world at Oak Ridge, it would take 3,000 megawatts of power for one computer. That is three large nuclear power plants for one computer.

That is obviously not only not feasible from the power system, it would actually fry and melt the chips. So this is innovation on this topic to drive down power costs and efficiency and so on, has multiple needs.

*Mr. Palmer. Well, just the modeling over a four-month period consumed enough power to power the average American home for 41 years.

I yield back.

*Mr. Duncan. The gentleman yields back. I now go to Mr. Sarbanes for five minutes.

*Mr. Sarbanes. Thanks, Mr. Chairman. I kind of feel like I am in one of those films where they go chi, chi, chi, chi, chi, and then you go back to like, you know, October 2023 in a hearing in a room somewhere, and then you fast-forward again to time when machines rule the world. And we are like, yeah, we were at that hearing.

So, Mr. Sistu, I wanted to ask you about the potential application of AI in terms of all the benefits that have been discussed when it comes to the way the Federal Government manages its kind of green building initiatives, and I didn't know if you had any perspective on how that _

this AI building management opportunity can be applied to the federal sector, whether there is any kinds of initiatives going on around that to maybe demonstrate the potential of it, just what your views are on that.

*Mr. Sistu. Thank you, Congressman. So on the _ to put it simply, I think buildings are a great place, you know, for the application of AI and in the federal, you know, sector in particular because of the number of buildings that are there, and the age of buildings, and the uses of them.

So the application of AI into buildings can take a few forms. The first and foremost is around the optimization of energy consumption, what it means is, you know, we need a good, you know, state of the art building management system that has the ability to understand the building and control the building. So we can have multiple sensors in place in building, not only to simply control the temperature but also understand the occupancy and the behavior of the buildings, right.

So the modern now workplace has shifted to hybrid environment. We know unpredictable behavior in terms of

[indiscernible] and AI can help a lot in forecasting that. So that is one angle, you know, lots of sensors, having state of the art building management system that can help optimize the energy consumption.

And we have examples of, you know, doing the optimization of HVAC systems that can, you know, provide significant reductions in the energy usage while maintaining the same comfort level that people are used to.

*Mr. Sarbanes. Are you saying these energy-saving companies that are in this space of managing buildings, are they pulling AI into their toolkit?

*Mr. Sistu. Yeah. It is, you know, coming up and, you know, in fact we at Schneider Electric, you know, are also investing, you know, in these capabilities, so there is more to come in this.

*Mr. Sarbanes. What _ I mean, we obviously worry about the potential downsides or dangers once you pull AI into the mix. In the context of managing building energy efficiency and so forth, are there any applications there where overreliance on AI might lead to some bad outcomes, and any examples you can envision there, and are there areas of

building management where _ that you should sort of keep away from AI in terms of how it is managed because of those things and make sure the guardrails are in place?

*Mr. Sistu. Yeah, so I think what is important to keep in mind is buildings are pretty complex entities and, you know, not all HVAC systems are exactly the same, you know, they have different physical properties. So one of the things that is important to understand about building artificial intelligence is how we would place for the physics, because just the data on _ predicting pattern from data is one thing, but combining physics so we know the physical limitations of a system _ for example, how much time it takes for a space to heat, you know, it doesn't heat instantaneously, or, you know, how early to start heating the building so, you know, people when they come in it is, you know, warming enough.

So I think we have to understand the physics and the response that HVAC systems have and blend it into artificial intelligence, which is an activity _ something that must be done more.

*Mr. Sarbanes. Mm-hmm. One last question in the last

40 seconds, because you made me think of this. Obviously we did a whole relook at HVAC systems in the middle of the pandemic in terms of how air moves and so forth. I presume that is another place where AI can benefit us in terms of how the buildings are operating.

*Mr. Sistu. Yeah. You know, it is a big, you know, competition problem, you know, to understand the airflow patterns, you know, in large buildings and especially with unpredictable occupancy, so absolutely.

*Mr. Sarbanes. Thank you.

I yield back.

*Mr. Duncan. The gentleman yields back. I now recognize the chair of the Environmental Subcommittee, Mr. Johnson, for five minutes.

*Mr. Johnson. Thank you, Mr. Chairman. It is too bad we have had the day that we have had today because I was hoping this room would be full to show you folks what I saw for the first time this morning.

I want everybody here if you have got an iPhone, take your iPhone out. This is going to be an ah-ha moment for you. Go to settings in your iPhone. Scroll down to

battery, and then scroll all the way down to battery health and charging. Scroll all the way down to the next _ to the bottom. You will see a clean energy charging button, it is probably green.

Have you been having any problems charging your iPhone lately? Here is the reason why. Read that paragraph. Apple, without your knowledge, without our knowledge, opted us in to a clean energy AI, we think, option to not charge your battery if they think the grid is under stress or you are not in a good enough carbon emission area to use the electricity.

Proponents of this will say, oh well, you can opt out. But, friends, why are we being automatically opted in and how many more things are we going to be opted in by some of these environmental zealots on the other side without our knowledge? The ethics of this are troubling to me and I can guarantee you this committee, maybe not this subcommittee, but _ we may, but others are going to be looking into this because I think it is egregious.

But let me go back to last June. Many of you remember in this committee we had a hearing that focused on a

Democrat piece of legislation that would look into mandating so-called demand response technology on new water heaters, at that time. On the surface, new technology they say can be leveraged to improve efficiency and save consumers money. Sounds great.

But here is the catch. This idea that an outside entity like the power company or even the government at the push of a button could force you or your family to take cold showers because the grid is overloaded is absurd. And it is not just water heaters, it is heating and air conditioning and perhaps even EV charging stations. And, yes, it is voluntary for now. And now with AI coming to the power sector, well you can see where this could all be heading and what might be happening behind the scenes without any of our knowledge.

So, Mr. Sistu, have I got that right? Am I saying that right?

*Mr. Sistu. Yes, Congressman.

*Mr. Johnson. Okay. Thanks for being here. I am a technology nut myself. I am an inventor, computer scientist. Things have come a long way since I started out,

but I was working with AI back in the early 80s when AI was a buzz word. I appreciate what you do to make people's lives better.

But I do want to ask you, the technology you work on to make homes more efficient, automating usage, and as your testimony says, "Prioritizing what to power during outages,'' do you believe that American consumers should be able to consent to all of this first and opt out _ opt in only if they want to?

*Mr. Sistu. So first of all, Congressman, I would like to _ since you said you studied A1 in 1980s, I think we can all see how far the technology has come.

*Mr. Johnson. Yeah.

*Mr. Sistu. It is not something that came last year, so _

*Mr. Johnson. I am limited on time.

*Mr. Sistu. Yeah.

*Mr. Johnson. So do you think people ought to be able to opt _ be _ have to opt in and they don't have to participate if they don't want to?

*Mr. Sistu. Absolutely. I think this is a tool.

*Mr. Johnson. Okay. Do you believe that AI from say the power company should be able to override the temperature that someone wants to heat or cool their homes at any given point in time? Do you think the power company ought to be able to do that?

*Mr. Sistu. I think it is a contract between the consumer and the utility _

*Mr. Johnson. So the customer should have the choice, right?

*Mr. Sistu. Would have the choice.

*Mr. Johnson. Absolutely. Or should they be able to prevent someone from charging an EV at the time of day that they choose to?

*Mr. Sistu. Same as before, they should be in control.

*Mr. Johnson. So we know consumer behavior can be changed with prices, too. Is it ethical in your view to use AI to force Americans into higher prices for charging or using electricity based on the time of day or energy mix on the grid at any given time?

*Mr. Sistu. So most of the AI algorithms, Congressman, take into account the prices that are there, published, that

are published by the utilities, not really influence them, per se. But, you know, it is not something that I foresee AI doing to influence prices.

*Mr. Johnson. Okay. Because some folks on the environmental left would love to weaponize this technology, and if they had their way it would be mandatory and we wouldn't have a choice to opt in or know about it first.

So, Mr. Chairman, we have got to look more into this kind of activity for sure. I yield back.

*Ms. DeGette. Mr. Chairman, I just want the record to reflect nobody over here is having trouble charging their phones.

*Mr. Johnson. Not today, because we have got plenty of electricity because the House is not doing anything else.

*Mr. Duncan. Okay. The chair will now recognize Mr. Pfluger.

*Mr. Pfluger. Thank you, Mr. Chairman. The things that happen in Congress.

Look, I am very intrigued by this, and I am going to come at this, Mr. Dabbar, from kind of a productivity angle to begin with because I have stopped saying all of the above

and I am kind of saying the best of the above, and I think AI is a tool that can help us with that best of the above equation. But I kind of want to hear it to start with on _ let's start not on production as much as on what _ the pipeline, midstream space, the reduction of emissions.

We are in a big fight right now with some of the regulatory bodies, the administrative state that is placing very burdensome regulations on us that maybe some think are scientifically-based, but I am not so sure they are. So how can AI help us reduce emissions and to what degree would that be more effective than even some of the proposed rules, regulations and, you know, things that are going on with our regulatory bodies?

*Mr. Dabbar. So, yes, Congressman, obviously Permian is incredibly well-positioned in terms of given how vast it is in terms of production for the matter of data, the number of pumps, the number of situations, and therefore the air _ the number of opportunities to optimize that you asked about.

Putting sensors at every pump, every compressor, every production, linking it to a high-performance computer with

AI to optimize, to evaluate whether there is any emissions coming off that can be quickly, you know, kind of captured, preventative maintenance on pumps, right, to allow for that. The opportunity set is not only vast but it _ a number of the big companies in Texas in the Permian are already doing this. You look at ConocoPhillips, you look at BP, they are actually some of the first early adopters.

I am doing a podcast with someone from ConocoPhillips later _ at Columbia specifically on Permian oil and gas optimization with AI.

*Mr. Pfluger. With regards to energy security, I mean, we talk about the term security. How can AI enhance that security in the posture? Thank you for bringing up the Permian Basin, the world's largest and most secure source of oil and gas.

*Mr. Dabbar. So, you know, the opportunity for criminals or adversary nations like China to put viruses into our operating systems is quite easy, and that is a tough thing to say, but that is actually the case. And so the ability to scan, to look for these particular viruses in operating systems, not just in IT like in your phones, but

in pumps and control systems that are made is I think vitally important.

*Mr. Pfluger. Well, thank you for that.

And I will turn to Dr. Renshaw about the topic of carbon capture and storage. Talk me through how AI can play a role in identifying those formations and getting, you know, to a point where we actually can reduce emissions, scientifically-based, and find those formations that they could be used for this purpose.

*Mr. Renshaw. So to clarify, you are talking about carbon capture in underground storage?

*Mr. Pfluger. Right.

*Mr. Renshaw. Okay. Yeah, so one of the things we are doing, I would say this is not directly analogous, but looking at various forms of three-dimensional inspection data. So inspection data could be underground formations, it could be nuclear power plant structures.

What we are using AI for is to help _ again, humans do what humans do best which is that deep technical analysis, and have computers do what computers do best. So what we are doing on the inspection side that could be applied to

the geologic side is utilizing AI to parse through that data and filter out the things that we don't care about or that aren't relevant to then focus the humans on that small fraction of data of whether it is underground storage _ or underground formations that could be conducive for a carbon capture or whether it is flaws in a nuclear reactor.

*Mr. Pfluger. Obviously very excited about the possibilities of using this technology. Mr. Sistu, with the 40 seconds we have left, when it comes to the type of power that we use to power the grids, you know, talk me through how we can predict peak usage or when we are going to be, you know, very slim on the margin and running a deficit potentially and how AI can be used to overcome that and pull in that best of the above sourcing for our grid.

*Mr. Sistu. Yeah, absolutely. I would like to briefly mention that we thank the support from, you know, State of Texas where we have a lot of presence, significant presence from Schneider Electric.

So on the topic of how AI can be used, we _ the AI models have really tremendous potential in improving the accuracy of predictions. We had statistical methods in

place, you know, previously that did a reasonably good job but now using [indiscernible] we have much greater ability that allows us to operate, you know, much more agile and in real time way in order to work with the grid.

*Mr. Pfluger. Thank you very much.

*Mr. Sistu. Yeah.

*Mr. Pfluger. My time has expired on the 50th anniversary of our _ of the Yom Kippur War and where we had scarcity of energy sources, and we are talking about Israel at this point in time.

Mr. Chairman, I would just like to point out how nice it is to have the sourcing of energy in this country.

*Mr. Duncan. Yeah.

*Mr. Pfluger. And to be able to use that energy in a geopolitical way. Thank you for this panel. I could go on and on about that topic, but I appreciate you.

*Mr. Duncan. The gentleman's time has expired, and I think him for the questions.

Well, that looks like all the members. I want to thank our panelists for being here today. It has been fascinating. We are just sticking our toe in the water, so

to speak, on this subject.

Members may have additional written questions and members that aren't here, couldn't make it, may have questions for you. I will remind members they have 10 business days to submit additional questions for the record, and I ask witnesses do their best to submit responses within 10 business days upon receipt.

I ask unanimous consent to insert in the record documents included on the staff hearing documents list.

And without objection, that will be the order.

[The information follows:]

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

*Mr. Duncan. And without objection, the subcommittee will stand adjourned.

[Whereupon, at 3:30 p.m., the subcommittee was adjourned.]