U.S. COMMODITY FUTURES TRADING COMMISSION

ENERGY AND ENVIRONMENTAL MARKETS ADVISORY COMMITTEE

(EEMAC)

Tuesday, February 28, 2023

10:32 a.m.

Nashville Public Library

615 Church Street

Nashville, Tennessee 37219

PARTICIPANTS

CFTC COMMISSIONERS AND STAFF:

ROSTIN BEHNAM, Chairman

CHRISTY GOLDSMITH ROMERO, Commissioner

KRISTIN N. JOHNSON, Commissioner

SUMMER K. MERSINGER, Commissioner and EEMAC Sponsor

CAROLINE D. PHAM, Commissioner

LAUREN FULKS, EEMAC Secretary, and Acting Chair

CHRIS LUCAS, Chief of Staff to Commissioner Mersinger

EEMAC MEMBERS:

TRABUE BLAND, ICE Futures, Inc.

ROB CREAMER, FIA PTG

DEMETRI KAROUSOS, Nodal Exchange, LLC

WILLIAM F. MCCOY, Morgan Stanley

JACQUELINE ROBERTS, West Virginia Public Service Commission

DEREK SAMMANN, CME Group

TARA SHAW, The Energy Council

PARTICIPANTS (CONTINUED)

EEMAC ASSOCIATE MEMBERS:

MATTHEW AGEN, American Gas Association

SNEHA BAGRI, OTC Global Holdings, LP

FRANK HAYDEN, Calpine Corporation

PAUL HUGHES, Southern Company

FRANK MACCHIAROLA, American Petroleum Institute

JOHN MELBY, Xpansiv

JEAN-MARC MONRAD, Vitol, Inc.

MATTHEW PICARDI, Commercial Energy Working Group

JAMILA PIRACCI, Life:Powered

DR. RICHARD SANDOR, Environmental Financial Products, LLC

MIKE TAYLOR, AEGIS Hedging Solutions, LLC

SARAH TOMALTY, BP Energy Company

JEFF WALKER, ACES

KAREN WUERTZ, National Futures Association

PARTICIPANTS (CONTINUED)

PRESENTERS:

DAN BOWERSON, Alliance for Automotive Innovation

DR. JOSEPH BOWRING, PJM Independent Market Monitor, Monitoring Analytics

GEORGE PULLEN, Senior Economist, CFTC Division of Market Oversight

AGENDA

P R O C E E D I N G S

MS. FULKS: We are excited to welcome you to the second EEMAC meeting under Commissioner Mersinger being held at the Nashville Public Library in downtown Nashville, Tennessee.

I would like to welcome all of our new and returning members and associate members. I would also like to thank Commission staff, as well as the staff of the Nashville Library for all of the hard work. I could not have done this without any of you.

As you may have noticed, the EEMAC chair, Dena Wiggins, is not in attendance today. As such, I will be acting in her place and serving as chair for this meeting.

Today's meeting is taking place in a hybrid fashion. Several participants are here in person, but several are also on the phone. So to ensure that the meeting goes as smoothly as possible and the recording of the meeting is complete and accurate, please note the following.

If you are in person and you would like to be recognized during today's discussions, please place

your name card so that it sits vertically on the table. Before you speak, please identify yourself and the organization that you represent on the EEMAC. Please unmute the microphone and speak into the microphone. You will notice that you have to share microphones. After you are done speaking, please mute.

If you are participating virtually and would like to be recognized during the discussion for a question or comment or need technical assistance, please message me within the Zoom chat. Please identify yourself when you begin speaking and signal when you are done speaking. Please speak directly into your phone for optimal audio quality on the webcast.

Please unmute your Zoom video before you speak and mute both after you speak. Please only turn on your camera when you are engaging in the Q&A after the panel. If you are disconnected from Zoom, please close your browser and enter Zoom again using the link that was previously provided before today's meeting.

Before we begin this morning's discussion, I would like to turn to Commissioner Mersinger for her opening remarks.

COMMISSIONER MERSINGER: Thanks, Lauren, and I want to welcome all of you to Nashville. And thanks to the Nashville Public Library for the opportunity to hold our second EEMAC meeting. It's a beautiful space and excited to be here.

I also want to thank my fellow commissioners who are joining us and participating virtually today. Thanks to all the guests in attendance and online, and panel participants, committee members and associate members on the EEMAC.

Special thanks to Chris Lucas, my chief of staff, and a special welcome to some new EEMAC members -- Tara Shaw, Jamila Piracci, and Sneha Bagri. I'm sorry if I'm getting -- my pronunciations are off here.

But finally, a special thank you to Lauren, Lauren Fulks, the acting chair today, secretary of EEMAC, who once again has gone above and beyond in organizing today's meeting, from finding this space to lining up the speakers. I can't tell you how thankful I am to have Lauren on the team, and she's an amazing asset to the agency.

Just a quick word of thanks as well to the CFTC

staff who helped the logistics and travel for today. There is a lot of work that goes on behind the scenes for these meetings, and I'm always grateful for the hard work and efforts of those at the CFTC who take care of the many details that go into having these advisory committee meetings.

Many of you were at our last meeting in Oklahoma, and we talked about the importance of traditional energy infrastructure and how that infrastructure is critical to well-functioning energy futures markets. As we learned, Oklahoma's history is deeply intertwined with the production, storage, and transmission of fossil fuel energy.

Crude oil futures contracts, particularly the West Texas Intermediate contract, are some of the most liquid and vibrant contracts for the energy industry, and the WTI price sets a benchmark that's used around the world. But the energy industry is much more than fossil fuels, and current policies are dictating an abrupt transition to other forms of energy.

So, to that end, today we'll be discussing electricity and electrification, a source of energy

that's critical to our economy and the well-being of all individuals. And kind of continuing on our theme to tie in the location to the topic, I can think of no better location to discuss electrification than Tennessee.

The creation of the Tennessee Valley Authority was one of the greatest public works in U.S. history. Though it encountered many setbacks, failures, and controversies, the TVA brought electricity to farmers and rural Southerners at an affordable price. Beyond electricity, the TVA also controlled the flood waters of the Tennessee River, improved navigation, and brought modern agricultural techniques to Tennessee Valley farmers.

Rural electrification and the electric grid are truly one of the miracles of the 20th century. By the 1930s and '40s, electricity was common in urban America, but for farmers and many living in rural America, it was an unimaginable luxury. And the Tennessee Valley Authority and other public works projects brought electricity to the people.

Before electricity was widespread in rural areas,

anything that required the use of water was work. A Federal study found that prior to electrification, the average person living on a farm used 40 gallons of water every day. For a family of 5, that meant 200 gallons per day, or over 73,000 gallons per year.

The study also surveyed the average distance from the farmhouse to the well. With the average well located 253 feet from a farmhouse, this meant a total of 63 8-hour days and 1,750 miles walked per year in order to supply the water to a farm family needed for drinking, cooking, washing, and bathing. Electrification gave these families indoor plumbing and relief from the drudgery of hauling water from wells.

But it did so much more, too. Without electricity, there was no refrigeration, so every meal had to be started from scratch. All produce was either eaten immediately or canned, and all clothes washed by hand.

And these changes occurred very slowly in rural America. In fact, the farmhouse where my dad grew up still has the old outhouse building in the yard. And my aunts and uncles often share not-so-fond memories of

the fights over who got to use the bath first in the outdoor stock tank and who was the one stuck at the end with the cold, dirty bath water.

So thanks to projects like the TVA, a connection to the electric grid and affordable electricity are now basic parts of every American's life. We expect if we flick a switch, no matter where we are, in an instant, a mass of electronics will go to work making modern life possible.

However, our electricity markets are changing in complexity, size, and scale. Additionally, commodities that were never thought of as being tied to the energy industry are proving to be vital sources of raw materials for the production, transmission, storage, and use of electric energy.

Functioning commodity-driven markets are similar to the modern electric grid in that they both take time and investment to build, and when things are working, no one complains. But just like the grid, when things break down, the resulting issues have a big impact on our day-to-day lives.

So no doubt we can all agree on the importance of

electricity and the role it plays in our economy, whether or not electricity is created and supported by traditional fossil fuel energy or as we consider the impact of the push toward sources designated as green. To support these new industry dynamics, at this meeting we are going to examine how CFTC-regulated markets can support electrification.

Hopefully, we'll get the answers that I would like to see -- or the questions that I'd like to see answered is, you know, will the derivatives market reforms be required to continue production and transmission of abundant affordable energy, and how do our regulated derivatives markets provide electric energy producers, hedgers, and end-users the tools they need to properly hedge exposure?

On our first panel, we are going to discuss financial transmission rights, or FTRs, with EEMAC committee members Jackie Roberts and Demetri Karousos. We'll also be joined by Joseph Bowring, independent market monitor at PJM.

As the power for electric grids moves from traditional sources, such as coal and natural gas, to

intermittent sources, such as wind and solar, grid operators are challenged to find ways to supply power when power supply becomes unpredictable. Power usage has become a challenge. For example, the increased use of electric vehicles creates new power usage patterns, which create new stresses on the grid and provide both risks and opportunities for CFTC-related derivatives markets.

FTRs are, of course, subject to exemptions issued by the CFTC, as authorized by the Commodity Exchange Act in recognition of the regulatory interest of the Federal Energy Regulatory Commission in these transactions. But given the interest in FTR markets by our EEMAC members, the implication of increased risk regarding FTRs for power derivatives markets and our general surveillance of derivatives markets, I agree that this is an important topic for EEMAC to discuss and better understand.

Second, we will discuss how CFTC-regulated markets are important tools in the widespread expansion of electrification. Those of you who were in Oklahoma, we talked about some of the metals futures contracts that

CME has offered. Today, we're going to continue that conversation.

Dan Bowerson from the Alliance for Automotive Innovation will discuss the needs of end-users in the energy industry -- oh, sorry -- the car manufacturer, auto industry, as they ramp up production of electric vehicles.

Following Dan, George Pullen, a senior economist at the CFTC Division of Market Oversight, will discuss the actual mechanics of physical delivery and how CFTC-regulated contracts for metals and minerals needed for electrification can be listed in the United States.

Again, thank you to my fellow commissioners who are joining virtually, to the committee members and associate members who are both here and virtual, and for guests who are taking time out of a busy schedule to explore this important topic today.

With that, I will turn it over to my fellow commissioners who are joining us virtually.

MS. FULKS: Thank you, Commissioner Mersinger.

I now recognize Chairman Behnam to give his opening remarks.

CHAIRMAN BEHNAM: Thanks, Lauren. I hope everyone can hear me. Good morning, and a big thanks to all of the committee members, Nashville Public Library for hosting, and of course, Commissioner Mersinger for her leadership of EEMAC and the creativity to think about issues that really, I think, are on the cusp of having a huge impact on our economy and, ultimately, CFTC markets.

I think discussions like today are a clear demonstration of the intersection between a modern economy, changing power grid, and what those impacts will mean on end-users and how to manage risk and achieve price discovery -- things that we care about deeply at the CFTC, that we've done well for many, many decades. And as the economy changes and evolves, as manufacturing changes and evolves, and as our power sources change, we need to be, with you -- the market, manufacturers, commercial end-users, and financial intermediaries -- to make sure that we understand what we're doing and our markets can achieve optimal outcomes for the American economy.

So, again, special thanks to Lauren for her

leadership as DFO and Commissioner Mersinger and look forward to the discussion today.

And again, thanks to all the members for your service, a huge benefit for us at the CFTC that can't be recognized enough. It's a huge opportunity for us to learn from you in many, many different ways. So thanks again.

MS. FULKS: Thank you, Chairman Behnam.

I now recognize Commissioner Goldsmith Romero to give her opening remarks.

COMMISSIONER GOLDSMITH ROMERO: I really wanted to express my gratitude to the EEMAC members for your service, and I also wanted to welcome the new members.

I want to echo what Commissioner Mersinger was saying about the importance in the history of our country about affordable electricity. That was just a great opening. I loved the family story. I do not want to be last when it comes to your family in terms of those outdoor baths.

I also want to echo the statements that our chairman gave about the importance of looking at all of these issues in our modern economy.

I want to thank Lauren Fulks and the rest of the staff for taking EEMAC on the road to Nashville, a town with really good food and good people. I hope you guys got to get some good food.

The last time I was in Nashville, I found myself in a restaurant with Al Gore, who, as many of you know, was like one of the earliest leaders to seek solutions to climate issues. I wish I could have toured General Motors' electric vehicle plant. As the special inspector general of TARP, I conducted oversight over GM for the 4 years that they took part in TARP, and I even testified before Congress about General Motors.

So in preparing for this, I'm really interested in hearing the issues today, but I was looking more into this issue about the demand for EVs, which has just been soaring, and sales have tripled in the last 2 years. According to Consumer Reports, more than a third of Americans plan to buy or lease an EV or are seriously considering doing so. So with this anticipated growth, all eyes are on metals and the critical minerals that are needed for batteries, and so I'm really glad that we're discussing that today.

The United States is making historical investments in EV and in battery manufacturing. In October, the Biden administration launched the American Battery Materials Initiative, which is an effort to secure a reliable and sustainable supply of the critical minerals that are used for power, electricity, and electric vehicles. It's designed to make America more competitive by growing an American battery supply chain rather than relying on China or other foreign supply chains for the critical minerals used to produce batteries.

And I was looking, and the Department of Energy has provided already billions of dollars to support battery-grade metals. And then under the Inflation Reduction Act, the EV tax credits have to meet standards on domestic battery production, including that a substantial percentage of the battery components and the critical minerals must be produced, extracted, processed, or recycled in the United States or in North America.

So I look forward to the discussion about the growth and the challenges in the metals markets related

to EV production. When I was just sort of looking at the listed derivatives market, CME has their first quarter 2023 metals update that states that both the lithium and the cobalt contracts have found quick adoption from the marketplace, as the automotive sector seeks to manage commodity price risk in the transition to higher EV production volumes. But it will be important for the CFTC to have a clear understanding of how the metals derivatives markets are working with this increased EV domestic production.

I'm also looking forward to the discussion on electric power systems, as well as renewable energy. Our electric grids continue to experience stresses, including amid climate events. Major U.S. electrical grid failures increased by more than 60 percent from 2015 to 2019. That's a lot. And between 2000 and 2001, about 83 percent of U.S. major outages were attributed to weather events, which appear to be increasing in frequency and intensity due to climate change.

So, as we know, much of our power grid was built decades ago and was not designed to withstand the

frequent and extreme climate events that we've been experiencing. Renewable energy like solar and wind are being deployed at increasing rates and are expected to account for 16 percent of electricity generation in 2023. That's more than double from 2018. This change will be driven by expected expansions in solar capacity.

The move toward U.S. reliance on renewable energy may be dramatically accelerated by the IRA. By 2030, according to American Clean Power, the IRA will have put in motion investments that will mean that roughly 40 percent of the country's electricity will come from wind, solar, and energy storage.

But there are challenges. The increased deployment of renewable energy will require infrastructure to reliably distribute the renewable energy, and investments in storage and storage technology could help improve reliability and relieve stresses on the grid.

As we accelerate a transition to more renewable energy, it will be critically important to ensure that the renewable energy producers have access to the

appropriate hedging tools for managing price risks related to grid congestion. Recent studies suggest that wind plants face higher risks from congestion than some other sources. So the financial transmission rights, the FTRs, could help manage the congestion.

However, given their development long before wind and solar played a significant role in U.S. power generation, I'll be particularly interested to hear how those markets have evolved or need to evolve with the growth of renewable energy.

But I'm so thrilled that you could be here today. As advisers to the Commission, you play an important role, and I very much look forward to hearing your thoughts on these important energy and environmental market issues.

Thank you for your service.

MS. FULKS: Thank you, Commissioner Goldsmith Romero.

I now recognize Commissioner Pham to give her opening remarks.

COMMISSIONER PHAM: Good morning. Thank you, Commissioner Mersinger, for your leadership of the

EEMAC and for holding this meeting today.

Thank you to EEMAC Secretary Lauren Fulks and the committee members for the discussions and work you have planned. I am very sorry that I could not be in Nashville with you, but I was really looking forward to it.

Over the course of the meeting, guest speakers and members of the committee will present on how changes in U.S. physical energy infrastructure could impact the energy markets and CFTC-regulated metals derivatives markets. As a commissioner, I especially appreciate the planned discussion surrounding the physical energy markets, given CFTC's complementary jurisdictional authority with the Federal Energy Regulatory Commission, or FERC, over these markets.

While the CFTC has exclusive jurisdiction over the trading of energy futures, options, and swaps, FERC has jurisdiction over the transmission and sale of electricity and natural gas in interstate commerce, including regulation of the electric grid and natural gas pipelines. The regulatory frameworks of the CFTC and FERC, however, are not mutually exclusive. When

Dodd-Frank granted the CFTC exemptive authority over physical commodity transactions entered into pursuant to a tariff or rate schedule approved by FERC, it also expanded the CFTC's anti-fraud and anti-manipulation enforcement authority over physical commodity transactions. For these reasons, it is important for the CFTC to be hearing firsthand from market participants about the critical issues surrounding the physical energy markets.

The world we live in is undergoing a digital and automated transformation with new technologies revolutionizing our daily lives and work. In the energy sector, this shift is particularly notable as we witness a swift rise in the utilization of electricity to power infrastructure and technologies.

As we transition towards a more electrified economy, we should expect a corresponding surge in the use of CFTC-regulated derivatives to mitigate the risks associated with increased electrification. This is due to the inherent complexity of physical electricity markets, which necessitates sophisticated risk management tools, such as our products regulated by us.

Over the last decade, we have seen significant growth in the CFTC's energy derivatives markets as our registered exchanges continue to create new products for companies to manage risk and invest in the necessary infrastructure to continue operations. Since 2020, some of the most actively traded contracts in the CFTC's regulated markets are energy derivatives that reference the PJM Western Hub and ERCOT North. These markets provide energy producers a means of hedging against price risks, which helps protect consumers from volatile energy prices. These markets also allow traders to take advantage of price movements in energy markets to manage their energy portfolios more efficiently.

As the energy sector evolves, we must be aware of the challenges that lie ahead. One of the key challenges these days is the need to ensure that there are significant upgrades to grid infrastructure throughout most of the country to replace existing equipment that has proven its inability to perform during periods of severe weather.

Indeed, the impacts of the Texas winter freeze of

2021 were far-reaching and damaging. As temperatures dropped to single digits across most of the State, equipment failures at power plants and wind turbines were unable to produce enough electricity to meet demand. This led to an increase in natural gas prices and rolling blackouts throughout the State for days.

Another major challenge is ensuring that the CFTC's regulation of energy derivatives markets keeps up with the changes that we're facing. To address potential challenges arising, a coordinated effort between the CFTC, market participants, and relevant stakeholders is needed.

As the U.S. economy increasingly depends on electricity, the rising reliance on electricity could result in a surging demand for specific industrial metals that are necessary in the manufacture and distribution of new electrical infrastructure and equipment. For instance, industrial metals like copper and aluminum are widely used in power generation and transmission and distribution systems that are part of the electrical grid.

Estimates suggest that the global energy

transition will require upwards of 50 million metric tons of copper a year by 2035, up from 25 million metric tons, to achieve a zero-emissions economy by 2050.

An increased demand for industrial metals could potentially drive up their prices, which in turn could impact the value of related exchange-traded derivatives on industrial metals. Additionally, derivatives on industrial metals may become more attractive to investors seeking to hedge against rising prices or to profit from potential price increases.

At the same time, disruption to the grid caused by cyber attacks or other factors could have knock-on effects for demand for industrial metals and related derivatives. Overall, the increasing reliance on electricity in the U.S. economy could have significant implications for industrial metal markets and their related derivatives, which highlights the importance of closely monitoring developments in the energy sector and their potential impacts on these markets.

I believe that we need to be proactive in addressing these potential challenges, and by doing so,

we can ensure that the CFTC's derivatives markets continue to play a critical role in managing risk and promoting economic growth.

Thank you, Commissioner Mersinger and to the members for their service on this committee. I hope you have a productive meeting and look forward to hearing the remarks.

MS. FULKS: Thank you, Commissioner Pham.

I now recognize Commissioner Johnson to give her opening remarks.

(Pause.)

FEMALE SPEAKER: Good morning, Commissioner. You are live and ready to speak. Good morning, Commissioner Johnson, you are now live.

COMMISSIONER JOHNSON: Good morning.

FEMALE SPEAKER: Yes, we are ready for your remarks.

FEMALE SPEAKER: Thank you.

FEMALE SPEAKER: Commissioner Johnson, you are unmuted. We are ready for your remarks.

(Pause.)

MALE SPEAKER: Can you confirm if you can hear us?

FEMALE SPEAKER: Yes, Gene, you guys are live.

MALE SPEAKER: All right. Thank you.

COMMISSIONER JOHNSON: Thanks so much for your patience as we navigate technical issues. Such a great set of issues to have on such an important day, during which EEMAC will take on many of the issues that Commissioner Mersinger described.

I want to just say welcome to the EEMAC members and tremendous thank you to Commissioner Mersinger and to DFO Lauren Fulks for organizing this meeting.

I'm impressed and amazed beyond words by Commissioner Mersinger and have been since we met a little over a year ago ahead of the confirmation hearing for the four of us who joined the Commission together last spring. I have been astonished by her wit and thoughtfulness, her carefulness, her dedication to the CFTC and to the issues of our markets. And today's meeting and yesterday's tour are no exception but, in fact, illustrations exemplary of the type of commitment she has to thinking about our markets and market participants and ways that we can improve the lives of those around us and improve the possibility of

sustaining and maintaining the integrity of our environment and our economy for many years to come.

I wish I could be there with you in person. I am personally deeply lamenting the fact that I didn't get any Tennessee BBQ. I grew up in the State of Texas, and one of the most fantastic things that I know about the State of Tennessee, the City of Nashville, is how wonderful the culinary delights are there. And so I'm personally just deeply saddened that I can't see each of you, be with each of you, and have participated in the tour yesterday, but also didn't get to taste any of those delights.

I know that Lauren has worked tremendously hard alongside Commissioner Mersinger for today's meeting, and I know that the EEMAC membership and today's panelists are prepared to share from their time and resources to support and amplify the CFTC's mission. I know that there are two topics that you're focused on discussing today, and I would emphasize and encourage continuing discussion on each of those. First, the role of metal markets in transitional energy and, second, energy infrastructure.

At the last meeting of the EEMAC, I discussed the bipartisan infrastructure bill and its ambitious goal to facilitate the transition to a post-carbon economy. Part of that transition, as you all know well, is the move from internal combustion engine vehicles to electric vehicles, with all the additional changes that entails.

Importantly, as was discussed by Commissioner Goldsmith Romero, the integral inputs for creating the plug-in electric vehicle batteries really do create a point for thoughtful reflection. The batteries, even if they're manufactured in the United States, often require materials sourced from outside the United States through the global commodity markets.

I look forward to hearing from today's speakers about the ways that the derivatives markets we oversee can assist with this significant transformation. I'm also deeply thoughtful about energy infrastructure and am grateful that Commissioner Mersinger and DFO Lauren Fulks have focused on financial transmission rights.

The bipartisan infrastructure bill also dedicates billions of dollars to facilitating the expansion of

renewable energy. This investment, in conjunction with the increased electrification of our economy, exemplified by, among other things, the increased adoption of electric vehicles, requires careful consideration not only as to how to ensure our electric grid adapts to changing sources and the nature of our power supply, but also how our regulatory framework must keep pace.

The EEMAC will also examine financial transmission rights and how these changes to energy markets will affect the FTR market. While the Commission has generally exempted FTR markets from our regulatory framework, it remains important for us to be thoughtful about the areas where we may have oversight authority or at least obligations to be mindful about activities happening in markets.

It's critical that we look to the issues that are being brought forward by the EEMAC today. I am thrilled that Commissioner Mersinger and the EEMAC members today are leading this conversation, are leading this discussion. I am excited to listen in and hear all that you have to share, to learn from the

things that speakers will reveal, as well as ideas and thoughts that we'll continue to talk about long after today's meeting.

Thank you for inviting me to join you today, and thank you again for your tremendous patience as we navigated technology challenges. As exciting as technology is, from time to time, it's also somewhat challenging.

I'm excited for the colloquy and the exchange of ideas that will happen today and the forum that will be generated by the discussion that you will engender. I look forward to the presentations and continuing conversations later today and hope in closing remarks to share some thoughts about what I have learned.

Thank you again, EEMAC members. Thank you again, Commissioner Mersinger and DFO Lauren Fulks.

MS. FULKS: Thank you, Commissioner Johnson.

This committee serves as an important vehicle to discuss matters of concern to hedgers, consumers, exchanges, firms, and end-users within our energy and environmental markets, as well as the Commission's regulation of these markets.

There will be two panels today during the meeting with prepared presentations. Following each panel, there will be an opportunity for discussion related to that panel. As acting chair, I look forward to facilitating the discussion among both associate members and the members of the EEMAC.

I understand there is widespread interest in the topics being discussed today. So that everyone has an opportunity to share their thoughts and opinions, please be respectful and cognizant of time when you are speaking.

To ensure that today's discussion is consistent with the EEMAC charter, which prohibits associate members from providing reports and recommendations directly to the Commission, we will first take questions and comments from the EEMAC associate members after the panelists have shared their prepared remarks. We will then turn to the EEMAC members for their questions and comments and prepared remarks and feedback provided by the associate members.

As I mentioned, for those of you who are here virtual, please use the chat function to alert me if

you have a question or a comment. I will recognize you as a speaker after receiving your notification.

Before we begin our panels, I would like to do a roll call of the members and associate members so we have your attendance on the record.

EEMAC members, after I say your name and organization, please indicate that you are present. Please make sure your phone is not muted if you are virtual. If we are unable to hear your response, please send me a message via the Zoom chat to confirm that you are present on today's call.

Trabue Bland, ICE Futures?

MR. BLAND: I'm here.

MS. FULKS: Rob Creamer, FIA PTG?

MR. CREAMER: Present.

MS. FULKS: Demetri Karousos, Nodal Exchange, LLC?

MR. KAROUSOS: Present.

MS. FULKS: William McCoy, Morgan Stanley?

MR. MCCOY: Present.

MS. FULKS: Jackie Roberts, Public Service Commission of West Virginia?

MS. ROBERTS: Present.

MS. FULKS: Derek Sammann, CME Group?
MR. SAMMANN: Present.
MS. FULKS: Tara Shaw, the Energy Council?
MS. SHAW: Present.
MS. FULKS: Tyson Slocum, Public Citizen?
(No response.)
MS. FULKS: Dena Wiggins, Natural Gas Supply Association?
(No response.)
MS. FULKS: Thank you.
EEMAC associate members, after I say your name, please indicate that you are present.
Matt Agen, American Gas Association?
MR. AGEN: Present.
MS. FULKS: Bob Anderson, Committee of Chief Risk Officers?
(No response.)
MS. FULKS: Sneha Bagri, OTC Global Holdings, LP?
MS. BAGRI: Present.
MS. FULKS: Greg Broussard, Cargill, Inc.?
(No response.)
MS. FULKS: Paul Cicio, Industrial Energy

Consumers of America?

(No response.)

MS. FULKS: Frank Hayden, Calpine Corporation?

MR. HAYDEN: Present.

MS. FULKS: Paul Hughes, Southern Company?

MR. HUGHES: Present.

MS. FULKS: Frank Macchiarola, American Petroleum Institute?

MR. MACCHIAROLA: Present.

MS. FULKS: John Melby, Xpansiv?

(No response.)

MS. FULKS: Jean-Marc Monrad, Vitol?

MR. MONRAD: Present.

MS. FULKS: John Murphy, Mizuho Securities USA?

(No response.)

MS. FULKS: Matt Picardi, Commercial Energy Working Group?

MR. PICARDI: Present.

MS. FULKS: Jamila Piracci, Life Powered?

MS. PIRACCI: Present.

MS. FULKS: Malinda Prudencio, the Energy Authority?

(No response.)

MS. FULKS: Dr. Richard Sandor, Environmental Financial Products?

DR. SANDOR: Present.

MS. FULKS: Mike Taylor, AEGIS Hedging Solutions?

MR. TAYLOR: Present.

MS. FULKS: Sarah Tomalty, BP Energy Company?

MS. TOMALTY: Present.

MS. FULKS: Jeff Walker, ACES?

MR. WALKER: Present.

MS. FULKS: Karen Wuertz, National Futures Association?

MS. WUERTZ: Present.

MS. FULKS: Thank you.

Our first panel today will discuss how electrification and increased renewable and intermittent energy production could affect the electric grid and the FTR market. We will hear three presentations -- from Jackie Roberts, West Virginia Public Service Commission; Joe Bowring, PJM independent monitor from Monitoring Analytics; and Demetri Karousos from Nodal Exchange.

Jackie, if you want to begin?

MS. ROBERTS: Sure. And I have waters. I'm going to just -- when I went to get mine, I got an extra few because this can be a dry subject.

(Laughter.)

MS. ROBERTS: So if you want to just -- just pass these down.

It is my great pleasure to be a member of this committee and to be able to present to all of you. My name is Jackie Roberts. I'm the Federal policy adviser for the Public Service Commission of West Virginia. Most of you will remember me as the consumer advocate for West Virginia.

My industry experience includes corporate counsel in-house for gas companies and electric companies and public advocacy, and now at the Commission where I focus mainly on PJM and FERC.

So what I want to do is kind of set the table with my remarks, although the commissioners did such a good job of it, I feel kind of extraneous. But I'll see if I can add anything.

First, I need to say the Public Service Commission

only speaks through its orders. Any opinions I present here are my opinions, and they are not the opinions of the Public Service Commission. Before I could speak for myself and my agency, not anymore. So I've got to make that clear.

This is a really serious issue, the transition that we're going through to low-carbon resources. It will require significant investment in transmission, and by extension, FTRs will be implicated. For example, even though we'll need great investments in transmission, our generation is the real concern, actually. Because in the cold -- Winter Storm Elliott in December, the problem in PJM with tight supply was not transmission. Transmission was great. It was generation not showing up.

So they had 40,000 megawatts of generation that when it was called on, and it was extremely cold day, said we can't help you. So there are two big issues here going on, and I'll try to say something about both.

This is an issue that for probably the last 5 years has been percolating at FERC and at NERC. The

DOE just Friday released its draft transmission study looking at this problem, and PJM is also very concerned about -- about this transition. Everyone is, and everyone should be.

And the reason they should be, from a generation perspective, is that generation, baseload generation is retiring faster than it's being brought on. And it's being replaced with some, not all, intermittent resources, but a lot of them.

And I apologize to those of you who read -- I don't read my slides, but I hope they provide information.

(Laughter.)

MS. ROBERTS: PJM has an installed capacity of over 190,000 megawatts -- I know this says 180,000, but that's not right. There are about 160,000 megawatts in PJM's interconnection queue, which is the process you'd have to go through to connect new generation to the grid. And about 80,000 megawatts of that queue are intermittent generation.

So that just gives you an idea of the magnitude of the issue. Not all that generation comes online -- not

all that intermittent generation comes online, but that's the size of the ask right now.

The next few slides are ones that PJM presented last week at one of their meetings. They're public. Oh, you want me to do it? Well, this could be tricky. I just follow the arrows, I guess.

Okay. And it just graphically tries to depict what some of the issues are, and I know the legends are missing in some of these. I don't know why that happened. But I will give Lauren the slide deck for any of you that want the complete picture.

Forecasted retirements to 2030. On the donut graph on your right, you can see the left purple. That's -- that's thermal. So, predominantly coal. The blue part is gas. So we're looking at 40 gigawatts of retirement, which is 21 percent of PJM's installed generation, which is significant.

Next slide.

Deactivations and announced retirements to 2023. Again, there is some information missing on this slide when it transferred into my deck. But as you can see, starting on the left in 2023 going to the right in

2030, the retirements are predominantly gas and coal, which are baseload resources.

Now these are the policy retirements. So certain States have policies and low-carbon or zero-carbon goals. The coal policy retirements are the predominant retirements, as you can see on the right. And gas, too. So once again illustrating our baseload generation, our thermal generation is going away.

This -- next slide. Forecasted new entry of generation into PJM 2022 to 2030. You can see that on the left side -- or is there not? Numbers are not coming, and it's interesting. But this year, the lower part of that column is gas, and then you go over gas. And then you can see where gas and thermal just kind of diminish.

Load is going up. That's all this is saying. So load increasing while exacerbating the conditions we're facing in the transition.

This is about forecasted reserve margins. Right now, reserve margins are about 50 percent still in the ground reserve margins. As illustrated on the far left, at 2023, that bottom color of the column is -- is

thermal. So the declining reserve margins from baseload to renewable or demand response, both intermittent.

FTRs and the energy transition. Energy transition, in my view, is literally all hands on deck. It's very serious, and as illustrated by the interest of FERC and NERC and the entire industry.

FTRs in the energy transition will also be affected. They're going to be integral to the transition to low-carbon generation. Significant proposed generation will require transmission expansion because of its remote location to the grid. And you know that the first thing I think of is New Jersey's 15 gigawatt offshore wind farm. There's no transmission for that project, and to bring that into the country where it can be used is going to be very expensive.

Congestion, I think, will be more volatile in some areas, as -- or higher, I guess, may be a more accurate term, as some areas have greater generation trying to come onto the grid and not enough capacity to take it onto the grid.

The PJM comments in the DOE draft transmission study acknowledge that current utility plans for transmission development in the Mid-Atlantic do not meet anticipated needs. There is no -- that's an absolute statement. They don't meet anticipated need. So there's a big lift that's going to have to happen.

So what are financial transmission rights? Financial transmission rights are awarded to the bidders in the FTR auctions that entitle the holder to a stream of revenues based on the hourly day-ahead congestion price differences. To put it simply, congestion is the difference between what generators get paid for their generation and what load pays for that generation.

And theoretically -- well, not theoretically, fundamentally, congestion should then be returned to load, any congestion revenues, because they paid -- they've already paid for that. They paid for it, and they should get the congestion back. And if you haven't figured out yet, my perspective is you and me, when we pay our electric bills, what does this mean in

our costs and to our households and our businesses?

And I've got to tell you, in West Virginia, PJM-related costs are about two-thirds of the retail electric bill. So about two-thirds of the retail electric bill are not within the control of the Public Service Commission of West Virginia. They are controlled by FERC. They're regulated by FERC.

So this has a huge implication for retail customers, and one of our big concerns is that the way the FTR market and the way congestion is being handled now, the FTR congestion is not being returned to load. It's never been completely returned to the load, and I think Joe Bowring might talk about that in a little more detail.

Who can participate in FTR markets? FTRs are a commodity. It is not connected to the sale and delivery of electricity for reliability purposes. It's a hedge. There are no requirements that the participants in this market own generation or transmission. Many participants are financial traders.

PJM designs the FTR markets in PJM and sets the collateral requirements for market participation,

subject to the oversight of FERC. Shortfalls in collateralization become the responsibility of retail customers. So if PJM is not overseeing properly the collateral requirements for the FTR market, there is someone who pays for that, and that are retail electric customers, as opposed to other markets where there is no one to pay for that. So that's a concern.

You're well aware that there is concurrent jurisdiction between the CFTC and FERC and that RTOs requested an exemption for FTRs. This is the language from one of the exemptive orders exempting FTRs.

So FTR markets versus congestion. As I said, congestion is the difference between what the generator is paid by the market and what load pays. Congestion is paid by load, and congestion revenues should be returned to load, 100 percent of them. And -- and that's never occurred. FTRs could be a perfect hedge against congestion, but it's designed in that and congestion revenues should be a simple -- a simple pass-back.

One of the exemptive orders that this Commission issued said that one of the reasons FTRs were exempted

was because there was a market monitor overseeing the operation of FTRs. That's never been the case in PJM. It's never been within the scope of his duties.

So I think FTRs are good. I think they're important. I'm a little concerned with how the risks around FTRs are being handled from the perspective of the retail customer and the cost that can flow to the retail customer. And the energy transition, like I said, is a real concern, and this will only affect the FTRs even more.

That's all I have. Thank you.

MS. FULKS: Thank you, Jackie.

Joe? Can you hear me?

DR. BOWRING: Yes, hello.

MS. FULKS: Great. So we're going to put your slides up. I will control them. So just tell me "next slide" when you want me to go to the next slide.

DR. BOWRING: Great. Thank you.

I'm still seeing Jackie's last slide. I'm not sure what you're seeing.

There we go. So, great.

So thank you very much for the opportunity to talk

to you today. I am the independent market monitor for PJM. And sorry to start off by contradicting you immediately, Jackie, but we do oversee the -- we do monitor the FTR market as well, and we have -- there are some rules that we've developed to try to prevent manipulation of the FTR market.

So if we go to the -- actually, let's just leave it on this slide for a moment. So, from the very beginning, you need to think -- in order to understand FTRs, one needs to understand a little bit about LMP markets.

So back at the beginning of time, we had cost of service regulation. And under cost of service regulation, utilities, vertically integrated utilities owned everything from the distribution side all the way up through transmission and generation.

Customers were charged average prices. So regardless of whether you were served by an expensive generator or a cheap generator, everybody was charged the same average rate, accounting, of course, for rate design issues. But holding those aside, in general, customers within a class were charged the average

rates.

So when LMP markets were developed and implemented in the late 1990s, one of the challenges was how to reconcile LMP -- locational marginal pricing -- with the appropriate payments by customers. And as it turns out and in order to understand FTRs, we need to understand congestion. In order to understand congestion, which derives from LMP markets, we need to understand a little bit about the logic of LMP.

So, under LMP, load in a load pocket or in any area pays the short-run marginal cost of the offer of the local generator. So I want to walk through a simple example just to show what congestion is and then talk about FTRs.

So the next slide, please. Maybe the next.

Right. So, yeah, keep going, please.

So we're going to start with a simple example. So there's load, load of bus A at zero, and load of bus B at 150.

Next slide, please. Next slide, please. I didn't realize the automation was at this level of granularity. Yes, next slide, please, and the next

slide, please.

Okay. Right, great.

So we have generation at bus A. We have generation at bus B. We have load and zero load at bus A, 150 megawatts of load at bus B. And we have a transmission line between A and B.

And now, Jackie, I'm going to get some water. As you say, it is a dry topic.

Okay. Next slide, please. Okay. So I'm not sure what happened. Next slide, please. And again. And again.

Okay. So now, now we've identified the offers of the generation at A and B. So the generator at bus A is selling its power for $5 a megawatt hour, and the generator at bus B is selling its power for $15 a megawatt hour. That's the short-run marginal cost of generation at each of those buses.

So next is how LMP is formed. So let's see if we can go to the next slide, please. Next slide, please. Next slide, please. Yeah, just keep clicking through them until we get back to the full slide, sorry.

Next one, please. Next one, please. And one more. Okay, great.

So, not surprisingly, as I've indicated, under a locational marginal pricing system, LMP, LMP is at each bus the price actually paid by load as a function of the marginal generator. So, in this case, the marginal generator is setting their price at $5 at bus A and $15 at bus B.

Also in the LMP system, it's optimized so customers pay the lowest-possible price for each incremental megawatt generation. So as you can see, since we have a 100-megawatt transmission line between A and B, it's cheapest to serve the load -- at least the first 100 megawatts of load -- from the generator at A at $5 a megawatt hour.

So the way this would actually work and does work in PJM markets is the generator at bus A generates 100 megawatts to serve the first 100 megawatts of load at bus B, and then the generator at bus B is turned on and sets a price of $15 a megawatt hour and serves the remaining 50 megawatts of load.

Now let's try the next slide.

All right. So there's a 100-megawatt flow. And as it says, the line constrains the flow from A to B. So we need the higher-cost generator to meet load. And this -- this price difference, this is the very definition of congestion. Congestion is this difference in -- or it's derived from this difference in price, which results from locational marginal pricing.

Next slide, please. Sorry. Just I'm not sure why the automation keeps repeating, but just keep clicking through them. Yep, keep going, please. Yep, keep going, please. And one more.

So, so here's how the accounting works, and here is where congestion comes from. So in an LMP system, the load at B, all 150 megawatts of load at B pays $15. So unlike in average pricing where the load at B would have paid an average of 100 megawatts at $5 and 50 megawatts at $15, in an LMP system, the load at bus B pays $15 for every -- every megawatt of load. So 150 times $15.

Next slide.

And what clearly happens, and let's, yeah, go to

the next slide, please. And one more. And I'll just show the accounting in a simple table. Actually, let's just go to the next one. One more, sorry. One more after that.

Perfect. So, yep, one more.

So this is just -- this summarizes how the revenues actually flow. So load is paying $15 for all the generation, but the generator at bus A is only receiving $5. The generator at bus B is receiving $15, but only for 50 megawatts. So what happens is load is paying more for generation than generation receives, and it's paying $1,000 more.

So it's paying the difference between the generator cost at A and B of $10 times the amount of power that's being provided by the low-cost generator, which is 100 or 10 times 100 is 1,000. So what this is showing is that the load is paying $2,250 in this simple example, and generation is only receiving $1,250. So load is paying $1,000 more than generation is receiving.

And that's the definition of congestion, as Jackie correctly said. Congestion is the difference between

what load pays and generation receives.

Now congestion has been, interestingly, widely misunderstood, and I think the fundamentals of what FTR is have been widely misunderstood, and that's what I'm going to talk about for a few minutes.

So let's look at the next slide, if we could?

So congestion is paid by load, as I said. It's the difference between what load pays and generation receives. So it was always part of the understanding at the very beginning of creating LMP markets that the way that load would be held harmless from going to locational pricing compared to what average pricing would be is that congestion dollars would be returned to load, and the development of FTRs at the very beginning, in 1999, did exactly that.

But it did it, unfortunately, based on what was an old-fashioned way or an incorrect way of thinking about congestion, which is it did it based on generation to load paths. So it imagined that everyone knew exactly where power flowed. It flowed from a generator to load, and one could calculate the congestion on that path.

And early on, it didn't really matter because the actual generation to load paths in a network matched pretty much what had existed before. So it was a pretty good match. But as time went on, it became a less and less accurate match. Some generation retired. New generation was built. The system expanded, and there became an increasing divergence between actual congestion paid and what was returned to load.

2003, PJM developed something called ARRs, which was an effort to directly assign congestion on specific paths to load and identified incorrectly that there was some level of congestion revenue that was available for others to have access to. So the fundamental flaw, the original sin in FTR design, as I call it sometimes, was the notion that congestion is defined by specific generator load paths, when that is clearly not the case.

This is a network system. Congestion is a network phenomenon. Congestion can be calculated, but the way to calculate it is not on generation to load paths. And in fact, PJM had, until recently, generated load

paths that were still from 1999. And after we pointed out that some of the generators had retired, PJM started to replace some of those, but there is still a number of generation to load paths included in the ARR allocation based on 1999.

Next slide, please.

So if implemented correctly -- that is returning congestion to load -- FTRs are actually a perfect hedge for load against congestion by definition because they would return 100 percent of congestion to load, but not a penny more and not a penny less. In the FTR market, there's something, a phenomenon that is asserted to exist called "underfunding" in which FTRs are not -- are not paid exactly what the intention is. That is exactly what the price differences are, and that they had market times the amount of the FTRs.

But there can be no such thing as underfunding if FTRs are defined correctly because the only goal of FTRs is to return congestion to load. So if you're returning congestion to load, you can't either underfund or overfund. It just is what it is.

Next slide, please.

So, as I mentioned these two parts of the current design, there are ARRs and FTRs. The goal of the ARR design was to split out the congestion that belonged to load and appropriately, as I indicated. And then FTRs were designed to permit load to sell rights to congestion.

So, but it doesn't work well. ARRs have resulted in a substantial reduction in providing congestion released back to load.

Next slide, please.

So under the current design, really the property rights of congestion are not clearly defined, and as a result, load doesn't actually have the rights to congestion under the design. Load is not actually allowed to sell FTRs. The ARR auction does not allow load to set the sale price. In fact, load plays no active role in that whatsoever.

PJM sells the rights to FTR buyers, but there's no strict price. And load, load has no role in setting the price. And load, in fact, doesn't even receive all the auction revenues, and some of those revenues can be taken back and returned to FTR holders under certain

conditions.

Again, fundamental point, last bullet. Load cannot receive the rights to all congestion under the current design. And that's a very significant issue.

Next slide, please.

So the first bullet is just about the historic gen to load. So we talked about that. So let's -- I think the next slide actually shows some of the details. Let's go to the next slide.

So one of the points we wanted to make is that if congestion is properly defined and rights to congestion are assigned, there needs to be a market mechanism that would permit load to sell its rights to congestion. So load would, under a properly defined FTR mechanism, have a right to a variable stream of congestion revenues that would only be known after the fact.

An FTR auction or an auction of congestion revenue rights would allow and could allow load to sell those variable condition rights to other parties for a firm price, for example. And that design could take a lot of forms. It could look like the current design. It could include paths, but it cannot pay out more than

actual congestion.

In fact, the FTR auctions could be operated by a third-party exchange, and that should say "third-party," not "part." And that could well be subject to CFTC regulation instead of PJM regulation. So as long as the congestion is paid to load, the structure of that auction and the structure of the swap of a variable for a fixed payment could happen under a range of market designs.

Next slide, please.

So this is just a lot of detail here, but the bottom line is if you look over all the way on the righthand side, it shows the level of congestion that's been returned to load compared to the actual congestion received. And you can see at the very bottom righthand corner -- it's hard to see the number on the slide -- but it is substantially less than 100 percent. And in fact, it's about -- over time, it's been about -- it's 69.5 is that number. It's a little hard to read.

And over time, the shortfall in congestion payments since 2011-2012, when we began this calculation, is on the order of $7 billion. So the

underpayment of congestion back to load is very significant. We've documented here. The red boxes just document the fact that the rules have changed. The last two columns document the amount of the shortfall.

So in case anyone thought it was a small matter, it's not a small matter. It's very significant, and the amount of dollars is very significant.

The next slide, please.

So this shows the fact that there's very different offsets by zones, which is not consistent with a logical design, and it's very hard for supporters of the current FTR design to explain why the offset is so different by zone. But this is the actual offset of congestion by load in each of the -- in each of the PJM zones, and you can see it ranges from actually negative to well more than 100 percent.

But that variation, the range is inconsistent with a logical design. It's just one more piece of evidence about the issues.

Next slide, please.

And this shows even the fact that the ARR design,

if implemented, and all ARRs were so-called self-scheduled -- that is, turned into FTRs -- even then, only about 65 percent of congestion would be offset.

So the real point I wanted to make to you is that the FTR market design -- and we've been saying this for some time, and clearly, FERC has not yet agreed with us, and many of the participants in the room today don't agree with us -- but we think the FTR market has been and the design has been broken for some time. And as we talk about a transition to clean energy, it's important to ensure that customers have congestion returned to them and that it not -- that the customers' money not be turned to other -- to other purposes.

Congestion will always occur in the LMP market. There is nothing wrong with congestion. Congestion really simply reflects the balance between the level of generation, the cost of generation, the cost of fuel, and the level of transmission.

So the goal in a rational system is never to eliminate congestion because in order to do that, you have to, as it's sometimes called, to "copper plate the system," that is build billions of builds of

transmission. So the goal is never to eliminate congestion, but it should be to manage it properly and to make sure that load is not harmed by the introduction of LMP, continues to pay the correct marginal price, but also does not pay more than the marginal price, does not pay more than the amount of -- does not pay more than generation actually receives.

So let me stop there. I really appreciate again the opportunity to talk. I know there will be some disagreement, and I look forward to the discussion.

Thank you.

MS. FULKS: Thank you, Joe.

Demetri?

MR. KAROUSOS: Good morning, everyone. First, I'd like to thank the chairman and the rest of the commissioners, and especially Commissioner Mersinger, Chris, and Lauren, for having us here in Nashville. This is quite fun and good to get out of the bubble, so to speak.

And very much appreciate the opportunity to speak on this topic. It is a topic that I've been following with quite some interest for over a decade. So look

forward to our discussion.

And I do apologize ahead of time for any apparent duplication of materials. You know, an old canard or an old saying when you're doing deck presentations is to say a point, say it again, and repeat it for a third time for good measure. So here is the third time.

But I suspect you'll see some differences in the way we think about FTRs and the way we understand our role. And I won't go too deeply into FERC policy, but essentially what's underpinning some of the disagreements that may emerge here is what FERC policy is and has been.

So, with that, I don't see any deck up there, but --

So where are FTRs even relevant? Let's start with that question, right? So they exist in all the markets that adopted a standard model, also referred to as the nodal model, as part of deregulation of power markets over the last three decades. That dereg- -- so it's all the colored areas here.

That deregulation sought to break up vertical monopolies, exposing generation, transmission, and load

serving to competitive market forces, and it also sought to harness the use of price signals to target both new transmission and generation capacity. So despite the amount of gray space that you see on the screen, the vast majority of the population and the bulk of economic activity in the States takes place in areas that have now adopted this nodal model.

And the price signals that emerged emerged from the use of what Joe referred to as locational marginal prices, or LMPs, which are produced by the ISOs, by these independent system operators, at thousands of nodes across the network essentially wherever significant amounts of power are injected or withdrawn from the grid.

So, again, what is locational marginal price? It's composed of three elements, and the first is energy. And what you see here is energy is the price that comes from the optimal dispatch in an ideal grid with no congestion or loss.

First off, energy is what power prices used to be completely. And in the markets that don't have nodal design, that is -- that is the power price. It's the

energy price.

So what is it? Just imagine ranking all of the sources of generation in a grid, in a region, from lowest marginal cost to highest marginal cost. Wherever the demand curve intersects that supply curve, that is the energy price. So lowest cost energy all the way -- so renewable, nuclear, low-cost, all the way up to oil and gas, high cost -- wherever the demand curve intersects at any moment in time, that is the energy price.

So it is actually by design the same at every location in the grid. So the energy component is the foundation for the power price across the ISO, and it's the same definitionally for every point in the grid.

Right. The other thing to note is that that supply curve, of course, isn't the same throughout the day and certainly not throughout the year. But even throughout the day, you have different amounts of sunlight, different amounts of wind, other weather effects that affect the supply that's available. So what the ISOs do is they actually organize hourly auctions to determine what's called the day-ahead price

-- so tomorrow's hourly pricing -- for every location in the grid.

So that is -- so that's energy. Then what's congestion? So you can look at it from a node-to-node perspective, but at a high level, congestion represents what happens when you can't actually run all those generators that you want to based on their cost order, also referred to as their merit order. So because some of that cheap generation is just not well located relative to where the demand is, you actually have to call on a more expensive generator to supply the demand.

So the difference between what the energy bill would have been if everything was allowed to run based on just cost zone and imagine there was no -- there were no transmission constraints whatsoever on the grid. The difference between that, which is energy, and the actual power price resulting from these out of order generators needing to be called to generate is what the total generation is. And then the brilliance of the ISO model is that they allocate that congestion bill precisely to the nodes in the network where the

congestion actually is in the transmission grid.

So you know exactly where to target, therefore, new transmission capacity because you know, "Oh, I see the constraint is right here," or new generation. You could choose to just locate a new generation plant, if feasible, closer to the load to get -- to avoid that reduction in revenues that you would receive as a generator represented by congestion.

And then the third component is loss. Loss is simply -- represents the fact that we inject 100 megawatts into the grid, less than 100 comes out because we lose electricity to transmission losses. So FTRs don't care about loss. FTRs just focus on the difference of prices between locations. And since energy is the same at every location, it's really the difference in congestion values from one location to another.

So what is an FTR? Here is where the first differences will occur. So it is simply a financial forward spread contract that exists in FERC markets -- and the NERC -- that settles to the difference in prices between two locations, right? So they look and

feel just like all the power spread transactions that occur on Nodal Exchange all the time. So they -- you know, Pepco, Western Hub -- 24 hours, planning year June through May. That's all this is. It's just a spread contract for the difference of prices between two locations. And they could be on-peak, off-peak, 24 hours over typically with a monthly settlement.

They are created in periodic monthly auctions that allow the RTO/ISO to pre-sell on behalf of the transmission capacity owner. So the first thought here is if the FTRs represent the value of the difference between two locations, that's really representing the value transmission between those locations. So transmission capacity owners are kind of the key folks here.

And so it allows them to fix the price that they will receive for the congestion revenues on the network. And so they -- FTRs and FTR auctions -- exist for two purposes. One, to distribute the congestion revenue, but two, very importantly, to provide transmission capacity owners the ability to hedge that congestion.

So think about that. I said before, the energy price was just simply the same. The power plants was just the same. There was just energy. And so now you've got generators and other entities in the grid that now are exposed to this variable price that's determined by hour in these auctions. And so the FERC required that the ISOs organize FTR auctions to provide a hedging mechanism for this exposure.

And then, at a very high level, the way these revenues go around, it starts -- so the ISO is in the middle. You can think of -- that shows the ISO New England, for example. But the ISO is in the middle. It starts at the bottom, right? On a daily basis, the ISO runs these day-ahead markets. Every day it collects revenue from load and pays out revenue to the generators, and the difference, which we've all said, is congestion.

So it now has this difference. Let's call it in this case $8 per megawatt hour. An FTR participant who participates in the auction is bidding a fixed price for this revenue, for this congestion revenue in expectation of receiving a variable price, whatever the

day-ahead congestion ends up being.

Presumably, they're going to participate in a manner of trying to do so profitably, right? So their expectation going in is that they're going to bid for the FTR slightly less than they will receive in the form of congestion revenue.

And then the owners of those revenue rights, transmission capacity owners effectively, they are the ones receiving that fixed-price hedge. That is the function of the FTR auction, provide that fixed-price hedge for those participants. So, so the market participants, as said, include visible participants, but also hedge funds and speculators who are willing to provide that fixed-price hedge at bidding the FTR auctions.

Now a little context about these FTR markets. They're big, and they've grown a lot over the last decade. So what you're seeing here are the terawatt hours by path of the FTRs that have been awarded at all the various auctions they have.

Monthly auctions, annual auctions, in some cases longer-term auctions, multiyear auctions -- all of

those combined in any given year are represented here, and the growth has been tremendous, right? And so PJM is one of the largest, which is why you're probably hearing that name come up a lot. But the other ISOs also have significant activity here.

And to put this into context, here is how all the kind of forward power activity is organized in the U.S. This data is from 2021, but you saw that 14,500 -- I'm looking at this second box from the left up top. Well, first let's talk about the colors. So the blue represents those markets that are overseen either by the PUCs or the FERC directly, and the green represents the CFTC directly overseen markets. So, the futures and swaps, right?

So starting with cleared futures contracts, the third box, it's around 6,000 terawatt hours between futures and auctions across the various exchanges. By contrast, the FTR markets are 14,500 terawatt hours in 2021, but that's actually not how we would represent that volume in the futures market. That's a path level. And again, this path has a source and a synch.

So in our market, when we see those spreads, of

course they're underpinned by standalone contracts, by Western Hub and by Pepco, for example, right? So you would actually double that volume if you were to represent that in a futures equivalent way. So it's actually like 29,000 terawatt hours. It's quite a big market, right? So it's really important that we're looking at this and trying to understand this a little better.

So these auctions are really unique, and they're very different than what you and I might normally think of as an auction. Imagine I have a bottle of water, and water is, let's say, dear in the room at the moment. And so I'm willing to auction off this water. You know exactly what I'm auctioning. I have a specific thing I'm selling, and you all may try to bid for this water.

That's not how the FTR auctions work. And so I've tried to -- we tried to show this graphically, but essentially, by showing a big, giant red arrow of what's being sold versus all the individual blue arrows of what's being bid. What the ISO does is it says we've got all this transmission capacity. You bid on

the paths that you care about and the paths that you're trying to get a hedge on, and we will -- in trying to maximize revenues to the transmission capacity owners, we will award as much of those bids, as many of those bids, maximizing revenue, as we can, constrained by the capacity on the grid.

So it's actually intimately tied to their knowledge of the topography of the grid and their ability to say, yes, we can handle this path, and we can handle that path. It's very different from the traditional model where you're saying, yes, I'm selling this thing, and then I'm selling that thing, and then I'm selling this other thing. Not an eBay auction. It's very different.

And so, right. And so you'll hear terms like simultaneous feasibility constraint. So it's basically that their knowledge of the grid is what allows them to try to maximize the revenue from the FTR auction subject to those physical constraints. And because of what they do, running the market, they're best suited to run these auctions.

Okay. But some questions have arisen about risk

management of the credit exposure that emerges after these FTRs are awarded. After all, as I said, they look and feel just like futures positions, right? So it's real forward exposure that you need to manage.

And so this slide at a very high level just summarizes across a couple parameters how the various ISOs have pursued their risk policies. I won't go through them in detail, but no two have the exact same risk solution for their markets.

And the FERC, as well as the PUCs, continue to explore through their recent Show Cause Orders and Notice of Proposed Rulemakings a concern for making sure that best practices are being used and whether new minimum standards need to be applied. And we applaud the FERC's activity here.

But our take is simply that the CFTC exemptive relief of FTR markets does not conflict with the ISOs and RTOs exploring novel risk management solutions. Essentially that exemption is for running the markets. And as we said, those ISOs are uniquely positioned to run the markets. In other words, executing the transactions happening inside those

auctions.

That's separate and distinct from the risk management challenges that emerge after those awards take place, right? You can think of those as very distinct issues, and we think the exemptive relief did a great job of recognizing the unique role that FTRs play and that the auctions play, but we do think that as the ISOs explore how they're going to provide risk solutions for the credit risk exposure that emerges from these auctions that they should be allowed to, for example, if they want to work with a CFTC jurisdictional entity to provide appropriate risk management solutions to the markets. And we would think that the CFTC would welcome and be supportive of that collaboration.

So, in summary, we think improved risk management of FTRs supports moving toward a carbon-free future. You know, renewable generation development -- we talked about this earlier -- requires financing, and the FTRs provide that exact granularity where the participants can choose exactly what path to bid on for their new generation to provide the hedging required to get

appropriate financing.

If that is removed, essentially you need to then go find counterparties to provide that specific hedge that you're looking for. And traditionally, that meant going to a few large, you know, banks that would charge a pretty penny for providing that hedge. And so the FTR markets provide quite low-cost hedging for the market participants.

So that's all I've got.

MS. FULKS: Thank you, Demetri.

At this time, I would like to give the panelists the opportunity to respond to each other if they would like to do so. I will start with Jackie, then go to Joe, then to Demetri. In the interest of time, though, please keep your remarks brief, under 5 minutes.

Jackie?

MS. ROBERTS: I'll pass at the moment.

MS. FULKS: Joe, do you want to say anything?

DR. BOWRING: Yes, please.

MS. FULKS: Go right ahead.

DR. BOWRING: All right, thanks. So, I mean, I think -- so I appreciate, you know, Demetri is

obviously very expert in these markets, and we appreciate his expertise.

I think that one of the things that was missed a little bit in what Demetri said is that load cannot actually sell its rights to congestion. So it's load that has the rights, not the transmission owners. Transmission owners don't have a role in this.

Load pays for transmission. Load actually overpays under LMP markets, it's well established. So load has the rights to that congestion.

But unlike any other market, including the market for bottled water, sellers in this case don't have the chance to actually set the price to determine the terms of the sale. So that's one fundamental problem.

We believe that if FTRs were used to assign congestion to load, that private markets like Demetri's, like Nodal Exchange, could handle the sale by load of those congestion rights, and it could have all the details we've talked about or that Demetri talked about in terms of paths and all the rest. But the reason that the FTRs are a cheap hedge is because you have someone on the other side who's providing the

funding for it.

In a market like Nodal Exchange or any other market, you have two willing counterparties, and one is providing a hedge to the other because both parties think they can benefit. But that's not what's happening here. Congestion revenues that belong to load are being used to fund FTRs without any active participation from load.

So there's a lot here, but we actually think Nodal Exchange could play a key role going forward. Not in taking over the PJM FTR market, but in serving as a private market to provide private parties operating at arm's length with the ability to manage congestion.

So, thank you. Hopefully, that was less than 5 minutes.

MS. FULKS: You're perfect. Demetri?

MR. KAROUSOS: Joe, I very much appreciate the vote of confidence. So here is the -- here's the situation.

We certainly do see hedging at nodal positions, which is why we offer nodal contracts from time to time. But the liquidity produced in these auctions is

tremendous. You saw the volume that I highlighted. It's just a tremendous amount of liquidity, and it's the nature of the auctions, it's the very design of the auction that produces that liquidity.

You know, I contest the notion -- but we don't need to get into this. No one disagrees that load ultimately pays a higher price because it is behind the congestion. In other words, it is in the locations where the congestion exists.

But in the 15 gigawatt offshore facilities that New Jersey could be contemplating for offshore wind, if the participants themselves wanted to build or Google wanted to build a transmission line -- they had mentioned that a while ago -- a transmission line connecting that generation to onshore, then they would be taking the economic exposure of that transmission capacity, right?

So it's really important to think about just what the fundamental risk that we're managing, it's the point-to-point, it's the value of the transmission between these points, right? And so if you're a generator, you're facing that exposure, right? You

could be getting the full price, but for the constraint in getting to the market.

So I'm not -- no one is arguing that the ultimate payer is the retail. The point of these markets is how do we lower those aggregate costs and make the most efficient investments possible? That was the whole point and intent of the design, and so I don't want that to be lost here. That's a different statement than saying who ultimately pays for this.

Of course, the consumers ultimately pay for any product category. But the point is how do we most efficiently deliver that product to the consumers?

DR. BOWRING: Sorry, is there any chance I could add? Could I add? I know I'm out of order.

MS. ROBERTS: Let me jump in here, Joe.

DR. BOWRING: Sure, go ahead.

MS. ROBERTS: And I would say when you're looking at it over the last 10 years, load being cut out of $7 billion, I'd say something is not right.

MS. FULKS: Joe?

DR. BOWRING: Yeah, just one simple point, which is that in an LMP market, generators -- the correct

price to a generator is the locational price at its node. You can't make it artificially higher by giving it money that belongs to load.

So, so wind receives the price that it will receive at its node, and that's appropriate. Load overpays, and I don't think anyone contests that load is paying more than generation receives, and it's just logical that that difference goes back to load.

So an LMP market has different prices by node, and that's the logic of it. And that's why generation has an incentive to locate at high-priced nodes. But if it's at a low-priced node, it doesn't automatically deserve a higher price.

Thank you.

MS. FULKS: Demetri?

MR. KAROUSOS: All right. So, Joe, 100 percent agree. I'm not suggesting that a generator magically deserves a higher price. The point is that the LMPs serve as price signals to target investment, and in order to justify the capital spend, it's important to hedge the revenues you expect from that capital spend.

So that capital spend is buying a more expensive

lot closer to load or building the transmission capacity to connect your generator to load. Either way, that's a cap-ex that you'd like from the financing perspective to be able to hedge the revenues that you expect to receive from that investment, right?

So that's the point. It's not about -- I'm not disputing that the generator node is going to have a certain price. I'm saying now whoever is going to make that capital investment to try to ameliorate that gap needs a way to hedge that, and that's what FTRs do.

And I would argue that the FTRs are a really low-cost means of hedging. That's kind of the key takeaway, right? You have to ask yourself if the FTRs didn't exist, how much would these generators and other participants be paying for that hedging, if they were to go out in the open market and pay for this path by path?

That's kind of the point. This is creating a much more efficient hedging mechanism, which was the design.

DR. BOWRING: Well, can I just add it is a core point. But the reason it's cheaper is not because it's fundamentally cheaper, it's because the customers are

paying. They're contributing money outside of their control, money they're not voluntarily contributing. So I think the right test is what would the hedge cost if there were counterparties, and that is the correct market value.

If you have someone on the other side who is an unwilling participant, who is giving away something they have no control over, sure, it's cheaper, but that's clearly not the right price.

MS. FULKS: Thank you. I'm going to have to, in the interest of time, go ahead and open it up, the floor to questions and comments from the associate members.

So, at this time, associate members, do you have any questions or comments? Jean-Marc, go ahead.

MR. MONRAD: We greatly appreciate the CFTC's interest in understanding FTR markets, but it was a bit surprising to see FTRs on the EEMAC agenda, given that the FERC currently has jurisdiction over FTR markets.

Markets are well served to have regulatory certainty, and the points that are being made today have already been addressed by the FERC. FERC recently

issued an order which includes a thorough examination of the role that FTRs play in facilitating congestion hedging and open access to the transmission grid. That is FERC's March 2022 order, Docket Number ER22-797-000.

While the order has many important points and conclusions, I'll summarize just a few. The purpose of FTRs is to serve as a congestion hedge, not simply to return congestion revenue to load.

The FERC went on to explain that FTRs have several advantages over other market designs being proposed, including participants can match their hedge to the price risk based on how the load is served. FTRs, when combined with other available tools, allow load to customize their hedging program. FTRs create profitable trading opportunities, which increase liquidity and competition, enhances price discovery, and provides additional congestion hedging opportunities.

Because the FTR market is an integral part of the broader LMP market, we are concerned that efforts by the CFTC relating to the FTR markets will cause confusion in the FERC-regulated markets and increase

the regulatory burdens associated with using this important product.

Thank you.

MS. FULKS: Thank you, Jean-Marc. Matt Picardi?

MR. PICARDI: Yes. Matt Picardi, with Commercial Energy Working Group, and wanted to follow up a few of those points.

Just a few I could make. First of all, I think what we learned a little bit today for those that participate or not as familiar with these markets is how they're very much integrated with the other markets that FERC regulates, especially the energy market. And so just separating them and trying to examine how they would work would be a difficult task and create a lot of regulatory confusion.

I think that one of the things that would be important for the CFTC to hear about is a perspective from, in addition to hearing how FERC views the importance of these markets, but other -- from other markets, including New England, New York, California, other parts of the country where these markets are used and are an important part of their markets. I think it

would be fair for them to have a say in what happens here.

I think that it's important also to understand how market participants use these products. They're not only used to hedge the location of where new generation is going and maybe hedge that basis risk to move the generation to a more liquid point for trading purposes and expanding value or realizing the value of that generation. They're also used to hedge load in today's markets to serve load very often and through competitive auctions. And it's important that they're an important part of that feature of what commercial energy suppliers do when they're serving load on a competitive basis.

And finally, I think there's a little bit of a concern that would be raised here is, as the CFTC looks at this is kind of raising a fundamental issue, is what standard would the CFTC want to apply when it decides to maybe step in and look at what a complicated FERC market that FERC is administering? You know, what standard would it use to decide it's going to make that move? Because as I said, these markets are intertwined

significantly, and it would be a challenge to try to regulate them separately.

I think that in the future, there's a lot of good issues that are raised here, though, and that this being touched on around the FTR markets and things like what the grid of the future is going to look like and how products that FERC administers and the RTOs administer are going to change and evolve to manage the changing grid are important. And FERC has a docket on that and is taking comments on that. So it is taking up forward-looking activity that would also affect the way these instruments are transacted.

I think that it would be important, if CFTC is interested in this topic, to have another meeting that provides those perspectives and that provides more of a background to what's taking place in this space at the Federal Energy Regulatory Commission.

Thank you.

MS. FULKS: Thank you, Matt. Any -- Sarah?

MS. TOMALTY: Hi, this is Sarah Tomalty, with BP Energy Company.

I'm going to leave aside the jurisdictional issue

and current market rules issues. But Commissioner Goldsmith Romero started her opening statement with saying as we would transition to greater prevalence of intermittent resources, there is a need for access to appropriate hedging tools to manage congestion.

And I was hoping, as we went through this discussion, we would look at kind of the grid of the future and what's appropriate, for example, with like wind generation, where you don't necessarily have a certain volume profile -- you may have more variable volume -- and if the current FTR products are appropriate hedging tools for the more intermittent resources like wind and solar.

In preparation for the meeting, I read an article entitled "Rethinking the Role of FTRs in Wind-Rich Electricity Markets in the Central U.S." And it discusses that there is a need for a wind FTR with variable volume to vary with wind plant output.

And I'm interested if any of the presenters, who did an excellent job -- I think you all should be college professors. You made --

(Laughter.)

MS. TOMALTY: You made the topic actually interesting and very easy to understand. But I'd be interested if you have any ideas for whether there are current tools or new tools that could be implemented that would be appropriate for the future markets?

MS. FULKS: Anyone want to take that question?

DR. BOWRING: This is Joe, very briefly. So, I mean, I think that private parties are best situated to provide hedges of the kind you talk about. I mean, certainly wind resources are going to need different kinds of hedges.

And I think there is also some misapprehension, and there was a recent report from Berkeley Labs actually on this topic that somehow FTRs are free money that can allow wind resources at low-priced nodes to get higher prices, as if they were located somewhere else. And that's really, really not the case. LMP is what it is, where the generator is located.

But certainly, people are going to need new hedging products. And rather than using the current structure of the FTRs, I think a redesigned FTR balance where -- in which customers get the rights to

congestion but can then sell it will make those products available through third parties as well as PJM to wind resources and others.

I just want to make one thing clear in case it wasn't, which is I am not advocating here that the CFTC take over the FTR markets. Just in case there was any concern that I was suggesting that, that's not what I'm saying.

Thank you.

MS. FULKS: Demetri?

MR. KAROUSOS: So, you know, I think what I would say is I agree. Further customization will probably be helpful. I can say that, for example, PJM just recently changed its off-peak contract to be 7 by -- this is getting technical, but 7 by 8, which represents the night-time hours of the traditional off-peak schedule and then the weekend on-peak hours, essentially.

So what that allows is that you can now -- if you have solar, for example, you can now buy on-peak plus the 2 by 16 to have 7 by 16, which allows you to hedge more correctly solar rather than something that

magically changes on the weekend, as if the sun doesn't exist on the weekend, right? So they're making progress --

MS. ROBERTS: It usually doesn't.

(Laughter.)

MR. KAROUSOS: Exactly. So they're making progress. The wind one sounds intriguing. I'd like to spend some time thinking about how to do that, but they -- but that is happening and intrigued to see how it could happen further.

And again, to be clear, if I wasn't clear, our view is that the CFTC did a great job with its exemptive relief allowing the ISOs to run the markets that they run, to run those auctions. The suggestion we have, which we don't believe creates any issues for that exemptive order, is that if an ISO chooses, in its desire of how it wants to run its risk policies, to work more closely with the jurisdictional -- CFTC jurisdictional entity, that the CFTC should be supportive of that.

And so that's the position we take, but we don't think -- we're not suggesting any kind of takeover of

the FTR auctions or anything along those lines.

MS. FULKS: Jackie?

MS. ROBERTS: And I think that's my interest, too, is that the risks are not being properly managed, and we've seen that in several defaults in PJM where load has had to pick up those monies because load could. It was there. And that left $7 billion of congestion that hasn't come back to load in the last 10 or 12 years is just fundamental issues that I think should concern us.

You can imagine what your electric rates would be if you had $7 billion returned to you, and that affects everything. It affects the energy transition. It affects energy affordability and many other issues that are really important. And if the CFTC can help with that and maybe get PJM to apply industry standards to the risk metrics, which they aren't doing, that would be a great role.

Thank you.

MS. FULKS: Thanks, Jackie. Any other associate members have a question or comment?

I'm sorry. Frank, go ahead.

MR. MACCHIAROLA: Thanks, Lauren. And I want to

associate myself with Sarah's remarks on the presenters. Really very well done, described a very complex topic in a digestible way. So appreciate that.

I want to ask a question of Jackie Roberts. At the start of your presentation, you said significant investment in transmission is going to be needed given the retirements that you outlined out through 2030. I'm wondering if you could quantify the level of investments that you think are needed for the transition in terms of transmission and also where that investment is likely to come from, and what's going to happen if that investment does not meet the future demand?

MS. ROBERTS: Well, for reliability purposes, it will have to meet future demand. That's just the way the transmission planning is designed, at least in PJM.

And I would say that transmission is a very lucrative investment. If you -- for example, I used to listen to AEP's earning calls and FirstEnergy's earning calls because they have subsidiaries who are the electric utilities in West Virginia, and it's very clear that their earnings are driven by transmission

investments. It's clear because they say it.

So I don't think there is going to be a lack of entities that want to invest in the transmission. I think that's -- I think that's going to happen.

MS. FULKS: Last call for associate member comments and questions. Anybody virtual?

(No response.)

MS. FULKS: All right. Okay. So now we're going to go to EEMAC members' questions and comments.

Trabue, go ahead.

MR. BLAND: I just want to say this was an excellent presentation. It's very, very interesting.

I'll be very brief. And since we're an advisory committee, I'll give the CFTC some probably unsolicited advice.

I wouldn't touch this with a 10-foot pole, and just for all the reasons that Jean-Marc pointed out. Unless you want to spend a lot of time, commissioners testifying in front of Senators Sanders and Cantwell, who are well known for their love of the derivatives markets. FERC sees a clear jurisdictional interest in the FTR markets. And so -- and I don't think blending

those two together is a good cause choice.

Remember, that was written by then-CFTC Chairman Gensler, who is well known for his love of regulating any market out there, and he decided not to do that. So I would look to that as something critical.

The second thing is just, you know, running auctions and everything like that, I think that's a great place for a CFTC jurisdictional entity to be there. Clearing that is a different question, and I think there is some inherent dangers, which we haven't really spoken about -- it probably calls for another meeting -- that we should talk about in clearing the FTR market.

The principal one that comes to mind to me -- and I mean, look, Nodal and I are competitors. We're fierce competitors. I admire a lot of the work that they do, but if it was me on these markets, the one thing I'd worry about is weakening the ISO. And so if you took the cleared trades, it's going to be necessarily the best trades out of the ISO and cleared those, it kind of leaves the rest, I think, with the ISO, which kind of leaves them with kind of the dregs

of all of this bad credit.

And I think that that would be a problem for the ISO and probably good for the clearing house, but bad for that ISO. So something to think about.

Anyway, thank you. And there were -- I love talking about electricity and everything like that. It's fantastic. Thank you.

MS. FULKS: Thank you. Rob?

MR. CREAMER: Yeah, hi. It's Rob Creamer here, with Futures Industry Association's Principal Trading Group.

I want to thank for the opportunity to be able to participate in this sort of meeting. I'm sorry that I'm not there in person. It's a fascinating conversation. Obviously, it's very complex.

The FTR market, like many, many other markets out there, though, really benefits from the engagement of many diverse parties that are coming to the table to bid and provide liquidity and transparency to markets. I'm really fascinated by the FTR market in that it is so transparent. There's so much data out there that you can look at and really understand on

such a granular level.

And I've certainly witnessed just in our own participation in these sorts of markets, as well as feedback from many others, how competitive these markets are getting. And to me, when markets become competitive and they're providing price transparency on that granular level, I believe it provides incredible opportunities for better decision-making. And really, as Demetri was pointing out, it shows opportunities where improvements or changes could be made. If the smartest people in the markets can really focus on where the opportunities are, I think you have very good outcomes.

I will also say that, you know, you can certainly look at the data of how participants fare in these markets, and folks are -- market participants that are engaging in them, this is not a handout. This is not free money. You see a lot of market participants that end up losing, significantly bidding on their views about these FTR markets and where congestion is going to appear and how to price it. But overall, as a market participant, I believe that bringing people to

the table, providing liquidity, and having an auction that provides transparency leads to very positive things.

Thank you.

MS. FULKS: Thank you, Rob. Any other member comments or questions?

(No response.)

MS. FULKS: Anyone virtual?

(No response.)

MS. FULKS: Okay, great. At this time, do any of the commissioners have a question?

(No response.)

MS. FULKS: All right. Well, then so at this time, I think we are going to break for lunch. We are running a bit ahead of schedule. The food is not here yet, but I think we'll still break, and it should be here in about 5 minutes.

So let's take 30 minutes, 35 minutes and call back to order around noon.

Thank you.

(Recessed at 12:24 p.m.)

(Reconvened at 1:04 p.m.)

MS. FULKS: I would like to call this EEMAC meeting back to order.

Our second panel today will explore how CFTC-regulated metals markets could grow and make new stress due to increases in electric vehicle production. We will hear from two presenters, Dan Bowerson from the Alliance for Automotive Innovation and George Pullen, a senior economist with the Division of Market Oversight Product Review.

Dan, if you want to begin?

MR. BOWERSON: Thanks, Lauren. And thanks, Commission and advisory committee, Lauren and Chris, for inviting us to participate today. This is obviously a very important topic for automakers as we transition to an electrified future.

So, with that -- so, as Lauren mentioned, my name is Dan Bowerson. I'm a senior director for energy and environment policy with the Alliance for Automotive Innovation, or Auto Innovators. We're a national trade association that represents light-duty vehicle manufacturers that produce about 98 percent of the vehicles sold in the U.S., battery suppliers and other

tier 1 suppliers, along with automated vehicle start-ups and other technology companies.

So my goal today is to kind of just give an oversight of where the industry is, where we're heading, why we're heading that way, and then I'll let George kind of get into the nitty-gritty of the commodities and the expectations in terms of minerals.

So where we are today, what customers are buying. So third quarter of 2022, we saw about a 2 percent increase in EV sales from the year prior. Most of those EVs that are sold are battery electric. So pure battery electric, not the plug-in hybrid types, although we do see a considerable amount of those as well.

The other thing to note is the number of models that are available in electric options. So, currently, we have about 86. That number continues to grow every quarter. We expect that by 2025, we'll be over 130 EV models available for sale in the U.S.

And what we're seeing in terms of segment that those vehicles are coming out as, many of those -- you'll notice the gray bar there -- are utility

vehicles. The orange bar at the bottom is cars. So we're seeing larger vehicles. Before, you know, I'd say generation one EVs were very -- you know, those small, compact cars. Not a lot of people were purchasing them. We're seeing now getting into these larger vehicles, and obviously, larger vehicles mean larger batteries, means more critical minerals and materials necessary.

And I just -- we kind of look at the regulatory landscape for the auto industry, and we said we've got one tailpipe -- or I guess with EVs, we're out of that. But one tailpipe, six regulations, and three State and Federal agencies regulating our industry.

When we talk about greenhouse gas, we have California with their Advanced Clean Cars. They have greenhouse gas requirements. The U.S. EPA has greenhouse gas regulations, and then Department of Transportation, NHTSA, has their CAFE, or their fuel economy.

In terms of criteria pollutants, we have -- California and EPA have regulatory authority. And then California is unique. They actually have a ZEV

mandate, which is a requirement that light-duty manufacturers that sell vehicles in their State must meet a certain percentage of EVs sold every year.

So what that looks like in regulations that just passed this past year that will go into effect for model year '26 to 2035, you'll see that we ramp up to 100 percent EV sales by 2035. So, effectively, a gas engine ban in the State of California by 2035.

That's ambitious. But looking even up to that, looking at model year 2028, that's half of the vehicles sold in California must be electrified. Going out a few more years to 2031, that's -- oops, not part of my presentation.

(Laughter.)

MR. BOWERSON: I can take a hint. Yeah, sorry, 2031, looking out, it's for every gasoline engine vehicle that you sell, you have to sell three electric vehicles in the State of California.

Now I say the State of California, but California is not the only State that follows California regulations. There's about 16 States today that follow California vehicle regulations. What's important about

that is it's not just 16 States, that's about 35 percent of the light-duty vehicle market follows California regulations. So these States are in the process of adopting or have adopted those Advanced Clean Car II regulations, again with that 2035 100 percent EV sales.

On top of what I've shared, President Biden had an executive order in 2021 that by 2030, set a goal of 50 percent EV sales by 2030. So this is looking federally. Currently, U.S. EPA and Department of Transportation NHTSA are developing standards that will go into effect through 2031 and 2032, respectively, that will line up with that 50 percent goal.

So EPA and NHTSA must set performance-based standards, so it's not a ZEV mandate. However, the regulations will line up. We expect that they will adhere to that President Biden's executive order of 50 percent by 2030.

So lining that up, and this is a possible ZEV requirement for Federal. This is not -- the proposed rulemaking has not come out yet, but if we just look at it linear, you know, we're looking at 50 percent by

2030 and 85 percent federally by 2035 on top of the 35 percent of the market that's going to be 100 percent by 2035. There's a lot of EVs coming very, very quickly.

And what that means -- this is just an estimate. If we assume that those battery electric vehicles have a 75 kilowatt hour battery, we're going to have about 81 million EVs if the goals and regulations are met by 2035, and we're going to need over 6 terawatt hours of battery capacity to meet those needs. So I know George is going to get into more of the details of what that actually means from a commodity standpoint, but that is a lot of battery materials that are going to be needed to meet these goals and regulations that we expect.

And of course, we're not alone. Europe and China are very active in this space as well. Just a couple weeks ago, Europe -- or the EU parliament approved a law banning gas and diesel vehicles by 2035. October of 2020, China set a requirement of 50 percent EVs by 2035. Other 50 percent are hybrid electric vehicles. So everything is somewhat electrified. And what this is going to mean again is we're all fighting for the

same components and materials to meet these goals.

If we look at that same chart that I showed before, add in Europe and China, we're looking at about 218 million EVs in the 3 regions, equaling approximately 16 terawatt hours of battery capacity needed by that point. This is taking into account vehicles coming off the road and new vehicle sales adding on.

Throw on top of that California also has proposed new medium, heavy-duty ZEV mandate, which would bring up 100 percent ZEV sales for medium and heavy-duty by 2036, up from where it was proposed in 2040. So this is a proposal right now, but again, we focus on light-duty, but this is obviously the batteries, other than being larger, are not any different.

And it's not just automotive, there is a complete race obviously to electrify everything. When you think about it, from large offroad vehicles to stationary storage, to e-bikes and scooters, to lawn equipment, all of these segments are looking to electrify, and they're all relying on a subset of these materials that you see here. So the supply chain you can tell is

already constrained for light-duty market. When you start putting on top of it other sectors and industries, it gets very, very tight.

So, obviously, the automakers can build the vehicles. That's not a problem. But there's conditions that we don't necessarily have control over. It's we're reliant on other industries and markets to make sure that we meet the goals and regulations set forth.

Obviously, charging infrastructure, both on EV charging and hydrogen refueling, residential and public, is necessary. And then I'll focus a little bit on the battery production and critical minerals, and then I'll close on the most recent Inflation Reduction Act that does provide some incentives to bring domestic supply chains for EV batteries.

So this is from Financial Times, and it's a little probably outdated. However, it does give an indication of where the supply chains are now. So you'll notice that on the left, it's the mining of the four critical minerals that are used most prevalently in batteries.

You'll notice that China doesn't control -- with

the exception of graphite, doesn't control most of that. However, if you start moving -- not that far to the right -- further to the right, you'll notice those blue bars get higher and higher, right? So for mining, it's got to be processed and then built into cell components and battery cells and then, finally, EVs.

That is where the bottleneck comes from. That's where you're going to see the supply chains going through China. So while they don't own the mines, they own the things down from the mines up until the battery production.

So the Inflation Reduction Act, the goal or one of the goals with that when it relates to clean energy is to domestic, whether onshore or friend-shoring battery production. So there is incentives placed into the Inflation Reduction Act, whether that be tax credits or grants to actually produce EV batteries domestically. Those are on the left side there. So those are the manufacturing and supply chain. There's also infrastructure credits.

But then the consumer incentives is what I'll spend more time on, and this is where you're seeing

currently -- or previously to the Inflation Reduction Act, there was a $7,500 tax credit for EV purchases. The only restrictions on that was if a manufacturer had a 200,000 vehicles sold cap, they were no longer eligible. They'd have a down -- have to come down from that.

What happened with the signing of the Inflation Reduction Act is it got very, very complicated. So the first requirement in order to receive any sort of tax credit for the vehicle is it has to be assembled in North America. There are MSRP and income-level limits as well.

But what's very unique about the new credit is we've split it from previously a $7,500 credit into 2 separate credits, $3,750 each, with part of it looking at the critical minerals. So, in 2023, 40 percent of the critical minerals must be extracted or processed in the U.S. or in a country that we have a free trade agreement with. And the other half of it would be for battery components. So the value of the components contained in the battery must be assembled or manufactured in North America to qualify for that.

So it's split. These numbers, those percentages go up on a yearly basis as well.

What's unique -- and then 2024 introduces another step that must be met. You'll notice that second step there. For components, you cannot have any battery components coming from a country that is considered a foreign entity of concern. So, Russia, China, Iran, North Korea. Not a single component within the battery can come from any of those countries.

If anything comes from there, you do not qualify for any portion of the credit. Whether or not you're -- if 95 percent of the battery is manufactured here, most of the critical minerals are here, you will qualify for zero credit if any component comes from a foreign entity of concern.

But on top of that, 2025, we also add in critical mineral requirements. So similarly to the battery components, in 2025, if a single critical mineral comes from a foreign entity of concern, the vehicle is ineligible for any portion of credit.

When we talk critical minerals, aluminum is a critical mineral. If you have a -- without any de

minimis, if you had a bolt in your battery pack that was dipped in aluminum that came from China, you would be ineligible for any portion of the credit. So we're still waiting for final guidance from Treasury on what actually shakes out to, if there is going to be any sort of de minimis requirement there, but that is kind of where we are at today and what we expect coming forth from the Inflation Reduction Act.

So, with that, again, I wanted to kind of set the stage. I know George will get into more of the topics that you guys are probably all more interested in. But as I think you can see is there's a lot of sectors and a lot of players globally looking to electrify anything from a lawn mower to a class A truck, and it's going to be a very strenuous supply chain to get there.

So, with that, I think I'll hand it to George? Okay, perfect. And then these are back-up slides, which I'm happy to share, but I think George will do a better job of getting -- yeah.

(Pause.)

MR. PULLEN: All righty. Well, thank you so much for having me in today. I appreciate the invitation to

provide you some staff comments and opinions on the derivative markets and the impacts that electrical vehicles will have on them.

I want to make sure that you understand this is staff analysis. So it doesn't necessarily reflect the analysis of DMO as an entity or the entire CFTC. This is George Pullen's analysis. You've heard that disclaimer before, right?

So let's start this out like I would one of my Econ 101 classes, right? Let's talk about a macro perspective in the worldwide market. This is a really important level set, and Dan did a great job doing some of this already.

We're talking about a worldwide market, where we've had 10 million BEVs and PHEVs sold. BEVs is, of course, battery electric, and the PH stands for plug-in, okay? So we've had a large number of them sold last year, representing about 14 percent of all new automobile purchases.

Overall, we've got a little over 25 million EVs on the road today, which only actually represents less than 2 percent of all vehicles on the road because,

remember, we have billions and billions of automobiles on the road. In the U.S., if we narrow in here a little bit, we can see there was a little bit more than three-quarters of a million BEVs sold, representing about 5.8 percent of new automobile purchases.

The reason it's important to put these next to each other is, much to the presenter before me's points, this is not just a U.S. phenomenon. This is also happening with vehicle electrification in other markets, which means when we start talking about the related commodities, the demand signals aren't just U.S. demand signals.

A little bit more macro before we start diving in here. There's also hybrid electric, also sometimes referred to as "brake charging." I had that broken out for me very nicely by EIA. Thanks, EIA. Very nicely by EIA. You can see it represents quite a big percentage of the overall powertrain sales market.

It's also important to keep in mind that this is just one of many changes happening in the automobile industry. This change also means that hybrid electric vehicles, or brake charging vehicles, if we don't see

an even substitution between electric pure vehicles and braking charging vehicles, we'll also have competition for similar sets of minerals, okay? So keep that in mind.

Also, I have here a great chart from the European market because, again, this is a global phenomenon. In Europe, you can see they also have battery electric plug-in and hybrid vehicles. They also have a small percentage of fuel cell vehicles and also natural gas vehicles, in addition to our traditional gasoline and diesel. So, again, keep in mind this is a world market that we're talking about.

Let's talk about the supply and demand here a little bit. Average price sales for EVs are quite a bit higher than those of ICE vehicles. No, Trabue, that's not you. That's internal combustion engines.

(Laughter.)

MR. PULLEN: That's internal combustion engines, and also keep in mind, too, that new vehicle purchases are actually a fairly small percentage of all vehicle purchases. Used vehicle purchase numbers are up there, too, around $30,000 each.

We can see here the U.S. supply of these vehicles is currently dominated by Tesla. That percentage has been dropping rapidly over recent years. We can see here 7 percent divided for each of Ford, GM, Hyundai/Kia, and then another good check -- or excuse me, chunk there for everybody else under the "other" bucket.

Demand drivers, this was already hit on the previous presentation. There are, of course, tax credits, charging station options, urbanization, some fantastic HOV lane rules, and the like.

Next let's just do a little 101 here not so much for this crowd, but maybe for the general public who might be listening in. There's different types of financial risk that EV manufacturers have to think about. There is foreign exchange risk. If you examine the 10-Ks of any of the major automobile companies, the vast majority of their derivatives and hedging activities as publicly available in any EDGAR filing is actually their foreign exchange risk.

Next is their exposure to interest rate risks. Then, of course, they have counterparty credit

exposures. They rely on a lot of OEMs, who also rely on second- and third-level providers of materials and goods. And then, finally, you have raw material prices.

Keep in mind, too, I'm talking here about financial risks, okay? So we're going to get into that when we talk about market structure.

So, market structure -- and again, this is a level set for general public -- but we have raw materials that can be hedged out financially, but we also have to think about raw materials' physical delivery. So, as we all know, not all futures contracts contemplate physical delivery. In fact, the minority of current futures contracts that have been self-certified contemplate physical delivery.

If you are an auto industry producer, you have to also figure out your physical delivery, not just your financial risk. I want to make sure that's highlighted because we also have to remember how derivative markets develop. We start with our spot cash markets. For many of the minerals that we're going to talk about in the next slide, we're talking about spot and cash

market minerals and materials still.

Next you have forwards that develop, long-term contracts, bilateral between individuals.

Then we'll see swaps develop, the financial exchange of payments. Yes, that's a very short definition of swaps. Please refer to the actual definition when you want to read the 600-page version.

(Laughter.)

MR. PULLEN: For futures -- I never want to get ahead of myself there. And for futures, that's where we evolve to. And it's important to keep in mind that for many of these materials, we haven't evolved there yet. Okay?

And last, of course, we have where it gets really fun, the indexes, the options, and all the other subcategories of derivatives that become supported and enabled by the fact that futures exist. Also defined as futures.

Here is the list that everyone wants to see. What derivatives are available for EV manufacturers, and what does that mean to their business? Well, when we look at it -- and again, we're just looking at the big

components here -- we're talking about plastics. How do we get plastics, right?

When we estimate global supply in Product Review Branch, a lot of times we'll do a full market survey. We're talking to participants. Plastics have many different hedging contracts -- natural gas, oil, ethane, propane, ethylene, propylene. We've got oodles of contracts for these.

Next, we have steel -- hot-rolled. Steel, of course, being iron and manganese. You can remember from the previous slides that Dan provided, manganese is also a critical component of batteries. Yes, we have futures contracts for those.

Aluminum, of course. Rubber, natural rubber? We don't have those with the CFTC, but TOCOM does.

Graphite, nothing.

Copper, yes.

Cobalt, we have a Fastmarkets index. When I refer to an index, remember this is something that will help you with a financial hedge. This is not something that's contemplating physical delivery, okay?

Next, and we have lithium. Of course, something

that everyone is going to want to talk about, and I expect a lot of questions around lithium. We have lithium hydroxide and carbonate. The big difference between those two is the percentage of lithium in each.

If you make me do a chemistry class here, I will. But essentially, you can break carbonate into hydroxide, increase the concentration of lithium, and depending on the battery configuration, they'll need more or less of those elements. For those, we do have exchange contracts for hydroxide, and we also have carbonate contracts at LME.

Last, and importantly not least, is the lanthanides, our friends the "rare earths." You don't get high-tech cars without lanthanides. You don't get high-tech anything without lanthanides and rare earths. The rare earths are, of course, elements 57 through 71. You also get scandium and yttrium. I know yttrium starts with a "Y", but trust me on that.

We don't have commodities contracts for those. The reason this is important is, like we talked about before, the demand signals, the demand drivers that are taking place, it's not just braking charging

vehicles. It's not just plug-in vehicles and your traditional BEVs. It's also the automation and the autonomy coming into vehicles.

There has been several reports talking about how the chips as a function of vehicle cost went from 40 to 60 percent of the overall cost for a vehicle. Those chips come from our friends the lanthanides, the REMs. We do not have commodity markets for those that have been self-certified as futures contracts.

Next slide.

And Dan did a great job here. So I'm going to quickly skip regulation -- boop.

And questions? We can -- I can go sit down, and you can run it like a lecture.

MS. FULKS: Okay. So now I would like to open it up to associate members for questions and comments.

Paul, go ahead.

MR. HUGHES: Yeah, I was just wondering if maybe either one of you could comment a little bit more on maybe the pace of demand? Because, obviously, you talked a lot about EVs, and I think there was a slide that here is -- it's not just car manufacturers. I'm

thinking about on the electricity side. I'm thinking about solar being paired with battery really as you kind of move forward, and thinking about this whole energy transition. There's a lot of people seem to be playing or will be playing in this space really quickly.

So I just wondering if you might be able to talk a little bit about, one, pace and, two, probably -- maybe I ought to hold this for a second question, but two would be automobile manufacturers, at least these large ones we talk about, are very much global players. And they've dealt with global risk for a really, really long time.

But some of the countries you mentioned seem to be in our news quite a bit here as of late, and so I'm just kind of curious how flexible, how much optionality they have built in the process. Not a financial option, but kind of a process option, if you will, where things turn a different direction. So just be curious, your thoughts on that?

MR. BOWERSON: Great question. I think in terms of pace, on the light-duty market for sure we're seeing

that pick up. Where before it was the early adopter stage, I'd say we're in between early adopter and the next phase now. We're starting to get there.

I think it's going to -- a lot of that, though, is going to depend on, to be honest, charging capability. Most of those that own EVs right now own single-family homes. They have access to home charging. When you start getting into customers that don't have access to a garage to charge, that's going to be where it's very important for apartment buildings and those.

So that's going to be, I think, a hindrance to get there. If that's not there, it's going to be very difficult.

On the other sectors, I think a lot of that will follow the light-duty market, to be honest. It's getting a comfort with those products and the need to charge instead of filling it up with gasoline kind of thing. So I don't have a good read on how quickly those are going to adopt.

Your other question on demand and those things -- and sitting next to somebody who works at a public

service commission, I can tell you that a lot of the utilities we're working with are looking at how do they match the load and demand and make sure that you're kind of leveling out that curve, right? So there's a lot of whether it be time of use rates using vehicle telematics to ensure that it's charging at a time when it's beneficial to the grid instead of detrimental, there's a lot of activity and work going on in that space right now.

I may have missed another part of your question. If I did, I apologize.

MR. HUGHES: Just really comments on kind of the global aspect --

MR. BOWERSON: Oh, I'm sorry.

MR. HUGHES: Yeah.

MR. BOWERSON: Yep. Yeah, so it is absolute that these companies are global companies, and they're looking at this as a -- as I showed, the major regions are looking to electrify, and it's almost as if there is a competition who can get there quicker through regulation.

I think one thing that's unique, and we started to

see this, is this global market, you're starting to see more onshoring and friend-shoring of manufacturing. So even these global companies, they're going to likely have battery manufacturing facilities in the U.S., in Europe, in Asia. To get some -- one, some of those financial incentives and, two, the supply chain risks that we saw with the chips was kind of a canary in the coal mine effect. There was last year we actually had less sales than the first year of COVID because of the chip crisis. Demand was through the roof, but supply was extremely low. So --

MR. PULLEN: I might offer up a slightly different angle outside of the electricity and the policy drivers there. We have to think about what it looks like for Dan's slides when we get to a production of 100 million vehicles that are electric, right? So that would be the zero future state projections of ICE vehicles.

You're talking about 100 million vehicles. So if you estimate -- and they vary based on manufacturer -- at about 5 kilograms of lithium. All right, I'm going to focus on lithium here, but there's other elements involved. But focus on lithium.

So 100 million, right? Five kilograms. So every 200 cars, right, I need a ton of lithium, right, a metric ton. If I need -- for every 200 cars, I need 1 metric ton, that means that I'm creating a market of about 500,000 -- 500,000 metric tons of lithium, okay?

That's significantly more than today, where we're talking about estimates between 2,000 and 3,000 tons of lithium consumption. So 500,000, future projected state; 2,000 or 3,000 today. I'm only talking about cars.

No. And of course, for electrification, as Dan said, does it roll? Yes, with an electrified. Does it not roll, well, we're probably electrifying it, too.

So think about how much more lithium that is, and then remember that we don't currently have large-scale lithium storage. So think about some of our commodities markets where we do have large-scale lithium storage, and we do have futures markets that contemplate physical delivery and also provide financial risk mitigation tools, right?

Oh, and of course, price transparency -- we all like that -- and clarity. Go, futures.

But if you think about let's just talk about copper, right? I'll pick on copper for a little bit here. But copper, we're all familiar with it. We use it every day. We use a lot of copper. We use quite a bit more copper than we've even projected that we might use for lithium. It's about 2 -- I want to get my number right. I did write it down earlier -- 2 million metric tons, about 4 times as much copper as we're projecting that we might use for lithium.

What underpins the copper contracts and the copper market? Of course, we have transparency. We have deflected markets. We have clearing. We also have storage for copper, and we have the ability to take that physical delivery of copper.

So someone could offset their financial risks with the product, or they could also contemplate and receive physical delivery of that copper. That is not a current part of our ecosystem today. It might be one that evolves if we use that as a proxy, albeit a messy proxy variable. But that could evolve.

MS. FULKS: Jamila?

MS. PIRACCI: Thank you. Piracci, Life Powered.

I have a question for both of you regarding what is happening in terms of how -- normally, markets develop by, as Commissioner Mersinger described, sort of electrification, allowing people to move from running outside to get their water to instead being able to turn on faucet, right? And markets evolve from those physical circumstances as we get better at simple technology, and eventually, then all the derivatives and other markets come onboard, and those other markets provide price transparency, making the underlying markets perform more efficiently and, ultimately, reducing cost to the consumer.

In this, it seems that the biggest driver for demand for electric vehicles in particular is regulation. We've decided as a society at some point that we are going to do something in a very particular way, and we want to get rid of another particular way. So my question is, have you seen any research or work being done on what a reverse engineering pattern of a market looks like?

You start to decide on an end point as regulators, and then you start to make derivatives and other

markets function to support, to falsely, in my view, prop up an underlying market. What are all the things that happened in a normal course to a market maturity that you have to reverse engineer into play to keep, for example, people from dropping into severe poverty or what's happening now with mining involving slavery?

We have lots of principles that we don't want to break in terms of producing the way we live. How do you reverse engineer that path in a very short timeframe to avoid all those pitfalls that hurt the individual? Have you seen any research on that backward planning?

MR. PULLEN: So I'll go first because I'm not going to answer the why we did the regulation part because, obviously, that would get me in some trouble.

But in terms of what we've seen, there are other examples of this. Oh, also thank you for mentioning the slavery aspects of the cobalt market. I think that's really important to highlight. It wasn't part of the prepared slides, but I think that's important to mention that that is a real function of the cobalt markets.

The thing, though, about the directions here, we've seen something similar with the way that we've handled renewable energy credits and SRECs. I know that previous to this was more about electricity and not electrification. But in those markets, we've seen regulatory standards put in place that expect a certain amount of renewable energy to participate in the grid. They then participate those credits and that feature of the generation alongside the transmission of electricity, or separately, they have swaps forward markets and futures markets around those characteristics that were set up via systems and dictated by systems.

So we do have comparables, and that's where I would look to if I was to try to find a good research paper on it.

MR. BOWERSON: I don't think I can answer better than that. All I would offer is obviously the manufacturers that we've talked about are global companies. They all have their own decarbonization and sustainability goals. Many of them have seen electrification as how to get there the quickest, and

regulators are either responding or the autos are responding to the regulators.

So it's kind of a -- you know, we're not in silos. California is looking at what Europe is doing. Europe is looking at what California is doing. And they're seeing that and going forward from there. So it's I don't have an example of research of looking at that backwards, although it'd be interesting.

MS. FULKS: Frank?

MR. MACCHIAROLA: Thank you. Thanks for the presentation.

I have a question on just overall resource base in the U.S. You both alluded to the amount of materials that are going to be needed to meet the California mandates, the 16 States, and then the overall shift beyond those States.

Can you comment at all about both the U.S. resource base ability to meet those objectives, and then also the kind of little bit less definitive, the permitting and actual construction of mining, et cetera, to be able to meet those mandates?

MR. BOWERSON: Yeah. So I think the first part,

Frank, is the resources are certainly constrained. We don't have all of the resources necessary in the U.S., the minerals in the U.S. to meet those. I think what you're seeing now is looking towards processing and refining of those minerals. So we may not have the rocks here, but we can put the processing and get that here so it's not -- we're not reliant on adversarial countries.

I think the -- what was your second question? I'm sorry, Frank.

MR. MACCHIAROLA: I'm not sure I understood the last part. We'd still be reliant on adversarial countries for the resource?

MR. BOWERSON: Not necessarily for the resources. So that slide that I showed from Financial Times where China doesn't necessarily own all of the mining, but they have all of the processing and refining. So looking for opportunities to take that step and put it --

MR. MACCHIAROLA: Got it. Yep.

MR. BOWERSON: -- to onshore or friend-shore. And I do think you've already seen manufacturers partnering

with lithium suppliers, which is something that before you would never see, right? You're looking at before, the manufacturer would source the tier 1 or maybe the tier 2 supplier. Now you're getting all the way down into the critical mineral to ensure that they are protected from some of those. But --

MR. MACCHIAROLA: Has USGS done any survey of the --

MR. BOWERSON: They have, and I'm not well-versed enough in them. But I know they've done surveys, and they've looked at this. And there is definitely activities ongoing there, but I'm not, unfortunately, well-versed enough to --

MR. MACCHIAROLA: Thanks.

MR. PULLEN: I would add a couple different things there. So the first is remember that not all battery technology is the same, right? So they all are using a lithium electrolyte solution, and they're passing the charge from anode to cathode. And then, afterwards, you need to plug it back in. It's from cathode back to anode.

The way they make those is, of course, using the

graphite and the other materials we talked about. There has been different research that has brought things online, such as using more aluminum and less cobalt. That's been a big driver lately with some of our technologies. So I don't actually think it's fair to say that we know what materials will be in batteries by the time we get to 2035 and some of the estimates that Dan shared.

Also I think we go back to copper, I think we can also think about the copper market and how much of U.S. copper is actually from recycled copper. So when we're talking about EV battery market production, we should also consider circular economics theory, which means that we have to think about the construction of a device or mechanism and how those components are able to naturally break back down or efficiently break back down and be recycled and be reused.

Even though we produce very, very little copper and we're finding very, very little copper here, we are able to recycle and use that for half of our copper supply in the U.S. You could see a future where we'd do similar things for some of these materials.

MS. FULKS: Jamila?

MS. PIRACCI: Jamila Piracci, Life Powered, again.

I have a question about the batteries themselves. Because of the fact that the processing is right now predominantly done in countries that we don't want to be hanging out with too much, what is being done from an educational point of view? Both for consumers who are going to, I assume, be expected to turn their cars in when their batteries are done for so that the battery can be reused.

I mean, some people just leave their cars. I live in a semi-rural area --

(Laughter.)

MS. PIRACCI: Nobody is taking their car in, okay, to drop off that battery, just to be clear. And my batteries for my remotes and whatever are in the trash can. So from a consumer perspective, what kind of education are you seeing, Dan, for consumers about the use, reuse, and turning in of batteries?

And then, similarly, what's being done from an educational point of view to develop a workforce that can become the folks that start to handle the

processing to make these minerals into usable objects so that we don't have to rely on China?

MR. BOWERSON: Yeah. So the first part is a great question. So I work a lot with battery recyclers, and they will go near and far to get those batteries back because there is such a market for them right now. So we expect that there is still going to be demand -- there's going to be such demand for those critical minerals that are in those batteries that they will have value that instead of leaving it on the side of the road, you could likely make money by getting that scrapped because of the value of those critical minerals.

So that, I think, will -- the free market will likely play out there. You're already seeing partnerships with OEMs or vehicle manufacturers and recyclers because they want to keep that circular economy for the battery minerals.

The workforce and education part, there is active work going on there within DOE, along with some of the battery associations as well. Highlighting some of those opportunities, there is a Battery Workforce

Initiative that DOE and Department of Labor just set up I think in December. So that's actually part of their goal is to get that education, and how do we transition not just to electrification, but the workforce to go along with that?

So that activity is absolutely happening now. Does it need to speed up? Probably, to get there, but --

MR. PULLEN: Workforce development would be a little bit outside of scope for me, but one of your comments there about the cars alongside of the road, I also grew up someplace very rural. I grew up in Maine. And one of the things that Maine has done is, of course -- and other States -- is they have recycling programs, the 5 cents for your cans.

There is also several programs around -- and these, again, just creating economic incentives for people to bring things into recycling centers -- around white goods. So, washers, dryers, refrigerators. That is then another mechanism to keep those off the side of the road -- and Coke cans.

So if you could see a future where something

similar is taking place where these critical materials are processed and recycled, I think those are the types of mechanisms to anticipate.

MS. FULKS: Frank?

MR. HAYDEN: I have -- by the way, I would say this has been excellent. This morning's session as well as current discussion has been very good. So, thank you. Thank you for your presentations and your time and your work.

So I have basically three questions. The first one is kind of easy. Have we heard of any manufacturing for batteries or processing, refining here in the United States since the Inflation Reduction Act? Has there been any -- any discussion about people putting that project online or doing anything with that? And so, then the -- yes, I'll let you talk.

MR. BOWERSON: Yeah, I was going to say I'll forget your other two questions, and I don't have a pen on me. So I apologize.

To answer your question, yes, kind of. There was already plans in advance to have more battery production facilities in the U.S. But the Southeast is

getting a lot of those facilities.

I would say with the Inflation Reduction Act, some of those timelines have been moved up. So that absolutely was happening and is -- like I said, the timelines of those coming online are moving up because, as I showed, in order for them to receive.

MR. HAYDEN: And what's the runway for that? Is it like 5 years, 2 years, I mean once -- once they break through?

MR. BOWERSON: It's -- yeah, a weak answer, but it does vary, depending on, you know, if they're doing all of the processing in-house. Most of them will be doing that not in-house. But the manufacturing of the batteries is, I'd say, less timeline than before. So rough guess would be 3 years or so, but obviously, there is some of that that goes into it of what incentives they can get from the State and city, and a lot of those that I'm not as involved with.

MR. HAYDEN: And then my second question relates to microgrids for EVs. I mean, early this morning we talked about the grid capacity and how do you kind of run it? Has there been any real thought about using

cars to kind of create little microgrids or demand response products and stuff like that?

And could you speak to that if you've been thinking about it?

MR. BOWERSON: Yeah. There is a lot of B2G or B2Home or B2X, whatever that is, right? So B2G would be vehicle to grid. There's been a lot of pilot programs throughout the country with utilities and vehicle manufacturers. There is definite opportunity there.

My only caution would be that it has to be incentivized for the customer or the driver to actually want to provide energy back to the grid, right? I'm not going to want to reduce my range if I need to leave without it being some sort of incentive for me. So that's -- that's absolutely happening, and those pilots, I think, we're very much encouraging that we can kind of consolidate those instead of having a bunch of pilots turn into more of a program.

But somewhat challenging there is obviously the public service commission and public utility commissions have jurisdiction over their State. So

we're trying to encourage coordination across State lines to make sure that those are understood.

MR. PULLEN: Since we're staying on the mike, Frank, what I'll say, too, about the microgrids is -- and this dovetails onto what was just shared -- these are retail market participation points we're talking about. We're not talking about the active consideration of let's say a group of these participating at a wholesale level, in wholesale markets, okay?

So this is retail participation, NEM, net metering and how that might play into their bills. We're not talking about wholesale participation.

MR. HAYDEN: All right. And then my last question is really about market design stuff. Like has there been a lot of work with regards to standardized contracts? I know like, you know, ISDA is really big in various products that we all trade. Has there been a real focus on developing standardized contracting for these rare earths or these minerals?

And then, with that, you know, collaterals. There's been discussion about how collateral would be

exchanged, given these minerals and index price formation, like who's reporting prices or how that's being done or anything along those areas that you can kind of speak to? We've heard a lot about the demand issue, but I'm kind of curious about the plumbing, you know, to kind of get all that stuff working. So --

MR. BOWERSON: The engineer is going to punt to the economist.

(Laughter.)

MR. PULLEN: I love a good market design question. That's always fun.

So to think about where the research has come from, I'm occasionally loaned out from CFTC to go over to Eisenhower. So that's the senior staff war college. And over at Eisenhower, they have actually an On the Rocks program, and that has been contemplating lanthanides, lanthanide security, lanthanide contract description, contract details for DOD for at least the last 7 years that I've gone over there for those lectures.

So the answer is some of that work has been done and is being contemplated by DOD for their suppliers

because they need lanthanides to do really amazing things, like build submarines and the like. So they're also very interested in this in terms of contracts themselves. Of course, contracts are self-certified, and they are presented to us. I have not seen any that have contemplated lanthanides.

MS. FULKS: John, go ahead.

MR. MELBY: Thank you. John Melby of Xpansiv.

I like everyone's comments. These are great presentations. So, thank you.

My question is really around the markets. You described -- both described the physical nature and supply certainty problem that was quite clear in the presentations. I guess my question is, is there a physical or policy reason that we're not able to develop storage, or is this a moment in time where they just haven't been developed yet? What's the hindrance there?

MR. PULLEN: So this is interesting, and I think it has to do with the size of the demand signal, right? So if I think about it just as any other market -- and I, again, use copper as the example -- we are

now seeing a size of demand signal that makes storage, contemplation of delivery, and the like more, more palatable.

I don't think, when you look at markets that represent 1 or 2 percent of overall vehicle market that have now become 5 and are estimated to become 100 in a couple short decades, the demand signal is now. And so I don't think it's for a lack of action. I don't think there was necessarily the demand for it before. And so now I would not be surprised if we start seeing people contemplate that at all.

MR. BLAND: And can I ask something because it's probably something that Demetri and I think about, too. It's because when you have that storage, it levels out the nice volatility in our electricity markets, which we make a lot of money off of, and there are a couple of reasons why.

I mean, one of the things is when you get to battery storage, one of the I think super innovative things that Tesla did wasn't the electric --

MS. FULKS: Trabue, I hate to interrupt you.

MR. BLAND: Oh, yeah.

MS. FULKS: Can we -- can you hold your comments until the members part?

MR. BLAND: Yeah, sure. Oh, of course. Yeah, yeah.

MS. FULKS: Just because, just per our charter, I don't want anything said that then the associate member comes back and comments on, and then --

MR. BLAND: Sorry, I just jumped ahead.

MS. FULKS: No, it's totally fine. So, sorry. I know, I do need a gavel.

(Laughter.)

MS. FULKS: Frank, go ahead.

MR. MACCHIAROLA: Sorry if this is repetitive, but I'm still -- I'm sort of stuck on this question still whether there is any good research or data out there. Again, the mandates are sort of not market-driven. They're artificially set up and essentially go from 1 to 100 percent, and is there any good analysis out there about recognizing that markets change?

In our market what people called the "end of oil" two decades ago has turned out not to be true. So certainly technology changes, and that changes our

estimates of a resource base or potential.

But again, is there any credible estimate out there with data about whether the U.S. can actually meet the resource base required to meet these mandates? And if not, whether there are public policy plans to attempt to do that through permitting, for example, if we do have the resource base or imports if we don't?

And then sort of if the CFTC, in your opinion, or any or what Government agency has a role of ensuring that? I only reference that because we've all sat through States of the Union for our entire lives, and every single President across both parties has talked about the national security and economic security and national imperative that we be energy independent. And then we are entering a discussion about an energy transition and without credible data about whether we're going to enter into that transition and maintain our energy security and energy independence.

Well, we're going to go backwards on that, and someone 50 years from now is going to be in front of Congress talking about the need for energy independence

because we don't have the resource base to meet our energy needs.

Sorry, long-winded answer/comment, but -- question/comment, but just wondering if there is any data that you all are aware of or any reports or studies or --

MR. BOWERSON: So, great question and great points. We're actually in the process of working with a third party to do exactly that. So looking at what resources we have, what percentage of an EV penetration that would mean. And then, on the flip side, looking at it, saying, okay, if it's going to be 100 percent by X year, what resources do we need, and do we have that available?

So that is in process. I think Benchmark Mineral Intelligence is a firm that does a lot of that work that is looking at that as well. So I don't have any data today but would just say within the first half of this year we will have ourselves worked with a third party to develop that.

To the point, I mean, it'd be too late to influence likely the regulations we've seen. I mean,

California is baked. However, there has got to be some sort of realization at some point that if the resources aren't there, at some point it becomes impossible for those regulations to be met. So what becomes achievable at that point? So no real data right now, but just -- yeah, yep, yep.

MR. MACCHIAROLA: That would be great.

MR. BOWERSON: Yeah, for sure.

MR. PULLEN: I would be hesitant to say that I've surveyed all economic papers available in fear of offending one of my fellow economists. I am not aware of a study like the one that you've proposed.

I think that it's a great question, though, because we are talking about, as I said, you know, 500,000 metric tons of lithium, a little bit less than that -- 500,000 -- a little less than that for the nickel. Three, almost four times that for the manganese, and then three times that for cobalt, depending on how much we do substitution to aluminum.

So these aren't small numbers. These are very large numbers, and the contemplation of what that looks like, how we get that domestically, how much that comes

from recycling -- as I mentioned before, circular economics -- how much that is available for storage and then delivery and those mechanisms, I haven't seen that paper, no.

MS. FULKS: Jamila?

MS. PIRACCI: Jamila Piracci, Life Powered, once again. I promise not to be long. Obviously, I'm very fascinated by this, and I failed to say earlier, George and Dan, thank you so much for the presentations. It's very clear and super helpful.

Dan, in the study that you guys are looking at doing, will you include things like the potential price impact on consumers? Because I assume that this is going to look like very expensive at first and then, eventually, it calms down. And I'm just wondering what impact there will be on folks who are already struggling to pay their bills?

MR. BOWERSON: That will likely be a part of it, but it won't, unfortunately, be the focus. I will say that, you know, all the projections had EV batteries' prices declining. Then Russia invaded Ukraine, and nickel prices went through the roof, and battery prices

went back up.

So every projection I think is wrong, right? Is that the saying? So --

(Laughter.)

MR. BOWERSON: To your point, though, on affordability, I think part of that is as there are more EVs on the road, there will be more used EVs available. And part of the Inflation Reduction Act did have a credit for used electric vehicles, which is new. That's very novel that we haven't had before.

So there will be an opportunity there that we did not have before. And part of it is those first generation of EVs, their second life wasn't very long. They had some battery issues, and I think we're starting to see those be corrected. But there will be an opportunity there.

So most -- from the data I've seen, most low- to moderate-income families don't buy new cars, let alone EVs. It's a used market. So as we see more EVs come to the market, I think there will be more opportunity there to have more residence in those types.

MR. PULLEN: I think the statistic I like to

reference to is the one where it's $5,000 a year for transportation per household. So depending on what income bracket your household is in, that could represent as much as 20 percent for a lower-income family, 25 percent of their overall income.

So these are big considerations, not just for the folks who are buying $80,000 or $100,000 EVs. This is also a consideration for everybody else.

I think on the second part of your question, what I would say and kind of tails into what we were getting at earlier, the factors and influences of something like the war in Ukraine. Russia is the number-three producer of nickel, and so when we talk about battery compositions, we have to keep in mind what can happen is completely outside of our control and then how that then ties back to and impacts the consumer on all kinds of different income brackets.

MS. FULKS: Any other comments or questions from associate members?

(No response.)

MS. FULKS: Thank you, associate members.

I'm going to open the floor up to comments and

questions from members now. And actually, I'll start with Trabue, since I so rudely interrupted him.

(Laughter.)

MR. BLAND: No, I was just going to say that, you know, building a battery for electricity source is very hard. It's a software issue, and it's like how you discharge that battery without it getting extremely hot. Tesla has done that for cars generally, but doing it at a utility scale is extremely difficult, and that's one of the reasons we haven't seen that. So it's just not getting batteries, it's actually being able to use those batteries.

And so just one other broad point because we're talking about markets. George had an excellent picture up there of how a market develops, and just when I look at this market and whether it's ready for futures thing, it isn't -- it hasn't reached that first stage there. I mean, we're all talking about the physical supply and how it's varying and there is Government incentives and stuff like that. It's shifting. So it's really hard to build a market around battery materials right now.

And there's no commonly accepted index, although there is the Fastmarkets one and, I think, Platts. Both of those, there is struggling around those two indices as on the financial side.

On the physical side, it's even more difficult to try to build a contract around that because you're really looking at some countries that aren't particularly friendly to the United States, but also just -- just solidifying that chain is extremely difficult.

So we've been looking at battery materials now for a couple of years. We just haven't seen a common, you know -- we haven't seen the equivalent of a Coffee C contract. Coffee C is the contract that represents all of Arabica coffee. And that just hasn't happened yet for a lot of these battery materials.

But I think it will happen. It's just not there yet.

MS. FULKS: Bill?

MR. MCCOY: Bill McCoy of Morgan Stanley. And again, I also want to thank both this morning's presenters and these two presentations, which are

excellent.

And of course, we've heard the discussion about with the demand and the expected growth of demand for electric vehicles as this corresponding need and demand for more charging stations, and then as we're hearing much of the discussion about the impact on the metals markets and demand of metals because of EVs. I'm just curious whether there's been -- and I don't pretend to understand the technology behind the charging stations, but I imagine they require microchips and potentially copper and some other metals.

Has there been a look at the degree to which there's going to be an incremental demand on these markets as EV growth goes and suddenly we find ourselves building an infrastructure of more charging stations, both at homes and in public places, and what impact that will have on the markets, on the metals markets?

MR. PULLEN: I think we go back to our nickel example a little bit earlier. Nickel, Russia the number-three producer. Both Indonesia and the Philippines are also major producers of nickel. But if

we think about it, nickel is also a primary driver and necessity for stainless steel, and there is huge amounts of stainless steel demand coming out of both China and India right now.

So when you're talking about some of these components, we have to remember that they participating in a much larger global market for that input. So it's not just going to be a pricing signal from electrification or even specifically from a charger or an EV battery. It's going to be a market signal that also has to deal with the fact that, well, we need nickel for stainless steel.

And I think you're talking about second- and third-order effects, and so that's going to take a lot of research to really get a handle on.

MS. FULKS: Any other comments or questions from EEMAC members?

(No response.)

MS. FULKS: No? Okay. Yes, Commissioner Johnson, do you have a question? We can't hear you.

(Pause.)

FEMALE SPEAKER: We have someone headed your way,

Commissioner Johnson.

MS. FULKS: While we're waiting on Commissioner Johnson to get some technical help, Commissioner Mersinger, do you have any questions?

COMMISSIONER MERSINGER: Just real quick on the recycling side. With the kind of supply, the fact that the supply chain will continue to evolve because we'll be in a state of recycling those materials as well, how does that change when if you're -- the first kind of process of creating these batteries to the recycled and bringing -- you know, is the supply, is it the same quality? Do things have to happen so that you can fully reuse the metals and the minerals?

It's just an interesting kind of supply situation here because now you're doing -- you have to get it from the ground or wherever, but then, eventually, we'll shift to kind of a recycled supply. I'm just curious if we've started to look into how that will change -- if the demands will change and whether or not the supply, through the recycling, will meet those demands and how that's going to affect prices long term.

MR. BOWERSON: So I don't know that I'll be able to answer the pricing part, but on the actual recycling part, the material that does get recycled from the battery meets the same purity requirements as fresh material coming into it. So those, for a vehicle or a battery, it would be -- it would not know the difference between recycled content and fresh content.

I think one thing to keep in mind is vehicles on average are on the road about 12 years. So the vehicles that are being built now with those batteries, we're not going to see the materials from those batteries for 12 years. That being said, the biggest input into recycling right now is actually manufacturing scrap.

So the battery plants that are online now, that is the biggest input into the recycling stream of whatever the scrap material is that's getting recycled and put right back into that to circulate. So I can't -- I'm not sure about what that's going to do to price signals. I would say that recycling is certainly an opportunity, and it needs to be focused on. It's not the silver bullet that's going to get us out of all of

our mining and supply concerns.

MR. PULLEN: I think another way to look at it, and I know that Trabue and Demetri had to run off, but has to do with basis. So if you think about chemical purities, a lot of times they're measured in two 9s, three 9s, four 9s, or five 9s. So that would be 99.999 percent pure of a given element, right? That's the five 9s.

Five 9s might be necessary for a battery. And so the nickel in the battery might need to be five 9s, but the nickel in stainless steel might not. And so you could see, as markets develop, different contracts trading or a contract trading and basis trading around it. That could be one solution.

Much just like nickel, but also aluminum. Because we all know there's plenty of other ways to get aluminum, and we use aluminum other than for batteries. And the same thing for, of course, the graphite and the magnesia.

So there's other things that could be done, even if the purification standards aren't the same.

MS. FULKS: Commissioner Johnson?

(Pause.)

MS. FULKS: Commissioner Johnson, can you hear us?

(Pause.)

COMMISSIONER JOHNSON: Hi, everyone. Can you hear us now?

MS. FULKS: We can hear you.

COMMISSIONER JOHNSON: Hello? Oh, that's great. We're so sorry. You know, in truth, I suspect I could offer no comment worthy of the time that we have consumed as you guys have waited for us to connect to the meeting.

So I hesitate to offer what I had to share, but this has been such an interesting presentation. Commissioner Mersinger, thank you so much again, and Lauren, thank you.

I only wanted to share that, for the panelists this morning and for this afternoon, I've learned a tremendous amount. I specifically want to thank George and Dan for sharing with us, and I found a lot of the questions and comments really helpful. Trabue's comments and Demetri's presentation were fantastic.

I just want to follow up on one thing Jamila

raised, which is really this question of affordability and impact on consumers or effect. I'm just really thoughtful about this discussion line that was shared regarding the credit for used electric vehicles and the possibility that the market there really could create an opportunity for those who have less financial resources, who aren't able to buy, roll them right off the lot, you know, shiny and brand-new electric vehicles.

That seems like a significantly important way to really radically alter access to more sustainable technology and particularly for the least financially able. So I was just curious to know, I think it was George, but it may have been Dan who was responding to Jamila's question and speaking on this particular point. So I'd just love to hear a bit more about that, if someone is willing to share?

There was also a bit of a discussion about the impact of geopolitical events on access to underlying input and the challenges related to those events. I'm curious to hear if anybody who's joined the meeting would be open to commenting, or either of the

panelists, on how we could effectively separate out -- and maybe the answer is we can't -- those geopolitical events and their effects on input versus general competition from China or other significant market participants who are sort of aggressively engaged in gaining greater access or market share to those same inputs, or other factors that may be influencing increased demand for the inputs that have been described.

So those are the couple of questions that I have. I'm happy to hear responses, or I also am happy to follow up, Commissioner Mersinger or Lauren, if your time for this discussion has expired.

MS. FULKS: Go right ahead.

MR. BOWERSON: So thanks, Commissioner. I will take the easy one on the used EV credit and then let somebody else try to tackle the geopolitical issue.

But on the used EV credit, that was just implemented through the passage of the Inflation Reduction Act. So the stipulations around those are a vehicle has to be at least 2 years old. There is a price cap of, I believe, $25,000. It has to go through

an authorized dealer, and there's income-level caps to that as well. But passing all of those, the consumer would be eligible for $4,000 off of that credit.

And I'm happy to send you offline a lot more information on that, but that's kind of the gist of it. Those are the requirements going into it, and then it's a $4,000 credit available.

COMMISSIONER JOHNSON: Thanks so much. Really appreciate that.

MR. PULLEN: I will definitely not tread deeply into the geopolitical waters because I'm a staff downstairs. And so what I will say is it's important in any sort of economic model that we think about to remember that some of the participants here are non-free market suppliers. And since they are non-free market suppliers, we can't assume that they participate in the supply and demand curve the same way that we might expect.

And so keeping that in mind, and also just look back a few years. There was tension back in 2010 between China and Japan, where China withheld certain critical and rare minerals from Japan over a dispute.

And so I'm not saying that could happen, but these are considerations, and you'd have to look back through history to see them.

COMMISSIONER JOHNSON: That's fantastic. Thanks, George. I do appreciate -- and our chair, I'm sure, does as well -- your measured response to the question.

So thank you so much, Commissioner Mersinger. Thank you so much, Lauren.

MS. FULKS: Thank you, Commissioner Johnson.

So I think this concludes our second panel. George and Dan, that was amazing information and insight, a great discussion. I think everybody really appreciated it.

But this also concludes the work of the EEMAC today. Thank you to all the members and associate members for your thoughtful participation, and at this time, I would like to allow the commissioners to provide closing remarks if they'd like. We will start with Commissioner Johnson.

So, Commissioner Johnson, if you want to give closing remarks, go ahead.

COMMISSIONER JOHNSON: Thanks so much. You guys,

again, were generous beyond words to pause and allow us to gather ourselves in terms of technology to join you directly here in the last couple of minutes. So I won't take more time than to share that I congratulate you, Lauren. I congratulate you, Commissioner Mersinger, on an amazing meeting.

I am -- again, I said this earlier -- jealous beyond measure that I have missed the tour of the plant and also that I didn't get to have those great Tennessee BBQ bites.

I'm also going to share a little bit more personally that I didn't have a chance to share with the commissioner before this moment and with you all. My grandparents lived in Michigan in a small town about 45 minutes away from Detroit, a suburb. And that small town came into existence because of a car plant, and an entire community was built up around it.

And I just want to highlight that, Commissioner Mersinger, your commitment here -- I said this earlier -- to the CFTC and our market participants is amazing and should be celebrated. But I also want to highlight that it is always clear to me that you are deeply

thoughtful about how we impact many citizens beyond the entities that are our market participants and their employees and the suppliers and others that are part of the vertically integrated supply chain that support them.

There are also many communities that are impacted by the success of a number of these enterprises. So I just want to applaud you again for being so thoughtful and thank you for allowing me to join this meeting.

MS. FULKS: Thank you, Commissioner Johnson.

Commissioner Mersinger, I now recognize you for your closing remarks.

COMMISSIONER MERSINGER: Thanks, Lauren, and thank you to all of our presenters. It was really fascinating, both the morning session and the afternoon session. I think the best thing that can come out of these meetings is that we all walk away having learned something related to the work we do each and every day.

So I'm just really appreciative to the hard work that everyone put into putting together these presentations, the travel to get here and be a part of this, and making this -- you all took a full day off of

work to -- well, probably 2 or more to be here. And you don't have to do that, but you do it. And it makes our job as commissioners a lot better. We could do our job better because of your willingness to participate in these advisory committees and share with us your perspectives.

And I will say one thing on the advisory committees. So this advisory committee is the only advisory committee at the CFTC that was actually created via statute. So the EEMAC committee came to be under the Dodd-Frank Act. Where other advisory committees are discretionary, this one we are mandated to have. So you all play a role in us fulfilling our obligations under the Commodity Exchange Act as well. So that, definitely appreciate that.

And the idea behind this is we want to discuss issues that you all have to deal with day in and day out. All of you are on this advisory committee because of your perspective, and your perspective isn't limited to just what we regulate. It goes far beyond that, and I think it's important for us to be able to talk about those impacts beyond what we see as your regulator from

the CFTC perspective.

And that's one thing I've hoped that I've been able to do as a commissioner is try to get out there to the public and the others that the work at the CFTC, the markets that we regulate, it's not -- it's not just the big financial players. It impacts the average individual. It impacts citizens. It impacts your pocketbook.

So we don't operate in kind of a silo. It really does have an impact on everyone's day-to-day life, budgets, et cetera. And I think that's one thing we can do as an advisory committee -- or we can use our advisory committees for is to help educate others about what our markets are for, how they can be used, and really the impact they have on the economy.

And so that's why it's exciting to dig into these topics that maybe haven't been addressed before or we really haven't had a lot of discussion around is we have that opportunity to show where there's areas of concern, show where there's some areas where the CFTC should be working more closely with other agencies, and just help frame what we do day in and day out. And I

think this was a great example of that.

When I started this, I said that I would hope that this advisory committee does not shy away from anything controversial. And today we not only talked about FTRs, but George at one point almost brought up the RINs market.

(Laughter.)

COMMISSIONER MERSINGER: So, so the fact that those two topics came up in this meeting means we are definitely touching on difficult issues, and -- but that just brings about a more robust conversation, which I think is really important to our job at the CFTC and how we do -- the input you're able to give us so that we do a better job regulating the markets we regulate.

So I just want to really thank everybody for being here, for being on screen, for participating, for presenting. It definitely makes -- it makes my role more -- it's more interesting and more engaging, and I really -- I really appreciate the opportunity.

MS. FULKS: Thank you, Commissioner Mersinger.

So before we adjourn, I just want to mention a

couple things. So there have been a lot of questions about the status of the subcommittees that we voted on to create during the last meeting.

So I think everybody knows this, but it was approved by the Commission. So there are two subcommittees. We are trying to finalize the membership of those subcommittees, and we anticipate that we're going to kick off work probably in June. So that is the subcommittee agenda item I wanted to mention.

The other thing is in the very near term, like tomorrow, be on the lookout for a date survey for our next meeting. We anticipate that meeting is going to take place in June. We're thinking the first week or the last week, but I'll send out the exact date.

And again, it will be the same format where we go outside of D.C. We do a -- you know, we go outside of D.C., I'll just put it that way.

So, yeah, just be on the lookout for that. And other than that, just I love being a part of EEMAC. I thank you, Commissioner Mersinger. This is something that I really enjoy doing. So, and I really enjoy

getting to know all of you.

So, with that, safe travels, and we are adjourned.

(Whereupon, at 2:25 p.m., the meeting was adjourned.)