In The Matter Of:

Illinois Commerce Commission

Policy Meeting

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ILLINOIS' POWER METER

RENEWABLE ENERGY & the FUTURE JOBS ACT

Wednesday July 12th, 2017 at 1:45 p.m.

ICC|160 North LaSalle Street

Hearing Room 8th Floor

Chicago, Illinois 60601

Report of Proceedings had at the Illinois' Power & Future Energy Jobs Act meeting of the Illinois Commerce Commission on July 12, 2017, at the hour of 1:45, p.m., pursuant to notice, at 160 North LaSalle Street, Suite 800 Chicago, Illinois.

APPEARANCE:

MR. BRIEN J. SHEAHAN Chairman
MS. SHERNA MAYE EDWARS, Commissioner
MR. MIGUEL DEL VALLE, Commissioner
MR. JOHN R. ROSALES, Commissioner
MS. SADZI OLIVA, Commissioner
MR. GERARDO DELGADO, Legal & policy Advisor to Acting Commissioner Oliva, ICC

PANELISTS

MS. SHAY BAHRAMIRAD, Director, Distribution System Planning, Smart Grid and Innovation, ComED
MS. AMY FRANCETIC, Senior Vice-President, Corporate Affairs & New Ventures, Invenergy
MR. MATTHEW R. TOMC, Director & Assistant General Counsel, Ameren
MR. JAMES P. GIGNAC, Environmental & Energy Counsel, Illinois Attorney General's Office

COMMISSIONER OLIVA: All right. Good afternoon, everyone. Welcome back. I want to again thank the contributors on this morning's panel for sharing their insight and perspectives on Illinois' renewable energy landscape.

And because I don't want to keep you any minute past 3:00 p.m., when we close our policy session later on this afternoon.

Before we begin, I just want to give a shout out, and I don't know where he is, to Commissioner Del Valle, who over coffee at Petros, of course in the building, said, "You know, you should really host a policy session on renewables," and here we are.

And I would also like to thank all of you who attended in person, and who are listening online, my colleagues for their support, especially Chairman Sheahan, for guiding me through my first policy session, the Commission staff for being a fountain of knowledge, the amazing and dynamic panelists, the industry experts who helped us formulate this idea, including those at CUB and NRDC for their insight.

And, finally, to the moderators of today's session, by legal and policy advisors, Azeema Akram and Gerardo Delgado, through their unending enthusiasm and ability to learn. Let's give them a round of applauds.

For this afternoon's program, we will just address the integration of renewables in Illinois, in what my office calls a 3-D view, meaning discussing the FEJA's potential affect on distribution and transmission, development in technology and deference.

To lead this panel, please join me in welcoming Gerardo Delgado.

MR. DELGADO: Thank you, Acting Commissioner Oliva. Good afternoon, Commissioners, panelists and attendees.

At this morning's panel, we heard how the Future Energy Jobs Act aims to pave the way for the expansion of renewables in Illinois, a state that is historically known as A leader in clean energy.

This afternoon, we transition to explore the strengths, challenges and solutions with integrating renewables, in order to achieve these goals.

Moreover, the panel will begin by

addressing the advances its made, and that will need to be made, to the electrical power systems, as well as technological innovations to measure and enhance the on-boarding of renewables onto the grid.

The panel will conclude by exploring the sole collective deference given to enviromental policy and economic theory in today's evolving energy landscape.

The format of the panel will consist of presentations by each of our panelists, and then a series of questions for an open-ended discussion.

As a reminder to our panelists, the Commissioners may have questions along the way. Before we begin, I would like to introduce OUR panelists joining us today.

We have Shay Bahramirad, who is the Director of Distribution System Planning, Smart Grid and Innovation at ComEd.

In her role, she leads Smart Grid organization with a focus in developing the vision, business models, and investment strategy of ComEd's Grid of the future initiative. Shay is also an adjunct professor at the Illinois Institute of Technology.

We also have Amy Francetic, who is the senior Vice-President of Corporate Affairs and New Issues at Invenergy. Amy overseas Invenergy's sourcing and integration of technology innovation and strategic investments that leverage -- excuse me, that leveraged its operating portfolio.

She also focuses on enhancing brand visibility and strategic partnerships. Prior to Invenergy, Amy served as CEO of Technology Accelerator Clean Energy Trust.

We have next Matthew Tonc, who is the Director and Assistant General Counsel at Ameren. Matt joined Ameren in 2007 and currently represents the Illinois Utility Company before the ICC on a wide range of matters.

In addition to Illinois, Matt has presided before -- or, excuse me, practiced before the State Utility Commission in Kansas and Missouri, as well as the Federal Energy Regulatory Commission.

And, lastly, we have James Gignac, who serves as an Environmental and Energy Council to Illinois Attorney General Lisa Madigan. James works on a variety of matters involving clean energy, climate change and environmental protection. Prior to joining the Attorney General's Office, he was the Director of the Sierra Club's Beyond Goal Campaign.

Please join me in welcoming our panelists. Shay, you may begin with your presentation.

MS. BAHRAMIRAD: Sure. Good afternoon. So what I'm going to talk about is -- first of all, thank you for having me. I'm very excited to be part of this conversation.

It's very timely in the state. What I'm going to talk about is the legacy, how the distribution system looks like right now, and what challenges and interconnection of different technologies, including the renewable, that is going to be introduced, and how technological innovation is going to help resolving those issues and helping adopting more integral energy into the system.

And then I'm giving to you examples on the R&D side that we are working on and introducing it more in a conceptual framework that has been out there for, I would say, about 18 months or so, more on the academic front and reset center that you are looking into and thinking about it.

The system, decades ago, or longer than a century ago, was built on one-way flow based on a centralized generation and consumption. So that is a pipe model, meaning that there is production, and then there's, like, a one-way safety taking it all the way to the customer delivery.

But then there are new technologies that have been introduced into the system that we didn't have to deal with for about 15 years ago, like energy storage demand response, microgrid, different types of distribution generation.

So that changes the whole dynamic at the architecture of the system. As you see the picture on the right, it's a lot more complex, and I think needs more consideration for the design and operation of the system to make sure that you're operating system safely and reliably.

From a technical standpoint, the challenges that renewable energy introduces to the grid, to the distribution system, has been on the motive side, when you are connecting solar, or any kind of distribution it creates over voltage.

But, historically, we have to deal with under voltage. So all the equipment that we have in the system historically has to deal with different phenomenon. So that is changing right now.

When clouds are passing solars, that creates different -- for voltage to go up and down. So the regulation of the voltage is going to be another issue and challenges.

Then two-way power flow or reverse power flow is going to introduce overloading of transformer, distribution transformers. The positions that our engineers set, the equipment that is set to protect the system from fall currents, they have to act and behave differently.

So we have to set them for a dynamic -- setting for protection as DC versus behavior energy. Power electronics, meaning target stations, solar and energy storage, they create distortion. We call it harmonics.

From a technical standpoint, that means we need different types of equipment, like filter lines, in order to take those distortions away and these type of distortions have the capability to impact negatively, especially industrial customers.

Things are syncing about the distribution system, or transmission system, is every single feeder is unique in its nature. So we can't say the way that they are coming is standard, and we can apply it for all the feeders in our service area.

Each feeder can go to each trench holding, in terms of capacity at different moments. So from the technological standpoint and Smart Inverters, it's been part of the feature of the new legislation, and there are some policies associated with that.

So what is this Smart Inverter and how it's going to help working through those challenges that I initially talked about. So inverter, generally, it converts the DC electricity, meaning that the type of generation that you see up there, like solar energy storage, the type of electricity that is produced is DC.

Then we want to transfer them to distribution lines or transmission lines. We have to convert them into AC. So there is an inverter that takes these certain types of generation and the grid.

So the Smart Inverter, compared to the traditional inverter, has different capabilities and capacities. First, it allows two-way communication between the inverter and the electrical utility.

It helps to balance supply and demand.

That is a basic for electricity for the grid. The supply and demands needs to be balanced at all the time.

Utilities have visibility to have -- in terms of measurement and the application at the end of the feeder, whatever these type of generations are connected, and how it looks like, so we can look at the voltage or power factor or the battery power.

Lastly, it provides control over these intermittent sources. Solar, it's there. That's the distribution that intermittency introduces challenges associated with reliability.

A Smart Inverter has the capability to control the power coming out from that generation to make sure that the demand and supply are balanced. One thing about Smart Inverter, it's a very hot topic in the industry.

Actually, currently society has been investing a lot of time and effort. That is a collaborative effort globally, not just in the U.S., to define standards for interconnection of these type of standards.

And, second, coming up with what is a common language for Smart Inverter; and then after that, issuing licenses for different manufacturers so they can -- the new equipment that are coming out, they receive all those specifications.

We've been part of this effort that has been going on for several years, and New York and California, both states, are heavily engaged. So is Germany and France, feeding that technological community.

The next technology that I want to talk about that is energy storage, which is a type of electrical chemical equipment that can be found in many different shapes and sizes and applications.

It comes with different benefits. First of all, it improves the value of renewable generation. So intermittency that I talked about previously can be modified and can be mitigated by energy storage.

Depending on the business case, which it needs some innovative thinking to balance -- to create a business case to defer the large investment on capacity on the transmission and distribution energy storage there.

It helps stability and reliability on top we see, on balances, and the voltage issue, the voltage regulation and over voltage in distribution system because of solar and energy storage company are usually in there.

The hosting capacity, that's a new method that there are different ways of calculating how much distribution system -- specifically, how much each feeder can accommodate distribution generation at specific locations.

As I said, distribution system, each feeder is unique in its own way, and there are ways that we've been working for eight months or so to come up with mathematical ways to calculate -- to balance between the accuracy and efficiency, how much solar and other types of DG we can accommodate in a specific feeder.

A few things here, this is -- what I tried to list here are a number of grants that we have received from the Department of Energy to help us to learn and test different things around distribution energy resources.

The first one is a microgrid controller. So taking away the central control, distribution control, is going to send a signal to all the equipment and all the loading distribution level.

The second grant is a $4,000,000 that is going to allow us to test the combination at the operation of energy storage and solar and help with economics of that.

The third one that we have, three weeks ago, we got -- we received $1.5 million dollars to create a sense of platform to come up with a very accurate measurement in distribution system in 12KB and 34KB to help with combination of DER.

The system, the one that I mentioned, it's very early on in the industry, and the thought is at the time that we have a lot of distribution generation in the system, 40 percent, 50 percent of the peek, how can we accommodate, how can we run the system at the same time accommodate more renewable?

There is some thoughts out there, again, on the concept and theory between, like in universities and academia, to create a distribution system operator.

Similar -- just imagine what we have at BJMI, and taking it down to like another entity to facilitate transaction in distribution system.

There are lots of different things to figure out on this topic. The transmission system was built as a network. So a lot of -- it took years to come up with location on margin and pricing, the pricing methodology, but just those methodologies don't apply to distribution system because there are so many radio feeders out there.

So there needs to be a close collaboration between economists, engineers and policy makers, to come up with a way that how you price out the different types of the DER to accommodate them, at the same time you operate them to make sure it's safe and survival.

And then to wrap it up with a few things, first, developing this vision for the future to operate the grid or integrating the renewable energy. Utilities should consider different types of customers, businesses, as well as the impact on the grid.

There are states and countries that, you know, you see the impact of renewable energy, both on the positive side and non-positive side. And then lastly, in order to make right decisions, utilities need to be experts.

That means it needs policies, in order to support R&D and research and testing and learning along the way to be prepared for that time of.

MR. DELGADO: Great. Thank you very much, Shay. Amy will next speak on technology.

MS. FRANCETIC: Great. Thank you so much for having me today. It's a pleasure to be here. As Gerardo said, I run New Ventures, Invenergy, as well as corporate affairs. Sorry about that.

And I will talk today a little bit about how we're looking at optimizing our generation infrastructure through control systems and data and software applications.

For those of you that don't know Invenergy, we are a local independent power producer here in Chicago. We've been around for 16 years. We have developed 16 gigawatts of renewable energy that includes wind, solar, battery storage, and thermal projects.

We financed about $20,000,000 of assets over the years, and we have 350 employee at One South Wacker and another 450 around the world.

First, I wanted to make the point that in order to really understand the opportunity for these control systems, you have to understand the economic competitiveness of renewables and why we have hit the tipping point where we can look at improvements to our infrastructure on the margin, as opposed to at the core technologies.

So this is a slide that shows Lazar's levelized cost of energy. They actually measure this and update this annually.

And the two areas that show the cost of the pricing of wind and solar, and how it is dramatically cheaper today than fossil fuel and nuclear energy, and is only really beat by energy efficiency.

So it's important to understand that people that are making decisions to purchase renewal energy or build renewal energy today, are doing so mainly based on economic reasons and cost competitiveness and looking for some way to hedge future prices of energy.

And the next it's really important to know that most of the installed and built generation has been in renewals. So in 2015, renewables outpaced fossil fuel generation by about 30 percent and are projected to grow dramatically over the next 20 years.

The application layer is really defined as the software and hardware that intersects with our energy infrastructure, and we think that this is a really opportune area for investment because it tends to be capital light.

It does not cost a lot of money to build these technologies or these businesses. They integrate hardware and software pretty nicely, and they're very scalable in other industry verticals.

So the opportunity here for anyone that is investing in these kinds of solutions is the total available market for these technology solutions is far beyond energy.

It includes industrial equipment, manufacturing, financial services, defense are some of the key areas for these digital controls systems in data applications. The reason why now is a time for these types of solutions to gain wider adoption is for a number of reasons.

One is the dropping cost of hardware sensors. Hardware sensors are nearly disposable today. They have been installed in all kinds of equipment, and they can measure everything from vibration to heat to temperatures, weather events.

They can take in so much and digest so

much input, and then put out so much data that we've never been able to really do this at the fine grain level that we can do today.

One of the other opportunities is the software needed to actually understand that data, and the storage needed to store all that data, but the cost of that has dropped dramatically over the last few years, and it's projected to drop even more so.

So you've got these low-cost sensors producing a lot of data, and then low-cost computing power, combining to make for an opportunity where everyone wants to collect as much data as possible and try to discern some value from that intelligence.

The other opportunity here is cybersecurity. So with this data, we can also detect intrusions. We can detect gaps and vulnerabilities in the grid and industrial applications, and that vertical is growing very, very dramatically.

So over the coming years, data analysts and cybersecurity are projected to grow three to four times. And then that's married with distributed energy resources. As Shay described, you know, bringing more smaller-scale renewables onto the system creates both an opportunity for reliability as well as stress.

And so the combination of these distributive resources with data provides an opportunity to analyze and provide more reliability for our grid than we've ever had before.

We think about the opportunity here in five key verticals, and I should say that Invenergy has created a venture fund to invest in these five key verticals.

And we are doing so because we believe these five verticals are going to be very, very important to the future, but we also think financially this will be a very very attractive investment over the coming decade.

In the category of new power generation, that includes the componentry, not necessarily the base technology, like a new solar cell, or a new wind turbine design, but the Smart Inverters as Shay described, or new means of installing or constructing systems, or a new coating that helps in wintertime shed ice.

That is what we put in the componentry, which are modest hardware improvements in today's existing infrastructure.

And then for battery storage, you are basically taking a dumb piece of equipment, and you are layering intelligence on top of it, so you can garner more revenue from that investment.

So using software to analyze weather events, to analyze low profiles, and to then operate the battery so you are charging it when you have energy at the cheapest cost, and you are deploying it to energy at the highest prices, can help users reduce the overall energy cost, but also improve the liability on the grid.

Next, distributive energy resources. We're looking at the control systems for integrating small-scale resources like microgrids, rooftop solar and building technology into the grid.

This is, again, an opportunity for software to analyze how best to move those resources around, and also how to price them, and how to respond to a day ahead market opportunities, as well as weather events.

And then the category of data analysts and cybersecurity, this is technology that is helping to predict performance of the invested infrastructure, as well as to help predict the security of the equipment itself and the grid.

And, lastly, in the category of operational efficiency, it's using data to improve workloads, reduce costs and to streamline some of the decision making in organizations.

I'm going to dive a little deeper into this data analytics piece, that fourth category, because we are seeing a tremendous number of investment opportunities in this phase, and it's worth sort of understanding why this is so important.

So you are hearing a lot about big data. There is some local companies. A lot of the big players are jumping into this phase, General Electric, Seamen and others, but then you have some start-up companies that are gaining traction and raising a lot of money.

So locally we have a company called Uptake is one of the sort of well-funded players of this phase. And, initially, a lot of companies were looking at data to improve their overall system operation, and now we're looking at moving it over to asset management.

How do we manage the assets to get the most credit possible for the equipment owner? We can also use, as I mentioned before in the operation efficiency space, how can we use data to improve how we make decisions and to reduce the overhead in operating the business?

There's four main areas of innovation in data analytics. One is collecting the data. That's where the sensors are basically installed on the equipment and collecting data, and then transmitting it back to some kind of centralized system.

That's where the transfer happens. It's usually done either through wireless means or through some kind of wire connection fiber optics, if it's at the edge of the grid.

And the key innovation now is really analysis. How do we make use of all this data? The data is overwhelming, a lot of the infrastructure managers, and so now they need helping understanding what to do with all that data.

Just because you've got the data doesn't mean you start making better decisions.

And the insights you gain from that analysis should be recommending certain decisions and certain actions at the company. That would be faster and hopefully more profitable than what humans alone can do.

COMMISSIONER ROSALES: There was a question. The question is what is the difference between structure and unstructured data?

MS. FRANCETIC: Okay. Structured and unstructured, when we're thinking about industrial applications, where you are usually wrapping the data into some kind of information about the source, and then we're building it into a model that either the controller has built to understand that data, or that we have from a software provider.

So is that sort of what you're asking about is how do you sort of wrap the data and information to understand it?

COMMISSIONER ROSALES: What's the difference between structured and unstructured?

MS. FRANCETIC: In this particular case, I'm not really -- most of the data that we're looking at is not unstructured.

It's coming in at some very highly

structured way. It takes some architecture to understand what it means already. So it's coming in with some intelligence. It's falling into a software solution that is actually producing some analysis on the fly.

We don't really deal with a lot of unstructured data where we have to dig into it and sort it out. It's usually wrapped into some kind of intelligence already.

COMMISSIONER ROSALES: Okay.

MS. FRANCETIC: Okay. In driving adoption, so one thing I wanted to mention here is one of the barriers to growing this field is going to be privacy and security of the data.

Once an equipment provider or a generator has collected this data, they don't necessarily want to share that with other folks. It becomes a competitive advantage, and it also could be very damaging, if someone got ahold of the data and either used that data to sort of harm their business.

So looking at the security and privacy around protecting that data is really, really important. So a lot of the companies that are delivering solutions in this space, are actually having to make sure that they don't leak the data out to competitors, and their systems are sort of designed to get smarter each time they digest more and more data.

So the platforms, themselves, are becoming -- are learning, are improving and gaining intelligence every time it digests more and more data. You do not need to actually take that data and give it to someone else.

A lot of these programs can be run on site at the company that owns the data. So that becomes a really important consideration, and I know when I looked at the questions, Gerardo, I know you guys were thinking about how do you share this data to make it useful.

It's going to be very hard for a lot of the industrial owners of the data to share that. They are not going to want to do that. They are going to want to just be able to get value from someone's software system to improve their own operations, without necessarily having any kind of leakage to their competitors or to, you know, God forbid, a nefarious actor who could actually figure out where certain critical infrastructure is located, how to access it, and the other sort of, you know, key components that would make it vulnerable to attack.

So cybersecurity and protection and privacy around the data is a very, very major concern and it's why, you know, the opportunities to invest now in a start-up company at a pilot scale, so that eventually they become enterprise hardened and become a solution that is more secure is really, really important.

So we're looking at ways we can pilot test these solutions, help them scale up and improve their security, so they can get optimal volume in the industry, without having to share our own data along the way.

So thank you so much for that opportunity. I am happy to answer questions.

MR. DELGADO: Is there any questions? We will conclude, and we will move to Matt, who will then begin speaking on getting distribution between Ameren and environmental policy.

MR. TOMC: Thank you, Commissioner Oliva. I appreciate the opportunity to visit. Thank you, Commissioner Oliva and Members the Commission for the opportunity to speak today as a policy session.

As Gerardo mentioned in my adoption, my career here in Illinois began in 2007. And so in 2007 was the watershed moment in Illinois.

We saw the onset of retail competition for residential customers. We saw energy efficiency, distributed generation and renewable energy beginning to gain traction within the state regulatory framework.

Now, I think today we're looking at another watershed moment, in terms of the policies associated with the Future Energy Jobs Act, or FEJA, as it's become to be called.

So I'm familiar with this issue and the question what's the difference between competitive and environmental policy.

What makes this topic so timely, in my opinion, is we have this new dynamic, which is rapidly-evolving technology and technology applications.

Shay and Amy I think did a great job giving us an overview of some of these issues that are beginning to be presented to us as stakeholders to this regulatory process and framework.

So the question in my mind is as we go forward and implement these policies, sort of aiding and interfering with competitive markets. Let me start with the economic theory aspect question.

We start with the premise that when they work competitive markets are the most efficient means of allocating resources. In Illinois, we have a customer framework in our utilities. My employer, Ameren, is the integrated distribution company of wire zone utility that is intended to be neutral towards of the customer's choice of supply.

Customers do have choices in energy supply in Illinois, in the game of service territory, and that choice includes distributed generation assets, such as solar panels on their house.

We also have energy-efficiency opportunities as well. So the theory is -- the theory goes is the construct is to have this efficient means to allocate scarce resources.

It construct starts with this concept of a perfectly competitive market. Perfectly competitive markets have lots of buyers and sellers, low barriers of entry. Everyone in the market has an equal and instantaneous access to information in the product options.

This doesn't exist in reality. Today's consumer markets we dignify as competitive because customers have competitive choices. They are not perfectly competitive. So why is that? I think this is going to be a topic of a general argument all on to itself.

But, basically, when we talk about the entry of new technology, as we see today, and we all have experience with, it takes time before new technology is great, and it's economical, and the applications may be coming to the consumers as a viable alternative.

Also, we have economies of scale. There are manufacturing capital requirements. There are wholesale distribution channels to get to market, and then there's retail outlets that have limited capacity to offer products, and want to offer products that customers are aware of and want.

Let's turn to environmental policy. I think environmental policy, in my mind, and I do have an undergraduate degree in economics. I kind of view it from that angle, is closely related to economic policy.

The reason I say that is because I think all environmental policies, at least in my mind, this is arguable, is related to the concept of astronomies. That is an economic concept.

It is also referred as a collective action problem, also referred to as the tragedy of the common situation.

To give a classic example, let's say it's 1910. I own a manufacturing facility along the Chicago River. I have some waste. I can just take it and dump it out back.

Now I internalize that cost to my obligation. That cost is now somebody else's problem. So at its core, I think environmental policy seeks to minimize or limit externalities.

Now, how does that come into the law? That's a perspective concept as an attorney. How does it come into law? It comes into law through codes and standards, regulations, government programs, general regular policies.

I'll give you an example of a condition regulation. That was adopted back in 2007, 2008 time frame, and recently updated. And that is the standard distributed generation interconnection rules. Those are standardized.

So prior to that, when the customer came to utility, there wasn't any standard practice. This created a barrier for customers that may want to opt those choices, and it created complexities for utility to having to handle those one-off situations.

So here is a regulation that comes in and actually takes a barrier entry lag for customers looking to do this, and these customers have an easier alternative.

I think we tended to use codes and standards restrictive, like vehicle emission standards, but they aren't necessarily always that way.

So now I'm going to address the future. How does that come into play here? So the Future Energy Jobs Act, there's no question we heard about that. I won't go through all of these statutory provisions, but it certainly embodies the environmental policy, and those environmental policies are going to augment to interact with the market-based way in which we operate today.

And I would note that the Future Energy Jobs Act is now in a competitive retail framework that was set forth in 2007. It layers on top of that framework. It also adds and builds upon the competitive procurement process of the IPA, and that process is competitive.

So I get to the question at hand. To answer that question, are we interfering? Are we disrupting marketing economics?

I think, in my mind, here is the short answer: I think no. I think we can have our cake and eat it, too. I think that is dependent and incumbent upon us. I think as stakeholders we should be open minded and we should be informed.

We should be willing to hear one another's perspectives, but we should also look at the engineering realities. We should look at what the market suggests. We should look at competitive markets in the future modeling, in making decisions with respect to the implementation of this new statute on a number of funds.

I think it's also clear, as I mentioned, the policy foundation of FEJA is clearly not intended to disrupt their impending competitive markets.

I think where it's successful, we will enhance and accelerate market choices for Illinois electric consumers. I think we have done this before in another respect. That is energy efficiency.

Illinois, like the government states, probably about a decade, some states earlier than that, which is California, began to go down the path of utility-sponsored energy efficiency programs.

At their core, those programs are marketing programs. At their core, they are designed to do number of things, but one of those things that is the goal that is specifically associated with certain provisions is market transformation.

So let me give you an example of market transformation. I think everybody is familiar now with LED light bulbs. LED light bulbs last nine years and use a tenth of electricity.

They certainly cost more than candescent bulbs at the cash register, but nonetheless, they are very much an economic decision, and a choice that is validated by the economics that they produce.

It took time, even with federal standards, to get those revenues available to consumers at retail outlets, and consumers accept and utilize those light bulbs.

Even today, that transition continues. So I think what we've done in Illinois, and other states, is we've actually help to transform that marketplace by through these programs, the regulated programs.

So that these are now available customers. If you go to Home Depot, if you go Walmart, you go to any retail stores, such as those, you will now see this future prominently.

I think many consumers, such as myself, had readily adopted that technology now. I just want to note one thing as well, in terms of addressing this topic, that is there are special considerations, with respect to low-income customers.

And we exist, to address this from an economic theory standpoint, an externality standpoint, as I mentioned before, why is that?

Energy economy is a network economy, in

the sense that our community members' usage of energy impacts everybody, and that is an externality issue. It's an issue associated with externalities.

Special considerations exist because you have to be very strategic on how you effectuate milligrams design distribution and energy efficiency, you know, in those communities.

And one of the challenges, of course, is the income constraints, obviously associated with capital requirements to get a higher efficiency appliance, perhaps, or to get take advantage of distributing generation when there is a large upfront capital cost.

So we have to be strategic in how we go about doing that and give special consideration of that issue. Thank you for the opportunity to be here.

MR. DELGADO: Thank you, Matt. We will next hear from James, who will elaborate on the topic.

MR. GIGNAC: Thank you for the opportunity to speak to you today. So what I thought I would do is talk a little bit about some issues and arguments that I've been following at the national and federal level and how those -- some insights that you might draw from those here at the state level. And also as the last speaker today, I'll be able to summarize and maybe echo some points made by the previous panelists.

So we heard earlier today from Becky about the growth in renewables. This slide here is from the Energy Information Administration, and it shows the growth in renewables in 2007 to today, and the thing about this chart is for the first time bringing this altogether made up 10 percent of total power generation in the U.S. on a monthly basis. This is March data.

And this growth has been driven by improved technology and reduced costs. Solar has dropped 85 percent in cost between 2008 and 2016, when the cost completely fell 36 percent during that same period.

This shows it has also been driven by state-level policies, like renewable portfolio standards and federal production and investment tax credits.

So I wanted to make two main points in my remarks today. And, first, properly managed this continued growth in solar will make the grid more reliable not less.

And, second, the results that we are seeing in various power markets today, I think is what we really would expect to see when we have an oversupply scenario, which is what we have right now, and an indication of those markets are functioning efficiently, even as we have a change in the midst of generation.

As mentioned by Andrew on the previous panel, these topics are receiving quite a bit of discussion and attention these days, due to, in large part, the Trump administration's approach to energy issues and statements that Department of Energy Secretary Rick Perry made about renewable energy, suggesting that renewables are a cause of coal in the past retiring, and most concerning is that the statement that there may be some sort of action or invention that could be needed on state renewable policies.

We do -- we are expecting the Department of Energy to release what they are calling a grid study, which Secretary Perry has requested, and requesting that the study address base-load power, which is the secretary refers to as coal nuclear and large-scale hydro, and stating that it's necessary -- to get this type of power is necessary to a well-functioning grid.

The next slide I want to show you comes from a battle group force that's difficult to see on the screen.

If you look to the middle of the axis, the colors that go up above, that's new generation added, and you can see within 2010 and continuing out, it's mostly gas and solar that are the being added to the grid.

And then if you look at the lower half of the light axis, those are units that are being retired. And it's mostly coal, old type of gas steam turbines, and then some oil and some nuclear.

So the question is whether this trend is the problem. The argument that some are making is that renewable incentives are the cause of this.

Now, although there is not a public process for the Department of Energy grid study, numerous analysts and groups have been producing reports that we can refer to.

And what these reports say is that its market forces that are the cause of this trend, and that's primarily low-cost natural gas, flattened demand for electricity, and these two things have led to a situation that we have an oversupply, too much generation, and that is what is producing low prices.

So that is an efficient market response to a situation we have too much supply, given the amount of demand, and what the market is signaling is lower prices, that more expensive generation should exit the market.

And then as numerous studies and analysts have pointed out, the affect from renewables is secondary to these primary market forces of low gas prices and flat demand.

So this is an image from an article about PJM prices, impact on PJM wholesale, ancient market prices, and comparing the influence of different forces on the market.

And you can see decrease in the natural gas prices, far and away the largest driver, decrease in demand, less so and then that's followed by the addition of renewables.

So despite this small roll in the solar plain in the lower pricing area we're seeing, there is still criticisms against renewable policies that they are interfering or distorting energy markets, and what we should do is we should level the playing field.

And I think what this argument neglects or ignores is that we already have a roughly level playing field, and that's because all forms of energy receives subsidies of various forms. We have incentives that flow to all sources of energy.

Traditional resource haves received tax benefits for many years, and also the externalities of pollution, such as free house gas emissions are not internalized.

These are subsidies that are received by traditional resources. Just to show you, this is one take on a mix of federal energy incentives, and this was prepared by Wind Energy Association. So you might see a different type of chart prepared by a different industry.

But what we did is look at total federal energy incentives, basically from 1947 on, and you can see that fossil fuel, because of permanent tax credits and other things, make up a big part of that. Nuclear is second, and then renewables as well.

So the question is: Is this change in increasing renewables does that affect reliability? And I think it's the opposite. And the trends today we're seeing moving to safer and more reliable grid, and why is that?

First, we're seeing a diversification of resources. So just like investments, when you diversify, you are safer because you're spreading your risk.

And, second, to echo a point made by Invenergy earlier, is that we need to rethink the way that baseload is used in common policy discussions.

And really, when we think about baseload, what it is, it's a category of demand. It's not a type of generation. So baseload is just minimum amount of electricity that needs to be provided around the clock, and that can be provided by any mix of resources. It should not be thought of as a specific type of plant or generation.

And as you see images, which I wanted to also point out, you see baseload on the top chart as a category of demand, and then a scenario on the bottom, which shows the high renewable penetration scenario. We can fill the categories of demand with a large amount of renewables.

We also have a growing amount of renewable experience that renewables can be incorporated into the grid. When you look at this next slide, it shows high renewable penetrations in Denmark and German, versus low-power outages and compared it to U.S.

Now, this is not to suggest that we renewables could eliminate power outages. It's to suggest that we can see a high amount of renewables and a high degree of grid reliability. So in Europe, they have more power lines that are buried.

They also don't have hurricanes. So that's why I'm not suggesting that renewables are producing that low-power outage.

Here in the U.S., we're seeing grids operate quite successfully with advanced levels of renewables. In the southwest power pool, there is more than 50 percent of electricity provided by wind.

And also in Texas, 48 percent of load asserted by wind; and then also in California, non-hydro renewables were up to two-thirds of the demand at one point.

So I wanted to end just with a quote from former Commissioner Collette Honorable. I think this sums up pretty good what we heard today, and how we should approach renewables.

She says -- she recognizes that we have to have ten ways in renewables and how this works, but she doesn't see reliability problems with renewables, and that you should continue to increase that.

Amy talked about earlier the key thing about flexibility, and thinking about other types of markets to property value, ancillary services, and frequency regulation load, following operating flexibilities, a lot of technical jargon here, but to apply remedial measures, we're confident that we can continue to expand renewables and ensure it remains stable.

So just to be clear, by and large, to continue to add renewables as we see this growth occur. We need to do that for both climate change, and keep the process stable and affordable, continue to expand renewables to make sure it's safer, cheaper and stable.

So just to clear, my remarks continue to add renewables as we've seen this growth occur. We need to do that for both climate change and keeping prices stable and affordable. Continuing the growth in renewables to make the grid safer, cheaper and is completely manageable. Thank you.

MR. DELGADO: Thank you. Thank you, panelists, for informing us on key factors to consider with the integration of renewable energy.

We will now move on into the discussion segment of our panel of Commissioners. Commissioner Oliva will pose questions to the panelists.

To begin the conversation, however, anyone on the panel can be free to interject. So to kick off the conversation today, Shay, you mentioned distribution system operator.

To help synchronize al the resources that we have on distribution system, what would be the dynamic, if any, between a distribution system operator and an RTO?

MS. BAHRAMIRAD: So as I mentioned, this is all in conceptual and theory at this point, but the idea is intended to balance -- the responsibility of the

DSO is to balance the supply and demand at the distribution system, and it be the interface between energy management system, microgrids with RTO or ISO.

And then that contraction should happen at the level that RTO or bulk power has visibility, in this case I would say it's going to be at a substation.

Depending on the type of services or the DSO can provide and the type of market products, like reserve balancing and creating capacity market or voltage of frequency regulations, then subject to regulatory -- creating a regulatory framework to compensate that type of transaction, that entity is going to get taped.

Any entity that works under the strict jurisdiction cannot be that DSO. So that needs creating it and new business model for utilities have to participate both on the operation, as well as facilitating such transactions.

Again, as I said, this is a very -- it's very complex. All transmission systems, they are all networked. They are parallel. They were built that way.

And the number of events that you see in transmission lines it's maybe five, six times, you know, in PJM. But the distribution system, if you want to compare those numbers, five, six compares to 40000 events that you see in distribution system, just because the way the system is designed and operates.

That means that it's complex, and it's dynamic, and it needs a very close collaboration on the regulatory front from operation and engineering design perspective, as well as economists to come up with different pricing models and regulatory models and operation models to facilitate such a market.

MR. DELGADO: So it seems there needs to be continuous with regard to, as we heard many panelists, constant collaboration, more collaboration among the stakeholders, especially given at this point where we are at the benchmark of FEJA.

Perhaps, James, you can also give some input as to how a DSO would work, given your discussion on the relationship between environmental policy and economic theory and how -- you know, what that kind of dynamic would happen or involve because

of something like a distribution system operator.
MR. TOMC: Sure, Gerardo. I talked about starting in 2007, perhaps, and even before that, we started down a pathway where the utility is become a wireless utility. It is neutral to the supply choice of the consumer.
I think today we're setting forth perhaps on a continuation of that journey, looking at the utility as a platform. And so I think in terms of implementing FEJA, and looking at how these policies roll forward, we're redesigning, so to speak, the regulatory framework upon which we can operate.
And I think that's kind of the question really sort of underlying the issue before the panel is how does the framework facilitate the economics that would be required under such an arrangement.
I can see a situation in the future where you would have the utility providing, you know, a type of balancing service similar to what the RTO does on a neutral basis. I could see that in our future.
I could also see it as a facilitator of market activity and a competitive market activity where the benefit ultimately is considerable.

MR. DELGADO: Thank you. So I believe as you heard this morning, we do have Twitter questions. I believe there is one. Excuse me.

COMMISSIONER ROSALES: To follow up on a question, you bring up a really good point. In Amy's slide, the efficiency of both wind and solar and only energy efficiency being more efficient.

So is there a way -- this is our responsibility here is to look 20 years further. And so a lot of it is speculative, obviously, but is there a way that in the future, with energy storage, that there would be or you talk about Ameren being a platform, or would there be an opportunity for there to just be an ISO, an RCO, that would streamline all of the different renewables, and there wouldn't need to be that power generation because there were would be energy storage to put that into effect?

MR. TOMC: I think that that's where we see, as I mentioned, this confusion of new technology and rapidly-involving approach.

Because once you introduce energy storage as a technology equalized on the grid, distributed or the utility scale level, you have a really a unique opportunity to address, you know, the inherent limitation in renewable energy sources today, which is intermittence.

So I think as we step forward, we have an opportunity to see how that technology evolves and then look at different regulatory models of how that technology can be utilized to best meet customer needs.

I think there is a number of ways that it comes into play. We could see storage at the utility scale level. We could see storage at the local level, and we can see storage at the individual customer level.

I think today we've got a little ways to go. I've been to Home Depot and a couple places in downstate Illinois. I have not seen the test power wall quite yet. I'm sure we'll get to that point where we do see those types of technologies available.

We ultimately talk about economic policy, like competitive markets. We talked about environmental policy. There is another credible essential function for the Commission, which is the existence since it's inception, which is to look out for consumers and make sure these essential services are reliably delivered.

So I think what we do we need to be open minded. We don't know exactly when and how these technologies are going to come forward. And then we need to be as informed as possible about what could happen in the future.

And what I like to do to try to sort out these predictions, is I would like to know if there's going to be any number of them. But I want to see who has the best data, who has the most thoughtful analysis.

And that, to me, in my mind, forms the basis of making good policy decisions.

MR. GIGNAC: I just wanted to add something about storage and new batteries, and that it's great to look ahead to that and think about it, but we don't need to necessarily wait for large-scale deployment of batteries to see an increased amount of wind and solar on the grid.

The Rocky Mountain Institute has pointed out things like that forecasting, as Amy talked about, the improvement of data analytics, constantly improving that, the forecasting of wind, diversification of renewables, and then demand flexibility.

There is many tools that we're using, and continuing to use, to see renewables grow, while we work towards the economics of wide-spread storage.

MS. FRANCETIC: I would like to make two points to build on that, of Matt and James and Commissioner Rosales.

When you think of what you're hitting on is what is unique in battery storage? That can really enhance today's grid, and what we expect the power range to be in the future.

One of the things that's really special about batteries is their instantaneous response time frame. So you don't have to ramp them up or down, you just turn them on.

I think Invenergy, as an operator of five grid scale battery products today, we just won a sixth, very large project in New York, one of the things you are seeing, once you have that system available to respond to demand, you can also use it not only to respond when needed in an emergency as backup, but you can usually use it to respond to demand requirements.

You can shave the prices off of your

energy bill. I think that that kind of control for the operator of the battery system, if it's a customer, is really, really powerful.

So when see the combination of renewals plus batteries at the building scale, or for a canvass or on a microgrid, as Shay talked about, battery plays very, very nicely with renewables.

And, actually, to be very, very instantly available power sources, but also to produce the overall energy bills at the end of the day.

One thing I wanted to mention about wind, and sort of the intermittency of renewables, the great thing today is that we can predict the performance of these renewables based upon all the data that we have, knowing low profiles, knowing weather events and knowing requirements from the customer standpoint.

So renewals are becoming the new baseload. Renewables are replacing fossil fuel as baseload today because of this intelligence that we're putting onto the grid to predict their performance.

So I think that is one of the great things and why we're so excited about the role that software and data can play in making our future power sources more reliable than we've had in the past.

COMMISSIONER ROSALES: That may be. However, then I get into the efficiency part, because if there is no solar, and there is no wind, particularly in the midwest, then you have the need for another location, and the location is going to cost.

So that's where the baseload would come in where is it more worthwhile? Is it more expedient? Is it more efficient to have that baseload with gas power, or to bring it in from wherever and what the price would be? Am I correct?

MS. FRANCETIC: Well, definitely the cheapest power is produced at scale in rural areas. So what you're getting at is you can produce it very, very cheaply, you know, from a utility scale. Wind and solar is dramatically cheaper than, you know, rooftop solar, or small gale wind.

That is because all of the costs that you have put into producing it at a very, very large scale, those installation costs, those setting costs, everything is spread over that very big installation.

So the cheapest place to produce that is in rural areas where you have land, available land. The challenge then comes delivering it to where those centers are. Right?

COMMISSIONER ROSALES: Right.

MS. FRANCETIC: So that's why you see Oklahoma, Iowa and Texas as the major producers of renewable energy today, wind energy certainly, and transmission needed to bring those to the load centers.

Gas is now performing that hardening function, in lieu of the transmission. So we looked at -- critical to the renewal industry is going to be investments, an additional long-haul transmission, to bring those renewals to where they are consumed and where they are needed the most.

That's why I think distributed resources are so important, because you can build small generation at the building level, or in communities, and that's going to enhance its flexibility and the liability of power, but it will not be the cheapest solution.

MS. BAHRAMIRAD: I want to add one thing building on what Matt mentioned and Amy. You heard about the utility company's role as a platform and facilitating that transaction, and there's technology, meaning storage and Smart Inverter to make that happen.

You heard about the economic theories that talk about how from a pricing perspective that can happen. The thing is you don't have a practical model out there.

There are places like California or Germany that the amount of distribution generation in the system is so high, but they didn't set the policy right in the first place.

But now we have an opportunity to not only set the policy right on the legislation and FEJA, and it brings a great opportunity to work on pilots or test systems, to try them and test different types of theories from an economic perspective utilizing all the technology that you hear from the panel to see how it works, and we can make it a statewide-type platform.

MS. EDWARDS: I want to jump in and ask another question. I know we talked about obviously we're now seeing higher penetrations of distributable resources than before.

Are we going to continue to see that?
Shay, I think you mentioned in your presentation that these renewable resources will need to be properly managed, in order to maximize the benefit that they provide to the network.

So whose role is that, management? I know you talked about the role of the utilities, but is it more of a collaborative process?

Does it take all the stakeholders of the Commission, or you just see that responsibility falling on the solar futility?

MS. BAHRAMIRAD: So from operational -- yes and yes and yes. Form operations perspective, that is utility's responsibility to make sure the investment you are making in the system and intelligence, to Amy's point, is in the right place, but then we have, as I mentioned, we have set the policies right on the legislation.

And we have clear straightforward interconnection rules by IIC 455 and 467 that if they want additional generation connected to the transmission line and distribution line, how to do that.

But now there is an opportunity to work

closer with customers, and anybody who thinks about putting solar on top of their roof. At the same time government-type buildings, that whatever codes you need to put in place for the building, to put a solar panel on top your roof, developers, aggregators and development process.

So we would be working on making a design theory to design a process, and engaging different stakeholders, meaning developers, aggregators and customers, and how that process might look like from the time that somebody wants to go, you know, on a website, common website, put an address to see how it looks like if you want to connect your home, put a solar on top of your home; or you are a developer, and you want to create, you know, a community solar summer how it can look like from an interconnection process.

So that is something we've been working on for a few months right now and bringing the new concept and process design, design thinking, and getting a group of stakeholders to coming up with a design with a process that's efficient.

MS. FRANCETIC: I would like to jump in, too, Commissioner Edwards, that we're seeing huge growth in the commercial industrial space.

So the big customers are taking this into their own hands, and it really is incumbent upon the utilities to be collaborative and for the Commission to think about how to blend, you know, the customer control with utility control because, you know, the commercial industrial users are investing in rooftop solar or purchasing wind and solar backing because they are looking for price protection into the future.

So we are signing ten-year contracts with these large customers that will give them some certainty about their future and their future prices.

I think that is really, really incumbent up upon the utilities, how to collaborate, especially with those very, very large customers so that the policies are set to enable this to happen efficiently, because it's already happening, you know, regardless.

It's best to embrace that and how it's remodeling things and move forward.

CHAIRMAN SHEAHAN: Can I jump in with a question for James? James, you mentioned some of the advantages of the increase of renewables and their integration improved prices and impact on climate and reliability, all which I agree with strongly.

But I'm interested in your thoughts on the investments and costs to the distribution network of actually facilitating that integration.

MR. TOMC: Sure. Well, first, I think it's important to remember that the traditional generation that we have right now, we have costs needed that we were paying to ensure the reliability of those resources.

So the nuclear -- when a nuclear plant or coal plant goes offline, those are one of the biggest contingencies that the grid operators have to plan for.

So that's why we pay for things like spending reserves and big reserve margins, to protect when a big unit like that comes offline, which they do sometimes do. So that's a cost that we're paying for reliability.

As we integrate and shift generation, there will be investments that need to be made on distribution so that from a distribution and transmission networks, we can have better interties between grid regions.

And so that when a renewable resource is variable, not performing as well in one area as another, because of the better interconnections, tower, when the grid is reliable.

So those would be investments. But as we make that shift, we'll have fewer costs, in terms of what we're currently paying to support the large centralized power systems, power plants.

MR. GIGNAC: Let me just react to that question as well. I think from my perspective, we can set standards. We can sell goals and aspirations with respect to environmental policy, renewable -- integration for renewables.

I think there is two limiting factors that, as regulators, stakeholders of utilities we also have to be cognizant of. One of those is customer affordability.

Ultimately, customers have to pay rates to support these new costs and these investments. We also have to recognize that just because we put a standard on paper, doesn't mean it necessarily is going to create the steel in the ground that's necessary to accomplish those.

We do have capital investments that's required to make those. We have to have policies that support utility or investor access to capital at reasonable capital cost.

I really see the issue of ensuring there is access to capital at reasonable rates and customer affordability. There's two sides of the same coin.

The heat does go to that central issue of the Commission to make sure that, first of all, customers get reliable and safe utility service, and that they do so at reasonable rates.

MS. BAHRAMIRAD: Thank you, Matt. Well, that concludes our second panel on our program. I would like to thank our panelists today for their presentations and insight and also join in giving them a round of applauds.

Next we will hear closing remarks from Acting Commissioner Oliva.

COMMISSIONER ROSALES: Commissioner, I just wanted to thank you for putting this together. Thank you, Miguel, for giving her the idea to put this together.

But I want to apologize to you and to your staff, because I know you put so much time into this. There were questions on Twitter, then we just took if over by having all these questions we have here.

It's a great time to be in this position because there's so many unknowns. You can see from the session that there's so many questions that still need to be answered, and we are wrapping them up.

So I just want to thank you, you know, for allowing us to do this, because we still don't have the answers. We're all trying together, everybody here, and everybody up there, everybody here, trying to get the answers.

We don't know, but by having this kind of conversation, it makes it easier. I want to thank you for the opportunity.

COMMISSIONER OLIVA: Thank you. I appreciate that. I just want to thank everybody again for attending, to the Chairman and for my colleagues for all their support, the Commission staff, the audience and incredibly knowledgeable panelists to have such a great discussion today.

We've concluded with today's policy session and stay tuned for installment two of Illinois' Power Meter. Thank you.

(WHICH WERE ALL THE PROCEEDINGS HAD.)

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