BEFORE THE

ILLINOIS COMMERCE COMMISSION

ILLINOIS' POWER METER

RENEWABLE ENERGY & ILLINOIS TRANSMISSION SYSTEM

Thursday, October 19th, 2017

Chicago, Illinois

Met, Pursuant to notice, at 11:00 A.M., at 160 North LaSalle Street, Chicago, Illinois.

PRESENT:

BRIEN J. SHEAHAN, Chairman

SADZI MARTHA OLIVA, Acting Commissioner

SHERINA E. MAYE, Commissioner

JOHN R. ROSALES, Commissioner

SULLIVAN REPORTING CO.
CARLA L. CAMILIERE
CSR NO. 084-003637

1 I N D E X

2 PRESENTATION BY:

3 MR. SCOTT BAKER, Senior Business Solutions Analyst, PJM Interconnection

4 MR. DANIEL BARR, Principal Engineer, ITC Holdings
5 Corporation

6 MR. JEFFREY BLADEN, Executive Director, Market Development, MISO

7

8 MODERATORS:

9 MS. AZEEMA AKRAM, Legal and Policy Advisor to Acting Commissioner Oliva

10 MS. JOHANNE VERPIL-GREER, Legal and Policy Advisor
11 to Commissioner Edwards

12

13

14

15

16

17

18

19

20

21

22

1 COMMISSIONER SHEAHAN: Okay. We will call to
2 order the Illinois Power -- Illinois' Power Meter
3 Renewable Energy and Illinois Transmission System.
4 I would like to welcome all of our
5 guests and remind our guests and panelists that this
6 session will be on the record. A court reporter is
7 present.
8 And also, for the record, we do have a
9 quorum present.
10 And with that, I would introduce
11 Commissioner Oliva.
12 ACTING COMMISSIONER OLIVA: Thank you,
13 Commissioner Sheahan, and to my colleagues for
14 supporting today's policy session.
15 Good morning, everyone. Welcome to
16 our second installment of Illinois' Power Meter
17 brought to you in collaboration with Commissioner
18 Sherina Edwards.
19 Thank you all for being here today, as
20 we get a reading on the integration of renewable
21 energy in Illinois and its impact at the transmission
22 level.

1 This conversation continues from the
2 Policy Session held in July, which evaluated
3 renewables at the distribution level.
4 Back in July, you heard from experts
5 who shared how local stakeholders are preparing for
6 the influx of renewables, they identified items of
7 concern and discussed how technology and data
8 analytics are advancing and they also stressed the
9 need for ongoing collaboration.
10 As Betty Standfield from Vote Solar
11 said at the first installment, Illinois is ready for
12 takeoff. But to ensure continued success, it's
13 important to understand the impact FEJA will have on
14 the grid's transmission infrastructure and the
15 wholesale energy markets. That's what we hope to
16 learn from today's Policy Session and from today's
17 panelists.
18 A big thank you to our distinguished
19 panelists, who will explore this very necessary and
20 relevant topic, which is the talk of the industry
21 lately and to our legal and policy advisors for
22 moderating.

1 So, moderating this morning's panel
2 are Azeema Akram and Johanne Verpil-Greer.
3 So, Ladies, let's get us started.
4 MS. AKRAM: Thank you so much, Acting
5 Commissioner Oliva.
6 Good morning, Commissioners, panelists
7 and attendees.
8 As Acting Commissioner Oliva stated,
9 my name is Azeema Akram. I have the pleasure of
10 co-moderating our first panel this morning with legal
11 policy advisor to Chief Commissioner Edwards, Johanne
12 Verpil-Greer.
13 This morning the panelists will be
14 discussing how Illinois stakeholders at the state and
15 regional level need to work together to ensure a
16 seamless, efficient and cost-effective integration of
17 renewable energy resources onto the power systems.
18 Our panelists will provide insight on
19 the planning for renewables that is occurring at the
20 regional level and the infrastructure and regulatory
21 needs of the direct and ancillary stakeholders in
22 this sphere.

1 The format of this panel will consist
2 of ten-minute brief presentations by each of our
3 panelists, followed by a series of questions from
4 Johanne for an open-ended discussion.
5 As a reminder to our panelists, the
6 Chairman and Commissioners may ask questions
7 throughout the presentations.
8 But before we begin, I would like to
9 introduce our panelists.
10 First, we will be hearing from Scott
11 Baker, Senior Business Solutions Analyst at PJM
12 Interconnection. Mr. Baker evaluates emerging
13 technology and policy issues in the electric power
14 sector.
15 In his role at PJM, he administers
16 technology demonstration projects with PJM members,
17 research institutions and the industry at large.
18 Recently, this work is focused on market evolution
19 initiatives related to demand response and energy
20 storage technologies participating in the PJM
21 capacity and ancillary services markets.
22 Next, we will hear from Jeffrey

1 Bladen, Executive Director of Market Development at
2 MISO. In this role, Jeffrey oversees the Market
3 Services division where he is responsible for the
4 strategic direction of MISO's markets, including the
5 design and development of new products and market
6 mechanisms to enhance the MISO marketplace.
7 Lastly, you will hear from Daniel
8 Barr, Principal Engineer at ITC Holdings Corporation.
9 For the last 12 years, he's been responsible for
10 coordinating the interconnection of new generation
11 resources at Interstate Power and Light Company and
12 ITC Midwest. Additionally, during that time, he has
13 been directly involved in approximately 35 individual
14 generator interconnection projects representing
15 approximately 3,100 megawatts of new renewable
16 generated capacity.
17 Please join me in welcoming our
18 panelists.
19 (Applause.)
20 MS. AKRAM: Scott, when you're ready take it
21 away.
22 MR. BAKER: Okay. Very good. All right.

1 Thank you very much.

2 Mr. Chairman, Commissioners, staff and

3 attendees thank you very much for having me today.

4 My name is Scott Baker. And as was

5 mentioned, I work in PJM's applied solutions group

6 which focuses on emerging technology and policy

7 issues that are going to impact the regional

8 transmission market that we run.

9 And distributed energy resources is a

10 growing topic as something that PJM is now starting

11 to focus on quite a lot, both internally and with our

12 stakeholders, through public stakeholder meetings.

13 So, what I'm going to focus my discussion on today is

14 more on the distributed energy resource side of the

15 renewables picture.

16 Certainly, wind has been a growing

17 resource in PJM and we do expect wind to continue to

18 grow in our footprint. But as you look out,

19 distributed energy resources are going to play a big

20 role. And so, I'm going to focus my comments on that

21 this morning.

22 When we talk about distributed energy

1 resources, really, the way in which PJM defines that
2 term is any generation or electric storage resource
3 that's connected to the distribution system and/or
4 connected behind a customer's load meter. But it's
5 any resource that's capable of producing power on the
6 distribution network.
7 It's slightly different than how other
8 entities have defined that term, some look at it as
9 energy efficiency or traditional demand response for
10 reducing loads, but we're focused really on those
11 resources that have the ability to get power onto the
12 system.
13 The existing PJM demand response
14 market has done a very good job at integrating these
15 types of resources. And we have about 1,100
16 megawatts of DER that participate today through PJM's
17 demand response mechanism. And they're offering to
18 PJM's capacity energy and to their ancillary services
19 markets.
20 We also have another 800 megawatts of
21 generation resources that participate in wholesale
22 markets, but they connect at the distribution level.

1 So, they are directly connected like a traditional
2 generator, but they're not directly connected to
3 transmission voltage, they're connected at
4 distribution voltage. But they have access to
5 wholesale markets, and so we consider those to be
6 distributed energy resources as well.
7 That's mostly solar that's doing that.
8 However, we also have some smaller natural gas
9 facilities, landfill gas facilities, batteries and
10 other technologies that participate that way.
11 So, within that wholesale market
12 bucket of DER, we have quite a bit of visibility into
13 what those resources are doing. Certainly, because
14 they're participating in the market, there's a
15 dispatch ability component to those resources.
16 And then, we have another bucket that
17 we term non wholesale DER. And these would be
18 distributed energy resources that are being deployed
19 for other reasons outside of the wholesale market, so
20 a customer preference, customers managing their load,
21 resilience, certain areas are growing rationale for
22 deploying non renewables through DER. And this is

1 actually the largest source of distributed energy
2 resources and the largest -- I'm sorry, the area in
3 which we've seen the most growth. And that's really
4 solar, solar PV.
5 So, today, at PJM, we are just shy of
6 300 megawatts of non wholesale solar PV, so rooftop
7 solar, commercial, that type of resource. And that
8 is a resource that is really expected to grow quite a
9 lot in the future.
10 When we think about distributed energy
11 resources and distributed renewables, we really focus
12 on our long term strategy around integrating those
13 resources in these four different areas. The first
14 is visibility. This is a critical component of
15 integrating more distributed energy resources and
16 distributed renewables. Because even if they don't
17 participate in the wholesale market, the RTO is going
18 to have to have greater visibility into where those
19 resources are, what's their active power operational
20 status and also how do they behave. So, that gets
21 into how these resources might behave during a system
22 emergency or during some sort of operational

disturbance.

We have a very good understanding of how traditional generators behave under regular conditions. We need to know how distributed energy resources will behave. When we get to forecast and measure, this is really determining our long term planning process. So, we need to have a way to forecast how distributed energy resources in the future are going to affect our load in the future and that, therefore, affects our long term transmission planning efforts.

I'll show you a slide in a moment about forecasting and what that currently looks like.

And then, "incent" here means to the extent with which distributed energy resources want to participate in the wholesale market, they should have the option to do that and they should have the option to do that in a fair and efficient way.

And so, we are currently working with our state boards to develop rules around aggregation and energy settlements, dispatch data requirements for distributed energy resources to participate in

1 the wholesale market.

2 And then lastly, I think this is a

3 growing area for PJM and others, is: How are DER and

4 renewables going to fit into the resilience picture?

5 And as we begin to use the resilience as a way to

6 plan the system and operate the system, how do these

7 types of resources fit into that picture? And,

8 certainly, micro grids are a big part of the

9 resilience picture.

10 So, just in closing, these distributed

11 renewables are definitely an area of growth not just

12 at PJM, but certainly across the U.S. and the world.

13 When we look out in our long term

14 planning forecast, this is what we see. This is an

15 economic forecast that is also adjusted by state

16 level policy and other Federal policy factors into

17 what we foresee distributed solar PV looking like in

18 our footprint.

19 This goes all the way up to 2032.

20 It's also by each transmission zone, but right now

21 we're expecting 2032 just over 17,000 megawatts of

22 distributed energy resources.

1 That's a big number. PJM is a big
2 RTO, so this number is not to say this is going to
3 cause significant impacts on our system. It's simply
4 to say this is what we foresee, this as an area of
5 growth. And so, we are working today to make sure
6 that we are putting in place the visibility and
7 operational and long term planning requirements and
8 mechanisms to make sure that we could integrate these
9 resources reliably.
10 And with that, I will look forward to
11 your questions.
12 MS. AKRAM: Thank you so much. Next, we will
13 here from Mr. Bladen.
14 MR. BLADEN: Thank you Mr. Chairman,
15 Commissioners. I appreciate the opportunity to be
16 here today. And, you know, I want to commend the
17 Commission and acknowledge this meeting, forums like
18 this one to think about the future, because it really
19 is starting to become apparent that the future in
20 this in many respects is upon us.
21 MISO is an RTO like PJM and we view
22 ourselves at that core as a service provider. A

1 service provider to the member utilities. The MISO
2 cooperative of investors as well as the LLCs. And
3 our job is to deliver reliability and to help deliver
4 reliability with them and to gain efficiencies in the
5 process. And that really is where we start and end.
6 And as we think about integrating any resources,
7 renewables, distributed or otherwise, our job is to
8 help our customers achieve the more efficient way of
9 delivering reliability.
10 And as we see the fleet changing, as
11 we see the resource that's changing, reliability is
12 and will not be compromised. The question that we'll
13 all have to face is: How efficiently are we going to
14 issue that reliability? How? Will it cost us more
15 how will it cost us less?
16 At MISO, we think it can cost us less.
17 And as we think of how to incentivize new resources
18 to become a part of the delivery of that, well, I
19 believe there's lots of opportunity. But if we don't
20 take that opportunity actively, we will, in fact, see
21 that efficiency lost. And that's really how we think
22 about integrating in order to set rules or laws.

1 So, as we think about the emerging
2 technologies that are really changing the nature of
3 how the power grid is operated and how reliability is
4 met, we are seeing a little bit of a different growth
5 pattern than the continent region out along the East
6 or West Coast. Because of the lower cost profile,
7 economics are leading to a somewhat slower adoption
8 rate.
9 As you might imagine, the folks are
10 not going to change their need or their want for
11 different sources of electricity without some
12 economic signals. So, there are some people who will
13 do that, but we expect the that the adoption will be
14 a little bit slower.
15 Having said that, we are also of the
16 view that the adoption will accelerate. As the
17 technologies get less expensive, as the alternatives
18 have other issues associated with them, the adoption
19 rates would, certainly, we would expect them to
20 accelerate.
21 Most prevalent in the mid continent
22 region renewables, of course, is the wind resource.

1 And there remains an extraordinary volume of wind
2 resources still available to be tapped. And over the
3 next few years, we would expect that trend to
4 continue.
5 I will mention a little bit about what
6 we will be seeing our mission as, as well as our
7 planning processes and our queue for integrating the
8 generators in a moment.
9 But, ultimately, our job as I said a
10 minutes ago is to ensure reliability. And then, as
11 we do that in an efficient way, in as efficient a way
12 as we can. Hopefully, gaining cost advantages over
13 time as well as using them.
14 And that is one of the lists of
15 challenges, in part, with our states and the member
16 utilities, as we think about how resources might
17 become part of the fabric of delivering reliability.
18 To Mr. Baker's comments, the more we can engage
19 within the resource base in an active way, so that
20 they're part of the reliability rather than something
21 that is managed around. The efficiency gained
22 opportunities, that much are there.

1 At the end of the day, what we are
2 obligated to do is remain diagnostic about how
3 different technologies and when they're able to
4 contribute to reliability's the only thing that
5 matters to us about integrating them. So, we will do
6 all we can to make sure the products are available,
7 so that at all resources types no matter whether
8 they're at wholesale or a distribution level have at
9 least an option, to help support a lot of them
10 renewing that option. At least the agreements or the
11 processes, is really the only question that's left
12 for the states to determine.
13 So, I mentioned a minute ago or I
14 talked a little bit ago about what we're seeing in
15 our interconnection queue. And as you can see on the
16 rack to the right -- it's kind of hard to see on the
17 screen -- but we're seeing a substantial trend
18 upward, in particular, of solar resources,
19 photovoltaics, on the bottom of there. And then, of
20 course, there's been some driving economic factors in
21 there that in addition to technological advances
22 lowering the costs of those technologies will also

1 have impending Federal incentives that are expiring
2 in the 2020 timeframe for wind and the 2022 timeframe
3 for solar.
4 So, you can expect investors in those
5 assets are going to look to reap the benefits of
6 those incentives on tax.
7 We are seeing a number of the
8 economics, particularly, around the wind, becoming
9 more and more competitive even without those
10 incentives. So, I believe we have a reason to see
11 the trend continue, particularly, with wind. And the
12 cost curve on solar has continued to decline. So,
13 everybody will see the examples of solar persisting
14 well beyond Federal incentives expiring as well.
15 So, the trends are certainly
16 accelerating rather than decelerating as a result.
17 Then the last thing I will note is
18 that the last interconnection queue process that we
19 ran, this was June of this year, was actually the
20 largest interconnection queue volume that we had ever
21 seen in MISO. So, we've seen in some respects a rush
22 to get into line, but it's also demonstrative of a

1 real shift found in the nature of completer resources
2 that are going to be made available to meet those
3 reliability gains.
4 And just speaking a little bit to the
5 emerging trend around distributed resources that
6 Mr. Baker noted that we're seeing similar trends.
7 Photovoltaics and MISO have been growing and are
8 expected to continue to grow. We think about
9 distributed resources as similar to resources that
10 are connected to the low flow problem level that are
11 available not to move massive amounts, you know, to
12 coordinate amounts. But the degree to which they are
13 part of the fabric of coordinated reliability
14 mechanisms, it really speaks to how efficient they
15 are at delivering these costs of electricity to
16 consumers.
17 And that really leaves the question in
18 front of us now that you've seen what the compromise
19 is with both, rather will we be able to do it at a
20 lower cost fashion as we would like? The more new
21 resources are integrated into our mechanisms for
22 delivering reliability, the lower the cost will

1 ultimately be as we take full advantage of every
2 resource's capability.
3 Then so, what we can see here is that
4 as the distributed resource is increasing in
5 integration, potential is for displacing, ultimately,
6 other power resources. That's neither a good or bad
7 thing. It's just a function of we will have more
8 megawatts than we need.
9 And if that occurs, and that is not
10 part of how we coordinate in the reliability of
11 services, the potential is, we will have higher costs
12 of doing that. It's our job at MISO to inform them
13 on that and then provide the tools the states might
14 want or need to be able to integrate these resources
15 into how we will meet reliability needs.
16 And with that, I'll save as much time
17 as I can to answer questions. I know there's some
18 very interesting questions posed in advance. I want
19 to make sure we have time for those. Thank you.
20 MS. AKRAM: Thank you very much. Now we will
21 hear from Mr. Barr.
22 MR. BARR: I would like to thank the Commission

1 for allowing ITC to participate in the discussions
2 being had here. I thank you again.
3 In general, I think I'm going to
4 basically represent the nuts and bolts side of how
5 generation is connected. In large measure, the rules
6 for interconnection are governed by who we connect
7 to. So, in the case you connect to the distribution
8 system, state's jurisdictions apply. If you connect
9 to the transmission owners or the RTO, the RTO has a
10 very explicit set of rules laid out in their tariff
11 that talks about the process.
12 I would be remiss in my duties if I
13 didn't take a few minutes for the ITC infomercial.
14 We've been around for 14 years. In that 14 years,
15 our four subsidiaries make up its holdings and it's
16 about $6 and a half billion in transmission
17 infrastructure. We operate in the area of a 90,000
18 square mile service territory. We're members of 4
19 RTOs: MISO, PJM, SPP, and NYISO.
20 One item that is not on the slide, but
21 we take great pride in is that we are the nation's
22 largest independent transmission company. We don't

1 have distribution customers. We don't own
2 generation. We strictly are transmission.
3 If the goal is to integrate and
4 optimize the use of generation resources, if they're
5 on the distribution system and transmission system,
6 we see the RTOs as playing a significant role.
7 And in my mind, I think of an RTO, I
8 see them as the entity that coordinates, monitors and
9 controls access to the transmission system. So, if
10 you look out across the transmission system and you
11 think of it as a large energy highway with all the on
12 ramps, off ramps and all the roads across it, the RTO
13 has quite a job in just managing all the inputs and
14 outputs. And we know what those inputs and outputs
15 are.
16 Just for sake of examples, if you look
17 at the customers that PJM and MISO members serve, it
18 comes to roughly 100 million people. And they
19 have -- their markets generate annually charges to
20 the order of collectively about $60 billion. So,
21 there's a big mechanism there. And again, if we want
22 to integrate the use of the distribution resources

1 and transmission resources, the RTO's going to play a
2 role.
3 Underpinning all that are reliability
4 requirements. We, under reliability requirements,
5 are mandatorily enforceable. There's a category, I
6 believe, there's about 14 different standards
7 categories. Within those categories, there is
8 roughly 113 standards.
9 If we look at the big transmission
10 planning standard, for example. Just that one
11 transmission planning standard and, again, it's
12 mandatorily enforceable, has 65 individual
13 requirements. That's quite a few requirements that
14 we have to keep track of. So, again, reliability is
15 paramount.
16 The modeling standard applies to a
17 wide variety of standards. All those mentioned there
18 are transmission owners, generation owners, but we
19 serve, again, these, and we have them all listed
20 there. We need that information to make sure that
21 the system is running responsibly.
22 I stuck this in here just to make note

1 of the fact that from the transmission perspective,
2 the distribution system is modeled simply as a bus
3 with some characteristics. The distribution system,
4 in general, is not modelled explicitly. So, look at
5 that blue line right there. You can barely see it if
6 you eyesight's not that good. But that blue line
7 actually represents in this graphic representation
8 within the transmission model, represents the 345,000
9 volt line. And then, if you go straight to the right
10 there, that black bus with the circle and a triangle
11 on it, represents a distribution bus. We don't see
12 beyond that bus. All we have are some
13 characteristics that are modelled at that note and
14 it's very critical for us as this generation comes on
15 line for it to be kept track of.
16 So, in a case of -- on a load serving
17 entity, let's say that the load serving entities have
18 the obligation to supply or update their loads so
19 that that load can be served reliably from the
20 transmission system. Having that load serving entity
21 simply back up their distribution generation or their
22 load is not a good thing for the system.

1 We are promoting -- we have been
2 working with our largest load serving energy line --
3 we developed a process where they're now providing us
4 with the data for aggregate generation. We have
5 triggers where they notify us and we can test the
6 system. And they also have manuals submitted from
7 them. From our perspective and in the interest of
8 reliability, we see that as a very moving cause.
9 This is just -- I want to call it a
10 picture of typical transmission system responses.
11 So, if you're tasked with ensuring
12 reliability, you have to know how the system responds
13 and modeling is at the core of that. Like if you
14 look across the bottom there and it has seconds and
15 they range anywhere from a tenth of a second over to
16 a few hours, in the real world, you can have a fault
17 on a line and the equipment on the line is actually
18 programed to operate very quickly. On the order of 3
19 to 5 cycles, you can have a circuit breaker open up
20 and then isolate a fault and then within another few
21 cycles it can close back in. So, if you're sitting
22 at home and you see the lights blink, that's

1 typically what happened.

2 Now, there's also responses that take

3 a lot longer time, like, if it takes a system to

4 operate. They've called for a generator and they

5 tell the generator to back down, if they don't have

6 good information in that control room, it could be

7 the case that they would make a bad decision and

8 reliability could be compromised.

9 We've actually had occurrences that

10 ITC operators where they will actually see a negative

11 load at a bus. So, there's generation there. We

12 can't see it, but they see the energy kind of flowing

13 back into the system and have no way to account for

14 it.

15 And then, just in closing and to state

16 the obvious, if it is the goal to develop renewable

17 generation, load circuiting entities into utilities

18 are going to be influenced by prevailing

19 infrastructure. And if in large measure, it's in

20 their best interests. And if you look at in Iowa,

21 MidAmerican has invested -- and now they are

22 investing another $3.6 billion in wind and Aligned

1 Energy followed suit with another $2 billion. So,
2 from their perspective if they get the generation in
3 time, they can benefit from the production tax credit
4 and they also get the state rate with a great return.
5 So, that's a pretty good prospect for them.
6 And I think I'll just leave it there
7 and we will get to the questions.
8 MS. VERPIL-GREER: Thank you, Dan.
9 Before I start with some of our
10 questions, we would like to check with the Chairman
11 and Commissioners to see if you have any questions at
12 this time to ask our panelists. All right then we
13 will get to it.
14 Jeff and Scott, you've touched on
15 reliability. Keeping that in mind, reliability and
16 the variability of renewable resources, what physical
17 changes are needed or need to be made at the
18 transmission level to better deal with increasing
19 amounts of DER being added to the distribution grid?
20 And any one of you can answer that
21 question, please.
22 MR. BAKER: I will start. I think the physical

1 changes here are -- so, when we do load forecasting,
2 we are looking at not just how much DER is going to
3 be installed, but also how that will behave on an
4 hourly basis. And that behavior changes the flow
5 across the transmission system even though we are
6 talking about resources that are embedded within the
7 distribution system. If you have thousands of
8 megawatts embedded in the distribution system, it's
9 inherently going to change the flows along the
10 transmission system.
11 So, those changes -- that will change
12 the physical characteristics of the transmission
13 system -- I should say it could cause the need for
14 changes in the existing system. And so, that's the
15 biggest impact that I see right now.
16 And the second one would be you have
17 basically reverse power flow from distribution system
18 to transmission system. That happens a tiny bit
19 today in PJM, but it's bound to happen more as you
20 have a larger deployment. Jeff.
21 MR. BLADEN: That's right. And you know, I
22 don't want to minimize the power grid that the

1 transmission block was always built by directional
2 flows, but at the distribution level it was never
3 built that way. So, I won't speak to what the
4 distribution utilities think they may or may not
5 need. But you do need to come into this recognizing
6 that. If you're going to have to higher directional
7 flows on distribution, you're going to have to
8 account for that in the physical infrastructure and
9 it's capability to actually manage that. There are
10 anecdotal stories, for instance, in California, of
11 sub-stations that have capacitors, which are
12 essentially short term storage devices, that were
13 designed to manage variability during morning and
14 evening ramping periods, when people start to use a
15 lot more or stop using quite as much, that had design
16 lives of 10 or 12 years that are going out of service
17 in three or four years because of the huge increase
18 in the amount of load taxes they're seeing behind
19 those distribution sub-stations. And those
20 capacitors, instead of being charged and discharged
21 twice a day, are being charged and discharged dozens
22 of times a day. Every time the sun goes behind the

1 clouds.

2 So, what I would encourage in your

3 action with distribution, is that you be thinking

4 about those kinds of challenges on the physical

5 infrastructure.

6 Moreover though, we were approaching

7 this question at the wholesale level, is thinking

8 about what we need to do to facilitate -- as I

9 mentioned earlier -- facilitate these resources being

10 able to bring their capabilities to offer reliability

11 services, bring that to the wholesale power grid.

12 How do we help them become part of the fabric of

13 reliability rather than being essentially invisible

14 and having to be worked around?

15 That's a different paradigm than has

16 existed historically, but it's also one that requires

17 close coordination with states and with local

18 utilities to think about what do they need. We are

19 not supplanting by any means what retail regulators

20 do or what your utilities do, we are trying to enable

21 that, so they can bring their resources to become

22 part of that fabric.

1 That looks like standards. It looks
2 like standards for communications as Mr. Baker was
3 mentioning. It looks for standards for products that
4 might be offered to help deliver reliability services
5 and they have to be developed in a fashion that is
6 compatible with the new class of resources that
7 haven't historically existed. So, it covers a lot of
8 ground.
9 MR. BARR: I think I'll just beat the modeling
10 drum again. I think connecting generation without
11 evaluating it is generally impractical. So, unless
12 we have an obligation to today have a modeling
13 obligation that exists at the level of the both the
14 electric system, but not so much the distribution
15 load. I think it's when we get cooperation with the
16 load, certainly, in ways with that view to
17 distribution generation's connecting. We have to
18 rely on them to tell us, hey, we have done some
19 evaluation. And you know what, we can't see inside
20 the transmission system. We think this is worthwhile
21 and worth checking out. So, if we get those heads up
22 from them, I think we can incorporate what eventually

1 ends up being connected into our models and the
2 system operators can operate the system reliably.
3 But on the front end if you have a --
4 and in the case of MISO, I deal with MISO daily, they
5 have some real problems processing their queue right
6 now. It isn't due to anything over there. It is too
7 many stakeholders, too many megawatts and there's not
8 enough transmission capacity. So, their studies or
9 the current study will probably go on for somewhere
10 around a year and that's not uncommon.
11 In the state of Iowa, they have a
12 strict timeline the utility has to follow when they
13 connect generations. So, the utility has to abide by
14 the timeline that they have to abide by and that
15 they're obligated to follow and you can't really
16 coordinate those two. It's impractical.
17 You can't have a generator connected
18 to the distribution system and follow that timeline
19 and force that generator to pay for upgrades on the
20 transmission system. Ideally, that should occur,
21 because if they cause problems they ought be required
22 to fix it, but I don't think it will ever get there

1 just from a timing perspective.

2 So, I think the best we can do is if

3 we can get notified by the load serving entities that

4 there is a problem or they reasonably think there

5 might be a problem on our system, allow us to

6 evaluate that on each load before that generation's

7 connected and then, once it's connected or they sign

8 an agreement then we can make that generation model,

9 so we can handle the load.

10 MS. VERPIL-GREER: Thank you, panelists. I

11 know you all mentioned the two way flow or the DSO

12 model. I wanted to ask is this the future model for

13 dealing with the complexities of integrating

14 distributed energy along the grid? If so, how should

15 it be implemented, who should be the system operator

16 and what other alternative systems should be

17 considered?

18 MR. BAKER: DSO is a new acronym that is

19 starting to be used a lot more. And it really

20 depends on how you define that. Some people think

21 about that as the existing utility, some people think

22 about that as a different entity that's operating,

1 operating but not owning. So, it really depends on
2 how you define that. I'm not going to define that
3 here.
4 But I will say that one thing that is,
5 I think, readily apparent is that whomever is
6 operating the distribution systems of the DSO is
7 going to need some sort of distributed energy
8 management type system, if you have really large
9 deployments on your grid. I mean, the distribution
10 system was never built to really be very actively
11 managed. It certainty wasn't built to dispatch
12 generation resources on it, particularly, over any
13 one on constraints like we do at the distribution
14 systems, where we are dispatching generations every
15 five minutes to deal with transmission level
16 constraints. That's just not done at the
17 distribution system, but it may need to be done, if
18 you have a really high level of DER.
19 So, I think that is the -- if I would
20 say the one thing that the DSO is really going to
21 need to do, it's be able to manage the DER for
22 constraints within it's distribution network.

1 MR. BLADEN: I'll add to that. First and
2 foremost the distribution levels have traditionally
3 been built and designed so they would not have
4 constraints. So, they have been designed in a
5 fashion that is explicitly supposed avoid the need to
6 actually dispatch them or actively manage them. So,
7 to the extent that that remains in the design
8 criteria, you may well not need somebody to actively
9 manage your non constraints. But, you know, the --
10 and the integration of new resources may change that
11 dynamic.
12 I would also note that before we think
13 about whether we need a new market, a different level
14 of the power grid, let's make sure that we are using
15 the advantages that already exist in the markets that
16 we already have. That there's a great deal of
17 opportunity to integrate resources in a fashion that
18 allows them to contribute to the reliability,
19 leveraging markets that already exist at the
20 wholesale level and leveraging a distribution network
21 that has been traditionally built so as to not need
22 to be actively managed around constraints. But you

1 will need some mechanisms to account for the change
2 in how flows are occurring.
3 And I mentioned some things that are
4 already seen in California. And that is, as
5 expected, going to change the nature of the grid.
6 But let's make sure we take full
7 advantage of what we've already got before we think
8 about the need to build something new.
9 MR. BARR: Yeah, I'd have to agree with that.
10 It seems like at some point you'd have to identify
11 one authority that would dispense or dispatch
12 generation. And it seem like that would have to come
13 from the regional level. I'm just thinking out loud.
14 But if you do have the distribution
15 company, it seems like they would somehow have to
16 have those resources representing the market. And at
17 some point, if there was a problem, you'd have to be
18 able to tell them to turn that off.
19 I don't know if you could tell them if
20 generation's only represented in aggregate. If you
21 had like -- say, within that transmission model all
22 you see is an aggregate generator that represents 3

1 megawatts of solar, but there might be a Joe with his
2 rooftop and he's making 50 KW and there might be a
3 whole bunch of other ones, so how do you effectively
4 shut that down? I think that would take some real
5 work in getting it through.
6 So, I can see representing larger
7 units like a wind turbine or something like that, I
8 think, where they represent more people doing that,
9 but going beyond that that would really take some
10 time. That would indeed have to be handled at the
11 regional level.
12 MR. BAKER: I'll just to add one other thing to
13 that. And this is kind of a growing area that
14 mirrors what other growth has, this interface between
15 the transmission system and the distribution system,
16 is going to become more complex. And it's almost,
17 like, a somewhat of, like, a new seam, if you will,
18 within the RTO, that is going to need to be more
19 actively managed between the transmission system and
20 the distribution system. So, you see that interface
21 growing in complexity.
22 MS. VERPIL-GREER: I believe Commissioner

1 Rosales has a question.

2 COMMISSIONER ROSALES: Scott, I love your

3 analogies on the question on how they act on the

4 system. Kind of like, it seems like if it's small

5 amounts they act nicely and if it's a larger amount,

6 larger amounts, then they get mischievous. So, my

7 question would be: As this grows and you used the

8 slide of 2032, are we going to have enough in our

9 grid to be able to have that way of building more

10 capacity as we go through this?

11 MR. BAKER: When you say "capacity," do you

12 mean generation capacity or generation and

13 transmission?

14 COMMISSIONER ROSALES: Transmission.

15 MR. BAKER: To have that without building more

16 transmission capacitors there's other factors that

17 can influence the amount of transmission that's going

18 to need to be built. So, it's hard for me to say

19 exactly that you could integrate this amount of DER

20 without having new transmission capacity.

21 But the one thing that I guess would

22 be kind of a force on one side to say you may not

1 need more transmission capacity is that this is
2 mostly going to be within the distribution system.
3 So, it's undetermined whether or not this power ever
4 flows up to the transmission system.
5 It may change the flows on the
6 transmission system as I mentioned earlier. And so,
7 you may have certain things that might need to change
8 from the policy perspective. But I would say, most
9 of this generation isn't necessarily flowing across
10 the transmission network.
11 So, I'm not -- you know, I'm not sure
12 that this amount of generation immediately signals
13 the need for new transmission.
14 MR. BLADEN: The challenge in answering that
15 question is it has a lot to do with what type of
16 resources are built and when their electricity is
17 being produced relative to when the local consumers
18 are consumers.
19 COMMISSIONER ROSALES: Absolutely.
20 MR. BLADEN: So, if you have industrial loads
21 that are not necessarily well matched with wind
22 resources or solar resources or other forms of

1 resources that are intended to produce locally, you
2 will end up wanting to find a way to send that
3 electricity to others in the network that might need
4 it at that time.
5 And as we see it at the whole power
6 level, we have parts at MISO that are producing lots
7 of excess energy from wind resources at times when
8 their demand in their state is less than that
9 production. And the benefits of having an interstate
10 power grid is that we can actually move that power
11 across state lines to other consumers and by sharing
12 that way, have a more efficient grid.
13 You can imagine something similar
14 where lots of solars are built in one town and then
15 lots of wind is built or lots of other forms of
16 resources remain and then they're complimentary in a
17 fashion in terms of increased electricity to the
18 consumer. But you still need to move them from town
19 to town even at the distribution level.
20 So, that is why it's a complex
21 question to answer about what are you going to do for
22 an organization. Routinely, you would have to

1 continue to spend on where we are seeing rejection
2 and where are we seeing local growth. And then,
3 match the transmission to move the power to the
4 people and the consumption that's occurring.
5 COMMISSIONER ROSALES: And if storage is more
6 efficient at that point, there would be something
7 else to be put into the mix, I would think that would
8 be advantageous to have in the grid.
9 MR. BAKER: Yeah, if it's more efficient, I
10 would agree with you. I think there is lots of ways
11 to integrate. Renewable storage is potentially one
12 of them, using distribution transmission network is
13 another. So, storage is -- can play a role, but you
14 know I don't think it's a critical thing necessarily.
15 MS. AKRAM: Thank you. You all touched a bit
16 on how the grid network's predominantly designed for
17 one-way power flow. And Jeff, you mentioned that we
18 should think about taking advantage of what we have
19 and then we can look to the future. So, I guess
20 looking ahead, how will transmission lines or
21 transmission planning need to evolve or adapt to
22 support two-way flows to DER? So, I guess, kind of

1 what is the process then?

2 MR. BLADEN: I think Dan was touching on it a

3 few minutes ago. The main change that we're looking

4 towards is how to better coordinate with the

5 distribution level planning while they are occurring.

6 I think there's a recognition in many places, even

7 today, that distribution type queue processes are

8 something that looks a bit like the kind of

9 interconnection processes that you have at the whole

10 power level that need to occur for the integration of

11 distributed resources. And we would envision a time

12 and place where we are more closely coordinated, so

13 that our planning is aligned with the planning that's

14 occurring at the local level.

15 That would be an evolution and we

16 would need to work with the states and with the local

17 utilities in seeing that through. But we want to

18 make sure that what we are planning at the

19 transmission level is complimentary to what's being

20 planned at the distribution level.

21 COMMISSIONER EDWARDS: I have a question,

22 actually. I know that question has been established

1 and it has been established essentially over the last
2 couple of years we have been talking about this
3 shift, that it's a false premise, right? That's
4 because we are shifting to the integrated DERs, we
5 won't need transmission. However, in a state like
6 Illinois, where we're through all the primaries, DER
7 as opposed to solar, whereas Arizona, California,
8 Florida are sunnier places, how do you foresee those
9 places utilizing that transmission is it essentially
10 needing more lines? You mean by transmission though
11 you need it to move wind from west to east, but in a
12 place where your primary source of DER is solar PV
13 distributed generation, why is there such a stress
14 that need equals that of the continued transmission?
15 MR. BAKER: Well, I think what you see in
16 California is what Jeff was mentioning earlier around
17 getting that power to load particularly during times
18 when it's not matched with load very well. So, in
19 California shoal dearth months, you know, times when
20 you have lighter load and you have large amounts of
21 solar PV, you need to move that power somewhere. So,
22 I think that's the transmission expansion or part of

1 the expansion part of the rationale there in
2 California, is making sure you can get that power up
3 to the load.
4 MR. BARR: And I think there's another big
5 difference between California and when you live in
6 the Midwest because out there you have a huge amount
7 of load and under the CAL ISO model, there are
8 breakers that start big generators that are picked up
9 by the rate payers. Here, those same load breakers
10 are needed for like, large projects that gives you
11 MISO to drain. We make that up by the
12 interconnection solution services. So, it takes a
13 lot for a generator to do those things, a lot of
14 money for the line. So, it takes a lot to get a
15 whole bunch of generators built.
16 Where we live, we don't have a whole
17 lot of load, so low load density and having sources a
18 long ways away almost -- well, it drives home the
19 need for transmission, because you have to get the
20 power from there and it has to go where the load is.
21 It's kind of a unique case here.
22 MR. BLADEN: I'll add that -- and Scott was

1 getting to this a little bit. But within an
2 interstate power grid like MISO's or PJM's, you might
3 not see distributor resources grow substantially
4 across this.
5 So, MISO runs from the Hudson Bay to
6 the Gulf of Mexico. That's a pretty long area to be
7 thinking about the differences in the nature of the
8 resource you might build. You might build a lot of
9 wind in the central part of the Midwest and you might
10 build a lot of solar along the Gulf Coast. And even
11 though it's connected to the distribution grid, you
12 will find at times that there is more production than
13 there is consumption upon any particular integration
14 or distribution location and our opportunities to
15 share that excess creates an efficiency. And an
16 efficiency is a result that a transmission grid can
17 move the power from where it's being made to maybe
18 where it's needed.
19 The alternative is to go back to the
20 bulk of a system where we aren't sharing and the
21 walls that you build, the extra capacity to load more
22 than we need locally, just to meet those peak periods

1 where we are using more than we have locally. So, we
2 end up missing the opportunity to share rather than
3 having a more efficient outcome.
4 MS. VERPIL-GREER: Kind of piggy backing off of
5 what you just discussed right now, are there any
6 multi-state infrastructure investments that are
7 needed to successfully implement features in
8 renewables goals in Illinois like getting the wind
9 west? What planning and operational challenges do
10 these types of projects present?
11 MR. BLADEN: Within MISO, we have a pretty big
12 history of building transition as needed even for
13 more variation of renewables. We're actually in the
14 process of building and some are just actually
15 starting to come online this year, what we call
16 multi-value projects. Those are a good example of
17 how states can come together and identify the win
18 win. Anyway, the sharing of how to invest in
19 infrastructure to meet the needs of various states
20 for various purposes and keeping the costs as low as
21 we can. Our processes are designed to try and
22 achieve most of those things both in the past and

1 moving forward.

2 And we imagine similar opportunities

3 if they're needed will be brought through our

4 planning process. It's time that we are envisioning

5 something similar, but it's certainly plausible that

6 we could and our history shows we can put those in

7 place.

8 MR. BARR: I think that our company's

9 building -- I don't remember how many miles -- and

10 Iowa has roughly 400 miles of MV PVs, but in talking

11 to other transmission owners, there doesn't seem to

12 be much of an appetite for taking on more of those MV

13 PV type costs. There's a saying that all's well in

14 enrichment, load always pays. The problem is whose

15 load? Whose load in the end is going to pay? And

16 transmission owners are generally unwilling to incur

17 costs they don't absolutely have to incur. So, if

18 the mechanism, at least in MISO, is in place that the

19 interconnection customers pay, it will be hard to get

20 those projects built by those means. But in the PVs

21 and load efficiency projects, those would be the best

22 vehicle for expanding the transmission system.

1 MS. VERPIL-GREER: Thank you. Now, Scott, I
2 know you mentioned in this presentation about working
3 around or not working around, and I think, Dan, you
4 mentioned this as well.
5 Now, most DER are not wholesale, so it
6 can be hard to identify at the transmission level.
7 However, visibility in terms of types of resources on
8 the grid and the locations of these resources such as
9 data collection, modeling and forecasting. What
10 specific information do RTOs, ISOs and transmission
11 developers need when it comes to modeling,
12 forecasting and planning for the DER integration?
13 Who is best equipped to give you or to provide this
14 information to prepare for that transmission
15 planning?
16 MR. BAKER: I'm glad you asked that question.
17 Because I think this is early in this program and I
18 believe this term is analogous for integrating DERs.
19 So, we are trying to get to work on this at the
20 moment and there's a number of efforts on visibility
21 at FERC and at NERC within each resident class of the
22 RTOs within distribution.

1 So, there is a lot of work going
2 around visibility. I think to get down to a little
3 bit more specifics, when it comes to modeling, we
4 need to know how DER and specifically, in your case,
5 resources are going to behave.
6 And I think the most important point
7 there is with the new standard IEEE 1547, which is a
8 mouthful, but really it's going to -- that standard's
9 going to dictate how these newer resources behave on
10 the system. It's just very important material for
11 everybody, but for the RTOs, there are specific
12 aspects within that standard that we believe are
13 critical for bulk electric system reliability.
14 And the two items really are the
15 ability to have a frequency ride through and voltage
16 ride through. So, when you have a major disturbance
17 on the system, we want to know exactly how those DER
18 and that volt are getting around that disturbance.
19 And there's some horror stories about
20 this in Germany. They had their settings wrong and
21 all their solar tripped off line and it was a very
22 expensive problem that you have to go back and fix.

1 So, we want to implement this new standard in an
2 appropriate way. So, that's on the modeling piece.
3 On the forecasting piece, again, we
4 are using economic forecasts today, but anything else
5 that we can bake into those forecasts that can help
6 sharpen them. So, whether that's policy
7 expectations, whether that's distribution company
8 forecasts that may differ from these. So,
9 coordinating with distribution companies on DER
10 forecasts, anything that can sharpen that forecast
11 becomes very important. Because ultimately, that
12 forecast is going to impact how much capacity we
13 procure and it's going to impact our integration
14 planning process.
15 MR. BLADEN: Actually, let me just add one
16 little thing. I do want to emphasize something that
17 sometimes is lost in the conversation about
18 integrating distribution resources. In most venues,
19 the integration challenge is described as what do
20 RTOs need? What do utilities need? How are you
21 going to make this reliable? I want to emphasize
22 that our job is to make it reliable period and we

1 will.

2 What we need isn't necessarily a need

3 in order to ensure reliability. It's a need that

4 we're going to ensure efficiency. And it's an

5 important distinction and I don't want to lose sight

6 of it. Because this shouldn't be viewed as somehow

7 the RTO's imposing a requirement on the states or on

8 local utilities. It's rather an opportunity for us

9 to jointly figure out how to do this for the least

10 cost. Like we've done with generation. Like we've

11 done with transmission.

12 We didn't need to hand over to the

13 RTOs the operational dispatch and generators. But it

14 was more efficient, when we ultimately figured out

15 how to do it in a fashion that people were

16 comfortable with.

17 So, that's what this need is about.

18 It's about efficiency. It's about the least cost to

19 consumers. And so, the opportunity in front of us is

20 to maintain these costs that you have got or even get

21 better. It is not that reliability will be

22 compromised. It is that efficiency won't be

compromised.

MR. BAKER: This is such a great point. I have to add to it. So, an example of that is if we have real time data or something close to real time data for what is the active power output of the solar on the distribution system, we'll be able to forecast much better what it's going to do tomorrow.

That just means we are going to dispatch the system more efficiency. We are going to still keep the system reliable, as Jeff is saying. But if you have more data to make sure our forecasting is more accurate, it just leads to a more efficient outcome at the RTO level, which is a really good point.

MS. VERPIL-GREER: Continuing in this kind of vein, will current regional models and software systems be able to deal with the potentially tens of thousands of units as opposed to the number of generators they're used to currently?

MR. BLADEN: No.

MS. VERPIL-GREER: All right.

MR. BLADEN: We have already said pretty

1 clearly at MISO that the systems that we have are not
2 designed to handle tens of thousands let alone
3 millions of distribution local resources. And while
4 we are in the process of making a major investment in
5 the system of well over $100 million over the next
6 five to seven years to upgrade our systems, the
7 degree to which we desire to integrate that level,
8 that volume of resources, are going to require an
9 intervention on how we think about operating the
10 power grids.
11 So, I think the short answer is, no,
12 they're not designed to do that. RTOs were never
13 intended to build that kind of efficient
14 optimization.
15 But we have changed over the years and
16 developed new products and services to integrate lots
17 of new and different technologies and new and
18 different products. And I'm certain we can change to
19 lead this -- no, to meet this energy need. But it
20 will likely look different than the legacy system
21 that we have, which is the question that you asked.
22 MS. VERPIL-GREER: Dan, I want to ask you this

1 question: How does the behind-the-meter DER impact
2 the transmission system operation and planning
3 differently than the utility-scale DER, and what is
4 the value of its data and how is it being used?
5 MR. BARR: We certainly would like to know it's
6 there.
7 I mean, in the end, if a load serving
8 entity comes to us and they have, let's say a
9 customer, a large industrial customer, 100 megawatts
10 or more of generation behind meter and they're using
11 that to self-supply, well, they might have, let's
12 say, a few days a year where they're going to need
13 X-amounts of energy. Well, our goal is to supply
14 whatever they need based on what the loads their
15 demand tells us. So, we can even build the
16 transmission system out a type of need. But in terms
17 of, let's say, that there's an event on our system,
18 one we could use maybe that resource's available to
19 help with the cost if there's something that the
20 resource can contribute to. But the larger problem
21 can come from uncertainty in the stability in a
22 model, where you're looking at very very short

1 increments of time and the responses of generators on
2 the system. If you have a large generator, but you
3 don't know it's there and you have a relatively weak
4 system, you can get oscillations between the
5 generators where those generators could potentially
6 drive each other unstable.
7 So, in general, the more we know, the
8 more reliable the system is. So, our goal would be
9 to have all the high need generation made along a
10 larger model.
11 COMMISSIONER EDWARDS: Let me ask a question.
12 So, I had the privilege of going to
13 Australia a few months ago to study the shift of
14 renewable energy over there. And I met with our
15 colleagues over there. And some of you may know
16 Audrey Zibelman who is now the CEO of their grid
17 system there.
18 And one of the biggest things that was
19 shocking to me is that they have an abundance of
20 renewable resources. In one in four houses -- they
21 have a population of about 25 million. One in four
22 homes have solar. They don't have any financial, you

1 know, kinds of impediments. They're a very wealthy
2 country. And they have tons of winds. As a matter
3 of fact, I think southern Australia has a capacity of
4 about 60 percent of wind. It's a very resource full
5 country.
6 However, what I think Audrey and a
7 couple other people, the head of their Commission,
8 kind of referred to as an "epic fail" was that the
9 key piece they did not intuit was the integration,
10 right? So, how is it they had all the renewable
11 resources in the world, but they failed to use it.
12 They failed on the integration piece, which seems
13 kind of intuitive when you know how crucial it is.
14 So, you also know that the Illinois
15 Commerce Commission is leading -- I think, leading
16 the country into the future effort with our next grid
17 platform under the Chairman's guidance. And what
18 would you say that the next 18-month's collaborative
19 study, that will, in fact, kind of direct the
20 legislators, the legislature, the Commission and all
21 the key players on that integration piece, what would
22 be a potential "epic fail" here, so to speak? How

1 could you so -- what would happen for us to really
2 miss that integration piece? If you can, give like
3 an example. What's the worst thing that could happen
4 where everything would kind of fall apart? Could you
5 give us an example.
6 MR. BAKER: If I had to pick one thing, I would
7 pick the inverter standard. Don't miss the inverter
8 standard. It's going to be really important that
9 these resources behave appropriately and be good
10 citizens, if you will. So, I would pick that one.
11 MR. BLADEN: So, as you know, Audrey and I
12 worked for PJM for a number of years. And then, she
13 went to work in Australia and I went to work for
14 MISO.
15 And I agree that the inverter
16 standards is important. But I don't want to lose
17 sight of the value of the standards as we figure out
18 integrating resources. But when I think about what
19 the Commerce Commission can do it would be to work
20 with your neighboring states. Work with your RTOs to
21 think about how these resources will become part of
22 the fabric of ensuring reliability rather than

1 passive, potentially, encountering negative
2 influences on reliability, right?
3 So, the RTOs and the utilities and the
4 load server's job is to maintain reliability based on
5 what's happening with the load. And the degree to
6 which loads are essentially passive and predictable,
7 it's relatively straightforward. If they are passive
8 but unpredictable, it becomes harder.
9 And if the unpredictability is being
10 driven, whether it's the converter standard that
11 causes solar resources to drop off load amp and leads
12 to a disturbance or if it's because of the nature of
13 how the distribution network is interacting with the
14 transmission grid, I think that the opportunity is to
15 develop standardized ways for these new resource
16 types to be part of ensuring the reliability instead
17 of being things that we worry about ensuring
18 reliability around.
19 And I know it's something that MISO
20 has spent a lot of time beginning to think about.
21 Which is, what are the products and services that
22 resources in the future might be able to offer to

1 help ensure reliability rather than being the types
2 of things that we have to plan around?
3 MR. BAKER: These two things go hand and hand
4 by the way. So, I completely agree with what Jeff
5 said. If you need to develop some type of
6 requirements for how they'll contribute to the
7 reliability of the grid and if you create those
8 requirements, but then the physical inverter doesn't
9 have the capabilities to provide those requirements,
10 the frequency response for example, then you have a
11 disconnect. So, I think they really go hand in hand.
12 You need the technical requirements right and you
13 need the policy interconnection alignment right.
14 They go together.
15 COMMISSIONER EDWARDS: What I found interesting
16 certainly in your response is that you said you
17 really have to have almost like a regional effort,
18 right? You would be working with the other states.
19 But when it comes to the utilities in future and what
20 we are looking at to integrate these DERs into the
21 system, you have Illinois working with Next Grid,
22 Ohio, PowerForward, Minnesota, e21. Are we kind of

1 doing it wrong? Should we be collaborating instead
2 of having these state-wide efforts? Should they be
3 more regionally? We won't be offended if you tell us
4 what you really think.
5 MR. BLADEN: I don't know that anybody's really
6 doing it wrong, but I don't think anybody is
7 necessarily doing it right either. I think the
8 challenge is creating as much standard as a nation as
9 you can.
10 Because anybody that spends time in
11 the world of technology will tell you that if you're
12 trying to build things to meet 50 different product
13 types, 50 different service types, 50 different
14 technological standards, it's very difficult to get
15 an economy of scale around that. So, if you're
16 trying to develop a path for the service providers to
17 deliver reliability services to the grid, you want to
18 try to standardize them as much as you can.
19 Because anything that's standard in
20 Illinois, while it's a big state and it's an
21 important state, it's going to be that much easier
22 for folks to adopt if it's many states. And if it

1 were nationally, it would be even better.

2 COMMISSIONER SHEAHAN: I love the suggestion of

3 being the convener of states that are undertaking

4 utility futures studies and we will do that for sure.

5 I wonder if the panelists would

6 address cyber security and what the role of state

7 Commission's can or should be in the context of the

8 integration of possibly tens of thousands or millions

9 of distributed resources that, you know, in some ways

10 fall between the cracks under the current kind of

11 paradigm for considering cyber issues?

12 MR. BAKER: I hesitate, Commissioner, a little

13 bit, because I'm not a cyber expert. I will just say

14 that I do think is a -- obviously, it's an important

15 consideration, particularly, when you have more and

16 more devices that are going to be Internet connected.

17 Actually, I sort of saw an example of

18 this that during the solar eclipse. There was a

19 program that Nest thermostats did in which they

20 curtailed customer air conditioners during that solar

21 eclipse to help manage the reduction in solar that

22 was going to take place. Which was, I thought, kind

1 of a neat story, a neat story about the Internet. Of
2 things, devices, helping maintain the reliability of
3 the grid. But then, you can quickly go down, you
4 know, a negative path in which many, many, Internet
5 things and devices are controlled for malicious
6 purposes.
7 So, it's absolutely a consideration.
8 When it comes to DER, it's possible for these DER to
9 be connected to the Internet. And so, the cyber
10 security is very important. It's also part of the
11 standardization effort that I mentioned. So, it's a
12 big point.
13 I don't know the specific kind of take
14 home on, you know, what's the cyber requirement
15 around DER? But certainly that tightening that does
16 move over to cyber security for emergencies is just
17 starting.
18 MR. BLADEN: So, I'll second what Scott said.
19 And I'll add that the interesting challenges -- and
20 the Nest example is a good one -- is that when things
21 happen outside of some coordinated contribution to
22 reliability, as occurred with Nest, where they

1 effectively took it upon themselves to demonstrate
2 what their capability was without regard to whether
3 it was contributing to a liability or creating a
4 liability, is a real cautionary tale. Because what
5 we saw in MISO was an overshoot. And so, I think PJM
6 did as well.
7 MR. BAKER: Yeah.
8 MR. BLADEN: An overshoot in production of
9 demand relative to the reduction in supply. So, much
10 so that we had to, you know, carry over more
11 generation than we needed to be load and that turned
12 into more costs. It integrated reliably. We just
13 had more supply and ready to go than we needed.
14 Because, you know, we had a reduction that was going
15 outside a coordinated fashion.
16 I believe the same would be true if we
17 saw something similar occur in the form of cyber
18 intrusion, but we are able to maintain reliability
19 despite of that effect. The challenge is how do we
20 protect against that? I mean, I know there's a great
21 deal of discussion on how to protect the devices, the
22 Internet defense devices better.

1 We have already seen examples of
2 Internet devices being used on a malicious attack
3 basis. So, we should be cognizant of that. I do
4 think that in all honesty the potential for benefit
5 is far greater than the potential for ill.
6 So, I wouldn't let that become the
7 reason why we stand still. Let's be cognizant of it.
8 Let's take it seriously, but let's not stand still in
9 the process.
10 COMMISSIONER SHEAHAN: How should we be
11 thinking about -- you mentioned Nest which is an
12 interesting example, they had some of their own
13 problems with their own updates. You know, not
14 working as smoothly as they would have liked.
15 How should we be thinking about
16 consumer electronics that have an impact on the grid?
17 Meters or thermostats, obviously, you know,
18 potentially, have a very direct, but you could
19 imagine a world where you know the air conditioner
20 and the refrigerator and televisions and so forth are
21 all also connected. Should regulators or Congress be
22 thinking about the impact of those devices?

1 MR. BAKER: From a cyber perspective again or
2 just from a --
3 COMMISSIONER SHEAHAN: It could be cyber or
4 could just be you, know, how they work or sometimes
5 don't work.
6 MR. BLADEN: So, we have started to think about
7 this at MISO. And I'll offer a couple of thoughts.
8 So, first and foremost, there's extraordinary
9 potential there for how efficient we can get at
10 running the grid if the low side is part of ensuring
11 reliability. And whether it's what we're seeing in
12 the form of grid response emerge, which is heavily
13 driven by industrial and commercial loads which are
14 controllable, or it's at the much more consumer
15 level, retail level, through the Internet controlled
16 devices. There's extraordinary potential. So, we
17 should at least be thinking about what we can do to
18 extract that potential.
19 I can tell you that there are other
20 examples in other parts of our lives where consumer
21 devices are part of how we balance our systems. The
22 Internet, for instance, itself, is: Most devices

1 that are plugging into the Internet actually do some
2 self balancing in a way. When they plug in, they
3 have a situational awareness on the Internet, to and
4 from the Internet, from the impact full providers and
5 they actually have their own load pallets. So, we've
6 all experienced when you plug in the web address and
7 most of the time it comes up quickly if you have a
8 fast Internet connection, but every once in a while
9 it pauses. And most of the time that pause is a
10 result of your device realizing the Internet is
11 heavily loaded at that point, so it waits a second or
12 two to send the request to receive the data back.
13 And that's how they're balancing -- the Internet's
14 load bearing is managed.
15 So, you can manage it if your devices
16 are smart enough to do some of that themselves. The
17 refrigerator compressor waits a moment or two before
18 it kicks on. Air conditioning units could do the
19 same thing.
20 So, there's opportunities for us to
21 think about those standards to reflect how they would
22 be, as Scott was referring to, be built into device

1 standards. So, that when the devices are plugged in
2 they become systems in the power grid.
3 COMMISSIONER SHEAHAN: And do you model these
4 potential changes -- do you guys think about the
5 potential for, you know, you've mentioned balancing,
6 I guess, I'm thinking about, you know, you'd
7 mentioned the DOS attack. And there was one case
8 where the actors hacked household cameras and
9 televisions and things. And I just -- I can kind
10 of -- you know, we had a policy session, I think,
11 where someone expressed the vision that at some
12 point, you know, very soon, your coffee maker is
13 going to being connected. And they couldn't really
14 say why they thought that, but they said it will be a
15 fact your coffee maker will be a connective device
16 sometime very soon.
17 What happens when it's instead of like
18 a denial of service attack, what happens when it's
19 something turns all these devices on at the same
20 time, right? You know, that would be sort of the
21 opposite, but obviously would have a huge impact? Do
22 you guys kind of think about those scenarios?

1 MR. BAKER: I would say that there will come a
2 time when we are thinking about those scenarios and
3 need to plan. I think that's part of the resilience
4 planning. You know, how do we plan the system for
5 significant events like that? And how will we try to
6 prevent those and try to come back as quickly as
7 possible if you do have a significant event?
8 Now, I don't know whether the
9 controlling of Internet, of things, devices, will
10 classify as one of those significant events or not.
11 I think that's to be determined with just the
12 penetration of these things and what the potential
13 impact would be. But to me if it is, if it would be
14 considered one of those significant events, it would
15 be planned for in a resilience fashion.
16 MR. BLADEN: I will second that. We do it
17 today. We certainly plan for the services today with
18 the ability to either account for them with
19 sufficient resources that we can cover them or the
20 ability to come back very quickly. So, I would
21 imagine that as those sources of plausible scenarios
22 emerge, we would begin to build our mechanisms to

1 account for them.

2 And I also trust honestly that the

3 technologies will get better. That we will be able

4 to better protect these devices from being

5 infiltrated in ways that just isn't true today. And

6 so, I think the nexus of both of those things

7 emerging is where we will end up.

8 COMMISSIONER SHEAHAN: Thank you.

9 MS. VERPIL-GREER: Unless there are any other

10 questions, I think we will wrap up this panel.

11 Thanks to Scott, Dan and Jeff, the Chairman and

12 Commissioners for this great session. We will turn

13 it back to Acting Commissioner Oliva.

14 COMMISSIONER OLIVA: Great thank you. So, for

15 everybody here, we will now break for lunch until

16 1:45. Enjoy your break and we'll see you back here

17 in an hour and 15 minutes for our second half of our

18 Policy Session. Thank you.

19 (Applause.)

20

21

22