

Chris Mooney: First, I want to go into a little bit more detail about the reliability issues that have been raised in relation to the Clean Power Plan. I think we all know what it is, I don't have to give you too much background, but this is of course the EPA's regulatory approach trying to cut down greenhouse gas emissions from the power plant sector. And the way that it is going to be done is letting states hit emission targets through a variety of means, and they have choices, and that can include through more renewables, it can include more natural gas, it can include more energy efficiency, and so on.

So, first, let ask Commissioner Clark. Critics have raised reliability concerns about this plan. Can you give a sense of what they are and how much you are concerned about them?

Commissioner Clark: Sure. The Commission has been going through a series of technical conferences with stakeholders; EPA has been at the table as well as industry and state regulators. And this issue of reliability is at the top of everyone's mind because this is a sea-change in how energy will potentially be produced into the future. So whenever we talk about the Clean Power Plan there are sort of two prefaces that we have to make. One is understanding the rule as it is proposed today, understanding that it may change significantly over the next few months.

And, number two, assuming the courts uphold it, because we know this is going to be something that is challenged legally, it is certainly outside of the traditional box that we've thought of regulation under the Clean Air Act.

So assuming those things, the things we are hearing most often are, number one, timing. The interim goals that are set for 2020 are really more than interim rules for a lot of utilities. Because of the way utility investment is made on a very lumpy basis, a lot of the utilities see this is a cliff rather a glide path toward 2030. And if it maintains that sort of cliff-like apparatus of having to meet huge targets by 2020, it causes a lot of timing problems. And I think that that's well recognized and acknowledged, it's a concern that I have for certain. So I'm hoping that EPA can address that issue first off.

The second issue, which I think is one that we are beginning to develop as part of the tech conferences, is that some entity -- I happen to think FERC is in a fairly

good position -- but some entity has to look out over the grid as a whole as these various state and federal implementation plans come together and make sure that as those plans are stitched together that they make sense both from a grid operations standpoint but that they also make sense from a market operations standpoint understanding that these are large interconnections across many states and are regulated not under the Clean Air Act for purposes of market and reliability but under the Federal Power Act, which is under the authority of FERC.

Chris Mooney: Let me ask David Owens the next question. You contend, if I get this right, that there will be potentially negative impacts on reliability of service. Is that EEL's position?

David Owens: In the technical conferences that have been conducted a number of the participants have indicated, for example, if you've got to build natural gas pipelines in a two-year period, that's impossible. So there potentially could be reliability challenges if you have a 2020 interim target of CO2 emissions that you've got to reduce.

So we are observant of that. That infrastructure takes more than two years to construct, so it is very important that there be some sensitivity about the potential impact to reliability if you are not able to build the infrastructure.

We also make the point that you have to be prepared that to the degree in real time an emergency occurs, such as a polar vortex, where you are seeking to move off of coal and you have a situation where if you shut down a coal plant you will not have sufficient supply to meet demand, that's a reliability issue. So we argue that there needs to be a reliability safety valve. There needs to be some sensitivity to sometimes unexpected events could occur, and there needs to be the realization that reliability is very important to our nation as well.

Chris Mooney: Let me just follow up on that. Last month the Energy Department put out a study about pipeline infrastructure and basically -- I reported on this -- the bottom line is that, yes, we will definitely need new natural gas pipeline infrastructure. But the study found that it wasn't anything radical. It actually was less than what was built between 1998 and 2013. And so they are saying that this seemed very manageable.

David Owens: I don't think the study, at least in my view, really took into account the plans that are to be filed by the states once the EPA's final order comes out. In fact, I would suggest very strongly that once those plans are filed by the individual states, that that study would have to be substantially updated to reflect reality. So I don't think the study really reflects that conditions that will exist once the final order from the EPA comes out this summer.

Commissioner Clark: If I might on that study, what is really important to understand about that is that the type of modeling that is going to have to be done for reliability of the grid is very granular analysis.

David Owens: Yes.

Commissioner Clark: The DOE study, as I understood it and when I looked into, basically said this: Look, where shale regions are being developed is much closer to load than it used to be. So if you have Gulf Coast gas that was being produced it would take many, many miles of pipeline, lots of compression to get the gas from Point A to Point B where it was being used. Especially with the Marcellus, right on top of the eastern electricity markets, yes there will be less miles of pipe that need to be built. The challenge is you still have to be able to move the gas from Point A to Point B, which entails building pipe in very critical areas, in more densely populated areas than we have done in the past, and areas that are more challenging to site than they have been in the past. So I think we need to read that DOE report in that context.

Chris Mooney: And I want to ask more about fights about where you put pipelines in a minute, and the security implications of that. But actually I want to turn a question to Robert Johnson, I want to bring you into this. How does the price of natural gas play into this? And will that, potentially as it changes over time which it certainly will, will that disrupt markets? Can that disrupt reliability? Or do you think that we are going to have enough stability?

Robert Johnson: It guess it comes down to a question of whether we believe that the pricing we have seen since 2009 is the new normal, or if the pricing that we are going to see over the next 15 years is more similar to the last 15 years – the 1990s, early 2000s where we had significant price volatility in natural gas. Certainly we've had a big supply revolution, but we are also introducing new

drivers of demand: LNG exports, pipeline exports to Mexico, more power plant demand, more industrial demand. So there are some shifting dynamics to consider there.

We also have to consider whether the supply revolution is sustainable from a social license to operate point of view, and whether both the upstream permitting is going to be sustainable and whether the key infrastructure projects will be sustainable as well. I think it will be, but there will be some local and state-level issues that will have to be managed closely, especially in the Northeast.

Chris Mooney: Speaking of pipelines, they can be controversial, we see fights over them all the time. Does it reach a volume where activists' opposition to particular local pipelines can substantially affect whether there is enough natural-gas infrastructure to implement what we need to implement under the Clean Power Plan? Or are these just anecdotal and not really systemic?

Commissioner Clark: What is really important from FERC's standpoint – speaking for myself, but I think this is pretty clear through agency orders – is that we have site infrastructure under the statutory authority that we are given under the Natural Gas Act. And those decisions that we make under the Natural Gas Act are based on a record that is developed before the Commission. So while we know that there's lots protest, there's more intervention than there have been in the past, what is important from a decisionmaking standpoint is what actually gets into the record itself. To the degree that the record is fully developed and has more interventions, it may take the Commission more time to get through those because we have to answer every protest and every intervention that comes in. Citizen involvement, state government involvement can certainly lengthen out the timeline of siting timelines.

At the same time we are bound by a statute that says we have to site in a certain way. And then the goal for the Commission is that when an order goes out the door we want to make sure that it is upheld by the federal courts, because we know a lot of these are going to be appealed. It is increasingly litigious in this area. And we want to make sure that regardless of the decision that the Commission makes – for, against, or siting it in this location as opposed to this location – that a federal judge can look at that and say, based on the record that was developed in this case, the Commission made a reasonable decision.

Chris Mooney: David, do you want to add anything on that?

David Owens: Oh, I agree with him. I would also, however, switch it from natural gas pipelines to electric transmission. FERC has the unique responsibility of certificating all pipelines; you don't go to the state PUC you go to FERC. But if you are building an interstate transmission line, you have to deal with each individual locality, each individual state. So, one part of the Clean Power Plan obviously is to rely increasingly on renewables. Many of those renewables are remotely located from load centers, so it may require the construction of additional transmission, which takes a lot of years to build, much longer than natural gas pipelines.

Chris Mooney: I want to bring in transporting energy by rail, here, in connection with pipelines, and let me direct this question to Robert Johnson. This has its own security concerns. I think people generally perceive that there seem to be an increasingly number, or at least maybe they are reading more headlines about rail accidents. How does that fit in the context of arguments over pipelines? Are arguments over pipelines leading to more use of rail?

Robert Johnson: I think there is a connection. I think crude by rail has grown so dramatically that we weren't getting accidents five or ten years ago because there just weren't simply the volumes moving. We saw in the DOE data this week that it's over a billion barrel a day now that's moving, which is larger than [inaudible] pipeline, for comparison. So I think that's not surprising in that respect. Also we have a new safety regime that has come from the regulators that's basically just taking hold now, that will take time to implement as well.

That said, I do think the difficulties that my fellow panelists have described in terms of permitting a pipeline infrastructure project both large and small has pushed the industry more toward using crude by rail and that will continue unless, particularly, people building liquids pipelines can see a little bit more of a fixed time frame for getting projects approved and moving forward.

Chris Mooney: So beyond pipelines, let me just ask about the grid more generally. What are the main things that any of you think it needs for improved security? And are the right investments happening already? Or do we need to do a lot more?

Commissioner Clark: There are a number of areas that we've been focused on at FERC. If you were to look at the security of the grid, the reliability of the grid, we've broken down a number of sub-areas under that that have been very active for rulemakings that the Commission has been undertaking. For some time, and probably the longest period of time, we've been dealing with some of the very traditional reliability issues: tree trimming, making sure that utilities are training their staffs properly, those types of things, visibility of the grid. That moved into cybersecurity, and we've been issuing a series of orders on cybersecurity and encouraging an ecosystem of security.

That has moved more recently into physical security, and requiring utilities to come up with an assessment of their threats and then ways to mitigate those threats from a physical attack vulnerability standpoint for the critical infrastructure on the grid. The next area that we're delving into is a little bit behind the others in terms of timeline, but we are getting there quickly, is trying to assess and mitigate issues related to natural disturbances on the grid like geomagnetic disturbances.

Actually yesterday, I think, was the first day that those went into effect in terms of the utilities needing to have an operating plan for when they see a geomagnetic disturbance, how they will deal with that in real time. The next step of that is assessing how their unique circumstances of the grid where they operate may be affected by geomagnetic disturbances and coming up with a mitigation plan for it.

Chris Mooney: How do all the different companies coordinate when they are thinking about these kinds of things?

David Owens: So let me respond in a more focused and comprehensive way than what the Commissioner did. FERC certainly has mandatory and enforceable reliability standards, but there are three areas that I think we are focusing on in terms of enhancing the resiliency and reliability of the grid.

The first on relates to deploying tools and technologies. So I happened to have the opportunity when Superstorm Sandy occurred to be detailed over to FEMA for two weeks to help in restoration efforts. And what evolved from that was a tremendous partnership involving government and industry. There is an

Electricity Sub-Sector Coordinating Council, which involves FERC, Department of Energy, Department of Homeland Security, Department of Defense, the FBI, all federal agencies who are working very closely with the electric industry in tools and technologies, and information exchange.

It is very important that if we see an occurrence on the grid, that that information goes to the right people. And so, working with the Department of Energy we have expedited security clearances so whatever the government sees occurring on the grid, industry is also able to see it.

But then when you see something you have to be able to take action, so you have to be able to analyze its impacts, the risk that it creates. So we have risk assessments that we do with the government. I think that the deputy secretary mentioned very aggressively that she has been working very closely with industry in these areas.

So not only do we have this under way, we also realize that we have critical assets, our transformers are critical assets. So for some time now we have had a spare transformer inventory, where we inventory, we look throughout the entire grid, we look at our critical assets – transformers are critical – we have an inventory of those transformers.

We also have a data base, not just for transformers, but we know in real time that if you need bushings, if you need other critical elements you have access to them.

We do drills with the government. We've never done drills before. We did GridEx II last year; we'll do GridEx III this year. So, we are getting very, very prepared. We look at preparation, prevention, response and recovery.

Chris Mooney: Are there any security threats that are not actually threats? People get scared about a lot of things. They get scared about their smart meters and what they are doing to them. Is there anything that people actually don't have to worry about? Anything?

David Owens: Anything they don't have to worry about? They have to worry about paying their bills.

Chris Mooney: I just thought we'd go in a different direction here.

David Owens: I think that people...

Chris Mooney: People are afraid that radiation from Fukushima is reaching the West Coast.

David Owens: I think the most challenging area, and I suggest not just for the electricity sector, it's for all vital, all network services, would be cybersecurity. That keeps me up at night, a cyber-intrusion. Because unlike a physical disruption – you can see that – a cyber-disruption you can't see. You don't know what's lurking in the background, and that's why it is very important that we have very sophisticated tools in working with the government. The best tools, detection tools so that we can understand what's on the grid. That keeps me up at night.

Robert Johnson: If I could just add to that from Eurasia Group's point of view, and we do a lot of work on international political risk and threats. Unlike the terrorist threat, the cyber threat – like, where is it actually coming from? Sort of that upstream piece of it. Is it a state-sponsored issue, is it a terrorist issue, is it more of an anarchist-type agenda? What is the real nature of the threat? It is so much harder to qualify than where we are, for example, with Al Qaeda-type threats where we know they are certain regions and certain programs that are in place. So I think that is the biggest challenge we see on the cyber side.

Commissioner Clark: You are getting at an important point, which is as FERC has gone about promulgating some of these reliability standards there is a challenge that – any one of these threats could ultimately be a threat to the bulk electric system itself – so the challenge becomes that if everything is a priority, then nothing is a priority because there is only so much, so many resources that you can put into protecting all aspects of the grid. So what we've been trying to do, and I know the industry has been in a similar position, is trying to weed through and make sure that we are focusing on those issues that have the greatest threat, or the greatest potential of threat, to the bulk electric system.

But it is a culture change that has to take place both from a regulatory standpoint and within the industry, moving from a sort of check-the-box kind of auditing process for reliability standards toward more of a risk-based focus on reliability

standards, much like the transition that has been made in other industries such as aviation, medical communities, so on and so forth.

Chris Mooney: I want to shift a little bit more into the international geopolitical realm. When we hear the term energy security, I think a lot of people think it has something to do with how much the United States is dependent upon foreign sources of energy, and, thus, not having as big of a dependence now as we once did obviously has all kinds of security implications. That's sort of the radical development in US energy, right? The fracking revolution leading to a lot more of our own oil and our own gas. This has been a momentous factor in the recent plunge in oil prices and much else. So I want to direct this question to Robert Johnson: What is the security implication of this really big change? I know it is a big question, but how do you look at that?

Robert Johnson: I think there is a lot of ink spilled on the question of defining energy security, and I think in this administration it has been about obviously reducing vulnerability to disruptions in imports, it's been about affordable energy and about moving toward a more sustainable profile of energy independence from an environmental point of view. But in terms of geopolitical impact, it means that the US, although at this point with low oil prices largely a net benefit to the economy, we're still a consumer, but we also have more a producer's mentality. We are thinking more and more about the role that US oil and gas production plays in the world impacts geopolitics.

Whether it is having a little bit more room to get US allies to cooperate on Iran sanctions because the US is no longer competing for as many barrels out there that can go to replace Iranian barrels for our allies; whether on the gas side its talking about, as you mentioned earlier with the deputy secretary, about the possibility of US LNG balancing the market and creating more flexible supply that down the road, not now, but down the road could help Europe. I think these are some of the big geopolitical changes that we are starting to see.

Chris Mooney: I also understand that, tell me if I am wrong about this, you've argued that political turmoil in the Middle East is leading to less investment there and so some of that money is going to be coming here.

Robert Johnson: I think that is a great question in terms of, you know, we've looked at a world where over the last, really since 2009-2010, pretty much any US, Canadian or European energy company on the oil and gas side, if they have a dollar to invest they want to invest it in North America in unconventional plays. They have been shifting capital away from riskier markets, particularly the Middle East. So the big question now is, is that still sustainable in a \$50 world? Right? I think we don't know yet, but I do know that those top 25 or 50 oil producers want it to work and they'll try to use technology, they'll try to manage costs, they'll try to find ways to innovate to be competitive in this \$50 dollar world because they still would rather be here than anywhere else.

Chris Mooney: So can you speak a little bit also to how the changing global picture of energy affects how we relate to Russia and China.

Robert Johnson: Well, what is interesting with China is that since 2008 US dependence on OPEC has gone down and Chinese dependence on OPEC has gone up. And now a similar pattern has played out in gas where China is looking more and more at import dependence from the Middle East through the Straits of Hormuz, Straits of Malacca and from pipelines from Russian central Asia. So, in other words, their energy profile has become a lot more political risky while the US has become less political risky.

On the Russian side, a lot of this has played out that 10 years ago Russia was expecting to export LNG to the US, now they are basically competing with the US LNG exports for market share in Asia. So these are pretty seismic changes that are taking place.

Chris Mooney: Let me ask a broad question as someone who, I mean you've probably thought about all this more than me, but when I look at the energy space it seems to me that changes have happened really, really fast. And they are not always the changes we expected. That's why you see oil prices plunge so fast, that's why suddenly everybody is putting solar on their roof – five years ago where was that? In light of that, in light of this ability for changes to happen so quickly, are the reliability and security questions that we are talking about now the ones that we are going to need to be talking about? What are the unknown unknowns, the known unknowns, etc.? What are we not talking about?

Commissioner Clark: The deputy secretary in her conversation brought up I think a really important technology that will help answer that question, which is, how quickly is there a rapid development of utility-scale storage? To me, if you look at the next potential shift, and it is really based on the technology, it's the issue of energy storage. Because the little bit kind of scary area that we are moving into with regard to the tightness of the grid is this. We've gone from a grid that was primarily dependent on resources like coal and nuclear that had large stockpiles – you have a 30-day supply of coal in a pile sitting outside your plant or you have fuel rods. We still have a lot of nuclear plants and I hope there is a space for that in the future but there aren't a lot of new nuclear units getting built. So it was dependent on that type of resource.

We are moving toward a grid that very dependent on natural gas, which has to be flowing through the pipeline at the time that it is being used, and intermittent renewables, especially in different parts of the country like in the Southwest where you see the spike in rooftop solar. That's a much tighter grid. It creates operational challenges for the engineers who run the grid. It can create market challenges for those of us who oversee the markets.

If you can develop utility-scale storage it answers so many of those questions and solves so many of the problems that we potentially have out there. So if I was looking at any one technology that I'd want to know about before answering that question, that would probably be the one.

David Owens: I would agree. Long-term energy storage would be the transformational technology, but since we don't have it today then the grid is essential. Even if you have distributive resources, distributive resource has variability, it depends on the weather. So it needs to be...if the customer wants electricity 24/7 it has got to rely on the grid. That grid has a broadness of resources that are available: coal, nuclear, natural gas, not just renewable technologies.

I think the other thing that is important to point out too, even if you make the decision that you'd like to rely extensively or exclusively on renewable technologies and have a microgrid with battery backup, you still need to rely on that primary grid. So I believe that if there are evolving technologies – we are moving increasingly toward a hybrid electric system. A system that has central

station power supply with the bulk grid as well as distributive energy resources, not just renewable technologies but demand response, even electric vehicles is a distributive technology, but all of those technologies look at the platform that makes them work is the grid.

Robert Johnson: I would just add to that because we have talked much about the demand side yet, but all of this is taking place in the context of greater efficiency and decelerating demand growth for electricity as well. So that just adds another complicated element to the planning that is going on.