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Brookings Intersections Podcast:
Energy and Climate Policy Under the Trump Administration

Wednesday, January 4, 2017

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PITA: Welcome to Intersections the podcast, where we discuss the angles on policy issues, part of the Brookings Podcast Network. I'm your host Adrianna Pita and with me today are Bruce Jones, who is the Vice President and director of our foreign policy department, an expert in international governance issues among other things, and cochairman with our second guest, David Victor, of the cross Brookings initiative on Energy and Climate. David is also a professor of International Relations at the School of Global Policy and Strategy, and director for laboratory on international law and regulation at the University of California San Diego, specializing in energy and climate issues.

Gentlemen, thank you both for being with us today. We're going to be talking today about climate issues and I thought I'd start with sort of the big overarching question--the election, what are the effects going to be? Everyone who cares about climate issues, I think was incredibly dismayed. Apparently climate scientists, the report from Washington Post about them scrambling to get their data onto private servers so that it can't be discarded.

On the other hand, some people are trying to look for a ray of hope out of the state level action, that there's some progress being made there. You've got Governor Brown promising to send up his own climate satellites if NASA and NOA's budget gets cut, so I wonder if you can both start by offering, sort of, your actions about what we can expect from a Trump administration on climate issues, what does it mean to the Paris Accord, and does state level action…could that really sort of compensate for whatever happens at the federal level.

JONES: Well, let me start by making a controversial point, which is that your starting point is Paris and the targets that the United States set for itself in terms of carbon emission reduction. The United States was not going to meet its Paris targets if Hillary Clinton got elected and it's not going to meet its Paris targets with Donald Trump as the elected president of the United States. There was no reality to the notion that United States was going to meet those targets, those targets were ambitious, not necessarily by the standard of the desired change, but by the standard of real policy and real technology. They're based on a series of assumptions about the speed and effective policy adoption, and of a set of technologies that are totally untested at commercial levels. So that was never going to happen, and that doesn't mean that more progress might not have been made under Clinton presidency than a Trump presidency, though.

But certainly the perks that David and I've been talking about is one that we call diplomacy last: in other words, instead of starting with this notion of Paris and its goals, what we actually need to do is look at actual economics of energy markets, the actual investment strategies of companies and the major users--and the major users are cities, state grids etc., so it does matter a great deal what happens at the sub-state level, what happens at the level of individual states individual cities. And there, I do think it's interesting to see that a lot of major actors have already decided that they need to be in the mode of thinking about a transition to a lower carbon energy mix and a change in U.S. federal policy isn't going to be the decisive factor in that.

It will have some effect in terms of opening up new lands to drilling, and there might be another series of effects, and David might elaborate on that, but I don't think

we should assume that a shift in US federal policy is a night and day question for industry and for the major consumers…all the electricity and energy, you know.

VICTOR: I think that's exactly right and it's true not only that the United States was not going to meet its own self-declared Paris targets, but the whole Paris process as a whole was not going to stop global warming well below two degrees, which is the established goal for the whole enterprise, for the same reason that Bruce laid out. You know there's a tremendous amount of inertia in the energy system, it's difficult to change directions and the kind of bold visions of how quickly we can transform the energy system aren't really being met by the reality on the ground.

But I think for that same reason people have become a little hyperbolic and they're talking about what the Trump administration is going to do. My colleagues who were worried that the all this climate data is going to be deleted, that just seems a little out there from my perspective, the same is true on the policy front. I don't think we're going to see the Trump administration adopt lots of new policies around decarbonization, I think they'll try to roll back some policies, the courts are going to help them on that already. The Clean Power Plan for example is in some trouble in the legal system and that's just really in a deep freeze almost.

But I think the key point is that firms know they need to decarbonize and there's some uncertainty about the rate at which they're going to do it. I do think we're going to see the initiatives on the Trump administration are going to point in some sense in different directions on carbon emissions, although not because they're worried about carbon.

VICTOR: You know on the one hand you're going to see presumably a little more drilling in the fossil fuel industry, big effort to revive coal, most of which is going to be a fantasy, because the coal industry's troubles are not just federal policy troubles, they're fundamental for the markets. It's going to be a big emphasis on drilling for natural gas, it's actually going to accelerate the extinction of coal or the depression of coal in the United States.

To me, one of the most interesting things to watch is going to be on the nuclear side, this big effort inside the nuclear industry to improve the economic performance of the existing nuclear fleet. If that's successful, along with some more federal support, a lot of work going on the states right now. Illinois, for example, you could see plants that would otherwise close actually staying open, and the overall effect of that in the U.S. electricity fleet is to continue to have a significant amount of power coming from zero emission nuclear sources. So I think it's actually going to be a mix, and at least for the first four years, the impact on the overall emissions trajectory is going to be really small and actually probably indistinguishable from the Clinton presidency.

PITA: Okay, that's very interesting. What about some of the projected nominees for the office? A lot of people have talked about concerns about Tillerson, about his connections with Exxon, of course. Do you have any opinions about the way the cabinet is looking to shape up and what sort of effect that might be expected to have on particular policies?

JONES: Well there's any question that the cabinet is by broad inclination more oriented towards fossil fuels and skeptical on climate change, probably with the exception of Tillerson, and that sounds ironic but it's certainly everything I've seen out of

Exxon the last few years, it suggests that they're where David suggested. So, essentially all the energy majors of oil and gas majors have understood that they need to be making a transition. I don't think that changes if you are a major oil and gas player, you're looking at global markets: China and India aren't changing course, Europe isn't changing course, even if there's a kind of wobble in the United States for a few years, it doesn't really change the market in which you are operating. So he comes out of a background with a corporation that's understood that it needs to change course.

I do think the speed of change will be affected by the attitudes of the Trump administration to some degree. I don't think it's dramatic one way or the other, but it will have an impact. In terms of the EPA pick and Department of Energy pick, obviously these people who are deeply skeptical about the role of government in this place, so I think if David and I were people who believe that the role of government was fundamental to the function of energy markets in the United States, we would be more worried but the reality is that the government is a modest actor in US markets. We'll get on I think later to what it means for the global dynamics but in U.S. terms, I think it will be at the margins.

VICTOR: Yeah and you know, I think on EPA and Energy, there's some interesting parallels to what happened in the first three years of the Reagan administration where, you know, energy and climate were not major topics in the election. These were always going to be seen as somewhat peripheral to the core of the work of government, and I think Trump has assigned people to those agencies that frankly aren't that important to his core mission, and they are not surprisingly hostile to

the missions of the agency. Perry says he wanted to, he couldn't remember, but he wanted to shut down the Department of Energy.

Very similar claims were made by early secretaries in the Reagan administration, similar in EPA. And I think we have to remember that the agencies themselves are going to hunker down and fight back and so the relation, the kind of hostility between the leadership of these agencies, and then the normal day-to-day work of the agency is going to be the defining issue. And so the leader can keep the agency from doing more stuff and maybe steer the agency a little bit here and there, but this this kind of warfare inside the agency, I think is going to be the big story. And frankly, I think we also need to remember that if Trump wants to be reelected, he's going to need to pivot not too far into his first term towards putting people in charge who were not seen by the public as administratively incompetent or hostile, and so we could well see these picks actually change fairly quickly if they're proved to be not capable of running their agencies.

PITA: Or they might not even clear nomination process. I guess that's another thing to keep in mind.

VICTOR: Yeah I expect, there has been traditionally, although this is not a traditional election, there has been traditionally a deference to the incoming president around their choices and I expect that at EPA there's going to be a very hostile confirmation process, but it looks like these nominees will probably get through unless we see something dramatic in the next few weeks.

JONES: I think there are also a couple other actors in this that we tend not to think about as being part of the energy mix, but Secretary of Treasury has a big role in

how the United States thinks about its financial structure and an investment structure and that's a hugely important factor in what the shape of investment markets is and for energy. We don't know what's Steven Mnuchin's thinking on these issues is, we have no priors on this, I don't think he has priors on this. It'll be interesting to see how he sees his role and if you're looking at the United States, and you want to see a robust economy and you want to see growth, energy is an important part of that and you can't be flying against the face of kind of core market trends. So I think there will be an interesting struggle within the administration over how to approach this set of questions.

VICTOR: Yeah and the Department of Energy actually isn't mostly about energy; it's the National Labs, its nuclear policy, in particular the nuclear weapons, and a huge part of the secretary's job is actually managing that. It's an area where there's no experience from the nominee and the area where the Department of Energy actually affects energy is in investment, in innovation, and in new energy technologies.

DOE (Department of Energy) has been running a very successful program called ARPA-E, which is over the horizon energy technologies so I do expect to see the parts of DOE that always make the far right really unhappy, like energy efficiency and so on…to see those, really where they probably suffer, but I think one of the big wild cards is about how much spending will take place for energy innovation we could see a small budget administration which cuts spending on innovation way back, that seems to be the most likely outcome but when we look at past Republican administrations, and to some degree bipartisan support for energy innovation, it's actually quite plausible that we'll see an extension of investment in energy innovation. I think there's a huge amount

of uncertainty and that part of the energy equation that DOE actually has a big impact on, that's one of the most uncertain areas.

PITA: You're getting a little bit at what my next question was going to be: Are there any sort of unexpected positives that we might say came out of the administration?

VICTOR: Well I think the unexpected positives are that it's not going to be this kind of blood bath for policy, I think. So one of the unexpected positives, one is some of the states are going to mobilize and so you can see more happening in the states than you would have otherwise, because of the strategic effect the counteracting forces to the existence of the Trump presidency. And I think I saw the Sierra Club had more members sign up in the eight days after the election than they had the entire year. We had a huge amount of fundraising and political organization by environmental groups, states that have a consistent environmental record including my state of California, but many others, New York, and the list goes on from there.

So you can see a lot of effort inside the state it's going to create something that we're going to see, as I think more of a regulatory patchwork inside the United States which could be very costly, you can actually start to see industries organizing themselves to try and get…I'm not saying new legislation, but the federal levels to try and tamp down some of this tremendous diversity of the state level, because it makes it very hard for firms that operate globally across the entire country to operate in this kind of environment so I think that's going to be one of the unexpected upsides for energy policy. It's not necessarily going to be a well-designed energy policy, but one of unexpected upsides.

And as I mentioned a little bit ago, the impact on nuclear, and you know, whatever your views are about nuclear, there are some parts of the nuclear energy industry that really needs serious attention right now. One of them is about the economic efficiency of the existing plants, one of them is the waste, the back end of the fuel cycle, so Yucca Mountain or alternatives to Yucca Mountain, plus something called consolidated storage, so temporary storage facilities of the nuclear fuel; it can be put not at the 60 plus reactor sites around the country but at a couple more centralized locations that now looks set to go forward. So I think there will be some unexpected upside on that.

JONES: I think we also have to be focused on the most important change in American energy markets and global energy markets the last two decades is being natural gas in the United States and now starting another context as well. A lot of that came into fruition under the above administration, but all the policy change that made it possible happened in the Bush administration, and so this has been actually an evolution that has occurred across administrations, with pretty wide bipartisan support. I can't see why it would be that the Trump administration would try to derail that, certainly we would hope they wouldn't that kind of extraordinary American market dynamism that's led to the fracking revolution and unconventionals revolution, both in oil and gas has been an extraordinarily important story and one that should continue, and there’s no absolutely no reason why they should seek to undermine it.

I do think that David pointed important issue: they've made a number of promises on coal, if you wanted to live up to them you might want to be trying to interfere with the natural gas market…that would be a kind of crazy policy and it would be hard to

achieve. Much more likely is that they will continue the trend of getting out of the way of the market on natural gas.

VICTOR: Which I think means more exports potentially, that the process has already begun under the Obama administration but might be accelerated a little bit to create a somewhat tighter linkage between the U.S. gas market and other markets. Especially Atlantic based because the Atlantic Ocean is smaller than the Pacific, so it's a little easier for the markets across the Atlantic to connect together. So that would help improve the prospects for gas, and I think one of the big surprises could be on the coal side. If you really want to help recover the coal industry, or at least stop the erosion, you need a game plan for making coal viable in a world where there are limits on emissions. And that means investing and probably with carbon capture and sequestration CCS or a bunch of variants on that, that's an idea that's been around for a long time but almost none of the projects actually get off the ground. You could actually see some projects get off the ground, which once you start to demonstrate that technology for coal, that is relevant for other primary schools and that could be a big deal.

Going back to negatives for a moment, one thing that they could do with EPA of course is to reverse what EPA has done on setting standards for fuel emissions for cars, and that would be, I think, a mistake because you've already started to see serious innovation, your whole series of lines of hybrids and electric hybrid service coming on market next year and the year after that with the anticipation of going to meet those standards by that within the next decade. If you change that incentive, the industry might pull back from that, although even there I suspect we will find that the energy has already made the investments necessary for that sort of innovation.

In my talks with market actors, there also seems to be a correct recognition that this administration and it's kind of rhetorical attitude on climate is an outlier, and the industry has to bank on pressure, sort of assess the rest four years from now or even eight years from now. We'll be dealing with a different president who would change policy in a very different direction, and then that kind of disruption is exactly what the market doesn't want.

And one of the reasons why the market and certain key market players came in underneath and came in behind the Paris process and those kinds of things is because they recognize that uncertainty about which direction we were going on the carbon regulation was actually the biggest obstacle to effective investment in the industry, regulatory certainty pathway, a clear pathway was what they were demanding to have. And then they got to control, a wrench in that now is costly for them, so at least in the first instance, a lot of the market actors are going to say, well we'll just ignore that wrench and we'll keep on the path that we're going, under the assumption that still is the path both in global terms and in the U.S. terms for eight years from now and at the state level.

JONES: Yeah, it's one thing to say during a campaign where there seems to be sometimes little relationship between what's said and what's intended, to say mean things about the Paris process and the UN and so on. I do expect from administration is going to freeze the funds that have been pledged to the UN Global Climate Fund but you know to just walk away completely from the Paris process, blow it up and so on, it's going to be a tremendous amount of resistance from industry, from other very important

allies, and you've got other important things happening in the world and I think they're learning that quickly.

And so the idea that they're going to find more plausible is going to find a way to disengage it from a multi global multilateral processes and engaged to a greater degree in smaller groups, other kinds of settings that are more in line with their view of how you do deals, and in that sense it's actually very similar to what the George W Bush administration did, where they withdrew from Kyoto, unsigned Kyoto in some sense and then they set up a parallel process that is not particularly well implemented, a parallel process to work in smaller groups and work on particular technologies.

And it's quite possible to see something similar here

VICTOR: I would say, by the way, that they if they do decide to walk away from Paris or simply defund the mechanisms, etc. not that the U.S. is a major funder of these mechanisms. My advice of them would be to think twice about doing it, and not just because of climate reasons, for these kinds of things which are not going to be of particular interest, but simply from an American leadership perspective, I think that if you United States at this juncture walk away from Paris itd be pretty obvious what's going to happen and you already see the preparation for this which is that Beijing will say fine we'll lead, and the rest of the world will follow because the rest of the world is convinced of this pathway, and making investments in this pathway, and they don't want to see it eroded.

And you know, China is now the world's largest emitter, it's a huge market, it has the bandwidth to do this in sort of diplomatic and scientific terms, so it's not going to be

the case that if the United States walks away the mechanism class what will happen is simply the mechanism will continue, but the United States will not be a leader. China will lead. That strikes me is unfortunate as an outcome, so I think that the cost of walking away are measured just in terms of what its potential impact on climate, I suspect it would be modest, but more think in terms of what the erosion of them are and leadership.

PITA: So now that we're speaking about global issues and other countries and emissions, I wanted to ask a little bit about the idea of the decoupling emissions from economic growth. Our colleague Marc Mero just had a really interesting paper, he's looking at USA domestic side, looking at different states and showing that I think was more than 30 states have succeeded in making that deal linking, they were showing both significant economic growth and significant cuts in their emissions, so I'm wondering if you can speak a little bit to both the domestic side but also particularly internationally, what that means. China obviously went to a really intensive carbon new phase as they industrialized, everyone's eyes have been on India as the next big possible contributor of carbon, what does that mean for the rest of the world you know?

JONES: So let me just say that decoupling is a process that is built into almost every economy, because as the economy matures, although it uses more energy in total the economy shifts from very high energy, heavy industry, and so on to more frugal activities, services, and so on. So we got more economic output for the amount of energy put in, and then as a general rule, we see over long periods of time a decarbonization of the primary energy sources. So from coal, oil, natural gas, and in particular you see this right now in the U.S. we have this incredible shift from coal and

natural gas electric power sector and that by itself cut emissions roughly in half and that’s a really big deal. So, those patterns are to some degree autonomous inside the economy and policymakers think they're having a big impact, but actually the impact on policy is much smaller than the impact of technology and fundamental trends, so I think that's actually encouraging.

The problem of course is that that autonomous process is nowhere near fast enough to stop global climate change and this huge variation that we're seeing across the states expect that variations by going to go up over time as we see more diversity in the state based policies.

VICTOR: I do worry about India in this context because the following, a reality that we confront India has a huge problem of energy poverty 300-400 million people who have minimal if any access to modern electricity and there's no democratic government so it's going to not attempt to tackle that problem and there is no democratic government in India that's not going to drive them through their industrial revolution. And obviously they have every right to do that. If India develops its industry and its industrial revolution using the same mix of fuels that we did and China did, we can kiss goodbye two degrees, four degrees and just kiss that goodbye. You're adding another European Union in terms of sharing outputs to the global emissions pool if India does it that way.

They've made it very clear, and I think they have a perfect logic here, that if they are going to adopt a more expensive set of technology more expensive for them at this juncture in their development, more expensive set of technologies that are cleaner for that phase of growth both in terms of the urban infrastructure and the power

infrastructure, then they're going to need external financing for it. They have a pretty good strategic case, a pretty good moral case. That would take I think, substantial commitment from the United States to make it happen. Not that the United States has to pay that bill, but the United States is the most likely actor to mobilize the World Bank, the IMF, regional investment groups of private sector, to really put together the kind of technology learning and package of financing that can make that viable.

I think it was unlikely that we're going to see that even with the president is committed to these issues. It was going to be a heavy lift to try to get the United States to see the value of making that scale of leadership investment and financial investment in India's transition. I think it's in United States interests to do that as a key strategic player, key strategic partner and if we have any prospect of a credible energy transition we have to lean into that issue. I think that's much less likely under this administration than it would have been under a Clinton administration, so for me that's the big opportunity cost here is not leading into that question in India and that could have very substantial applications for both energy policy.

JONES: You know I think one of the great difficulties in this is that the backbone of the Indian grid is coal and although in diplomatic discussions Indian policy makers are always talking about the big pledges on solar and so on but the way they're really going to continue to electrify the grid is with more coal. I think one of the great difficulties is that many countries in the West including United States basically said they're not going to use external finance for coal plants and so that removes the United States and frankly now the world bank and everybody else from the discussion about the real energy issues in a place like India and it puts I think the Chinese actually in a much

stronger position because they're going to do external finance around coal technologies as well.

The reason that's important is because if you can build new coal plants and they're inefficient then that locks the country into an emissions trajectory. If you build new coal plants and they're dramatically more efficient and the best coal plants in the world, of which many now are being built in in China, the best coal plants in the world are their efficiencies are looking at forty percent to forty-two, forty-four percent range and they're much more efficient than a coal plant in the thirties.

That is, now the best plants in India probably being built in the low thirties and some legacy plants are even more inefficient than that. So you can, at that relatively small cost, have a huge impact on emissions and so the solar and wind but especially solar build out in India is going to be part of the grid and part of the future, but we really remove ourselves from the real conversation in India which is about how to utilize coal more efficiently and then have a viable strategy to move beyond coal, all of which is multi decades and I'm just I'm worried that we have not made it, we made ourselves not really relevant to the future of the Indian grid, and then on top of it, if you don't continue to engage the Paris process, we could see a world where India becomes itself less engaged in the Paris process, China stays in and that's the world that really is I think harmful to core US interests.

PITA: Let's stay with the developing world for a little bit and talk about what often I think at least in U.S. discussion goes unmentioned, which is that the developing world is going to bear the heaviest burden, bear the brunt first of climate change, of changes in temperature that's India as well as Africa, the rest of Southeast Asia… can we talk a

little bit about what that means for those countries as they are pursuing economic growth? What that means for them in terms of international governance issues?

JONES: One of those that would be interesting both analytically and politically is to look at winners and losers from climate change. It's always assumed that's like that kind of blanket loss and that may be true if you should walk out a hundred years, but certainly the next couple of decades that's not true, there are winners from climate change and there are losers. By the way, I actually think when you look at scientific patterns here, American Midwest and farm structures in the American Midwest could be part of the losers and there are there are real losses to crop efficiency above certain temperatures. The United States Midwest operates at a very kind peak efficiency for crops in terms of average temperatures. As temperatures rise, we'll see an important decline in crop efficiency in the United States, so that's a factor too, but India will lose out in a big way and not entirely clear depending on patterns about the Russian sort of wheat belt, where that will be. And Africa potentially loses out as well, although Africa I'm afraid is so bad that it loses up from so many different things; that's being buoyed economically for the last two decades by Chinese resource purchases, the kind of extremely high price for the most commodities, that was the Chinese led super cycle, commodity super cycle. I said buoy African growth, and now we're going to see, we're already seeing that decline.

In terms of a kind of first effects of a warmer climate, I think we're already seeing some of the elements of that in and around the Sehel, which is an extraordinarily hard environment in any case, overlapping challenges of governance poverty climate shrinking water resources water. By the way, maybe a real canary in the coalmine here,

we’re already dealing with Yemen, a country that for all intents and purposes has no water, the war now making that much harder. I think we're going to see things like that in the Sahel, probably the first place we see the impact of climate really proving to be unmanageable in context of weak governance, the Sehel, maybe the first place we really experience that.

VICTOR: I think has been a big shift in the climate negotiations on exactly this point: the least developed countries recognize in the words of a famous essay written by Aaron Velocity back in the seventies, they recognize that when you're poor that you have fewer resources to be able to adapt to calamity and climate change makes some calamities more likely. A huge variation in patterns and so on and so the climate discussions, not so long ago the discussions were focused entirely on how to control emissions globally and can we try to slow down and eventually stop the problem of climate change, and those discussions continue but a growing fraction of the discussion of the least developed countries is about adaptation, about compensation.

And this is one of the reasons why I understand that the Trump administration is going to make do on a pledge to not provide the money to the UN under the Green Climate Fund but I’m very concerned what that's going to do it alienate a lot of countries involved in Paris process and make it harder to just going to have basic diplomatic civility and discussions and getting agreements in that process and that could be very harmful.

But they recognized in Africa and the small island states of the middle of the ocean that are going to literally disappear some of them because of climate change, they recognize that they have tremendous vulnerability and they need to adjust to that

let's say on that is to me what's interesting is that much of what you need to do to adapt to climate change makes sense for other reasons. So farmers are worried about their exposure to variations in climate then you need crop early warning systems you need investments and what we call this country agricultural extension so that you could figure out the best cropping practices and extend them out to farmers help them understand and adapt and so on.

And so you want to do all that anyway and climate change accelerates the case for making those kinds of investments and that that could actually be an unexpected silver lining of the attention to climate change as you see more countries starting to do stuff of that type that's in their interest.

JONES: We haven't discussed by the way, so we're going back into thinking winners and losers out of these sorts of issues. This administration looks highly likely to forge a very different kind of relationship with Russia, than we've had over the last several years. Now there are some positives in that; we were on a rapidly escalating trajectory with Russia and there are real risks and some de-escalation is welcome. I will confess to being one of those that thinks the right way to deescalate with the Russians is not by caving on all of their demands simultaneously which we may see, but in energy markets its going to be interesting to see because we've been in a in a position where we and the Europeans were resisting or at least many Europeans were resisting greater European integration into Russian energy markets and Russian pipelines etc. That may now change, we may be in favor of Russian extension of pipelines etc. but we weren't going to be at least in the first instance, going to be likeminded with the Europeans on this.

So I think it's going to be very interesting kind of contestation United States, Russia on the one hand and Europe on the other. But what is the role of Russia in European energy markets… Russia's trying to diversify the you know they've got this commitment to build a pipeline with China to sell gas to China but that's a you know a 15 year project that may never be completed for political and logistical and financial reasons. Europe is still obviously the preferred market for Russian energy supplies and the politics of what happens there are next on this administration. It could be very interesting… distance of global energy in markets terms, obviously China, and Russia is another country that is deeply skeptical about climate change in Paris process, that came along in the end but deeply skeptical about that set of issues and have a lot to lose from a world in which carbon is more tightly regulated.

VICTOR: Yeah and I think a lot is going to depend also internally on how Russia thinks about interests in at least two dimensions, one of them climate. I think we believe that for forestry and agriculture, Russia is probably a winner for modest amount of climate change, it's a different story and beyond that, the Arctic around which Russia has a lot of interests, rapid warming in the Arctic on the one hand opens some sea lanes and so on, but people have overplayed that. A rapid warming of the Artic is going to be unbalanced very very harmful to the Arctic ecosystems and to the entire kind of organization of the Arctic regions.

I think the Russians may start to see that is not in their interest, and you could begin to see the Russians imagining as many other countries are, they learn about the real exposure imagining that they actually have an interest in doing something serious about climate. Then also on the geopolitics, if you could see that it looks like, the US

wanted to have a closer relationship or less toxic relationship with Russia, I think one of the key questions is how Putin and the rest of the Russian government see those changes, do they see those changes as an opportunity to start to cooperate more with the west and engage as partners, or do they see those as kind of a weakness, in which case you see more Ukraine like events and Crimea and kind of the chipping away at the margins of Russia, at which point then we're going to be back into deep freeze mode pretty quickly.

PITA: And you mentioned about increasing a natural gas export, liquefied natural gas presumably, a lot of that would be to Europe; would Russia view that as competition if they're still trying, if Europe is still their domain?

VICTOR: Absolutely, because they do. Russian gas is very expensive, the new Russian projects in the Arctic are unbelievably expensive. Its not actually clear to me that they make any market sense but in your country where your main export is oil and gas, you export oil and gas! And so you’re going to do projects like this that's high cost gas, gas in Europe won't be as cheap as it is the United States because the cost of doing an LG project is significant, and so that needs to be figured into it. But basically what's happening, as it happened to some degree of all markets, is around the Atlantic Basin, availability of larger quantities at the margin of US gas, biology is going to anchor the price of gas at a lower level and that's I think that's frankly in everybody's interest in terms of climate change, in terms of diversity for energy security, and so on, but I can totally see the Russians will see that a threat because it is.

PITA: Right we're running a little short on time, but I have one more question that I definitely wanted to try and get in: I want to talk a little bit more positive energy options

about technology and innovations so we had a Emory Lovins here recently, and he had written an article 40 years ago in foreign affairs about sort of the direction of us energy policy and one of the things he was talking about that i thought was pretty interesting is he was at the time that he was writing this and thinking of energy issues he said it was a little bit revolutionary to be thinking about the end use of energy.

At that time, US energy policy was just we just want more of it one more of it and cheaper, we don't care what it is just more. He said well what are you trying to do? Are you trying to fuel a vehicle, are you trying to heat a house, trying to run a manufacturing plant? And then that should inform what kind of energy you need to do that and how do you get it there, and that factors into that thinking. And David you had written something that one of our central energy challenges going forward, it's going to be less about the raw production source, but it was going to be about how that gets turned into electricity and energy and how it gets where it needs to go and what we do with it at the end. So I'm wondering if you could talk a little bit about the question and answer what's next for innovation.

VICTOR: Yeah so it's very important insight and it's actually an insight that is now diffused around the world. You see Chinese policy is a very much focused on improving efficiency across the chain so that there is a is a complete and total energy consumption in China will now probably plausibly past the peak in terms of total coal consumption. China has some uncertainty about that. Here in the United States were probably passed a peek, we've seen actually electricity consumption is basically flat, even as the economy rebounds you see some variation in the data.

But I think the arrow when people expected that energy consumption would just rise autonomously all the time, that era is over and it's because of a whole host of innovation to LED lighting for example, cost of LED lighting has come down ninety-four percent in the last decade, unbelievable what happened there and you see across the board all kinds of energy efficiency gains and it looks like we're nowhere near the end because you start to get more information ubiquitous sensors, the cost of the sensors are going down, ubiquitous information about where energy is being used how the grid is being managed and so on you could imagine a future where we continue to provide energy services but at a much higher degree of efficiency. All that said it doesn't get you 0 in terms of emissions and what you need to do to stop climate change is get essentially to 0 or eighty percent globally and so there's still a huge challenge of how do you take the core of the energy business which is backbone fossil fuels and either move to something that's not fossil fuels or use fossil fuels in a way that decarbonizes them through carbon capture storage or other kinds of technologies.

And that's I think the jury's out on that question, there are a lot of ideas and there needs to be a much greater degree of investment and innovation and testing and deployment of these ideas until we figure out what's going to scale.

JONES: The other piece of this is, battery technology and storage technology and we're starting to see dramatic improvements at the level of the lab…we haven't had the level of industry yet but we're starting to see dramatic improvements in storage technology in the lab. And that's again just added it doesn't change the basic damage what you just said but in terms of efficiency and in terms of being able to capture fuel in

one place and store it and take it to another place, better technology is hugely important in the storyline and so I think we'll see major changes in the coming years.

VICTOR: Yeah and that's going to trigger other kind of competitions around innovation so if for example battery technology makes electric vehicles more viable then it's not like the other options are going to sit there and not fight back and so you have a tremendous improvement in conventional vehicle technology whether its diesel or non-diesel, as a rival to electric vehicles hydrogen based transportation people stopped talking about hydrogen a couple of years ago, they can start talking about it again hydrogen fuel cells are another interesting option, biofuels and so the energy business in some sense used to be a very dull business because you wake up in the morning, you know what to do, which is the same thing you did yesterday, and now it's really different and there's all of these areas of competition.

JONES: And I think that one thing the United States has to be to be clever about here: we're not a country that likes to think that we have industrial policy. We do of course but, the United States is well positioned to be a global leader in a set of innovations, but we could erode that position, and there are lots of countries who are chomping at the bit and right behind us, and so if you look at the kind of competitive space that we occupy in global markets and global politics, retaining our edge and innovation is really critical to the future of this country and our leadership role in the international system.

And so policies that risk that I think are our mistake and policies that encourage innovation, which doesn't necessarily mean direct subsidies, there are lots of ways to think about innovation, but recognizing that innovation in the energy space is a critically

important feature of the American market right now and retaining that as we go forward for economic reasons for geopolitical reasons and for climate reasons you know.

PITA: Well thank you both gentlemen, to our listeners are reminded that you can follow intersections and cafeteria and the rest of the Podcast Network on twitter at @policypodcasts thanks very much for listening.

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