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THE NEW DYNAMICS OF GLOBAL ENERGY AND CLIMATE: A CONVERSATION WITH SUSTAINABLE ENERGY FOR ALL CEO RACHEL KYTE

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P R O C E E D I N G S

MR. JONES: Good afternoon. Welcome to Brookings. My name is Bruce Jones. I'm the vice president for Foreign Policy here at Brookings and it's my pleasure to welcome you to today's conversation, and a very timely one, with Rachel Kyte, who is the CEO and the special representative of the secretary-general for Sustainable Energy for All, commonly known as SEforALL just because it's too damn long as a title. (Laughter)

Rachel, who is also a professor at the Fletcher School of Law and Diplomacy at Tufts, served previously as the vice president and special envoy for climate change at the World Bank, the vice president for sustainable development at the World Bank, and the vice president for business advisory services at the International Finance Corporation. I've known Rachel for some time and I can say without hesitation that she is without any question the most knowledgeable and experienced leader working in this field in the international space today. And we're delighted to have her here at Brookings.

This is the third in a series, a new-ish series, that we're doing that brings leaders from international organizations, from industry, and from academia to Brookings to highlight the most important energy and climate challenges of our time. Previous speakers included Fatih Birol of the International Energy Agency and Charlie [*sic*] Crane from Exelon.

It stems from an effort that David Victor and I co-chair, designed to draw on the whole breadth of Brookings scholarship and foreign policy to domestic issues, to metropolitan issues, to look at the challenge of energy and climate from a multidisciplinary perspective, as well as from a geopolitical perspective.

I'd like to single out Todd Stern, who's joined the program over the last

year or so, who was part of the effort; and Samantha Gross, who helps direct the effort here at Brookings.

The topic of the conversation today is an essential one and SEforALL is really at the core of the international effort to think hard about how to manage and how to implement energy access in the development world, with the goal of providing access to modern energy services to the whole of the world's people who don't have it by 2030. But to do so in a way that balances with a wider objective of a transition to a lower carbon energy mix and that's a very thorny problem.

There's still a billion people in the world who lack access to basic electricity, 3 billion who cook with traditional biomass. And this lack of access to modern energy is harmful for economic development, it's harmful of health, for human dignity. Just to dramatize one element, several million people a year die from pollution due to traditional cooking fuels.

But this has to be managed in a context where we're aiming towards a lower overall carbon emissions in our energy mix and striking that balance is I think the crux of the challenge. All in a context where decisions in one major economy profoundly affect the options in another major economy at a time when multilateralism is stranded to say the very least.

I think the issues we're going to be talking about, certainly the climate issues, have been highlighted and sort of amplified in recent weeks. We had the report, the recent report, of the Intergovernmental Panel on Climate Change, which warned about the magnitude of the potential impacts of rising temperatures and extreme weather events. And we're watching what's happening in California, which the director of CAL FIRE has explicitly linked to a changing climate, and there's pretty good evidence to back

that up.

So I'm delighted that we're able to host this conversation today and my thanks to Rachel for joining us. And I'm delighted that David Victor, who co-chairs the Cross-Brookings Initiative on Energy on Climate, is going to be here to lead the conversation. So before I turn it over to David, Rachel, why don't you come up and make a few remarks?

MS. KYTE: Thank you, Bruce. And thank you, David, and to the team here for the invitation. It's always a great honor to be here at Brookings.

I just want to set a bit of context, sort of how do you see a pathway forward? I mean, how do you imagine that we could arrive at a decarbonized economy by 2050, the Sustainable Development Goal by 2030 that there should be universal access to reliable, affordable, clean energy? That's not exactly what the goal says, but I think the Paris Climate Agreement and then the IPCC report of 1.5 degrees kind of takes away any of the wiggle room or space for a fossil fuel-powered solution to access.

And so I think it's important to just sort of step back and think through the building blocks of an energy -- transitional energy transitions that would allow us to arrive at a point where everybody has access to reliable, affordable, clean power and how we will have done that.

So I think the important thing is that the decarbonization of the energy system, and increasingly in the future systems, is going to be at the leading edge of dragging the global economy to the point of decarbonization. That transition is already underway in a number of economies and the exact shape of that transition is I think up for grabs.

There are mostly known knowns. The question is whether or not we

have the political will, determination, and the institutions that are capable of expediting and speeding up that transition. So what I focus on in most of my work with my team in SEforALL and in the conversations at the U.N. is how do we achieve the speed and scale in the decarbonization of the energy systems?

The energy systems of the future are going to be increasingly decentralized, largely because of the revolution of renewable technologies. They are going to be increasingly digitalized, and that's because energy's going to be coming from all different kinds of point sources. We're going to be getting energy from our buildings, we're going to be getting energy from our cars, we're going to be getting energy from both highly managed smart grids, and we're also going to be getting energy from decentralized systems. So that digitalization and decentralization and then the decarbonization mean that the energy systems are really going to be very different in the future.

And one of the real challenges we face is that most people in most decision-making roles in utilities, in energy ministries, treasuries, elsewhere around the world, have a hard time closing their eyes and imagining what those systems look like. And it might seem trite, but if you can't imagine it, it's difficult building the thing that you can't quite see. And so we are running a sort of 20th century rolling stock towards what has to be a 21st century system, and that's producing a lot of friction and a lot of noise, I think.

There's been a revolution in renewable energy technology. The prices are coming down to a point where renewable energy is comparable or cheaper than coal without subsidy in most markets in the world. But we're also seeing a comparable drop in the price of storage. And so the ability of renewable energy to take up the strain within

smart grids around the world is something which is tantalizingly close to realization not just in South Australia or elsewhere, but in emerging markets where, of course, it's so needed.

So part of the vision of this pathway forward, this transition, is to electrify as much as we can and to make that electricity green or clean. However, we are still going to need extraordinary amounts of heating and cooling. And today, the Energy Transitions Commission published a report on hard to abate sectors of economy, so not just focusing on the generation of energy, but focusing on the big users of energy: steel, cement, chemicals, refining, and, of course, transport being the other big one.

And the Energy Transitions Commission report announces, somewhat unsurprisingly, that technically it's going to be feasible to imagine decarbonizing those sectors of the economy, too, by 2050. But I think one of the things that I'm sure Brookings can work on and others is that that vision of a technically feasible steel sector that is zero net carbon, right, so it's not producing more carbon, you know, that's going to run up against the reality of today's world where we've got trade wars either in progress or looming. We've got multilateral institutions straining under the burden of how to create the safe space for the conversation between climate and trade. And we've got a lack of financial flow and investment into what the future might look like for these sectors.

And so we see that it's not just about electrifying everything, but it's also about the transition of use of energy and transport, the transition of the use of energy in these other big sectors.

Which brings me to the piece of the work that we focus on a lot, which it the equity in this transition. The energy system of today has never reached a billion people. And for another 2 to 3 billion people it reaches them, but intermittently,

unreliably, and very expensively. And so what would it be for sets of energy systems to actually provide universal access reliably, affordably, cleanly going forward? And what is that going to take?

Well, it's going to take another shift in mindset. The mindset that has dominated the energy sector for the last hundred years or more has been to think about the amount of gigawatts one needs to produce, at what billions of dollars of cost, into a centralized grid that will perform at one or other level of efficiency, and it will reach as many people as it can reach. And the subsidy will be provided to the utility in order to make that affordable endpoint and the subsidy is provided to fossil fuels because that's mainly what's gone into that grid.

Increasingly, for countries that need to transition to make that energy system clean and to have it reach everybody the conversation is around how much energy do we need to run a health service that delivers healthcare for everybody? How much energy do we need to run our education service? How much energy do the communities need in order to be able to start small businesses? How much energy do we need for the manufacturing sector, for the ports, for the railways, for the airports, et cetera?

And if you build the picture up from the bottom up and think about what the actual energy needs are, then you can actually have a very different conversation about the mix or what we call an integration of an energy plan between decentralized energy and centralized between renewables and traditional sources of energy.

And those countries that are really going through that thought process may end up with a very different sort of set of needs than those who are traditionally still thinking about the gigawatts of energy into a sub-performing grid which is only able to

absorb fossil fuel energy.

So to the billion people who don't have any access and the 2.8 billion who don't have access to clean fuels for cooking, while the grid is being densified and while the grid is being improved, many of their needs can be met by embracing new technology and by embracing new business models and by embracing the idea that we can reach the last mile first. We don't have to wait for a very expensive proposition of extending the grid over the last sand dune to the last nomadic community that doesn't have access. Rather we can for the Sahel, for the Lake Chad Basin, for South Sudan, for Yemen, for other places in extremis, where many of the people live who don't have access to energy. We can exploit decentralized energy for their needs.

And I'm not talking about a solar home system that might give you lighting and a cellphone charger. I'm talking about productive use. That's enough watts to be able to provide refrigeration, television, communications, a fan, maybe some form of cooling, and allow you to perhaps start a small business; or within the community, to start running community-owned businesses.

And that's the key because at that point you start lifting people's incomes. And at that point communities start to have the ability to pay and you can start to build that micro grid into a mini grid, et cetera. Again, countries that are embracing the opportunity of decentralized alongside centralized are closing their energy access gap much, much quicker than those who don't.

The last thing I want to say is at SEforALL we track the financial flows into what we call the 20 high-impact countries. So 20 countries account for 80 percent of the people who don't have access to electricity. Twenty countries account for 80 percent of the people who don't have access to clean fuels for cooking. So we can concentrate

our diplomatic, political, financial, economic, and technical know-how to help 20 countries make a big difference in these indicators.

And we can see from the tracking of the financial flows into these 20 countries, public and private, international and domestic investment is that, first of all, the countries themselves are not investing enough in their own energy sector.

Secondly, the countries themselves are not pursuing a reform agenda with enough alacrity or dedication, in most cases. But we can also see that the international community is increasing the amount of finance going in, including the amount of development finance going into these countries, but most of it's getting absorbed into big markets. So it goes into India, in the Philippines, and Bangladesh. Very little of it goes to Burkina or Niger or Mali.

And, in fact, there is still an old-fashioned bias in development finance in that most of the money is going to grid-connected energy solutions, which is good. And we're glad to see that there's an increase in particular in solar PV, grid-connected energy.

At the same time, there's only 1.3 percent of the finance flowing into these countries is going into the off-grid sector. So there's either a time lag or there's still a, you know, "not persuaded by the off-grid solution" problem going on.

And then finally, I would just say one concern in the numbers that we looked at, and we looked at the period of 2015 and 2016, and I'll admit that the data can be quite lumpy because all it takes is one big project to sort of skew the numbers, is that the amount of money going to coal-fired power in these 20 countries tripled. And that means that there are still people out there who believe that coal-fired power is a solution for energy poverty. And there is still access to subsidized technology, subsidized finance, and in some cases subsidized feedstock in the poorest countries, and that this is

still an attractive option for policymakers.

So I'll leave it there and perhaps in conversation we can get into some of the nitty-gritty of it.

I would just say that it is -- at the very heart of the Paris Climate Agreement and at the very heart of the SDGs the notion that we won't leave anybody behind. So you cannot build a decarbonized economy that works for the 1 percent. You cannot strike a climate deal if Africa's not at the table.

And so the idea that we can somehow square the decarbonization that has to happen and, at the same time, meet people's needs differently is one that inspires young people, it's one that inspires entrepreneurs, it's one that inspires some political leaders. But I think that the development finance complex, I think many energy decision-makers in many parts of the world have not quite yet grasped how revolutionarily different energy systems of the future will be and that now's the time to grasp that opportunity and to try to drive it home so that everybody benefits.

Thank you very much. (Applause)

MR. VICTOR: Thank you very much. So I'm David Victor. I co-lead with Bruce Jones the Energy and Climate Initiative here at Brookings. Rachel, thank you so much for being with us today, a lot to talk about, including the fact that previously, before this job, you were special envoy for climate at the World Bank. You have some pretty harsh things to say about development finance, so we'll get into that.

But first, can you help us, say a little bit about what SEforALL actually does. Because in this new report about the state of financing for clean energy and energy access, you've laid this out as a problem that needs more than $50 billion a year in capital investment. Right now there's $30 billion a year going into it, so there's a $20

billion a year gap. Your organization is $10 million a year of direct expenditure.

And so I'm just curious, how do you get people to change?

MS. KYTE: So we're the sort of friendly flea on the back of the elephant. Right? So we are -- or as I sometimes describe myself as your favorite aunt, right? So if you're not doing your best, she's going to take you outside very quietly and have a word with you and not embarrass you in front of your parents. And if you're doing really well, she's going to be enthusiastically screaming in the front row saying yes. And that's what we do. Right?

So we believe that there is a pathway to a success against the SDG and against Paris, and that we need to move more quickly and more differently along that pathway in order to succeed. So we marshal the evidence, so I think by putting the evidence in front of people and saying what do you think when you see this, there's an extraordinary amount of data sitting captured in big institutions that is not being interrogated with necessarily the appropriate questions. It was gathered for a different reason. It sits to report in a different framework. And by asking that data different questions, I think you throw up an opportunity for a different response.

So we gather the data and the evidence. We benchmark progress. And we work closely with the World Bank on the regulatory indicators for sustainable energy across 111 markets. So who's doing well? Why? What do we understand about that? And what does it take for other countries to replicate?

So somebody somewhere in the world is doing a very, very good job. That's just not known. Good news does not travel fast.

And then telling the story of success is really important. So, you know, why did Morocco -- I mean, we know that Morocco made a decision about 10 years ago

that it would have a 20-year vision around concentrated solar power and becoming a powerhouse in solar energy. But exactly what did it take? Where was the delivery unit inside which ministry and how did that work with the other actors? And what was the role of the domestic capital markets in being able to do that? And how did they attract the blended finance that came from the development banks? And if the climate investment funds were able to provide $700 million worth of concessional finance, then why are the climate investment funds not financed to do that today when we should be speeding up the transition?

So we interrogate and ask questions and try to build sort of tables of different people with a different exam question in order to get a different conversation going.

MR. VICTOR: One of the success stories today is India.

MS. KYTE: Yeah.

MR. VICTOR: Which is pretty extraordinary because it wasn't that long ago that the Indian power supply was constantly falling short of targets and so on. Now the situation's totally different. Lots of building of central station power. There's off-grid markets. The Indian government's been setting all of these really bold targets for renewable energy, bold targets for electrification. Earlier this year, they announced that every village in India is now connected to an electrical power supply, maybe not a power supply that's on all the time, but they'll get there over the next few years.

It seems like the central part of the Indian story was not about what India did with the rest of the world, the rest of the world telling India what to do, but it was a whole set of policy reforms inside the country. So if that's what matters the most, how do you help in that situation?

MS. KYTE: So I think that what's interesting is to understand what about what India has done has led to success and then what of that is replicable or worth replicating or thinking about. So where are the lessons? And I think the Indians are extremely keen, both through the International Solar Alliance and just bilaterally, to bring their vision of the world to others.

And there's a very interesting exchange going on now between India and a number of countries in West Africa, where the one thing that India has is scale, right, so it's a massive market. One of the things that really bedevils investment into Africa is the breaking down of different jurisdictions. And so regional integration really helps, so power pools, regional markets, et cetera.

And there's a group of African countries that are now looking at creating sort of a regional market for solar that would allow investment at scale, would allow there to be the same investment rules and the same treatments of solar across at least six jurisdictions to begin with and then more. And so I think the Indians look to us as a neutral brand for a conversation that helps them be able to export their ideas.

In India, I think, we're also a little friendly voice that says, well, okay, so every village has access to electricity, but every household doesn't. And I think the household survey data that validates what governments report is going to be very important because it's not just governments saying we've achieved the SDG. It's when electrons actually flow through some kind of mechanism and it ends up actually bringing light to a child or allowing the clinic to operate. That's when the SDG has been achieved. So I think our role domestically is to engage India in a conversation about what does success really look like?

One final thing I would say is that India, because it has got some very

interesting institutions outside of government, is in a very interesting position when it comes to sort of other aspects of the challenge, including cooling. And recently --

MR. VICTOR: Air-conditioning.

MS. KYTE: Yeah. Well, air-conditioning and then, you know, design of buildings and there's all kinds of things one can do to cool, not just the air-conditioner. But the Rocky Mountain Institute, TERI, the government of India, and something that we're associated with in SEforALL, as well, just launched a cooling prize; the country and the company and the R&D that captures the ability to be able to produce a high-proficient, HFC-free cooling device which retails at an affordable price for the lower to emerging middle class. And these are the people who want it, and once they've got it, never want to go back to something without it. That market is 2, 3 billion people worldwide. And being able to manufacture into that market is extraordinary.

And I think that's something that the U.S. and Europe have sort of lost sight of and I think that's something where India and others clearly see that that's to their advantage.

MR. VICTOR: You have a lot of negative things to say about investment in coal and yet half of the coal plants that have received new financial commitments that you talk about in this new report are in India. India has had this extraordinary success in building out the grid and so on. What do you say from somebody from the coal industry who says, yeah, coal's a problem, but the problem of electrification is even more acute and so, therefore, we need to continue investing in coal power plants?

MS. KYTE: So I'm particularly critical of the narrative that suggests that new coal is going to solve the 1 billion people who don't have access to energy problem. Because most of those people are living in rural areas and if they're not living in rural

areas, they're living in peri-urban areas of fast-growing cities. And in most cases they are not going to get their electricity from coal because the grid is never going to be extended to them. It hasn't been up till now, don't see that it's going to get there quickly in the future.

The second reason I'm critical of coal is that most emerging countries are extremely -- are caught in a bind between the need to have affordable energy now and the deep, deep concerns about air quality, especially as they rapidly urbanize. And coal is, I don't think, the affordable option in the medium to long run and I think it endangers air quality. And as we know more and more about what air quality does to the mental health and development of children and to what it's doing to the health status of adults, you know, this is not something that you would ideally do if you've got alternatives.

The challenge I think is to provide a like-for-like alternative. So if somebody's going to come and sell you outside of India an out-of-the-box cheap technology with subsidized finance and perhaps subsidized feedstock, and you know that you can build it and within two years it'll be running and it will work in your kind of old-fashioned grid, then that's concrete. You can reach out, touch it, you can electorally promise it. Right?

The alternative is what? Is solar grid connected, wind grid connected, solar with hydro, geothermal and solar, whatever. You, in too many countries, will have to piece together a coalition of acronyms. You will get the subsidized finance, but it's going to come together in a difficult perhaps negotiation. You're going to have to have meet performance standards and safeguards, and people are telling you that that's going to take for forever where it shouldn't have to. And so, you know --

MR. VICTOR: So you go coal.

MS. KYTE: So, yeah, I mean, we've got to make it easier to choose the right thing. And that's where Mayor Bloomberg and others are putting so much energy not only into revealing the economics and the short-termism of coal, but also trying to get people around the table to make the alternative more accessible sort of in a functional way.

For India, I think there are increasing numbers of coal plants closing down now because they're not economically feasible. And one of the challenges for India is that private finance stopped flowing into coal a long time ago. And it is public finance and public banks that hold the debt on most of those coal-fired assets.

And one of the stories of the energy transition is going to be the sort of bad assets that will be held by the public purse, whether it's in Europe, whether it's in India, or whether it's in China, as their public money is investing in coal through the Bel and Road Initiative.

And so you've got a double-whammy, which is that this isn't good investment, but then those assets which are there, which may become uneconomic within 10 to 15 years, that's going to sit on the public purse. And so there's a very interesting sort of split between where private finance and public finance is going to end up in the transition.

MR. VICTOR: Let's talk about the Belt and Road Initiative for a little bit. The Chinese banks in various forms are responsible for about a quarter of the international finance flowing broadly into this space and it's growing rapidly. A big chunk of it's connected to coal, we just talked about. A big chunk of it is kind of broadly connected to the Belt and Road Initiative.

How do you see the Chinese internalizing the message here? I mean, the message is if you invest in coal plants, these are become stranded assets and that's going to look bad on the Chinese balance sheet, that we ought to move more quickly to renewables, we ought to move more quickly to off-grid solutions. And the when you look on the ground they're doing the opposite. So what do you tell the Chinese?

MS. KYTE: Well, I think, and we were talking before we came on stage, is that we tend to project onto China a sort of monolithic certainty that is not something that we experience in our own countries. Right? So governments not joined up.

MR. VICTOR: Except here. Here the government is really joined up.

MS. KYTE: So Tony Blair always used to say that the aspiration was for joined-up government and I think that's everybody's aspiration everywhere, and I think the same is true in China. Obviously they've just created a new ministry and there's a fairly substantial reorganization. And energy is still managed within one part of the government where the Belt and Road is in another. The overall coordination of climate change has moved places, as well. And so I think that there's still some sort of question about how that all gets organized so it's coherent.

I think it's also interesting to look at the financing. If you look at the energy infrastructure investment through the Belt and Road over the recent years, and these are numbers from Boston University and WRI and others, the vast majority of the financing is public Chinese investment, and that's gone mainly for coal, and the private has gone mainly for renewables.

Now, are those numbers known and understood and sort of produced in their stark reality something that is the everyday thinking of some of the policymakers? I think that's the conversation, is that the picture that you want? Is that intentional or is that

just the way it turned out in the first few years of Belt and Road? What's the long-range plan? Why can't China be part of closing the energy axis gap story? Because this is going to be -- this is going to take China into even further realms of the world.

So I think it's a dialogue at the moment. There's a lot of questions, open questions. And I think at the end of the day there -- it's not a monolithic narrative. And there are certainly those within the higher echelons of policymaking and power who do not want China associated with some push towards a planetary sort of cataclysm. Right?

And remember that this is the China that calls it's economic plan one for a beautiful China. This is the China that's going to host the biodiversity convention in 2020, where two big global narratives are going clash. Right? The narrative that we all have to live on half of the planet because nature needs the other half; and the decarbonization of the global economy. And at the moment those two don't quite jive and it's all going to happen in China's lap.

MR. VICTOR: Talk a little more about where the money is going to come from. The scale of the problem which you've outlined is 3 billion people who don't have access to clean cooking, roughly a billion who don't have access to electricity, reliable electricity. The nature of the problem is mainly a residential problem and a large part of it is rural. The capital is mainly flowing into industrial uses and urban uses, and so there's this disconnect.

So traditionally, we solve these disconnects with development finance, multilateral development institutions, bilateral, and so on. Why aren't they better aware of the problem and focusing more of their resources? I think the public sector in international finance is actually shrinking with the exception of the Chinese part of the picture. And so I'm just curious as to what they don't understand about this that is

making it hard for them to do their job.

MS. KYTE: So I think it's only in the reasonably recent past that the focus on access has come up the sort of priority list. And I was at the Bank when SEforALL as an idea was started by the secretary-general. And at that time that was not the purpose of the energy complex, so that's begun to shift.

I think there is also an incentivization to do big stuff and there's a lot of big stuff that needs to be done. Most of the transmission distribution financing in the grids of the developing world are done by the MDBs: Asia Development Bank, Africa Development Bank, World Bank. So that bias is still in the system. So it's an ocean tanker that needs to sort of like change its bearing a little bit.

But I also think that some of the banks were very slow to pick up on off-grid. And they were doing sort of boutique stuff, sort of off-the-books, but this wasn't a big push. And so now the trick is to now catch up and work out where can they play the most important role.

And this isn't just in finance. If you look at major sort of revolutionary shifts in development, whether it's microfinance or mobile banking or the use of what mobile telephony can do for service delivery and things like this, a lot of the market creation, a lot of the market surveys, a lot of the information that is needed for small startups and new businesses to come and crowd into this exciting new space is done by multilaterals or their advisory services or these pieces.

And we need a lot of that because, you know, there are extraordinarily exciting businesses starting up every day in Nigeria, in Côte d'Ivoire, in Kenya, in Ethiopia now, in Uganda, across Africa in particular. But each one of them is having to go out and from capital expenditure go and do that necessary spade work. And these

are the kinds of things that if the multilaterals embrace the space a little bit more energetically could make things easier to flow.

On the financing, then I think the question is whether or not the pressures on some of these banks and the way that these have been internalized mean that they've become very conservative. And the climate question is, guys, if we don't do it now, what are we going to do with all this money in 15 to 20 years when climate impacts have made the situation even worse?

So I think there is a need to take risk and to be able to explain that to the shareholders, and to take it in very specific locations on very specific things that will get economies going, that will get income levels rising.

I'll give you one other point, which is for the shareholders, not for the banks or of the MDBs' management, which is that we are going to be prepared or we will have to seek hundreds of millions of dollars of humanitarian assistance and security spending into some of these parts of the world because the people who are in them are ravaged by the impacts of climate change, droughts that have gone from every 10 years to every 5 years to every 2 years to being sort of sort of semi-permanent. They are being picked off by violent extremism moving in and exploiting what is an economically not hopeless, but pretty hopeless situation for many of them.

And our concerns about migration, our concerns about security, and our need to provide humanitarian assistance will, from a spending point of view, be to the nth degree more than what it would take to really coordinate and perhaps have a major push on solar irrigation for some agricultural innovation, for putting energy in health clinics so that there are decent health services. These are the things where the mindset is going to have to -- and the risk-taking is going to have to shift. And that's with the shareholders of

these institutions, not just with the management.

MR. VICTOR: Do you think that there's a group of shareholders that would be willing and able to point to the World Bank and point to the regional banks and say thou shalt go out and take more risk and here's the nature of the risks?

MS. KYTE: Well, I think if we don't, we're going to have a very, very hard time to meet the SDGs.

MR. VICTOR: A couple more questions from me and then I'm going to open it up to the audience for some commentary. You said in your opening remarks that you see an energy system of the future that is much more decentralized, digital, and what we see on the ground is this kind of incredible promise around off-grid solutions, and so on. You mentioned there's a lot of exciting stuff happening in East Africa, in particular. But when we take a step back and look at the numbers, 1 percent or so of the finance is going into these off-grid systems and almost all the rest of it is going to the grid.

Is that just because grid-related investments are much less risky and much bigger and so it's kind of easier to do those deals? Or are we seeing the kind of pointy edge of what's going to be a very rapid, radical transformation?

MS. KYTE: I think that it's -- well, to answer the question in another way, if you look at Kenya, where they've set very a clear political goal for energy access, where they've done a lot to set the policy table correctly for an expansion of decentralized energy alongside what they're doing for the grid, and you've also go the ability to innovate off a backbone of mobile telephony that not every other country has, you're starting -- and you've got a liquid capital market or more liquid and deeper than most countries in Africa, you are starting to see the closing of the energy access gap moving at quite a pace. And so the question is then, of those elements what could be done by

others?

You're starting to see a rural electrification plan come into parts of -- come partly into place in parts of Nigeria. You've seen a change of heart in Côte d'Ivoire, where the current government has realized that actually by exploiting decentralized energy, they could meet some goals that they thought they were going to have to very expensively meet by funding through the grid.

You've started to see a success in Ethiopia, which, of course, is this huge energy generator for the whole region through it's large-scale hydro and others, but had left energy access out of the mix. But now there's an orientation towards, okay, how do we reach the rural population?

And they start laying a policy table differently. They start making reforms. Bangladesh has moved very quickly. India's move very quickly. Now Pakistan has an opportunity to learn and start picking up the pace.

So I think that the finance will flow to where it can make a return and where it can be persuaded that there is a medium- to long-term future. And that requires a policy environment which is supportive or at least benign. And so those countries that are beginning to make those reforms, unsurprisingly, are beginning to see a greater level of investment.

So I think that what we're seeing is the leading edge of what could be something substantial, but it's not going to be substantial without policy reform. And it's going to need development finance, bilateral and multilateral, to take a bit more of a risk, I think, on some of these businesses.

MR. VICTOR: So this extraordinary success story in Kenya is yet when you take a step back, the numbers overall in Kenya are dominated by the grid, one

project in particular, the coal-fired power plant in Lamu that would use imported coal. And you're telling us to kind of look less at the --

MS. KYTE: Which they don't need.

MR. VICTOR: But you're telling us to look less at the macro numbers and more at where the market's really shifting, which is off-grid.

MS. KYTE: Yeah. So Kenya has been able to exploit geothermal and has managed investment and its own domestic resources to be able to take the upfront risk that comes from exploring geothermal. I mean, the cost of -- the problem with geothermal is affording the exploration and deciding where to put the well pads. That's the expensive part of it. So they were able to do that with international support and they're reaping the benefit of that. They obviously have opportunity for hydro to be imported from Ethiopia. And those transmission lines have been built, again, with international support.

They have extraordinary wind resources and they've got the very controversial project at Lake Turkana, which is the largest wind farm in Sub-Saharan Africa. But it's evacuating energy through a transmission line which doesn't exist at the moment. And the penalties for the non-transmission lie with the taxpayer in Kenya. So there's a really interesting case study there for any students in the room about how we do these things going forward.

And then there's solar. So you've got solar home systems, mini grids, micro grids. The government now has basically laid a policy environment which is going to encourage mini grid development by equalizing the tariff across the utility and mini grid suppliers. And that's one of the big things because what chokes off mini grid development is the fear that when the grid arrives, you won't be able to operate. And

also the fact that, you know, without some kind of policy environment which treats both in a transparent way, if you are paying more for electricity from a mini grid and you know that your cousin living in the city gets it cheaper from the utility, you start to have problems.

MR. VICTOR: You're going to be irritated, yeah.

MS. KYTE: But we've seen countries start to deal with that and I think that's going to be the future.

MR. VICTOR: Two last questions from me. The first one is about cooking. The problem is a billion people without access to electricity and 3 billion people who rely on traditional fuels for cooking and heating. Almost all these discussions, including what we've just been talking about, get focused on the electric part of it and they forget cooking.

The numbers that you put together show that there's $30 billion a year roughly going into electricity and $30 million a year going into cooking. Now, there's some problems with the accounting because cooking is hard. It's off-grid. It's way out in the rural areas. Nobody really knows what's going on. But that's a factor of 1,000.

Is this problem over time basically going to become a problem of cooking and heating because we're going to solve the electricity and the cooking and heating side of it is just to hard? Or where do you see progress being made on the cooking?

MS. KYTE: No, it certainly looks that way. The places where we see progress in cooking are in countries where at the senior political level somebody said this is unconscionable, Modi, Peña Nieto, the Peruvian -- two administrations before in Peru, and elsewhere. And at that point people have become galvanized.

So in India, the subsidy was taken away from kerosene and put on LPG.

And the Indian Oil Company was told to get the LPG out into the rural areas. And the plan is that they will go to solar cooking at scale or the grid will have arrived and you'll have solar energy coming through a grid into a stove. So these are all top-down and it makes a big difference.

But what you really need as well is bottom-up. And one of the real reasons why this problem has not moved more -- or the solutions have not moved more quickly is because it's a silent minority. So those women who have to spend five hours going and finding the animal dung or firewood of the right size or whatever, you know, that cost is just lost into the economy. There's no opportunity cost there. It's just that's what they do.

So if you could capture the opportunity of those women for five hours planting seeds or involved in some other productive activity and you could start monetizing that or thinking about that in those terms, let me tell you, you would not allow hundreds of millions of Africans to still be searching for fuel this way.

Secondly, there's a lot of mythology about what the poor do and do not do with their resources. And most people living on very low incomes spend an extraordinary amount of those incomes on being able to cook. So they will pay the very high price for the kerosene. They're spending 30 to 40 percent of their income on being able to cook. Can you imagine you spending 30 to 40 percent of your paycheck on cooking? This is extraordinary. So we have to understand this market.

And I think that the final thing I would say is that I worry that this issue became a sort of development fetish, which is that we obsessed over designing cook stoves that people might use and then trying to get them out to everybody for free. If you don't have access, affordable access to fuel for that stove, that stove's going to sit there

and it's not going to get used. And so I think that what's happening now in the clean cooking world is a much broader discussion about what's it going to take to create markets for clean fuels which are affordable to the people on low income who need them? And what are the stoves that can be used with those fuels at an affordable price?

At which point you start talking about a much bigger opportunity than, you know, trying to sort of vertically penetrate with one device or another.

But let me tell you, you know, if it were -- I do think the female face on the problem has suppressed its significance. But now that we know that 4 million people die every year from indoor air pollution and we know that cooking that meal is imperiling a child's health not only in terms of pulmonary disease, but their ability to learn and their ability to then be productive in society going forward, this has to rise up the political priority list.

MR. VICTOR: Very briefly, last question, it seems like a lot of the success stories around clean cooking fuels are stories about LPG, liquefied petroleum gas. It's a fossil fuel, but it's used for truly important purposes. Do you worry that the anti-fossil fuels kind of wing of decarbonization is going to get in the way of making the world safe for LPG?

MS. KYTE: Yeah. I mean, it has done. I think there's been a big fight over the last decade or more around that. I think the LPG industry has also sat a little bit too comfortably on its hands and sort of made general positive noises about willing to be a big part of the solution. But they make their money selling LPG to the middle class and they've been waiting for somebody to give them a subsidy to reach out to the lower-income people. And I think you can make the case that you should transfer the subsidy from sort of kerosene and heavy fuel oil to LPG, but that should be a step down and it

should disappear over time. It's not permanent. And so I would like to see a little bit more creative energy and a little bit more dynamism in the gas sector itself because it could be doing a lot more than it's doing.

We haven't learned the lessons of distribution finance and consumer finance from other aspects of development. We could apply those across.

So, yeah, I think there were definitely those who say gas is not -- you know, gas should not be a transition. But I would take you to Rwanda. So a small, densely populated country with alarming rates of deforestation, came out with an electricity plan for universal electrification; realized it hadn't dealt with cooking; came up with a plan. And its plan is I think to go from like 20 percent to 60 percent in just 5 or 6 years, and it wants to do that by having LPG in the cities and the big secondary towns, and then to use enhanced biomass or pellets and other systems for the rural areas.

If it can get to there, it can arrest deforestation. It can start to see incomes and women's lives improve. And then it will work out how to get itself off gas.

So I think that you have to work with governments when they have a vision. What we need is more governments to have a vision.

MR. VICTOR: Great, thank you. It's time for some questions. Right here, sir. You have to wait for the microphone and tell us who you are and ask your question.

SPEAKER: Hello. My name is Kim. I am a student from (inaudible) Syracuse University. I came from a very sensitive country in terms of climate change, from Nepal, so it's really interesting, the discussion. My question is when I was in Nepal I worked as a teacher for a long time and my realization is that if we just invest a lot in the education for the sustainable energy, that will be very effective and (inaudible) in the

future.

So in relation to this, can you share some ideas how the investment in education is going in terms of sustainable energy? Thank you.

MR. VICTOR: Thank you very much.

MS. KYTE: Well, I think that one of the concerns that I have is there's sort of an inertia. All systems can be inert, right? But I think that we are at a particular moment in time where technology and business modeling and new ways of financing offer us an opportunity in particular to close the access gap for everyone. And then obviously we need to do that while decarbonizing. And if it was 10 years ago and I said it's technically possible to close the energy access gap in Africa, I mean, you would have had a reason to sort of boo me off the stage. But it is technically possible now.

And so the education is around what's it going to take to sort of move in a hockey stick off an energy transition which builds access in and doesn't just exclude people because it's unaffordable? And I think there's a time lag on that. I think that you can specifically study the technology, you can specifically study energy system, but many of the institutions I talked about, most of their staff and most of their expertise is on the energy systems of past. Right?

And when I was the vice president at the Bank we talked about the fact that the fact that our transport sector and our energy sector staff were mostly coming out of degrees 20 years earlier, where they --

MR. VICTOR: That must have been a very popular conversation.

MS. KYTE: Well, yeah. You know, they have deep, deep, deep project expertise, which we needed, especially because you're managing a portfolio, but you need to then complement that with systems thinking, et cetera. So we need the systems

thinking to be coming out of the schools and colleges now.

MR. VICTOR: Back corner there, please.

MS. SILKOVSKY: Hello. My name is Ann Silkovsky. Back in the 1980s, I lived and worked in the country of Niger. I became aware that little girls could not go to school because they had to go gather firewood for their families. Yet, back in the 1960s, the French had set up an infrastructure to transmit school lessons into the remote parts of the country via microwave and satellite, the solar-powered TV sets in the villages. Is that infrastructure a possible beginning to broaden the dispersal of energy to these remote parts of the country?

MS. KYTE: Well, the technology that's available today means that you can stand up a micro grid almost instantaneously in a displaced people's camp in the north of Nigeria or in a village. Making that a -- building a sustainable economic model around the mini grid is more complex, but it goes to the heart of what kind of concessional finance we're prepared to use when to bring these systems into these villages.

But the penetration rate of electrification outside of Niamey and the major towns is still in the single digits in Niger. And so most people don't have access and they don't have access to energy for productive use. So people are working what is very marginal land now because of climate change and drought, and they don't have access to very affordable, solar-powered irrigation and things like this. So I would say that.

The second thing is that I was in the clinic. There's a major clinic in Niamey which is one of the only clinics for 1,000 miles around that's able to treat obstetric fistula. And there's 1 doctor, 650 beds, but more than 1,000 women. So obviously, the rest of the -- I was there with the president of the Security Council, Margot Wallström; I

was there with the deputy secretary-general; I was there with the Africa Union. So it was a big entourage.

And everybody's sort of like talking about the doctors. You know, I talked to the administrator. I said, well, what's the electricity like? What's the power like? He said, oh, it goes out 27 times a day. And I said, well, do you have backup power? He's like yeah.

So we went around the back and we saw a generator that was older than I am. And let me tell you, you don't want your generator to be older than me. (Laughter)

And for me, I would have thought that there was a fairly reasonable solution to that. Go online and look at Project Bo. A bunch of us raised 100,000 pounds earlier this year to put a solar system on the neonatal clinic in the main hospital in Freetown, Sierra Leone, which generators out the back. And no premature baby dies for lack of electricity in that clinic now.

So this can be done. I'm not saying that these are -- you know, I'm not Pollyanna about this, but this is not beyond our means.

MR. VICTOR: This is an area where technology has really changed a lot.

MS. KYTE: Yeah.

MR. VICTOR: I mean, it's changed education perhaps, but I think the impact on healthcare has been just truly brilliant.

MS. KYTE: And, of course, it is diesel -- you do need a diesel genset as backup, but a diesel genset as a backup to a solar system is a lot better than having nothing.

MR. VICTOR: Right here. We had some questions from the left, now

we're going to hear from the right.

MR. BENTLEY: Great. Chris Bentley, work for the Forest Service. And I know you touched on this a little bit.

MS. KYTE: Do you rake? (Laughter)

MR. BENTLEY: Do I what? Sorry.

MS. KYTE: Rake. Sorry. I'm sorry.

MR. BENTLEY: Of course I do. Yeah, you touched on this briefly about sort of having the political will to have some of these goals be achieved. You mentioned that technologically these goals are achievable, but I was wondering if you could talk a little bit more about the feasibility of there actually being that political will to actually achieve these?

MS. KYTE: So, I mean, yes. So 20 countries, 80 percent of the problem. Take India out because they're moving at their own speed. Bangladesh is moving at its own speed, Philippines. So let's go to Africa. Sixteen of the 20 countries in Sub-Saharan Africa; Kenya's trucking along doing okay now. Ethiopia's beginning to pick up the pace. Uganda's moving.

All right. So then you start talking about let's talk about 10 countries in West Africa. So now, you know, the World Bank, the Africa Development Bank, the French, the EU, Power Africa from the U.S., everybody's there or thereabouts. Right? So the question is, with the kind of data that we produce energizing finance, you sit down and you put the data in front of them and say, okay, guys, what can we do with what's already pledged and committed? I mean, we don't need to have another pledging conference. There's a lot of money in the system.

In the run-up to the Paris Climate Agreement, there was a $10 billion

commitment around the Africa Renewable Energy Initiative. The French have got a big initiative around the Alliotts; from the Obama administration, but continued under this administration, Power Africa. There is a lot of money in the system and a lot of technical know-how in the system. It's not yet reaching these countries.

Now, these countries have got to get their reform agenda going. They've got to do all of the things that they need to do. It'd be great if they had bigger capital markets. It'd be great if they invested more of their own GDP and their own energy solutions, and the mindset has to shift. Most of these countries have utilities which are, to put it mildly, not in good economic shape. Right? So there's a lot of institutional and governance stuff that needs to happen.

Yes, we can do this. The alternative is that we are going to be putting humanitarian assistance in. We're going to be putting holding camps in the north of these countries. We're going to be keeping people there because we don't want them in Europe. And it's cost us an awful lot more. I mean, if you want to use that argumentation. There are other argumentations to use, as well.

MR. VICTOR: And behind -- no, sorry, behind you.

MS. HUBER: Hi. My name's Sophie Huber. I'm an intern at the Austrian Embassy, and I had a question.

So what's going to happen with renewable technologies once they don't work anymore? For example, in electric vehicles, electric batteries, solar panels, what's going to happen with those afterwards? Has anybody thought about the recycling process or are they just going to end up in a landfill and make things worse in the future?

MS. KYTE: This is an absolutely brilliant question and this is a huge opportunity for Austrian innovation and a solution. So the one that always preoccupies

my mind is that if you take a taxi in Fiji, it's going to be with a nine-year-old Prius. And I think at 10 years the battery on a Prius is kind of like, you know, kaput. So over the years there's been attempts to sort of figure out what to do about that. I think it's a boat coming from Japan, you know, picking up all those batteries and taking them back. So this is actually a very important issue.

And there's some very initial work beginning to happen on what this begins to look like. And I don't have all of the solutions for it, but this is going to be something that has to be built into it.

So for me the International Renewable Energy Agency, which it was set up, you know, 10 or 12 years ago, this was an agency that had to sort of fight to get renewables taken seriously.

MR. VICTOR: They're supposed to be a cheerleader for the renewable energy industry, right?

MS. KYTE: Yes, a cheerleader for it. And so now, I mean, they've succeeded, but they've also been able to ride the wave of the renewable energy revolution. I think now there are a number of things where IRENA needs to sort of drive forward. It will have a new director next year and this is one area.

I think the other is that lots of bad things happen, even though renewable energy is great, when you're acquiring land quickly and so making sure that the renewable energy is maintaining the best standards of land acquisition and social safeguard protection. There are a number of things where I think the renewable energy industry as it matures is going to have to grapple with and I see that as part of a norm setting role for IRENA.

MR. VICTOR: Are you saying that there ought to be almost codes of

conduct about recycling cobalt and lithium and right stewardship of land or do you think the industry can sort that out on their own without (inaudible)?

MS. KYTE: Well, normally, some kind of voluntary standards within the industry would be a precursor to any kind of global regulation. And I think the renewable energy industry has to be allied to that and I think the leaders of that are. But given how much is manufactured in China, the Chinese have to be part of this conversation from the get-go.

MR. VICTOR: Sir, right here.

MR. GOLOVIN: Hi. Karl Golovin, I'm a retired special agent, U.S. Customs; domain reference, AnIdeaLivesOn.net. My first job out of grad school in 1980 was here in D.C. at the Center for Renewable Resources.

MS. KYTE: There you go.

MR. GOLOVIN: And I own two GenZe brand electric scooters and a Mercury Grand Marquee, so there's a little disconnect there. (Laughter)

MR. VICTOR: You can use the scooters to tow the Marquee.

MR. GOLOVIN: No, no, I have a motorcycle carrier on the back. I can --

MR. VICTOR: Continue.

MR. GOLOVIN: My question in part is drawn from the book, *Myths, Lies, and Oil Wars* by F. Willian Engdahl, who argues that really the labeling of petroleum as a fossil fuel was a branding in order to create a perceived scarcity and hence a price beneficial market for petroleum. In fact, it seems to be a geochemically generated liquid mineral in the crust of the Earth, that vast reserves exist off the coast of Haiti, but yet Haiti politically is not allowed to develop those.

And how would you respond to Czech President Václav Klaus in 2007,

after experiencing decades of Communism, said that extreme environmentalism, climate regulation is really the new Communism?

MS. KYTE: Well, I had the benefit of being on a platform with him in Moscow three years ago, so let's put extreme environmentalism to one side for the moment. The problem that we have is that as we put carbon into the atmosphere, we now know and we have known for quite some time, but now we know with no plausible deniability whatsoever that this is doing damage to the planet and it's doing damage to other species and it's doing damage to ourselves.

And so the question now is, for those companies that have been in the business of digging this stuff up one way or the other and those companies that are in the business of burning it, manipulating, and doing anything with it have to transform themselves, in the words of Robert Socolow from Princeton, into not the energy companies -- they were oil and gas companies and then they were energy companies and now they're energy services companies and now they're going to -- I mean, one them told me last week that they were rebranding in some other direction.

No, we're now in the business of managing carbon molecules. And we're in the carbon molecule business and that means we can dig it up, but we can't let any of it escape into the atmosphere. So we have to use it, we have to capture it, we have to use it again, we have to store it. Whatever we do with it, it can't go into the atmosphere. So that's the challenge. It's the challenge of the existing companies and it's a challenge for everything we do going forward.

And I think if you consider yourself as a carbon management company, then that becomes a very important way of seeing that the deep technological experience of these companies is something that we need going forward. There is no trajectory.

There's nobody out there that is talking about the energy transition who doesn't talk about the need for significant capture of carbon and significant use of carbon.

So we're not sort of -- we can't just go cold turkey on the fossil fuel part of our economy. We just have to wean ourselves off it over time and manage that carbon more effectively than we are at the moment.

MR. VICTOR: We have time for one more question. Sir, very briefly.

MR. ARVESON: Yes. I'm Paul Arveson with Solar Household Energy. And we develop and distribute solar cookers in sunny places around the world, and we've had some small but successful projects ongoing. I have a contact up at the U.N., a representative with Solar Cookers International. And I wonder if you could help us, meet with us, and discuss some of the other questions that we have about implementing solar cooking. Thank you.

MR. VICTOR: I'm going to take that as a comment and that's going to give us a chance for one more question. You've been very patient, the very back corner there.

SPEAKER: So in terms of climate --

MR. VICTOR: Tell us who you are.

SPEAKER: -- do you happen to know if we were to solve the energy problem if the Amazon habitat from what scientists say is being clear cut at such a rate, that it will kind of be unsustainable onto itself in its water system, what would happen if they're correct and we really lose much of the Amazon in terms of climate change? If we solved the energy use, but lost what they call the lungs of the planet.

MS. KYTE: Yeah. So the big component parts of what we will need to do in order to decarbonize our economy, right? So energy is a big piece of it. Transport

is a big piece of it. At the moment, the way in which we manage land and deforestation, these are contributing factors to climate change. Right? So these are all big chunks of the problem, and so just doing one is not enough. We've got to do all of the above. And the report in October from the IPCC, which said can we get to 1-1/2 degrees or not, and what it would take, we need urgent action on all three.

So anything that imperils the progress that was being made in Brazil and has started to -- that rate of progress has started to diminish and things have started to go the wrong way, but now with the new elected president of Brazil there's a big question mark over policies that may be introduced there, anything that imperils the health of the Amazon and the ability reforest, lay forest, as much land as possible going forward, means that we are not on track.

So we need an energy revolution. We need a revolution in transport. We need a revolution in the way we build and live in cities. We need a revolution in the way we manage our agriculture. We need to reforest and lay forests as quickly as possible. We are going to have to find ways to pull more and more carbon out of the atmosphere. We need all of the above.

So even if we got energy right, it doesn't mean that we wouldn't have to worry about the way we grow food, he way we manage our land, and the way that we manage forests.

MR. VICTOR: Quickly, before we close here, very quickly, we're talking about a global problem of profound importance that normally when we talk about global problems like this, we talk about what can the United States do? You've mentioned the United States once in passing, which was about the Power Africa program, which is still ongoing, but set up by a previous administration. Are the Americans just absent from the

scene?

MS. KYTE: No. But I think that -- no, they're not absent from the scene at all. They're present in the climate discussions. They're present at the U.N. They are present in the IEA, a governing body. They're present everywhere.

I think where much of the rest of the world has a question mark is which United States is showing up and what sense of urgency and appetite is there for joint action. And if I think back over the last 20, 25 years of sustainable development diplomacy, there have been moments when there is no agreement at the global level possible, but what has always happened is that a small group of countries, maybe with some businesses and some civil society actors and some people from the academy, have got together and said we've got to push forward on this, on forests, on short-lived climate pollutants, on agricultural research, I mean, you name it. And I can't think of one instance where a working coalition hasn't been formed in advance of a global consensus without the United States being one of those countries.

And I think the world is trying to work out what to do. I mean, people are moving ahead without and people are trying to include the U.S. in and sort of saying, you know, when you feel like it, come on along.

So it's not like the rest of the world wants to turn their back. I mean, the U.S. is a necessary nation. And the U.S. academy, U.S. think tanks, states, U.S. businesses, I mean, it's all needed. Right? U.S. science, U.S. technology. But I think the world is just adjusting to a sense of absence.

MR. VICTOR: Please join me in thanking Rachel Kyte. (Applause)

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