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BROOKINGS CAFETERIA PODCAST

WHY WE STILL USE FOSSIL FUELS

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P R O C E E D I N G S

DEWS: Welcome to the Brookings Cafeteria, the podcast about ideas and the experts who have them. I'm Fred Dews.

We know that humanities' use of fossil fuels is damaging the planet's climate; yet, coal, oil, and natural gas generate most of the electricity we use to power our lives. We know how to use alternative sources of energy that generate less carbon, such as water, wind, and nuclear; yet, replacing fossil fuels with other sources have proven difficult. Why?

That's the central question asked by my guest on today's episode, in her new foreign policy essay, "Why Are Fossil Fuels So Hard to Quit?"

Samantha Gross is a fellow in Foreign Policy at Brookings, and director of the Energy Security and Climate Initiative. Her essay is a rich exploration of the history, science and politics of fossil fuels and offers a way forward to cleaner energy.

Also in this episode, Alan Berube, senior fellow in the Metropolitan Policy Program, introduces the new Metro Recovery Index that tracks the impact of COVID-19 on and progress on recovery for the economies of the 200 largest metro areas in the country.

You can follow the Brookings podcast on Twitter @policypodcasts. To get information about and links to all of our shows, including "Dollar and Sense, the Brookings trade podcast," "The Current," and our events podcasts.

First up, here is Alan Berube.

BERUBE: Hi, this is Alan Berube, Senior Fellow and Deputy Director, at the Brookings Metropolitan Policy Program. Our program, Brookings Metro, has long contended that the U.S. economy is simply the sum of its individual metropolitan economies, the urban and suburban hubs that represent local labor markets and bring together collections of business, talent and

infrastructure to drive competitiveness and prosperity.

In normal times, U.S. metropolitan economies differ in their performance. As my colleague, Mark Muro has chronicled, a small set of big coastal metro areas, places like Boston, the San Francisco Bay area, and New York, and Seattle, has accounted for most of the nation's innovation job growth over the past decade.

Yet, for the most part, since the Great Recession, metro economies have been expanding in GDP jobs and standards of living, along with the U.S. economy as a whole. Our most recent metro monitor found that 97 percent of metro areas posted higher average annual wages in 2018 than the decade prior.

Of course, these are not normal times. So now, more than ever, what's happening in your local economy may not at all mirror trends in national economic statistics. That's because in the absence of a real national strategy to respond to the coronavirus pandemic, virus trends and economic responses to those trends are quite literally all over the map.

Getting a handle on what's going on in local economies, however, is crucial for city, region, and state leaders trying to understand where to devote their limited resources to blunting the economic impact of COVID-19 from laying the foundation for an eventual recovery.

That's the motivation behind our new metro recovery index. Each month Brookings Metro will be updating the data behind the index to assess the changing conditions of America's nearly 200 metropolitan economies that have populations of at least a quarter million people.

The index tracks not only the total impact of the COVID-19 crisis on each metro economy from a pre-pandemic baseline, but also its current trajectory, whether indicators have moved in a positive or negative direction from the previous month.

The re-shuttering of Sunbelt economies this week, in response to growing caseloads,

confirms that recovery in most places will not follow a straight line. The index reveals that sometimes, even within the same state, metro areas are experiencing very different economic effects from the pandemic.

In Cincinnati, Ohio, those effects have been severe. They're not as bad as in many other large metro areas around the country. In Cleveland, however, job losses, spikes in unemployment, declines in real estate listings since prior to COVID have been almost as bad as anywhere.

In the most recent months, small business has still struggled more to reopen in Cleveland than in Cincinnati, and initial claims for unemployment insurance were slower to drop. State leaders in Columbus, and regional leaders in northeast Ohio, may need to do more to economically support households and businesses there are feeling disproportionate effects from the crisis.

The summer is now bringing a new wave of coronavirus cases to states like Arizona, California, Florida, and Texas, even as deaths from COFID-19 reach new lows in the northeast and parts of the Midwest.

The devastating early impacts the index portrays for metro areas like New York, Boston, and Detroit may subside in the next couple of months, even as the Phoenix, Tampa, San Diego, and Houston economies take a potential turn for the worse, not to mention the impacts for even smaller metro areas, like Lakeland, Florida; Bakersfield, California; and Corpus Christi, Texas.

And, as my colleague, Nicole Bateman's recent research points out, metro economies will also face different impacts from the school closures that may persist through the Fall in many parts of the country.

Parents with young children comprise, for instance, 35 percent of the workforce in

Yakima, Washington, compared to just half that in Santa Fe, New Mexico. And so, as policymakers watch the case counts rise -- and, hopefully -- fall in the coming months, they should also keep an eye on what's happening to their local economies.

(Music starts) It's possible to preserve our communities' health and their economic well-being at the same time and the metro lands can help in that effort.

DEWS: You can find the metro recovery index on our website at brookings.edu/metro. And now, here is my interview with Samantha Gross on her essay, "Why Are Fossil Fuels So Hard to Quit?" (Music stops)

Samantha, welcome to the Brookings Cafeteria.

GROSS: Thank you for having me.

DEWS: And, congratulations, on the publication of your foreign policy essay, which was put out on the Brookings website in June.

GROSS: Thanks very much. It was a lot of fun to put it together.

DEWS: it's a very exciting piece, not only the actual content, the writing, but it's full of amazing graphics, and charts, and interactives. There is a really cool video. We can talk about some of that as we go through.

But I want to start with this question: Can you give us a quick background on the question that you raise in the title, "Why Are Fossil Fuels So Hard to Quit?"

GROSS: The inspiration for this essay came from several years ago, I was giving a talk at a conference. And I did a press availability and answered some questions, so the reporter came up to me at the very end.

And, he said, "You know, I have this big question that I just don't understand." He's like, "We know that fossil fuels are bad. We know that they cause pollution and climate change. Why

don't we just quit already? And why are we still using them?"

And I thought about it and I was like, that is a fantastic question that many people really don't understand how we got in the fossil fuel business in the first place, why they're useful, and why they are in many cases difficult to get rid of.

And so, I'm excited to have the opportunity to write the essay and to have the help from the team to make it interactive, and with the graphics and stuff, and to really try to explain that well for regular people.

DEWS: So, if you had to answer that question, "Why are fossil fuels so hard to quit," during an elevator ride -- and I know none of us are taking elevator rides because really our offices are closed, and so on -- if that ever happens again, if you're in an elevator and someone asks you, "Why are fossil fuels so hard to quit," how would you answer?

GROSS: Well, the elevator version, I think, is that it's relatively easy to make electricity without fossil fuels. We have gotten pretty good at that. We have wind and solar, geothermal, and nuclear, so electricity is pretty easy.

But it's hard to quit in the areas that are hard to power with electricity. There are certain qualities of fossil fuels that makes them really useful. And in areas you can't electrify, those are the areas where fossil fuels are especially hard to quit. And there is an explanation in the essay that we can go into, as we go, of the parts of the energy system where that's most true and where fossil fuels are the hardest to quit.

DEWS: Definitely, we will arrive at that pretty soon because it's a really important piece of the essay. But I want to put us in the current moment. You write in the essay that greenhouse gas emissions this year are down between 4 and 7 percent, as a result of the coronavirus lockdowns.

There are fewer cars on the road and businesses haven't been open. The air is cleaner in a lot of the world's smoggiest cities. We have seen some pictures from India, from China. And there is a lot of people who are cheering this; the air is cleaner. The environment is improving because we're all staying home. But how do you react to that?

GROSS: It's great, as far as it goes. And I will say that that 4 to 7 percent reduction in greenhouse gas emission is actually an estimate for the whole year. If you look at estimates for, say, the month of April, for instance, when the lockdowns were the strongest, you see emissions at some places down as much as 20 or 30 percent.

So it's wonderful to see the clean air; it's wonderful to see what we could do with fewer emissions. But the question for me is, how long those changes will last? And I'm concerned that most won't because the underlying energy system is the same.

And so, if we go back to the same system we had before and act just as we did before, we'll end up right back in the same place. It's possible that some of the changes due to the coronavirus will stick around.

People will find that they like them or they'll be necessary for a while -- things like, less computing, less business, and that will help. But, ultimately, when the world goes back a more normal economy, we'll be going back to the same energy to (inaudible), and the same emissions patterns that we started with.

DEWS: Since you're talking about climate change -- and a question I always want to ask climate experts such as yourself -- how would you describe briefly what is happening today with the climate? What are some of the markers that we're seeing of accelerating climate change?

GROSS: I just want to start by saying, the climate is warming and humans are responsible, clearly, just to lay that right out there. But we see it everywhere.

We see rising sea levels; things like sunny day flooding in parts of Florida because the tides are just higher than they used to be, the sea levels are higher; stronger storms, and just more energetic weather in general; drier droughts; wetter floods; changes in wildlife habitats.

As the climate changes, wildlife are moving towards areas that fit their needs, and sometimes they're moving geographically, living higher in elevation, for instance, in order to find a climate that fits them.

And so, it's no question that the climate is warming. We're up about a degree Celsius already, which is 1.8 degrees Fahrenheit. The climate is definitely warming.

DEWS: And in June, I think, there was a news story about a village in the Arctic Circle in Russia, maybe, that hit 100 degrees, the furthest a 100 degree temperature has ever been recorded that far north.

GROSS: Yeah. We have to point out the difference between climate and weather, and weather anomalies happen. We have crazy weather sometimes. The climate is sort of the overall weather taken together. And we're seeing a lot more crazy weather, like, 100 degree temperatures north of the Arctic Circle than we have before. And that is a result of climate change.

DEWS: Well, let's go into the essay now, with some more focus here. In the essay, you write about the various energy source transitions that start really in pre-industrial times and bring us up to the present. It's a really kind of foundational piece of your essay, as we get into the argument. Can you review that history, those transitions?

GROSS: Sure. The overall theme of the essay is the idea that humanity has moved towards more concentrated and more convenient forms of energy, as we have gone -- we have gone from using wood, as our primary energy source, and the energy of people and animals on

coal, and then moved on to oil and gas.

And each of these new energy sources opened up new possible uses, new things we could do with energy. A really good example is liquid fuels -- like, oil and those made from oil -- allowed us to develop the internal combustion engine, which has really opened up the transportation world. It powers all of transportation today.

And so, the idea is that we have gone on this overall journey from where we relied on, mostly, photosynthesis capturing energy from the sun, and through plant matter, and burning plant matter, and that being a primary source of energy.

Moving on to stored forms of solar energy, which is basically what fossil fuels are, ancient plant matter that has been transformed through pressure in millions of years in temperature into a very concentrated fuel.

And so, we've gone from using today's solar energy to using a much larger available amount of stored solar energy. And that's allowed the world we see today, this use of incredibly concentrated energy sources.

DEWS: I want to impact that a little bit more because there is some science in the paper -- and you have a background as an engineer, too, I'll point out to listeners -- when you talked about more concentrated and more convenient sources of energy; somewhere in the paper you also talked about energy density.

Can you talk about some of those concepts and why those are so important to understand?

GROSS: Sure. Energy density is a really useful thing to understand, as you're telling this story. And it's really a pretty simple concept. It's the amount of energy that something has per unit of weight or per unit of volume. And what happens as we went from wood, to coal, to fuels

based on oil, is every one of those steps that fuel was more energy dense. It packed more punch per unit of weight, for instance, in the fuel that preceded it. And so that made it easier to carry more energy around and that sort of thing.

Energy density is really particularly important when you think about transportation. And the reason why, as you think about your car, ship, or especially, an airplane, it has to carry around all the fuel that it needs. And so the weight and volume of that fuel is really important and this is the reason why we see battery powered passenger cars.

We don't see battery powered airplanes because the very best battery that's available today carries about 40 times less energy per unit of weight than the equivalent weight of gasoline, or diesel, or jet fuel. So it's the reason why you can't really power a 747 with batteries because it would be made up entirely of batteries with no cargo or passengers.

And so, those kinds of applications are the kind that I mentioned where the properties of fossil fuels are really hard to replace, and it's very difficult to electrify if you have to carry around a heavy battery versus a lighter fossil fuel. It's not true in all applications, but in certain ones that particular quality of fossil fuels really matters.

DEWS: And, as you say in the essay, it really matters for certain sectors like transportation, your long-haul trucks, and trains, and airplanes carry a lot of freight around.

Where we can electrify our homes, I guess, and our cars relatively easily, it's not so much the case with vehicles that have to carry a lot of load, is that right?

GROSS: Yeah. The way I think about it is if a vehicle carries a lighter load and it can stop frequently for fuel. That makes it much easier to electrify because the disadvantages of batteries are lower.

And I should also point out that electric cars, the batteries are heavy, but the rest of the

cars have some real advantages. They're lighter and simpler, and electric motors are a lot more efficient than an internal combustion engine at turning energy in batteries to forward motion in the wheels.

And so, they have some advantages that balance out. But if you have something that carries heavy freight that doesn't have the opportunity to stop for fuel often, like, an airplane, or large maritime shipping, then it becomes much more difficult to electrify because the energy density matters more.

DEWS: And so, we're talking a lot about electricity generation and electricity can come from many sources. Can you explain to listeners the composition of electricity generation that comes from fossil fuels, as opposed to, say, nuclear, and renewables, hydropower, that kind of thing?

GROSS: If you look at the compositions today, globally, about 64 percent of global electricity production is powered by fossil fuels. And, actually, oddly enough, the figure is similar here in the United States. It's about 63 percent fossil fuels.

The one thing that's true here in the United States is that we use more natural gas than coal here in the United States, which in many other parts of the world is not true. Inexpensive natural gas has outcompeted coal in the U.S. market. And so, that lower carbon, slightly greener fuel, has helped out our power system.

We seek new renewables, wind and solar, but the thing is they were starting out from a very low base. But if you look at what's being built in the United States today, new capacity, it is very much, overwhelmingly, wind and solar, with a little bit of natural gas because that's the most cost-effective form of electricity production that you can build today.

DEWS: What about nuclear-generated energy? I know it's not popular in the U.S., but

it's very popular in some European countries, like, France.

GROSS: Nuclear is such a tough one. We have seen some really scary disasters happen -- in Fukashima, most recently. But I will say the newer nuclear plants are more inherently safe than older models. They have designed plants that when they fail, they fail more downwards, in terms of energy, rather than upwards. And that's helpful.

But the biggest problem here in the United States -- there are two -- one of them is that we have not solved the waste problem. We haven't figured out what to do with spent fuel and don't seem to be getting any closer to figuring out this problem.

And then, the other issue here in the United States, is cost. There were a couple of nuclear plants under construction in Georgia and South Carolina. One of them was canceled; the other is going forward but with huge cost overruns, bankrupted the companies that were constructing them.

I don't think we're likely to see another big nuclear plant built here in the United States again. The costs are just prohibitive. Other countries are building them, and other countries have different solutions or have at least some temporary solution to the waste problem.

But I think the future of nuclear may be just in a very different kind of plant entirely. Instead of stick-building these plants from scratch, each one itself, if we can come up with -- and people are working on smaller, more modular technologies that you could manufacture and get some economies of scale -- those may be the future of nuclear power, both here in the United States, and in other places.

But the large nuclear power plants that we think of, we're not going to see another one of those built in the United States. They're important for our low carbon power base now, but I don't expect to see any new ones.

DEWS: Well, in terms of other forms of non-fossil fuel based electricity generation sources, I guess two of the bigger ones are, wind and solar.

GROSS: Yes.

DEWS: Can you discuss the role that wind and solar electricity generation plays? What are some of the concerns or some of the challenges to that? You know, we always hear that, well, the sun isn't always on, and the wind isn't always blowing.

GROSS: Yeah, of course not. I mean they have the disadvantage that they are intermittent compared to a fuel that you burn, that you can burn whenever you want to. There are also results in an electricity system that has a little different shape.

And I actually wrote another paper on this recently talking about how you build wind and solar resources where it's windy or sunny; you go where the resource is. It's gone down tremendously, as we build more and more of them, get economies of scale in manufacturing. As the underlying technology gets better and cheaper, the prices have come down tremendously. And they're, in many cases, the cheapest electricity generation you can build.

And so you see a lot of companies -- they're not building them out of the goodness of their heart, they're building there because they're great investments. And so that's just wonderful to see. That's how problems get solved, when people can make money solving them.

And there are ways around the intermittent generation that they have produced. For one thing, a wider grid that covers more geographic area. If it's not windy or sunny in one place, it may be windy or sunny someplace else, and so that helps keep things more even.

Storage can help. We have batteries and pumped hydro storage today, when new technology is under development to make storage more cost-effective. And then there are other sources that can kind of fill in the gaps when you have lulls in wind and solar production:

nuclear, geothermal, fossil fuel plus carbon capture and storage.

And so there are ways that we could have a zero carbon energy system with a lot of wind and solar but that still allowed you to, as the president likes to say, "Watch TV when the wind isn't blowing."

DEWS: That's a good moment to transition to the politics aspect of your essay. For one thing, when we hear talk about wind and solar, you do hear people like, President Trump, making quips like that.

But I have also seen around the country some state governments, or even local governments, pass ordinances that make it more difficult for companies, solar companies, for example, to operate, to install solar panels on people's houses.

I mean, I look at, say, Phoenix, Arizona, where I have been many times, and it feels like every single house in that whole valley of sun should have a solar panel on its roofs. And what are some of those political issues that are keeping us from going further into a world where more of our electricity comes from solar and wind?

GROSS: Yeah. But let's talk about wind and solar first, and then maybe we can move onto the larger climate issue, and maybe we can link on this podcast. I have another paper talking about some local opposition to wind and solar.

The trick with this is we often think of wind and solar, and we think of it like mom and apple pie. And it's this beautiful thing that everyone loves. But wind facilities, in particular, but also large solar firms are large industrial facilities and you have to site them. You have to find an appropriate place for them. Not everyone wants to look at them or wants them in their backyard, and so this can be challenging.

There are people who find solar panels on people's roofs unsightly. I know of cities

where, in older neighborhoods, they have been concerned about solar panels ruining the historical character of neighborhoods, for instance.

I mean there are all kinds of opposition to how these things look or their size in areas and so those are challenges. But we have to remember that an industrial energy system is an industrial energy system and it involves large facilities.

And we need to think about how to work with communities and develop in governments to site these appropriately and to find areas where we feel like they're good areas, and areas where we'd like to keep free of these kinds of things.

But we have to remember that we're still going to have industrial facilities. Even in a greener energy system, those aren't going to go away.

DEWS: Kind of switching gears then, from non-fossil fuel back to fossil fuel, an alternative that has emerged in the last decade, especially in America, as you pointed out, is natural gas. It's really displacing coal as one of the chief electricity generating sources for U.S. energy.

Can you talk a little bit about why natural gas has taken such a larger chunk of the electricity generating pie, and what some of the issues in natural gas generation have been and are?

GROSS: Sure. I mean, just in a few words, the reason why natural gas has displaced coal is because it's cheap. The fracking emission here in the United States brought out a lot of very inexpensive natural gas, and natural gas actually got cheaper than coal which hadn't before then been the cheapest source of electricity generation.

And so that was just a simple economic transition towards the cheaper fuel. The challenge with natural gas is it is the lowest carbon, and thus the lowest greenhouse gas

emissions fuel of any of the fossil fuels. However, it's still a fossil fuel; it's not zero emissions.

So it is helpful the reductions that we have seen over the past decade or so, in U.S. greenhouse gas emission from the power sector have almost entirely been replacing coal with gas but it's still a fossil fuel.

And so we need to think about areas where we can push gas out or areas where we can perhaps pair gas with carbon capture and storage in order to use some of its advantages; it's energy dense.

It's easy to ramp up and down in electricity production to respond to fluctuating solar and wind. So gas and renewables make a nice combination. Maybe we can do carbon capture and storage and keep that friendship together. But we have to remember that gas is lower carbon but it's not zero carbon. It's still a fossil fuel.

DEWS: What is carbon capture and storage? How does that work?

GROSS: The idea is that all fossil fuels emit carbon dioxide when they're burned. Fossil fuels are made of carbon. And so when you burn them you get carbon dioxide, and carbon dioxide is the most important greenhouse gas.

So you could not emit carbon dioxide at all and not burn something, or in applications where you really kind of need to burn something you can then capture that carbon dioxide after you burn it and either store it underground or use it for something. And that way it's not entering the atmosphere and it's not making the climate change problem worse.

The only problem with carbon capture and storage is that there is an energy penalty. It takes energy to grab that carbon and compress it and do something with it, either pump it underground or use it. And so there is always an energy penalty when you use carbon capture and storage.

However, in applications where you really need to burn something, you need really high heat, or you have industrial applications that emit CO_2 as part of the process. Like in steel or iron production, you can capture that carbon dioxide and that might be the easiest way to deal with it.

So it's not an all-purpose solution to everything but there are definitely times when carbon capture and storage or carbon capture in use could be really helpful.

DEWS: It kind of feels to a layperson, such as myself, that insofar as so much of our energy, necessarily even, comes from fossil fuels that emit carbon dioxide that warm the atmosphere that our alternatives are somewhat limited moving forward.

Can you talk about what some of the policy ideas are to, as people say, reduce our dependence on fossil fuels, but also reduce the greenhouse gas emissions that so far don't seem to be going down?

GROSS: Well, I say in the paper, and I say often when I talk to people is that the very simplest way to approach this is to decarbonize the electricity sector, and then to electrify everything that you possibly can.

When you think about new renewables -- wind, solar -- in addition to, you know, geothermal and nuclear, those are processes that produce the electricity and electricity is great stuff. It's very flexible. You can use it very efficiently in use. Electricity is wonderful stuff and so what we want to do is use electricity in every place where electricity is practical.

However, there are some places where electricity just isn't practical. And we talked about energy density in areas where you need to carry your fuel with you, and batteries are just not as energy dense as you would like. They're just heavy for the amount of energy they carry.

There are also applications where you need very high heat, where the best way to get that high heat is to burn something and so electricity is hard to use in those applications.

But, as far as decarbonizing the electricity system, we know how to do that. We have technology to do that. We're moving in that direction and we need to accelerate that process. We still have 64 percent of the world's and, roughly, the U.S.'s electricity made from fossil fuels.

And we can do a lot better, and we need policy to move us in that direction now; then we need to also think about some of the thornier issues, the issues where the properties of fossil fuels are hard to replace.

In some of those areas we'll need new technology, and some of those areas there are more policy issues. But, really, we can make an incredible start by focusing on the electricity sector and on electrifying everything we can.

DEWS: Well, it sounds like what I'm hearing is that there is just a lot tradeoffs, and we have to make smart tradeoffs obviously. So coming back to the political side of it, there is a really cool, really fun game embedded in the paper called, "The President's Climate Quandary," which is all about tradeoffs.

I played it a couple of times. I'll share those results in a minute. But can you tell listeners more about what this interactive feature is all about?

GROSS: We wanted to make this a little fun, and also to make readers think about compromises and political challenges, as well as some of the technical ones, which is mostly what the papers are about.

And, you know, what do you do? If you're elected president this November, what do you do when you take office? Do you go for broke and try to solve the climate problem all in one push?

Do you compromise with members of the other party and try to do it more piecemeal? Do you put in very stringent and prescriptive policies, or do you do things more incrementally?

And we let these (inaudible) play out throughout the game. Also, your goal in the game is whether or not you get reelected and so you need to put in policies that appease your base but that also are popular and encourage economic growth. And so, it's a fun game to kind of think about different things that you could do and how they might play out.

DEWS: Well, I went through one scenarios where I did go for broke and I tried to do all of the things that would seem to solve climate problems most immediately without regard to the other political party, or even without regard to the economy.

I did all of those actions and when I got to the end of my first term, I was very unpopular. I had reduced U.S. emissions by only 17 percent and I lost reelection, probably to somebody from the other party. Who knows? So it was almost like it wasn't worth it. You know, and I didn't make any of the comprises.

GROSS: Yeah. I think that "go for broke" strategy will be very difficult politically. I might be giving away the game a little bit, but this is a fun thing to talk about.

There has been a real push in the Democratic party, in particular, to really push against fossil fuel production; that one of the most important things we can do here in the United States is to stop producing fossil fuels. And I feel a little bit differently about that.

Clearly, we need to get to that point, at some point. But if we stop fossil fuel production before we stop fossil fuel use, we're just going to import them. They are plentiful around the world. And if we're not producing them here, they're going to come from somewhere else.

This hard push against producing fossil fuels here, I think, may be somewhat no effective and may cause more problems than it solves, particularly, if we reduce production here faster than we reduce demand.

So that's a small hint to the game, but a policy that I have so much use with it definitely

comes up in the political debate.

DEWS: Well, another big issue is not necessarily in the game. But it's kind of referenced in the game, is kind of the global dimension of climate change response in reducing emissions. And this came up a lot during the Paris Agreement negotiations.

And we hear about it a lot that countries in the developing world where there are billions of people still need to catch up. They need their economies to catch up so they can lift their people out of poverty, and so on.

But they don't have the luxury of going through the same industrialization process that the United States, and Great Britain, and other western nations went through; and yet they point out that you guys in the West, in the developing countries, you put out the most emissions of anybody; and yet you want us to reduce our use of fossil fuels where we're trying to develop our economies.

How do we negotiate that really difficult global problem?

GROSS: That problem is absolutely brutal. And the thing is the developing nations are right. I mean we did follow a pathway, but they can't follow that pathway or all of us will suffer, both them and us; and so we need to find a way to help them.

They need to develop; they need more energy. There are a billion people nearly in the world today who don't have access to modern energy services and leaving those people out is not a solution to climate change. But we need to find a way to help them develop following a greener pathway than we did.

When they complain that we caused the problem, they're absolutely right. And the morals may be on their side, but practically they can't follow the same pathway that we did or we all suffer.

And so we need to work together to get past this, the us versus them, and the huge challenges that this has brought to the UN process and figure out how to work together to find a greener pathway that provides people the lifestyles that they want, the energy services that they want, but not so much the emissions that the world just can't handle.

DEWS: Well, Samantha, as we wrap up here, I want listeners to know that I'll link to this great foreign policy essay in the show notes and also other research that you have done on these issues.

But just to sum up looking forward, what are some of your tenets for addressing these kinds of problems about why we can't quit fossil fuels?

GROSS: Well, I mean, I would really like to see us focus on the electricity sector. The electricity sector is where the low-hanging fruit is, and we haven't come anywhere close to picking all of it.

There is still plenty of room for replacement of coal and even natural gas in the system. There is plenty of room for more renewables before we run into the challenge of them being intermittent.

There is lots of work that we can do right now. A lot of that work is even cost-effective. There are projects where people can make money, help to solve emit (phonetic) problem. That's when things really get done.

And so I'd like to see us focus on research and development, focus on new technologies to deal with some of the thornier things. But there are a lot of things that are cost-effective and super helpful that we can do right now, and I want to see us focus on those.

DEWS: Well, that's perfect. Samantha, I appreciate you taking the time and sharing your expertise with us today. I hope people enjoy and learn a 0lot from the foreign policy essay that

you just published.

GROSS: I hope so, thanks. And it's my pleasure to talk to you. (Music plays)

DEWS: The Brookings Cafeteria podcast is the product of an amazing team of colleagues, starting with audio engineer, Gastón Reboredo. Bill Finan and Robert Wicks of the Brookings Institution Press do the book interviews.

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The Brookings Cafeteria is brought to you by the Brookings Podcast Network, which also produces, "Dollar and Sense," "The Current," and our Events podcast.

Email your questions and comments to me at bcp@brookings.edu. If you have a question for a scholar include an audio file and I'll play it and the answer on the air. Follow us on Twitter @policypodcasts. You can listen to the Brookings Cafeteria in all of the usual places. Visit us online at brookings.edu.

Until next time, I'm Fred Dews.

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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