RATIONAL MIDDLE

NET ZERO

MANAGING OUR CARBON

EPISODE TRANSCRIPT

Shannon Heyck-Williams:

Carbon dioxide is certainly the greatest contributor to climate change. It is 80% of the US's greenhouse gas pollution. There are some gases that are even more effective and powerful at trapping heat, but carbon dioxide really takes the prize as the greatest contributor.

Dr. Ramanan Krishnamoorti:

And so these radiation-trapping gases are really the problem. Yes, we need to continue to get carbon-free energy, but let's not forget that we are going to see fossil energy use continued globally. So, how do I address the global need for energy but simultaneously remove the emissions?

Dr. Julio Friedmann:

Carbon dioxide enters our atmosphere from many places, from the use of fossil fuels or biomass, from natural sources, from all kinds of things. Fossil fuel use is by far the largest piece of that, and we use fossil fuels in electricity production, in transportation, and in heavy industry, things like making cement and steel.

Dr. Ramanan Krishnamoorti:

Since the Industrial Revolution, we've put about 2,000 gigatons of CO_2 into the environment, 2,000 gigatons! Every year that we've got human development continuing to grow, we have about 40 gigatons of CO_2 that we put into the environment.

Shannon Heyck-Williams:

The most important thing that we can do as a country and with other countries is to transition away from burning fossil fuels. That is just the number one solution, and it needs to be done swiftly. Of course, that is very challenging.

Dr. Julio Friedmann:

Solar and wind have gotten a lot cheaper. We have nuclear and hydro and all these things, but still, in most countries, coal and natural gas are the majority of electricity production.

Lee Stockwell:

Many countries are still going through their development cycles, so stopping all activities that result in the emission of greenhouse gases and carbon dioxide isn't feasible for everyone on the

planet in order to achieve a quality of life that, say, those of us in the US or in Europe have achieved.

Dr. Julio Friedmann:

So we cannot zero out fossil fuels immediately. We must, however, reduce the emissions associated with them. If we can't replace the fossil fuels with something else, we can keep the CO2 out of the air and oceans. That's called carbon capture.

Shannon Heyck-Williams:

So carbon capture is a term used for various technological processes where carbon dioxide is captured at the source of emissions before it can be released to the atmosphere. Basically, it is a technology that uses chemicals to bind with carbon dioxide as it is released and then separates out the carbon dioxide so that it doesn't enter the atmosphere.

Alan Krupnick:

The other approach to capturing the CO2 is called direct air capture.

Dr. Richard Newell:

So direct air capture is an approach where you can actually remove CO2 emissions not from a smoke stack, but directly from the atmosphere.

Alan Krupnick:

And from there, you have to do something with it. There's two things to do with it. One is you can put it deep under the ground into geologic storage sites, so that means they're going to be able to store this for geologic time.

Lee Stockwell:

We look for areas with saline aquifers or depleted oil and gas reservoirs that we can put carbon dioxide in. We drill a well. We test that well to see what we can inject into these formations.

Dr. Holly Krutka:

It's not a big hole in the ground. There's rock, and the rock looks like solid rock like you would see anywhere, but it has actually very tiny pores in it, and the CO2 will actually fill up those pores. And so we talk a lot about pore space and how porous is the rock. Basically all that means is, how much room is there to store CO2, how much will it accept? One thing to understand about subsurface carbon storage or storing CO2 underground is it's very, very deep underground. This is nowhere close to drinking water. We're talking over a mile underground.

Dr. Julio Friedmann:

So we absolutely know how to do it and it's safe. The question is, can you recycle it and reuse it instead of just disposing of it?

Alan Krupnick:

Now, another thing to do with the carbon that you capture is to utilize it in a safe way and in an efficient way. The standard way to utilize it is enhanced oil recovery. When an oil well plays out, you can put CO2 under pressure into that well, and that'll push the oil out.

Dr. Holly Krutka:

Every other use for CO2 is much, much smaller. There was the XPRIZE competition where the winners are trying to use CO2 in concrete. There are researchers looking to convert CO2 and hydrogen into sustainable fuels, but those are early stage and they require a lot of energy.

Lee Stockwell:

Unfortunately, right now, the amount of carbon dioxide that we have to take out of the atmosphere versus the market that we have to utilize carbon dioxide is offset. There's a lot more carbon that we have to find something to do with than we have something to do with in these different ways that we might be able to utilize it. Now over time, those may start to equilibrate some, but right now you need storage.

Dr. Richard Newell:

You can also do things like what's called biological sequestration of greenhouse gases. Growing trees and other plants removes carbon dioxide from the atmosphere. Also, in coastal ecosystems like wetlands and sea grasses.

Shannon Heyck-Williams:

Abandoned mine lands, abandoned coal mines, hard rock mines, these are actually excellent areas for reclaiming, stabilizing, making safer a local environment, while at the same time, store even more carbon. We can do a lot more in our urban areas. We can plant native trees that absorb carbon, but also to improve the local environment of a lot of our urban areas. They can help clean the air, make for more beautiful living and working conditions. In the near term, I think we should lean in as much as we possibly can on every natural solution to climate change that we can, that not only will help in terms of buying us more time to transition our energy sector, but it can also boost resilience to the climate impacts that we can't avoid and help communities and wildlife be able to survive other changes.

Dr. Julio Friedmann:

One of the hardest things for people to understand in the climate issue is that we have to do everything on steroids. There is no option which we avoid or discount, so we must do tree planting. We must do energy efficiency. We also must reduce the amount of stuff we buy and use. We know all of that, and if we add all that together, that gets us 40%. The other 60% is still out there. We need nuclear power. We need geothermal power. We need biofuels. We need carbon capture. We need to remove CO2 from the air and oceans at enormous scale and speed. We need all of these things, and none of that's negotiable. If we take any of those options off the table, we add risk and we add cost, and in many cases, we just fail. The models can't solve for climate if you pull options off the table.

Dr. Holly Krutka:

The International Energy Agency found that in their Net Zero by 2050 scenario, carbon capture and storage should, by 2030, be at 1.7 billion tons of CO2 being captured and stored per year globally, and right now we're closer to 40 million tons a year.

Dr. Ramanan Krishnamoorti:

It's scary when you start to think about the scale of the problem.

Shannon Heyck-Williams:

That's why it's so important for the public and private sectors to really work together to ensure that there is enough financial support to get these newer technologies off the ground and to get them at the scale needed.

Lee Stockwell:

We have a short timeframe in order for us to meet our climate goals, and drawing this out a hundred years isn't a viable answer for us, so it is something that we need focus on.

Dr. Ramanan Krishnamoorti:

I think there are technology solutions. I think there are policy solutions. I think there are global solutions that can address CO2 emissions. Are they affordable today? Not really. Can they be made affordable? Absolutely. Is there a technological barrier to stop you from doing it? No. We can do this. It is getting the best minds to address the problem at hand, which is the emissions and its impact on climate change.

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