

# RATIONAL MIDDLE. NET ZERO

## THE PATH TO NET ZERO

### EPISODE TRANSCRIPT

**Dr. Richard Newell:**

There's really no doubt that the climate's changing. We have levels of carbon dioxide that are as high as they've been in two million years. We've got other major greenhouse gases, like methane and nitrous oxide, and those are at their highest levels in at least 800,000 years. It's led to temperature increases globally on the land, over oceans, and over ice.

**Dr. Virginia Burkett:**

We have changes in the rate of decline of ice sheets. We have changes in the distribution of plants and animals, increases in wildfire, tide gauge records from around the world showing an acceleration of sea level rise.

**Eric Drummond:**

We are just now at a point where climate change is clearly impacting virtually every segment of our population. When you start to have that happen, and it becomes clear, then it's a call to action.

**Dr. Richard Newell:**

One of the benchmarks that's come into prominence over the last several years is a focus on different degrees of allowable temperature change that we should tolerate globally. And there's been conversation around 1.5 degrees Celsius change relative to what it was before we had major industrialization, what's called the pre-industrial era.

**Dr. Virginia Burkett:**

The IPCC initiated a special report. And the current trajectory with greenhouse gas emissions would increase temperature to 1.5 degrees or higher above pre-industrial by 2050, roughly, unless greenhouse gas emissions are curtailed quickly.

**Eric Drummond:**

We're looking at having already achieved around an average of one degree C from pre-industrial times to now.

**Isabella Gee:**

Under 1.5 degrees, we're already seeing some of the impacts of climate change. We're seeing stronger storms. We're seeing ecosystem impacts. We're already seeing wars and civil unrest over water and natural resources. Well, in the future with mass ecosystem devastation, those problems will be worse.

**Dr. Ramanan Krishnamoorti:**

We can't afford to get it wrong. And if we get it wrong, our future generations are going to be worse off than the past generations. What is going well is that there is an awareness that is starting to build.

**Dr. Richard Newell:**

What virtually all countries agreed to at the Paris Agreement was to take actions to limit temperature increase to no more than two degrees Celsius, and to make best efforts to no more than 1.5 degrees Celsius temperature increase. So, that then led to a focus on, well, what does it mean to reach 1.5 degrees? How fast would the global energy system and how fast would our emissions have to change to try and limit temperature to that level?

**Dr. Michael Webber:**

If your goal is to prevent the additional accumulation of CO<sub>2</sub> in the atmosphere, one way to get there is to zero out your emissions, to stop all processes that would emit CO<sub>2</sub>. And those processes are things like burning fuels, like we use for our cars or our power plants, or reacting cement to make concrete and kilns that will produce CO<sub>2</sub>. There are a lot of things we do that produce CO<sub>2</sub> into the atmosphere. Decarbonization has three steps in my view. The first step is efficiency and conservation, which is light bulbs, mass transit, building codes, that kind of thing. Step two is electrification. So, when you electrify things, you get inherent efficiencies. But also the power sector is decarbonizing because wind and solar is so cheap, and gas historically, at least the last decade or so, has been cheaper than coal. If we look at the American economy, about 40% of our primary energy use is for the power sector.

We are going to have to at least double that. But whether we're electrifying 70 or 80 or 90% of the economy, there are parts of the economy that are difficult to electrify. Aviation, marine shipping, certain types of industrial heat, but we still need to decarbonize. And that's the third step, to use fuels that don't have those emissions or come up with alternatives. That's really hard. So, another alternative is to go to something called Net Zero where we still have some emissions. And then, we'll remove the equivalent CO<sub>2</sub> from the atmosphere with, say, direct air capture or planting trees or doing soil carbon sequestration or something like that.

**Isabella Gee:**

So, the benefit of Net Zero is that we can keep these processes that maybe are highly optimized that we don't yet have a great substitute for, or would just require massive investment in infrastructure changes, and then remove the emissions afterwards. And it's not perfect, certainly, and we shouldn't necessarily think of these carbon removal technologies as purely a way to keep doing what we're doing. But they are complimentary to a decarbonization mindset.

**Richard Newell:**

One of the things that is really powerful about the concept of a Net Zero is that it's a decision rule, and it's a target and a goal that can be applied at multiple levels of decision making. It makes sense for the global planet because to stabilize temperature, we need to get global net

emissions down to zero. It works at a country level, as a target. The notion of that a country's own emissions, when added up, should get to net zero. It works at a company level, and we've seen many companies commit to having net zero in their emissions. It works at a technological level. So, it's actually a remarkably resilient and applicable concept at multiple levels of decision making, and it's pretty unique in that regard.

It's incredibly important for the United States to lead on climate change and to not only decarbonize our own economy, but to really serve as a role model and as a demonstration to the rest of the world that this can be done. We are the wealthiest country on earth. We have the highest degree of technical capability on earth.

**Isabella Gee:**

We became a large geopolitical power through pollution, through our energy systems and our industry systems. And I think we can maintain that status by becoming a leader in cleaning it up. And I think that we can grow our economy that way. I think that we can become a leader in Net Zero technologies and in decarbonizing technologies.

**Eric Drummond:**

The truth of the matter is we have the technologies that are likely available to get us on the pathway through the next 10 years or so to the end of this decade. But beyond this decade and into 2050, we will have to bring into the marketplace technologies that are in nonexistence now. They're on the bench in a lab. They're a part of an entrepreneur's business plan. Technologies that need to be commercialized out of universities.

**Dr. Michael Webber:**

The workforce is demanding that we go to a low carbon future. The consumers are starting to demand that we go to a low carbon future. Major industrial customers are now requiring that their source of electricity or energy is low carbon. Customers like Microsoft and Amazon, big energy consumers, people who care about the bottom line. And the third factor is the investors are starting to demand it. So, if the investors, the employees, and the customers are all demanding that we change, we're going to change. Policies can slow it down or speed it up, but they can't stop it at this point. The markets have spoken, and the markets have said, "We're going to make this change."

**Dr. Ramanan Krishnamoorti:**

We can solve this and continue to have affordable, reliable, and sustainable energy. But we've got to take a systems approach, stop the lab exercises of saying, "We're going to try this boutique solution here. We're going to do this there." We're going to have to start doing things at scale and try out every one of these approaches, whether it is bringing solar and wind at scale, whether it is looking at geothermal, whether it's looking at electrifying transportation hydrogen as an industrial fuel, whether it's CO2 capture, whether it's direct air capture. All of these are going to have to be deployed. And if we deploy it at scale, and we start to find the appropriate winners that provide us affordable solutions that are reliable and are sustainable, we can solve the problem at hand.

**Isabella Gee:**

I think we'll know if we're on the right path to achieving Net Zero goals if we start to see the emissions declining. That's really the key metric. There might be some lags between, oh, we

start seeing emissions declining, but we're still seeing extreme weather patterns and things like this. But if we see those emissions declining, we know that that will result in our goal.

**Eric Drummond:**

We have to act now by bringing the right policies to the fore, technology, and partnerships. If we do that, we will be able to hit net zero by 2050.