

Scott Tinker ([00:00](#)):

Next on Energy Switch. We'll look at energy through the fascinating and essential lens of investing.

Ken Medlock ([00:06](#)):

You look around the world of 7.6 billion people and you realize, wow, there's more people in the world that don't have energy than do.

Scott Tinker ([00:14](#)):

What's the answer?

Deborah Byers ([00:15](#)):

If we make the right investments, you get the right outcome, which is we're trying to produce power with the lowest emissions possible.

Ken Medlock ([00:22](#)):

One of the best ways to promote cleaner, more environmentally sustainable communities in the developing world is to promote development.

Scott Tinker ([00:30](#)):

Coming up on Energy Switch, investing in our energy future.

Speaker ([00:35](#)):

Funding for Energy Switch was provided in part by Microsoft and by the University of Texas at Austin.

Scott Tinker ([00:46](#)):

I'm Scott Tinker, and I'm an energy scientist. I work in the field, lead research, speak around the world, write articles, and make films about energy. This show brings together leading experts on vital topics in energy and climate. They may have different perspectives, but my goal is to learn and illuminate and bring diverging views together towards solutions. Welcome to the Energy Switch.

Scott Tinker ([01:17](#)):

Energy is a very expensive space, meaning most energy decisions are based not just on price, but whether they can create a return for investors. So in this episode, we'll look at energy investment to reduce CO2 emissions, to drive new technologies and to supply reliable, affordable energy, especially for the developing world. My expert guests are Debra Byers. Over her 35 year career at Ernst and Young, the global finance and accounting firm, she's risen to lead its industry finance practice for all of the Americas. Joining her is Dr. Ken Medlock, world renowned energy economist for the Baker Institute at Rice University, who also directs their Center for Energy Studies and their masters in energy economics program. On this episode of Energy Switch, investing in our energy future. Let's jump right in. Challenges are... Deborah. What's been the impact of divestiture and investing in the oil and gas sector today?

Deborah Byers ([02:18](#)):

Well, I mean, look, I think divestiture is too strong a word. I think that there is still ongoing, very significant investment in fossil fuels. Now, what will that do? What's happening in Asia? I think that if

there is a return, there's going to be capital that chases that return. And so if the demand is going to be there for coal in India and China, I think the capital will show up. The cost of capital will go up and perhaps that'll push some of the cost up. And so maybe push that a little bit out of the market, but I think divestiture is probably a very strong word.

Scott Tinker ([02:58](#)):

So should we stop investing in fossil fuels?

Ken Medlock ([03:03](#)):

No, I don't think it's feasible actually. I mean, look, we just had our annual energy summit, and there was an entire discussion about views from around the world on the road to Glasgow. We had leaders talking about realities on the ground in Africa, realities on the ground in Asia, in South America, in Europe, in the US, in China. They're all very different, right. And so, when you think about where to invest in countries like Japan, where there's not really a massive land footprint, where there's not a tremendous wind resource, there's not a robust solar resource. And so what they're doing there is they're actually looking at ways to leverage existing energy value chains, which are fossil dominant, but thinking about ways to decarbonize them. So we get into discussions about hydrogen and ammonia and other things that you can use as a vehicle for hydrogen ultimately, but it doesn't mean you abandon fossil fuels. It just means you change the way you consume them.

Scott Tinker ([03:59](#)):

Yeah. So I'm hearing you both say, we need to invest in technologies that produce carbon emissions.

Deborah Byers ([04:07](#)):

Reduce carbon emissions. I mean, I think that's why in countries like Japan and Korea and Africa, you're getting a lot of interest in carbon capture, for example. What if we were to make significant investments in carbon capture technologies? Looking at those types of technologies, they're not as well known, but if we make the right investments and you get the right outcome, which is we're trying to produce power with the lowest emissions possible.

Scott Tinker ([04:35](#)):

So I've had a group in CCUS carbon capture for 20 years at the bureau. Technologically feasible, is it economically feasible?

Ken Medlock ([04:44](#)):

It's expensive, but it's not something that's been deployed wide scale in a commercial setting. So we don't know what that learning curve looks like, what that runway looks like over the next 20 years as we start to move forward with some of these types of projects.

Scott Tinker ([04:56](#)):

Economies of scale?

Ken Medlock ([04:57](#)):

Exactly. I mean, the one thing that I think is going to be game changing when we talk about carbon capture is how do you actually create a carbon devalue proposition? Whether it's through a paralysis

combustion reaction where you're getting a solid carbon residue and you can use it to make all sorts of advanced carbon materials that we can do in labs but it's not anywhere near commercial yet, or take CO₂ and use it in various chemical processes or other things, right. How do you create a value proposition out of that? Because then now instead of just capturing CO₂ and trying to move it to where it's disposed of, you actually have something that can generate a return on capital. That changes the game, right? So those are the kinds of technologies when you think about the world's need for energy that I think we're going to have to get into.

Scott Tinker ([05:42](#)):

So in a big umbrella, kind of a CO₂ to molecules.

Ken Medlock ([05:46](#)):

Yeah. Yeah.

Scott Tinker ([05:47](#)):

Use kind of thing. Let's talk about renewables. How successful on the finance side have subsidies been for renewables?

Deborah Byers ([05:54](#)):

I mean, look, I think the renewable growth in the US alone has been like 16, 17% annual compound growth. And a lot of that was driven by good policies around tax incentives, incentives for investment, production type credits.

Scott Tinker ([06:10](#)):

States more than federal or both?

Deborah Byers ([06:11](#)):

I think a little bit of both, but mostly on the federal side. And that allowed capital to come in, allowed the cost of capital be lower. And then it was also coupled with a real significant decline in the cost of materials, much faster than anybody predicted. And so it has been successful, but as you said, it's still a thin sliver because you need sort of a base load.

Scott Tinker ([06:35](#)):

If the cost has come down in solar and wind, why are we still paying more for electricity in places that have solar and wind?

Deborah Byers ([06:43](#)):

Well, so I...

Scott Tinker ([06:45](#)):

What's going on?

Ken Medlock ([06:46](#)):

So a lot of times what happens when people talk about deploying new technologies, they ignore all the delivery infrastructure. Texas is a great example of this, right? So we had the production tax credit actually really did help. That's a federal tax credit, helped wind to new heights in Texas. And coupled with that is you've got a massive and just absolutely incredible wind resource in Texas. So capturing that makes perfect economic sense. But what happened was we started to install all this stuff in west Texas and realized we couldn't get it to the Texas triangle. So that's the Dallas, Austin, Houston sort of area where most of the consumption is. And so the state legislature had to step in and effectively approve the \$7 billion infrastructure package to develop transmission, to get that power to market. Now that's all rolled into rate payers within...

Scott Tinker ([07:32](#)):

\$7 billion dollars.

Ken Medlock ([07:33](#)):

Yeah. The issue though with power pricing comes in because you've got existing infrastructure that is facilitating the adoption of renewables. When you've got a lot of wind and solar, you can integrate, which are intermittent or non dispatchable resources, when you can integrate those into a grid that's well established and has other resources that can back them up, then you can grow faster, which is exactly what you've seen in the United States and in Europe. Now what that also means...

Scott Tinker ([07:56](#)):

They have to have backup.

Ken Medlock ([07:57](#)):

Yeah. But what that also means is that those backup generation resources which were running a lot more previously, now run less. And so to generate the return to capita that's required to support new investment, prices have to go up. And so you've actually seen that particularly in having regulated areas exactly.

Scott Tinker ([08:14](#)):

On the backup.

Ken Medlock ([08:15](#)):

But that's the price at the margin.

Deborah Byers ([08:17](#)):

Because you still have to have the backup because it's intermittent, right.

Scott Tinker ([08:21](#)):

So what I'm hearing is that the cost at the plant gate, the levelized cost of electricity, which is quoted a lot is not the cost to me. There's all this other stuff.

Deborah Byers ([08:33](#)):

I mean, if it was truly that simple, we would be covering India with solar and wind, right.

Scott Tinker ([08:41](#)):

And they're not planning to.

Deborah Byers ([08:42](#)):

They're not planning to, because they don't have the incumbent installed infrastructure that they can leverage off to get to capture this advantage. And so I think this is something it's never that simple, right? There's always...

Ken Medlock ([08:56](#)):

And there's a lot of interesting discussions. Some people will immediately jump to, well, we can do renewables with batteries. Well, technically yes you can. But what you've just done is take a \$1,500 megawatt investment in a wind farm, right. And added \$3,500 a megawatt to it when you want to talk about batteries. And you've got to add enough batteries to support flow.

Scott Tinker ([09:16](#)):

So more than three X.

Ken Medlock ([09:17](#)):

So you're actually, yeah. So what you're doing is you're getting into the range that a nuclear power plant in Asia costs now.

Scott Tinker ([09:23](#)):

If you're an investor, how important are these subsidies?

Deborah Byers ([09:26](#)):

Well, they're very important. If you look at how some of the solar and wind projects developed in the US, you did have kind of an ecosystem that came together. You always had the developer that came in, got the project going, and then there'd be an off take, usually by the utility. And so, there wouldn't be that kind of interest without that type of front end return and the subsidies. And I think right now where they are, because the cost curve has come down is, they're pretty sustainable now.

Scott Tinker ([09:56](#)):

Without the subsidies.

Deborah Byers ([09:57](#)):

Without the subsidies.

Ken Medlock ([09:58](#)):

Yeah. I think investment would certainly slow, right? I mean, you see this in the cycle, in the US where subsidies are about to roll off, and then they get extended. There's a rush to invest so you capture the subsidy. So you see this big influx of capital into wind development and solar development. And then once the subsidies renewed, it slows back down to the previous pace. Those subsidies are very important for the investment to occur. And it doesn't mean the investments wouldn't occur. They

wouldn't drop to zero if there was no subsidy because there's still tremendous resource opportunities that haven't been captured, but it would slow down.

Scott Tinker ([10:30](#)):

Yeah. So...

Deborah Byers ([10:31](#)):

Well, and one other thing. A lot of times you need that push, whether it's subsidy, direct grant, or other investment to get you out of that value.

Scott Tinker ([10:41](#)):

A signal to the market.

Deborah Byers ([10:41](#)):

Signal to the market, this is something that's important, it's going to be sustained. So I think that's another area that's important.

Scott Tinker ([10:49](#)):

Yeah. So when we think about attractive investments, energy technology investments today, I'm hearing you both say it's really different. That India is different from Southeast Asia, different from Africa. Let's talk US and Western Europe first. What are the attractive technologies for investors? And then maybe we can look beyond that.

Deborah Byers ([11:10](#)):

I'm going to bring up a boring one because it really gets overlooked and is just efficiency.

Scott Tinker ([11:17](#)):

Yeah. Perfect.

Deborah Byers ([11:17](#)):

Right, efficiency. So I was struck by, I think one of your colleagues at the Baker Institute, Todd Moss did a talk. And he was getting you to kind of zoom out about how much energy we actually use. And he had this chart that said, this is my refrigerator. And my refrigerator uses more energy per capita than someone in Nigeria, annually. Annually, and I'm like, whoa.

Scott Tinker ([11:40](#)):

He took my graph.

Deborah Byers ([11:41](#)):

Did take your graph?

Scott Tinker ([11:42](#)):

I show it every talk I give.

Deborah Byers ([11:42](#)):

It's a great...

Scott Tinker ([11:44](#)):

Although, I use Ethiopia and Kenya.

Deborah Byers ([11:45](#)):

I mean, for somebody that doesn't think about these things, just think about your iPhone and how much it has increased in function, yet it's still the same size. And it's become incredibly efficient, and it's become relatively cheaper. Take that fridge consumption or video gaming, I think that probably is another one of your charts, the amount of money we spend just entertaining ourselves. So efficiency is really something we could go capture. There is tremendous upside there.

Ken Medlock ([12:16](#)):

Well, the gaming industry in the US uses more electricity per capita, annually than a lot of Sub-Saharan African countries do. So it's...

Scott Tinker ([12:24](#)):

Just gaming.

Ken Medlock ([12:25](#)):

Yeah, just gaming. So it's an interesting thing to think about that.

Deborah Byers ([12:26](#)):

Playing video games.

Ken Medlock ([12:27](#)):

But efficiency is a virtual source of supply. And I think if we approach it that way, we'd see some significant gains and in the state of Texas, for example, where you have a competitive retail power sector. Power companies have re imagined themselves to being energy service providers, not just delivering electricity to the home, but also providing services within the home, smart technologies, monitoring technology, stuff like that allow the consumer to be more aware of their consuming behavior. And they can adjust it down, right. So that's a...

Scott Tinker ([12:57](#)):

And they get a benefit for doing that.

Ken Medlock ([12:58](#)):

That's absolutely, and they do. And they do. And that's a really interesting way for a company to differentiate itself and provide value to its customers and expand its market share. And you're seeing companies do that, right. But you don't get that in a heavily regulated utility sort of market. It's just different.

Scott Tinker ([13:15](#)):

There's a rebound effect to these things, to efficiency. How significant is it?

Deborah Byers ([13:20](#)):

Oh, the more efficient, the more you use. So it sort of cancels out.

Scott Tinker ([13:24](#)):

Yeah. I got three fridges now or whatever, and...

Deborah Byers ([13:27](#)):

I can play 10 times the video games. So absolutely. But I think this goes to another area that we don't talk about. It is really changing consumer behavior. So let's not consume more just because it's cheaper or more efficient. Let's consume what we need. Now I know that sounds very idealistic, but these are also things that we can capture without spending a ton of money on new R and D. This is can we find a way to change customer behavior?

Ken Medlock ([13:58](#)):

There's another constraint that binds and you see this is really true in highly developed countries, and it's time, right? So even if you make a... We'll use cars, right. If you make a car more fuel efficient, you're still bound by how much you can actually feasibly drive any given day, right? So that time constraint becomes binding. And at some point the rebound effect diminishes and means the efficiency impacts at wealthier levels are much larger. So it doesn't mean you stop investing in efficiency when you bring up the rebound effect. It means if anything, you want growth so that the rebound effect is diminished.

Scott Tinker ([14:29](#)):

So efficiency is a big one in the US and Western Europe. What other technologies?

Ken Medlock ([14:33](#)):

If you paint with a big, broad brush on the US and Western Europe, you're missing all of the individual sort of opportunities that exist because the Gulf Coast of the United States doesn't look like the Northeast of the United States, doesn't look like Northwest Europe. One of the really interesting conversations that was happening was the development of more long distance transmission between Norway and Western Europe because Norway has a tremendous hydro resource. And if you think about hydro, it's the world's best battery because you build a dam, the water builds up behind it, and you can actually load follow with it. So you can control the rate at which power is generated. And so if you think about what that means, you can load follow with variations in wind. And so that's a great opportunity for Northwest Europe, but that opportunity can't be transposed anywhere else in the world. It's unique to that place. So you have to kind of go region by region and identify where the resources are and how you can capture them to deliver lower carbon assets.

Scott Tinker ([15:30](#)):

Sure. So we've talked about reducing CO2 emissions and how investment encourages that. Let's transition now to energy access in the developing world. It's so critical. Financing and investment is such an important part of that. Deborah, energy investing in the developing world, it's not simple. How do we encourage it?

Deborah Byers ([15:50](#)):

It's not for the faint of heart. Put aside just the asset class, energy itself has got a lot of risk to it, and expectations of returns are high. On the ground risk when you're going into these countries where you have to manage geopolitical risk, physical regime change risk, I mean, these are all realities. And so that ratchets up the expectations of return. With risk, with high risk, you want high return. So even before you even get to energy systems, which is a smaller class of investors to begin with, it's very, very challenging.

Scott Tinker ([16:28](#)):

Yeah. So what are some things we can do? What starts to facilitate the need? There's so much energy needed in the developing world.

Deborah Byers ([16:37](#)):

Yes. It is literally not to be corny, going to take a community effort to make that happen. Especially if we want energy systems that meet clean emission standards that we all aspire to. And otherwise, they're going to go to the cheapest source, and it may not be as safe. It won't be as clean. And so you do need more government bodies, government incentives, and the local governments themselves need to make the environment attractive for investment.

Scott Tinker ([17:10](#)):

So that dual challenge of affordable, liable energy and a cleaner environment is also a dual challenge in many ways with private and public money.

Deborah Byers ([17:18](#)):

That's right.

Ken Medlock ([17:19](#)):

Yeah. I mean, what what we're talking about is de-risking the investment, right? So one of the ways to do that, and you see this in the developed world is through loan guarantees or various types of loan programs that are government backed. And we're starting to see a lot of interest develop in the developing world around similar types of programs that are funded by the developed world to help finance infrastructure in the developing world that is cleaner and greener, so to speak, right. So what does that mean? It means you have a pool of capital that doesn't require a rate of return. So that means the rest of the capital that needs to be invested for a particular project, the weighted average cost of capital is lower. So that's a way you can think about de-risking. And you're seeing movement on that front, but at some point it becomes a talking point. It's already a talking point in the United States, for example, why are we going to commit to funding infrastructure outside of the US when we have our own infrastructure needs to address.

Deborah Byers ([18:12](#)):

Yeah. We have roads and bridges that need.

Ken Medlock ([18:14](#)):

It becomes a political issue.

Scott Tinker ([18:16](#)):

What's the answer? Why would we do that?

Deborah Byers ([18:18](#)):

I think as citizens of the world. I mean, everybody believes that this is something we ought to do. Otherwise, we will have consequences given that climate change is a global problem, right? So it's just a matter of, I think the right thing to do. And the question is, how do you kind of share that burden globally?

Scott Tinker ([18:37](#)):

Our second film is called Switch On, and we featured energy poverty. We went to Vietnam and Kenya, Ethiopia, and Nepal, Columbia. And we showed what it looks like when you don't have much energy or any energy. I mean, these are big global issues. And if we invest in this, doesn't that help us?

Ken Medlock ([18:57](#)):

I often say, the world of energy is a world of haves and have nots. You've got roughly 1.3 billion people in the OECD where energy is a foregone conclusion you just kind of take for granted in many ways. But then you've got about a billion people that have no access to modern energy services at all globally and upwards of three and a half billion that have access to energy, but it's not reliable or in sufficient quantity to support a lot of activity. So you look around the world of 7.6 billion people, and you realize, wow, there's more people in the world that don't have energy than do.

Deborah Byers ([19:34](#)):

If we came out and said, there are 3 billion people starving in the world, there would be a mass rush to fund to alleviate this problem. And energy is also very related. If we didn't don't have energy, it creates all these other health issues, equity issues...

Scott Tinker ([19:55](#)):

Food, water.

Deborah Byers ([19:56](#)):

Food issues. If you can couple that together, then you get a little bit more clear picture as to why you should care.

Ken Medlock ([20:04](#)):

What you're talking about is promoting development. You're talking about being against poverty.

Deborah Byers ([20:08](#)):

I'm against poverty.

Ken Medlock ([20:09](#)):

It's that simple.

Deborah Byers ([20:11](#)):

And I don't think that we've linked that issue because we talk about it as energy, energy poverty, and we understand it because we live and breathe this issue.

Scott Tinker ([20:22](#)):

But the link to economic poverty that is...

Deborah Byers ([20:23](#)):

Does yeah.

Scott Tinker ([20:24](#)):

So tight.

Deborah Byers ([20:24](#)):

Economic poverty, which links to women's development, education, healthcare, all of that. And I think that is a discussion that just isn't in the ecosystem right now.

Ken Medlock ([20:37](#)):

There's a lot of people who are blissfully ignorant of how important energy is to their everyday life. If you don't have energy, you don't have running water because you don't have pumps to run sewage plants. You don't have refrigeration so you can keep vaccines and medications cool. You don't have the ability to refrigerate foods and move things around long distances between places where they're produced and consumed in terms of food stuff.

Scott Tinker ([21:03](#)):

And clothes.

Ken Medlock ([21:03](#)):

So you lack all of these things, right. And that is very, very closely linked to poverty. And so, in reality, if you want to talk about how do you invest in the developing world, one of the best ways to promote cleaner, more environmentally sustainable communities in the developing world is to promote development.

Deborah Byers ([21:22](#)):

Promote development.

Ken Medlock ([21:22](#)):

It's really that simple. And that's often lost in the conversation. It's nice to talk about putting solar panels in rural areas in Sub-Saharan Africa to provide a little bit of electricity, but that doesn't actually promote transformational economic growth. You have to start talking about things at scale, right, gigawatt scale. And that's where you get into large scale utility type power plants. What's interesting about that is for that to occur, you need an influx of capital from abroad, and that's exactly what is drying up right now.

Scott Tinker ([22:01](#)):

Okay.

Ken Medlock ([22:02](#)):

The EU and the US and the World Bank stepping back and saying, we're not going to fund fossil infrastructure. Well, there's a lot of leadership in Sub-Saharan Africa. Africa says, I get it, climate change is a problem, but if you built 10, one gigawatt, natural gas combined cycle power plants in Sub-Saharan Africa, it would be transformational in terms of energy it provides. In general, it would be a net increase in emissions without a doubt but the benefit you bring in terms of economic development and prosperity, it's arguably going to offset that in many ways. And quite frankly, when you look at the net contribution of emissions of what's happening in India and China by themselves, 10 gigawatts of gas, fire generation Sub-Saharan Africa is nothing.

Deborah Byers ([22:46](#)):

Right. When you're talking about that kind of transformational change that could actually overnight change an area, a region. I mean, you have to be more practical.

Scott Tinker ([22:57](#)):

Right. So this conversation is fantastic. And to me, I'm taking away, it's not binary. And I worry sometimes that we have a binary conversation a little bit about either it's good, meaning no CO2 or it's bad, that's dirty. We don't invest in it. Am I just way over simplifying? Or how do we make it, how can we encourage things that do well and do good recognizing that it's a bit more to it?

Deborah Byers ([23:27](#)):

I think we're not being honest with ourselves. And I think we need to inject a little bit of humility in some of the discussions that are being held at the policy levels. To think that we have a complete understanding of the consequences of tinkering with very complex energy systems in the developed world and taking kind of what we believe worked in the US or in Europe and that's going to work in India, completely different geographic, lots of different resource issues and cultural issues, I think we need more humility. It's not one size fits all. It's really about taking particulates and taking emissions as much as you can out of whatever the molecule or fuel source. And you ought be open to any technology and anything that you can scale and get a good return and deploy. It's not binary. Nothing is ever binary.

Ken Medlock ([24:35](#)):

So you're getting at something that when you think about investing in the future, that I think is lost in this binary conversation, resilience. You have to make investments in resilience. This is a business school, 101 statement I'm about to make, but you actually promote resilience by investing in a broad portfolio of options. When you think about energy systems, it's the same thing, right. You need a portfolio of options to actually promote sustainability and energy. And if we make the conversation binary, it's not a portfolio discussion anymore. And that is a fatal flaw just to be blunt.

Scott Tinker ([25:14](#)):

That's a wonderful point.

Ken Medlock ([25:15](#)):

Yeah.

Scott Tinker ([25:16](#)):

Our experts think divesting in fossil fuels isn't likely because capital will follow a return. Instead, we should encourage investment that could reduce their CO2 emissions. Subsidies work to attract investors so that these and other new technologies can be deployed. The developing world desperately needs energy. Here's that graph Deborah mentioned. One refrigerator here uses more energy per year than one citizen in these African countries. As access to electricity grows, there's a tight link to growth and prosperity in developing nations. To encourage investment there, we need to lower risk such as through loan guarantees. To increase sustainability, we should promote development. To encourage resilience everywhere, we should invest in a diverse energy portfolio.

Speaker 4 ([26:36](#)):

Funding for Energy Switch was provided in part by Microsoft and by the University of Texas at Austin.