

Erik Schatzker: Good afternoon everybody. It is a delight to be back here at the Aspen ideas festival. You're here for a panel called the economist dilemma, how to put place a price on carbon carbon pricing as it happens. It's a timely topic. Not only does climate change promise to be a major issue in the democratic leadership race just today. As a matter of fact, the top court in Ontario back where I'm from, ruled in favor of the Canadian government's right to put a price on carbon pollution and to collect revenue from polluters, otherwise known as a carbon tax. Let me introduce our panelists to my left is Aldyen Donnelly. She's a consultant who specializes in the economics of carbon reduction. She's a Co founder and director of carbon economics at Nori, a blockchain based carbon removal marketplace. And to her left is Joe Aldy. He's an economist who specializes in the environment.

Erik Schatzker: He's an associate professor of public policy at Harvard's Kennedy School, but I am giving their bios short shrift. Uh, I encourage you to read about them on the Aspen ideas app and furthermore to explore more of what they've written and said, uh, via the intranet in the days ahead. Um, a couple of housekeeping notes, please silence your phones if you haven't done so already and there will be Q and a at the end. So get your questions ready. Um, I'm going to begin by saying this, um, as your moderator, I take no stake in the proceedings, but this panel accepts the science as real, which is to say there's already enough carbon in the atmosphere to permanently warm the planet and to raise sea levels and cause various other forms of irreversible destruction. And if the warming isn't curtailed, the changes will be so extreme as to perhaps threaten life as we know it.

Erik Schatzker: The challenge of course is figuring out how to formulate policy that reduces greenhouse gas emissions without doing major damage to a global economy that still generates the vast, vast majority of its energy by burning fossil fuel and mostly not accounting for the social costs. And I have to presume that's how you all ended up here looking for a few answers. It seems the best place for Alden and Joe to start is by giving you a sense of what in the way of carbon reduction policies are in effect now and importantly why the wrong headed and ultimately ineffective. Then we're going to move on to talk about what would be effective and finally we're going to try time permitting to contemplate some of the more ambitious goals for carbon reduction that are out there and the kinds of radical solutions that might be required to reach them and whether they are economically feasible. We'll start with the status quo. Joe Aldy, you've both studied and are deeply familiar with all the various regimes past and present in place to tackle the carbon problem and it would like you to both describe the landscape as it exists now and the thinking that shaped it because that helps people to understand maybe why it went down the wrong path and pick a few examples you think illustrate why what's being done now isn't working. Who wants to start?

Joseph Aldy: So, uh, the policy landscape is really complicated with a mix of regulatory policies, uh, various kinds of subsidies through the tax code, uh, some voluntary efforts that are going on as well. And some of these are occurring at, in the

United States, at the federal level, at the state level, and the local level. And the challenge is that at the end of the day, what you see are the result of, in some cases very effective lobbying to get policies that may benefit a specific sector or specific technology and may actually make some progress and getting us and reducing some of our emissions. But if we're really going to make the next step, if we're really going to transform the foundation of our economy, which has for more than a hundred years been built on fossil fuels, these kinds of, of small sector specific technology, Pacific policies aren't going to cut it. One reason why they're not gonna cut it is because when it comes into the regulatory space, anytime the administrator of EPA or the secretary of energy issues in new regulation, that's when the lawyers get busy and we end up in this long legal process.

Joseph Aldy:

So when I was in the government in 2010 we talked about if we didn't get legislation to address and price carbon, we would move forward with a regulatory approach. It wasn't until 2015 that the Obama administration came out with the clean power plan, which is actually a fairly thoughtful, given the constraints of the clean air act, a fairly thoughtful way to address carbon pollution. But immediately went to the courts. Scott stayed by the courts. We have an election, we now have a replacement that will truly do nothing. That was just finalized by this current administration, a just a this month. And so the problem is with regulations and sometimes we end up going something very narrow that we'll do the power sector. We're not really doing a much. We actually have to say what's the feasible technology and not sending the right kinds of signals to drive the innovation to bring new technologies that a government regulator can't even imagine today into the marketplace.

Joseph Aldy:

We start doing, we're going to do as a subsidy on this technology and that technology, and so if your lobbyists is effective to get that subsidy for your technology, that's great. You win. But if you have a technology that's not getting favored, you're not getting the capital you need to be able to demonstrate the commercial viability of that technology and that. So that's why I think there's a lot of interest in designing the next generation of policies that tend to be technology neutral and industry neutral to really give the right incentives to entrepreneurs and innovators and companies to figure out the lowest cost ways of reducing their emissions.

Erik Schatzker:

Before we get onto examples, Aldyen, I would like you to pick up on where Joe left off. Give us your view of the landscape, how it took shape and maybe let's also venture beyond the borders, the United States. We can talk a little bit about what's going on perhaps in Canada. We can talk a little bit about what's going on overseas in Europe. Carbon tax, you know, uh, Got, it's first foothold in Sweden, I think back in 1990. Um, give us a sense of what's happening out there.

Aldyen Donnelly:

Um, a lot of confusion. Um, and I, you know, this is I guess a time for confessions. Uh, from 1989 to 2002, I was probably one of the most aggressive promoters of cap and trade as the policy strategy for greenhouse gas

management around as long as I was that taking that position, I was very popular on the international conference cocktail party circuit. Um, I was, uh, I was in Canada and convinced that cap and trade was going to be part of our regulatory future and we encountered a, had no history with cap and trade, unlike our American competitors. So I was able to form a consortium of 14 of Canada's 20 largest corporate greenhouse gas emitters. And starting in 1995, we actually pretended we just got regulated and went out to build portfolios of offset credits to offset our emissions. Not with a view of becoming big players in the market, but to actually learn by doing, to catch up to our American competitors who we thought were way far ahead of us than we thought that was dangerous. Um, as a result of the process of doing that, I learned a lot and learned a lot from other people and uh, formed the opinion that cap and trade wasn't going to work and actually hadn't worked historically the way everybody was reporting it was working, which was pretty embarrassing cause I was part of a consulting team who told our ministers and environment in 1989 that it was the cat's meow.

Erik Schatzker: Could I interrupt for just one second and ask either of you for the benefit of the audience, because I'm assuming that they haven't been deeply enmeshed in public policy for a couple of decades to define what cap and trade is.

Aldyen Donnelly: Cap and trade is a quota based supply management regime. So you know how dairy quota controls producers rights to produce milk, buttermilk and cheese, and every economist in the world hates it. Cap and trade is the quota regime that governs your combined rights to produce fossil fuels, consume fossil fuels, produce building products, aluminum, cement, iron, steel, glass, and produce food. So we live in a world where a whole bunch of economists like me say, this is so wrong and inefficient and this just so right and efficient and they're exactly the same thing.

Erik Schatzker: I'll get Aldyen To be fair. No, no, no. So we don't,

Erik Schatzker: you're a former cap and trade or too.

Joseph Aldy: Yes. I tried to go, I should, 10 years ago this week I was negotiating with hill staff on what became the Waxton Marquee building actually pass, which was sort of a high point I would say in the history of us climate policy. Uh, it's, it's sort of sad to say the high point was a bill that never passed the Senate. Uh, but when we think about say quotas for dairy, there's not a fundamental market failure there. That's, that's a function of sort

Joseph Aldy: of the capture from political interests to wanting to sort of secure for the incumbents their market. Whereas for pollution, we have a problem that the market is producing too much of it. You know, if I am a factory, I care about limiting my cost when I'm producing goods. And I'll think about that in terms of my labor, my materials and the investments I'm making the factory. But historically I haven't had to care about the pollution coming out of my smokestack. And so the point of cap and trade is to say, if the factory owner

realize that there's a cost to putting something out of my smokestack, I'll start to figure out really efficient ways to reduce that pollution cause that way I then have to spend less to go buy the right to admit from someone else. Or if I have surplus rights to a minute, I can actually make that a revenue source and I can sell that to someone else.

Joseph Aldy:

And in the United States. The reason why we've been championing cap and trade, I worked in the Clinton administration during the 1997 Kyoto negotiations and we pushed hard on cap and trade. We were pushing hard against the Europeans are adamantly opposed to cap and trade and then eight years later they launched the world's largest cap and trade program for carbon dioxide. But we did that because we did have successful efforts in using cap and trade to drive down the emissions of sulfur dioxide in our power plants by cutting them in half, we had an effort to cut our nitrogen oxide emissions from our factories in our power plants and cut those by 40% showing that that actually saved probably several thousand lives a year. So we have this positive experience and trying to use cap and trade and yes, we do it quotas. This is a quarter, it's a tradable quota, but it's for something that we know we're admitting too much of and we ought to be limiting it. In contrast to putting quotas on dairy, which is a function of having a complicated foreign law that dates to the 1930s.

Aldyen Donnelly:

So I won't presume to know what might've happened if Waxman Markey was passed into law, but including the acid rain program, I cannot show it. Show you a single cap and trade program in u s history where the quota supply ever actually formed a cap on the emissions. Um, including the acid rain program. I was very much part of the crew that was sure that cap and trade was a replacement for regulations. If you actually read the Clean Air Act amendments, 80% of the greenhouse are also to reductions that are attributed by Manny to the cap and trade regime. We're fully engineered in place two years before the cap and trade regime was in full effect and those were directly because of other amendments to the clean air act that imposed new state implementation plan limits into permits in yes. Oh two regime, the total so to allowance supply every single year of its existence exceeded the maximum physical and permitted capacity of all of the covered units. To a Mitch and today and through 2045 under that law, the then owners of the hundred and 10 dirtiest plants are steel receiving 8.7 million free. So two allowances every year because the law said if you shut down your old plant, I'm going to give you SO2 allowances through 2045 and they're still getting them. So.

Erik Schatzker:

So how did, how did things evolve from a focus on cap and trade too? From what I understand, and correct me if I'm wrong, more of a focus globally on carbon taxing and, and what regimes would you point to as exemplars of, you know, the way thinking is being applied today?

Aldyen Donnelly:

I'll go there. Um, Short version of a long story is when I decided I had to get ready to stand up and tell everybody in the world how wrong I'd been about cap and trade for so long. I decided I should study carbon taxes and there are nine European nations who actually had their CO2 tax, their direct CO2 tax in place

before the European cap and trade regime showed up in most cases, more than 10 years. Um, so I, you know, well trained economist went in and studied all the different European carbon tax regimes because I assumed when I said cap and trade is not the right answer, someone would say what's the right answer and I would say carbon tax and then they would say which one? Cause these were all really different and I was trying to prepare to have the answer and discovered that none of their carbon tax regimes work as reported either, which was I did not find distressing.

Aldyen Donnelly: I was not going out to prove them wrong. To give you an updated version of carbon tax, we often hear that and Sweden is the leader in carbon taxation right now. If you're the average household owner in Sweden, you're living in a home that is got half the square footage per occupant compared to the American average. It's 40% more efficient per square foot. You are paying 44 cents us a kilowatt hour for electricity and your annual average bill just to heat spaced and water is \$4,500. You asked if you're using electricity and \$3,500. You asked if you're using district heat, you pay on top of that to turn the lights on and run your computer right now. Um, the

Erik Schatzker: which for those who are doing the math is a lot of money.

Aldyen Donnelly: It's a lot of money. Uh, the, that 44 cents and Sweden is a higher number in Norway, which is almost all legacy hydro and it's around 35 cents. And um, in Denmark, um, uh, it's interesting. Um, if you look at over the last 10 years since the carbon taxes came into place, five of the six OEC de nations with the highest and fast and growing fastest growing private debt as a percent of disposable income are number one. What's number one highest and fastest growing private debt as a percent of disposable income. Denmark, number two, Norway, number four, Sweden, Sweden, number five, that's the other big tax or Netherlands. What happened

Joseph Aldy: so I, I have a different view on Sweden. So Sweden decided to implement what is now the highest carbon tax in the world. And at the same time they cut taxes on income. So personal income and business income are cut. So there was an Alden, there was a tax reform in 1991 they did both.

Aldyen Donnelly: They got cut the excise taxes on large industrial energy purchases and they made households pay for it.

Joseph Aldy: Okay. So, so they cut personal income taxes and corporate income taxes. Uh, they have right now their emissions are about 25% below their 1990 levels. When we look at their power sector, about 80% of their capacity is zero carbon. It's hydro, it's nuclear, it's wind, and just sort of blame the current prices. You know, there's this complexity in the EU, uh, when we, it's not right to actually blame the current electricity prices, I think on a carbon tax because starting in 2011, they no longer assigned the carbon tax to the power sector in Sweden because it was covered by the Eus cap and trade program. So you had this, this complexity, and it's something that in the United States we'll probably have to

tackle between the mix of state policies like in California and the Northeast and mid Atlantic states and whatever may become the national policy.

Joseph Aldy:

They have something analogous in the EU where you have those policies set by Brussels that in some sectors covers the entire, uh, e u a region and then other policies that are set at the member state level. So, so I look at Sweden and I see a country that they set the same carbon tax across all their sources, which is the way you drive the right kind of, of changes. Norway in contrast, has a different price on, depending on how you use the gas, they have a different carbon tax on gasoline relative to diesel. They have a different tax on coal that's actually lower than the carbon tax on gas. So, so for, for me, when I look at that, that they call it a carbon tax, it might as well just be a complicated energy tax. The other thing is when we talk about Denmark, to me, the frustration that you see in Denmark is they basically exempted all their energy intensive industries. And so there's sort of smarter when they sort of do the same thing. What's that? Germany did something similar. Uh, well they don't have a carbon tax. I know. Um, one thing they did in Germany is when they decided to have a big push out in subsidizing solar, they subsidize it on residential power rates, but not industrial power. Right?

Aldyen Donnelly:

They have something else. They have something called an EEG, which most Germans understand to be a special charge that's only on residential and small business. Bill's not large consumers, which most Germans understand to be a, the premium they pay for the German renewable initiative. Um, but the EEG EEG has five cost components in it and since 2012, the largest growing component is something called industrial privileges. And that's the household subsidy for the electricity rates that the large energy intensive industry raises and House and industrial privileges is now the single largest component in the EEG. And the portion of the EEG that's been going to renewables has been declining since 2012

Joseph Aldy:

but the one thing I wouldn't say about how you address concerns about energy intensive manufacturing, because it's a big issue in the u s I mean this is one of the most contentious issues when we debated cap and trade a decade ago. And if we have a carbon tax debate, it's going to be one of the most contentious issues in the u s going forward on that. And so the question is, do you decide to just exempt certain firms that are energy intensive? But that sort of defeats the purpose. You want to be creating incentives for them to be more efficient, to find ways to reduce the carbon, uh, characteristics and footprint of their activities. Alternatively, what you could do this, get some of our friends who do trade policy a little bit anxious. You could do a border tax. And so the idea is to say if you're an energy intensive manufacturing firm, you should not be concerned that there's gonna be a sort of adverse competitiveness effects because we're going to make sure that, say if you're a steel manufacturer, any steel we import in the U s we're going to impose a tax on the carbon content of that steel.

Joseph Aldy: I actually think the first best is just to get all of our major trading partners to move forward with aggressive climate policy. Um, right now we in the US are not in the position to sort of make that happen. Uh, but that that would be if everybody's sort of imposing similar kinds of policies around the world or have similar impacts on manufacturing, you're not creating that kind of competitiveness wedge or differential that could as adversely affect your domestic industry.

Erik Schatzker: I want to move our conversation into, into some ideas from both of you on what might work. But before we get there, um, is there anything happening at the federal level, uh, beyond what we hear from the president and perhaps a few select other people in the administration that that does give you, um, a sense of a hope and perhaps even optimism for what might come out of this government either between now and the election, which I suppose is unlikely or perhaps after that if Trump has reelected

Aldyen Donnelly: for me, modified Q 45, uh, so does

Joseph Aldy: everybody knows what that means, right? You don't know, you don't know your internal revenue code, not that part.

Aldyen Donnelly: Yeah. No. 2018 a budget. The Trump administration put in a tax credit for electric utilities to install, to install carbon capture and storage. So utilities then installed carbon capture and storage and deliver the CO2 recovered CO2 to and an enhanced oil recovery rates get a \$35 a ton tax credit for 12 years. And if they inject the CO2 in a permanent sailing reserve, it's \$50 a ton. I would argue you're still not going to see what think of as CCS happening in the u s because I know there are other estimates out there, but I think the price range is about 110 to 140 bucks a ton. So I don't, I don't know

Erik Schatzker: the subsidy would, in other words, it needs to be a lot larger to incentivize

Aldyen Donnelly: by uh, recently, uh, group, uh, peeled to the IRS and got uh, the same tax subsidy applying to direct air capture, which makes, was part of the process of um, Occidental Petroleum, uh, deciding to invest in a apartment, energy engineering. But there's another one that nobody's talking about yet. In my real life, I'm working with a team that's trying to build a blockchain braced carbon room, dedicated carbon removal marketplace and there's a group of very important egg industry leaders and some other players who are about to go to the IRS and make what I think is a very strong legal argument that US food producers who draw down carbon and can prove they're storing it in their soil root systems and built environment. Also qualify for Q 45. Now let's put that in context. Um, I estimate that if farmers had a secure cashflow of \$35 a ton, u s food producers can be adopting regenerative practices and sequestering and drying down incrementally between 400 and 430 million tons a year for the next 30 years. So you're, that's the biggest play the u s will ever see. The, the IRS discussion hasn't happened yet, but that could change everything and it's couldn't happen in a more perfect time because u s food producers have been

broke since 2014 they need a new source of revenues from new sources, from new sources. So,

Joseph Aldy: So I think there's two things. One, it's amazing, uh, over the past decade, how much we seen costs come down for a lot of technologies and it's not just, uh, solar and wind, although we've seen a lot, especially in solar. And part of it is that the subsidies, whether it's in the u s whether it was in Germany, they created a really large market incentive that actually helped to enable a lot of the investment in solar manufacturing to improve the efficiency of the panels and to drive down their cost. And in fact basically a, a former student of mine who's a, is a professor at Cornell now found that uh, we in the u s benefited a lot from the German subsidies that they, they really enabled a lot of this, this growth, but it's also a natural gas. The, the innovation and natural gas has made it where we can do so much natural gas incredibly cheap.

Joseph Aldy: And that change in the relative price between natural gas and coal is why we now see in in large part the combination of pushing out wind and solar and then uh, changing the relative price of natural gas to coal is why the power sector in the US has emissions that are 25% lower than they were in 2005. About half of that is the renewable investment. And about half of that is the, is the shift over, uh, to natural gas. So one is we have a lot more low cost technologies that makes it much more feasible to have stakeholders in the business community say, yeah, we can do this, we can actually do more. And for people who may be concerned about the cost to say, oh, the costs don't look nearly as high as we thought they might've been in the past. I mean, when I was working on this issue during the era of the Kyoto negotiations, the critics of the Kyoto Protocol said this is going to be worse than the oil shocks of the 70s for the u s economy.

Joseph Aldy: And part of that is because we read at a time where we just couldn't produce a lot of our energy. We were a large importer in oil. We're in porter and gas and we thought we going to be large importers of those per rep. But the innovations is really both in on, on gas. And renewables I think helps that a lot. The second thing I would say is there is this growing interest about a carbon tax and there's more discussion on Capitol Hill about that. We have bills that I would describe as kind of marker bills that are being introduced. They're not going to be the basis of a Florida debate, uh, in, in the next a year and a half. But they're starting to sort of, you know, putting these out and saying, okay, here's, here's some ideas and getting a sense of sort of what do people think about it.

Joseph Aldy: This is the way the kind of process works when we're, it takes a long time to get a piece of legislation through congress is that you have these years where there's these marker bills introduced. Some of them are being introduced in the House by Republicans. Now. Unfortunately, like one of them had introduced it in the fall of 2018 was a republican in a swing district and he's now a former congressman. Uh, but there's still, I think this sort of growing interest in thinking about this as a possible way forward because I think there is more and more on the other side of the aisle, which feels like, okay, we need to do something, but let's do something smart. Smart.

Aldyen Donnelly: Go ahead. So I agree. So I did my Q 45 thing, but I'm a left wing Inviro geeky person who likes government to get out of my face. And after believing in cap and trade and looking in, spending a lot of time trying to figure out how to make carbon taxes work, I did the strangest thing. I decided that, you know, we have pretty, you know, good histories of getting lead out of gasoline and paint and getting silver out of diesel and reducing the ozone depleting substances, um, from refrigerant, Kemp, chemical supply chain. And maybe I should look like I looked at taxes at how Europe, Canada, U s Japan achieved those pretty significant pollution reduction success stories to see if it would give me a signal about what can policy is. And you know what? Every time we were serious about reducing, uh, pollution and re precursor in our supply chain, the whole developed world, every time we've done it successfully did it the same way.

Aldyen Donnelly: You know what? The efficient way to get a pollution precursor out of the supply chain is you order the suppliers to report, report their fossil carbon content per million Btu of energy delivered and you tell them to reduce it 3% per annum and any combination of obligated parties can comply jointly. I don't care how the hell you do it. Um, go out, go for it guys. Every time we've been successful government didn't say, I'm setting the price and I'm picking the solutions. Every time we were successful, governments didn't count and trade emissions at point of production and put a tariff on imports. They said, if you sell energy here, I don't care if it where it came from, you report the equivalent of your global supply chain, fossil carbon content. I don't even care what the emissions are. Fossil carbon content, it goes down. You can trade over compliance, compare credits with the guy across the street and they understood that the private sector only has two tools, price and innovation, and an effective successful regulation is one where government says this is the pollution precursor reduction goal.

Aldyen Donnelly: You guys figure out the price solution. You know how important this is. In 1978 when we agreed to get the lead out of gasoline and everybody including me working for Chevron at the time, was convinced ethanol was going to be a pure substitute for led as the oxygen we all got told to reduce the lead content. Again, never, never get told to reduce our emissions to reduce the pollution for cursor content. We started to move into fuel formulations that were substituting ethanol for led and found this thing we hadn't thought of before, which is the ice ceiling for ethanol in the fuel formulation.

Aldyen Donnelly: And by 1984 we had four count them, four t four new gasoline fuel formulations that nobody ever imagined in 1980 and we got lead out of gasoline in North America while the wheel prices of gasoline fell by 12% in 1978 when we made the commitment to get the led out by 1990 the e u by k e c in those days by comparison said we're going to have a lead differential decks. Exactly what we're talking about. We got the led out in eight to 12 years, depending on how you count it, they took 26 years. You did not get the let out till 1999 when all of the EU members agreed to phase out their lead differential tax and order the lead out of the supply chain. That's the difference. 15 years of just start with attacks. Eight years. If yes, do the performance,

Erik Schatzker: could I just jump in for a moment? It happens so subtly and so quietly you might've missed it. There was a big difference of opinion that just emerged between our panelists. Um, Joe was in the process of explaining why and he will continue why he thinks a carbon tax but not the kind that you've seen, um, deployed in other jurisdictions is the right way to go. And I think if I'm fair in summarizing Aldyen your view is that cap and trade doesn't work. Carbon tax doesn't work. The only way to get carbon out of the economy is to regulate it out of economy.

Aldyen Donnelly: And don't prescribe either price or solution.

Erik Schatzker: Um, and you made some drew some interesting analogs. I mean, I would submit that the energy economy is considerably more complex than the one that is involved in the production and distribution of gasoline. But it's, it is true that regulation drove, lead out of gasoline.

Joseph Aldy: Um, but I think there's something important about that story in the United States. We dramatically accelerated the phase down of lead over 1983 to 1986 and while we had a standard, we made the standard tradable. And so, you know, there's a sense in which we, we said we're going to allow the refiners to average across all the, the the owner, the refinery refineries to average across all the refineries. And they actually beat the standard. They can actually save some of the credits for use in the next year when the standards more ambitious, uh, more stringent and they can sell the credits to some refineries, which we're finding get sort of higher cost to, uh, remove the lead from their gasoline.

Joseph Aldy: And so that was a case where really the first time in u s environmental policy, we used a tradable instrument that is really thought of as kind of the precursor to what has become cap in trade. And, and whether you decide to say, I'm going to give you a standard and that case it was so many grams of lead per gallon or I'm going to tell you that you can only have so many grams of lead total that comes out of your refinery. There's not much of a difference there and difference. No, no. So, so, you know, the thing is, is that at the end, I do want to point out that the lead in gasoline debate is, but let's get back to a car. I think that's an important thing we thought is, you know, we in contrast, whether it's led or ozone depleting substances, there's not a single thing we do that doesn't have some impact on greenhouse gas emissions, positive or negative in our everyday lives.

Joseph Aldy: And then had the operations of every company that operates in this country, right? So it's everywhere. And so the idea that we're going to start to do sort of a a performance standard to go after the emissions here and the emissions there, it gets really complicated and it gets to be a long list of potential regulations that you might need to do and carve out potentially and potentially carve outs because every regulation is an at an opportunity for the lobbyist to come in to try to, you know, modify the rule a little bit this way or that way to their benefit. I think there's two really big reasons why having something like a carbon tax that is industry neutral, that is technology neutral, that's applied to

the whole economy really matters first what our industries today is changing, right? So it used to be that we, if you were trying to like move around, you never really thought about the price of electricity.

Joseph Aldy: But now we do as more and more people are thinking about electrification. When you talk about the people who want to decarbonize buildings, they're really talking about electrifying buildings. And so all of a sudden you need to start thinking about how electricity may end up competing gasoline and diesel in transportation, how electricity will start to compete with gas and heating oil and home and, and building heating. And so, you know, there's a concern cause we've seen this historically that for like the same pollutant, we'll do a regulation say in vehicles that is dramatically different in its environmental, uh, and attainment and its cost then addressing the exact same pluton in the power sector. So for nox emissions, we found that like the marginal costs different by about a factor of three. And we probably could've gotten at least 20% more emission reductions if we just set them at the same marginal cost.

Joseph Aldy: And by marginal costs, I mean like what we might do if we did attacks. The second thing is this problem is going to require us to eventually get down to net zero emissions. We've got to be pushing everywhere and we've got to be pushing in. It's innovation incentives everywhere do eventually get to that goal. And so, so my concern is is that when we start doing sort of a patchwork approach or a technology specific approach or an industry specific approach, we're not going to be delivering all those signals. We need to get the emission reductions down throughout the entire economy. And part of is when I think about, you know, what we need to do as consumers of energy. You know, if you look at the longterm scenarios and what they might mean, what we have to do globally to limit warming to two degrees C, we probably have to cut the energy intensity of our economic output by about 90% that means a lot of energy efficiency and that means a lot of conservation.

Joseph Aldy: And the tough thing is those models suggest that we're probably over this century going to probably half that energy to GDP already. So there's already a lot in the baseline and there's a lot more we have to do. And that's why I think we need policies throughout that are going to affect the decision on those who are consuming energy, not just the changing the incentives of those. We're thinking about the composition of energy all done before you jump in. And I want to make sure that I'm clear on one of the points that you make and that people understand what you're talking about. Joe is not mean, and you mentioned that it's not taxing emissions. It's not taxing the use of carbon. It's taxing carbon at the source at, at, at attraction. Right? So, so, so the way most people talk about this in the u s what you see in the legislative bills is that you would actually be taxing the carbon content of fossil fuels.

Joseph Aldy: Now one thing that's attractive about that, yeah, I emit fossil fuels out of my house. When we burned gas to heat our home, it comes out of the tailpipe from my car. It would be a bit of a headache if I had to comply with attacks and actually measure the emissions coming out of those. You don't have to do it this

way. If you focus on a crop of content, you're focusing on about 3000 taxpayers. And by the way, all those who do, the petroleum and the coal are already reporting the information to the IRS. That would require you to add one line to two separate tax forms and they could join administratively just being readily easy to implement the tax that they would be collecting.

Aldyen Donnelly: I totally agree. You've got all the data. We in Canada don't. So that's and I on, uh, and we're both talking about whether it's taxing or putting a reduction obligation in place controlling, and I think this is important. We agree the pollution precursor and every time we'd been serious we ended up going to start with the fossil fuel start with the fall. The Eve most efficient way to get the fossil fuel out of your supply chain is to order, in my view of the plot, fossil fuel out of the supply chain. The only difference between us is you're saying tax at and I'm saying no, just order it out. So the difference between us is I'm saying when you're taxing it, you're still giving jaw government the role to, to step the price or attempt to stop the price. And I don't have confidence in that, but otherwise we're in the same place.

Aldyen Donnelly: But I also want to sort of say I take a fence not just to you, because you're a great guy. When people maybe at least talk about what I'm saying is a patchwork. I got the opportunity to write a piece of legislation to cap greenhouse gas emissions in Nova Scotia in 2008 and 2009. Small province. Simple did, ah, I didn't get to go to the full performance standard regulation. I wanted to go, but I got to to control what got supplied as opposed to emissions at point of production. Uh, the uh, in other words, a similar principle, a similar principle. The legislation is 11 pages long and Nova Scotia submissions today are 28% below 2005 levels consistent with our, our law. And they are transitioning directly from coal to renewables and they are doing so at 50% of the compliance car cost impact that we have experienced in Ontario and Quebec who've been engaged in cap and trade.

Aldyen Donnelly: So if you want to take a quick look at, not what I'm recommending, but halfway there, it's on the, it's a, it's the Nova Scotia greenhouse gas legislation, which I was hired by a conservative, equal Republican government to right. They got thrown out of government and socialists CMDP trounced them and signed into law two weeks after they got into government. And Liberals are Democrats were a one, one the government four years later and added 10 year term to the, to the law. So it's, it doesn't need to be a patchwork. What becomes a patchwork is taxes and systems. Where you've heard me say this before, I don't want to go to one more meeting about pricing carbon where for every 10 minutes we talk about designing a tax regime. We're spending 80 minutes talking about how to spend the money. If there's money to spend, it's not working.

Joseph Aldy: I bet. But that raises a really important issue. I, you're, you're stopping me

Erik Schatzker: make it quick because we're at that time that I need to turn to the audience for Q and A.

Joseph Aldy: Yes. So, so, uh, the tax does raise money. The, the, the appeal of the tax over time is that will reduce emissions and so the money you raise will decline. Having said that, you can use that money in really smart ways that you don't have available to you in the context of a regulation. And by smart ways, that means you could return money to households to offset the concerns about higher energy prices. And in fact, some analysis suggests if we just wrote, uh, the American public, every person gets the same check every quarter that would come out at a carbon tax. You're probably looking at the bottom 70% of the income distribution is better off with the combination of getting those jacks and the higher energy prices that are associated with whether effort in driving down co two emissions.

Joseph Aldy: What we've seen is in practice in the u s a lot of our regulations tend to be regressive. They tend to actually impose more of their costs on lower income households. But the regulation doesn't give you anything to help mitigate those concerns. So I think it's important when we're raising the revenue, there is a lot of value in that because we can use that to address our concerns about regressivity. Uh, I mean I hear a lot from people say a carbon taxes were aggressive and it kind of frustrates me cause I feel like it's the same thing as looking at social security. If you look at the payroll tax we use to financial security, it is regressive on net. The policy is progressive because the payout from social security, the benefits you receive when you're retired are really skewed to helping low income households. So the same logic applies to our carpet tax. Actually raising energy prices do a carbon tax may hurt disproportionately lower income households, but if you use that revenue and target lower income households, they can be made better off. Just like the social security program.

Aldyen Donnelly: I just want to be really clear. I, I like what you're saying, but you've got to disclose Got To disclose that you are proposing that the government of the United States do something that nobody else who said they're going to do. That has ever done including my province, British Columbia. So it's not easy because it's not ever been done before.

Joseph Aldy: I think the gentleman in the white shirt here in the fourth row back was the first to raise his hand.

Audience Member: Great. Thank you for the commentary. I just have a question because I'm naive. If we do all this and China doesn't do anything, are we making an impact on global warming?

Joseph Aldy: Uh, I think China's concern right now is they feel like they're doing things and looking at us and thinking we're not right. So, so, so, so China, um, their industrial policies to go big and some of the in in solar they've gotten really big. One could argue, in fact, it's the reason why we impose terrace on solar panels starting about six or seven years ago that they were doing ways that we thought violated the WTO. Uh, they have implemented seven, uh, in seven cities and provinces, that cap and trade program, that's a kind of pilot, a pilot that covered

the consumption from about a couple hundred million people and now they're planning to go nationwide with that. I'm not sure how effective that policy is going to be. But there's this kind of dance where we're like, well, what if, what if they don't do anything? And they're looking at us and they're saying, well, it looks like you guys aren't doing anything. So, so we need to try to work together. And that's something that I think was actually really important in 2014 and 2015 when President Obama got the Chinese to agree to work with the US on climate.

Aldyen Donnelly: I want to give you a 30 seconds. China's already said that if you do a tax and transporter charge there, they're going to WTO cause that's taxing imports on the basis of how they're made, which is against the rules. So you got a trade war right there. If you tap, if you say get the fossil carbon content out of your slub supply chain, you're treating imports from China exactly the same way you're treating domestic supply. You've got no trade war.

Erik Schatzker: Um, go ahead, please.

Audience Member: So I understood very little of what you all three said. So, excuse my ignorance, but as we sit in the Koch tent and you're talking about carbon new carbon policy and we know their influence and those like them, how in the world are we practically ever get there? How do we create policy to get there? And we were told in the in the preceding session that we only have 20, 25 years to get there before it's catastrophic. So how do we do it from a practical viewpoint with all of this big money?

Erik Schatzker: You do realize you're asking, economists for political questions.

Joseph Aldy: I think there's, there's two things that are going to be important about this. One is we're seeing climate change now and I think people are starting to connect to connect how it's affecting their lives right now. Uh, I mean, I flew into St Louis, uh, about five weeks ago and it was stunning the last 10 minutes or our flight, seeing how much the flooding is there in the Midwest. So part of it is, is I think treally really tried to say, this is not some far off problem. We're seeing it today. I think you're seeing among some Republicans, they're recognizing that they can't keep the, this uh, and they, that that is having an impact on their constituents. And the challenge is whether you could actually get a broad enough coalition that says the uncertainty about future policy.

Joseph Aldy: I mean there's a lot of companies, yeah, ExxonMobil has an internal carbon price. Conoco Phillips has an internal carbon price like that. These are big companies that the reason why they are pricing carbon and some of other strategy and how they're evaluating the robustness of their investments is they think there's going to be policy down the road. They all have different prices. They don't know what it's going to be. And I think there's an appetite among men in the business community, even those who sell hydrocarbons, they just want to have some certainty over the policy framework. And if they can work together with some of those from the environmental community, say, Hey,

what is a thoughtful path forward that gives business predictability about cost and delivers significant environmental improvement, that may be the basis for a winning coalition that you can get across the finish line. In the house, in the senate.

Erik Schatzker: A gentleman here in the white shirt. Thanks.

Audience Member: I'll reading something something from Nora Kaufman. Uh, Nora, for those who don't know, nor Kaufman

Audience Member: is a, the climate energy economists, Columbia University Center on global energy policy, formally White House, uh, with Wri and whatnot. And I'm just to the comment, I mean we're hearing that it hasn't worked. First of all, there's carbon pricing and over 60 jurisdictions, 60 jurisdictions worldwide, over 40 countries, varying degrees of efficacy essentially based on the price we're arguing over the price. Uh, what he writes is if you try something difficult and fail over and over again, one possibility is that the strategy is right and you just need to keep trying and trying until, uh, the same thing until it works. I'm referring both to climate policy and to potty training my two year old.

Aldyen Donnelly: Yep.

Audience Member: Good point. I think so my question is simple. Under what scenario do you, anybody expect to see the massive exodus of capital away from dirty energy and deployed into clean energy while dirty energy gets to remain artificially underpriced

Joseph Aldy: I mean we

Joseph Aldy: we are seeing in investors and uh, talking more and more about this. I mean I think the use of internal carbon pricing was really driven by the investment community. Uh, yeah. The, the question is whether we can go from a, I'm going to run my business and I need to think about managing this risk to taking a more proactive step and saying, I'm going to lobby, uh, the congressman or the senator in the state in which I'm headquartered or I'm going to start to work. If I, if I'm an energy producer, I'm going to start working with the staff at an energy and natural resources and sit environment public works and say, what makes good policy? That's, that's the question is, is, is you have a number of, of companies that are doing somethings that I think are actually quite effective. Some of it is too, this demand from investors. Uh, but, but we really need to see them go the next step and engage in the policy.

Aldyen Donnelly: I think it's a really good question, but I just want to ask one favor. I can't show you one precedent anywhere in the world where the tax rate equals the price. It's not a lot of stuff. Not Not in anywhere, so let's, I'm saying let's not confuse what government's number which will apply here and not there with true cost or to to price. I also can't show you any place where any pricing mass

mechanism displayed regulations. One of my concern about obsessing about how to design a carbon tax system is we are not having a debate about what the efficient regulation looks like. I think I've got a prescription for vision regulation. Please go and look at the California Air Resources Board 2008 and 2014 sculpting plans. You know what they say? They say in 2008 we're doing cap and trade. We're going to achieve 174 million tons of reductions between 2007 and 2020 and table 17 on page 17 allocates does the law requires them to those 174 million tons to government measures.

Aldyen Donnelly: How much of the 174 million tons is attributed to cap and trade? Anybody? 300,000 plus 1 million attributed to the high street speed rail, which the revenues from the allowance auction was gonna Finance, which is now sideways 2014 what does the report say? The report says we need 24 more read command and control regulations and above the ones that were in the 200,008 report because we're running 75 million tons short of our goal and in 2016 they passed 24 more regulations. If we don't talk about what good regulation looks like, I've got a strong opinion about what it looks like, but if we don't have that discussion, we're going to get the California dog's breakfast, which is not scalable, which is inefficient and not working.

Erik Schatzker: We are over time, but this gentleman in the front row has a mic in his hands. We're gonna give you an opportunity to ask a quick question and our panelists to provide you with two quick answers.

Audience Member: Okay. I have a quick question though. I'm think the answer is squishy, Eh, the, I love the idea of a global carbon market and they cryptocurrency a based system, I think is the right way to go. I just want, if you want to expand a little bit more on that.

Erik Schatzker: We don't, we don't really have time for that, but as I suggested at the beginning, you can read it. You can talk to all them here. You can read about what she's doing in Nora. You can read what Joe has written and said and watch it on the Internet. I want you to join me in thanking Aldyen Donnelly and Joe Aldy.