

## MITOCW | 21. U.S. Environment Policy

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**RICHARD** --do is talk a bit about the politics of regulation and a bit more about EPA and how it works and how it has

**SCHMALENSSEE:** worked. Just by way of why are we doing this in a course on energy policy, an awful lot of energy policy is set by environmental regulation. All the-- much of the discussion of doing CO2 controls for climate change comes down to shaping energy policy. So you really do need to think about the environmental regulation when thinking about where energy is going and where energy policy is going.

And we'll talk about a trading regime. We talked about cap and trade earlier briefly when we talked about climate change. We'll talk about it in the context of SO2 in the case you've all read and subsequent developments, and then say a little bit about generally what the-- how the regime looks.

It's worth stepping back a minute just to relate to some of the earlier discussions we had about politics and interest groups. I like the Wilson piece because it splits politics into recognizable categories. I had a little trouble, I confess, as a non-political scientist getting my head around Lowy's four categories. Wilson's are easy. Who bears the costs? Are they concentrated? Who bears the benefits? Are they concentrated?

In the case of where the costs of regulation are concentrated and the benefits of regulation are concentrated, you get classic interest group competition. Cargos between US ports have to be carried in US ships by very long-standing law. Those rights are regulated by the-- those US flagships wouldn't exist but for that law.

This really affects people who live in Hawaii and who get cargos from the mainland. There are a small number of shippers. There are a small number of customers. They're regulated by the Federal Maritime Commission that you've never heard of, and they care a lot. And that is the ultimate inside baseball. So that's maritime regulation.

Client politics is where the benefits are concentrated and the costs are dispersed. And there's a lot of that. We talked about concentrated versus dispersed interests, milk price supports. A small number of milk producers benefit, the costs are dispersed among consumers. In the old days of airline regulation, it sort of looked like that.

The reverse-- then he talks about majoritarian, where like antitrust, where you really can't identify the benefits and the costs. They're both quite dispersed. The interesting case, and the case we have today, is where the costs are concentrated and the benefits are dispersed. And by our earlier discussions of what shapes interest group influence, that shouldn't happen.

And the examples of that are cases where there was a social movement-- EPA. The Food and Drug Administration came out of scandals in the early part of the last century. And you can talk about a lot of regulation that has that character, but that comes from a social movement. He calls it entrepreneurial, and that's because usually an entrepreneur drove the movement. So it's useful to think about sort of where the regulation came from.

It's also useful to think about, who does it? Does anybody recall the types that Wilson has of people who work in regulatory agencies? Why would you work in a regulatory agency? Yeah.

**AUDIENCE:** It's safe [INAUDIBLE]. Like, it's very-- it doesn't oscillate as much with the market.

**RICHARD** So you might make a career out of it. You might say, I want to work in the Food and Drug Administration as  
**SCHMALENSSEE:** opposed to a drug company because it's really safe and it's steady. OK. So that's the usual civil service argument. Any other reason? David?

**AUDIENCE:** Ideally because you care a lot about the environment in whatever you're doing.

**RICHARD** You might care a lot about what you're doing. You might care a lot about what you're doing. So you might be a-- I  
**SCHMALENSSEE:** guess an advocate, which isn't quite what-- quite one of his categories. Anything else you might-- any other reason you might-- Ryan?

**AUDIENCE:** Work with political leaders.

**RICHARD** You work with political leaders. You might have political ambitions. It doesn't arise so much at the EPA, but it can  
**SCHMALENSSEE:** arise in other settings. You might also-- this is kind of obscure, but you might-- why would an economist go to work for the antitrust division in the Department of Justice, or a lawyer, for that matter? To build a professional reputation and then move out.

So Wilson talks about careerists, politicians, and professionals. Careerists are those who really believe in the agency. And they're David's people who-- you work for the EPA because you care about the environment. Politicians want to go someplace with that, make contacts, and move on. And professionals, lawyers, want to gain status. You want to be a Washington lawyer, you work for a Washington agency, and you get known.

Who worked in the EPA early on, who would you guess? David? Who would work for the EPA when it starts?

**AUDIENCE:** People who care a lot about the environment.

**RICHARD** That means, and it's still true, that you know how the EPA thinks as an agency. EPA favors tight rules. EPA favors  
**SCHMALENSSEE:** vigorous enforcement because of the people who were there.

Think about the Department of Energy. Why do you go to work for the Department of Energy? Well, you'd like reliable, abundant supplies of energy. You care about that. Maybe you want to move into the energy industry.

EPA-- you may want to move into one of the environmental groups. The Department of Energy-- you know how they think going into the room. If you have a meeting with EPA and energy, as I had many of, you know. You don't have to know who they are. You know where they come from, you know how they think because you know why they got there.

One needs to think about this. Recall when we talked about biodiesel at MIT. We talked about what do those people do? What is their job? What is their responsibility? You didn't have to know them to know how they'd act in a meeting. You had to know where they sat-- where they sat. Where you stand depends on where you sit.

OK. Just talking now about EPA, they do water, toxics of various kinds, regulation. Mostly what we care about here is air. They set national air quality, ambient air quality standards for six pollutants-- ozone particulates, carbon monoxide, oxides of nitrogen, SOx and lead. All of them-- because the lead came from leaded gasoline primarily-- are driven by energy use. So those standards and other regulations set energy policy, in effect.

The law requires them to set standards to protect human health with an adequate margin of safety, which presumes a threshold. People have said for 30 years and more, there aren't any thresholds. The law presumes thresholds.

As we discussed last time, they control-- they review state implementation plans. The reference to MIT parking is to remind me to tell you that the Massachusetts state implementation plan limits the number of parking spots MIT can have. And one of the reasons there's a large garage under this building is that MIT wasn't using its limit and was afraid the limit would be lowered. So state implementation plans can go into great detail and are reviewed by the EPA.

We talked about taxes to limit pollution. EPA has never done that. They do-- early on they did very little trading. We talked about offsets and so forth. I'll come back to that in a second.

Mostly, they set standards. Most regulation is so many grams of this, per unit of that, or use this technology. The economist's alternative is put a price on it, or limit its amount and let people trade the right to emit. When might a standard be better? Why might a standard be better in some cases, not to be too dogmatic? Yep?

**AUDIENCE:** Well, standard, you're-- you leave the option for the specific solution to be localized. So if a specific-- is it all just setting how exactly how they should go about--

**RICHARD** Well, that's a standard versus a technology. How about a standard versus a tax or trade? Because a standard  
**SCHMALENSSEE:** tells you what you must achieve-- doesn't necessarily tell you how. That's an interesting distinction. Tell me about why you--

**AUDIENCE:** Oh, OK. So for example, cap and trade, you can get-- when you establish cap and trade or some sort of taxing, like, you can still-- you're still not going to limit the amount of pollution, right? So if for whatever reason, a specific region has a lot of credit, they can still overpollute, as long as they get their qualifications in other ways. So I think--

**RICHARD** So let me just cut you there. What you're saying is, it doesn't-- you can have intense pollution in some areas.  
**SCHMALENSSEE:** Now, for carbon dioxide that isn't going to matter, is it? Because it mixes. But it might matter if it doesn't mix.

So suppose you have a pollutant that basically travels 50 feet from the plant. Then you wouldn't want to use trading from plants and widely separated areas because you'd have a hotspot. OK. So standards can deal with hotspots, and that's called the hotspot problem. You had a comment, Jacqueline?

**AUDIENCE:** Is there any hazardous substances?

**RICHARD** Well, that's the same issue. Hazardous substances, you might just-- if they're really hazardous, you might want to  
**SCHMALENSSEE:** ban them. And if they don't travel-- all that stuff's hazardous, to some extent. If they don't travel and they don't mix, then you don't want to say an emission here is equivalent to an emission there.

Lots of emissions here, and none there is the same thing as none there and lots there. It may not be true. People may live over here, and not over there. So that's the hot spot problem, where things don't mix.

Any other reason why you might want to-- suppose you couldn't measure emissions very well. Like automobiles-- we don't do cap and trade for automobiles. Can we measure what comes out of the tailpipe of your car? Not real easily.

We can measure per mile when you go to get it inspected. But it's-- aside from monitoring your driving, putting a meter on your tailpipe, we couldn't do cap and trade. We can't measure it.

So there are enforcement issues, right? If I say to the power plant, you have to put this device on your smokestack, and it has to be working when our inspectors come, that's easy. I can go check that. That's why EPA-- one reason EPA loves standards, particularly technology standards.

Do you have the box? Is it working? Easy. Not, how many tons did you produce? Did you run it the daytime or night? So there are enforcement issues, and there are hotspot issues.

Let me see. Is there anything else you can think of? Did anybody look at the Sandel piece that's on it and recommended? Probably not. It's late in the semester. Sandel argues that none of us would agree that you ought to be able to buy a license to dump garbage in the street.

So he would say-- even if we could do that, we could have licenses to just dump garbage in the street. But we'd all sort of think that's wrong. If you could buy the right to dump garbage in the street, you'd eliminate the stigma. And if you eliminate the stigma, you eliminate a force for cleaning up. So Sandel would say it's wrong to do trading because it sort of eliminates the stigma.

Now, carbon dioxide versus hazardous chemicals-- you may want to argue whether a stigma is appropriate as we breathe out CO<sub>2</sub>. Maybe that's not such a terrible thing to be doing. But the other issue you might think about-- if I can put a device on the smokestack and I'm done, I get no credit for doing better. So I get no credit for beating a standard if a standard is set. So there's no reason to innovate.

If you've told me that all I have to do to comply with the law is x, then I'm done. If you tell me it costs \$5 a ton every time I emit, I have a constant incentive to figure out ways to avoid it.

So standards ease enforcement. They avoid the hot spot problem. Environmentalists don't like markets traditionally because they like the stigma, which I guess would apply-- I think makes more sense in the case of toxics than in the case of CO<sub>2</sub>. Plenty of people would like to stigmatize SUVs.

It raises costs-- may raise costs, which we talked about. We'll come back to. And there's no reward for innovation. There's no reward for beating the standard.

OK. A little bit about early trading, which is in the text assignment. Let me just mention this. This is before 1990. Did we have any trading allowed in the US apart from the lead phase-out? Well, there were a few.

Netting says you can go to your regulator. You have an oil refinery. Emissions here are regulated and emissions there are regulated-- different parts of the same factory.

And you say to the regulator, look, I'd really like to emit a little more here in exchange for a lot less there, or maybe it's even. That's called netting. It's in the same internal transactions or within an entity, within a plant. External transactions are outside. These are inside. They happened, thousands of them.

Offsets-- I think we talked about. Offsets are, I'm going to do more than is required in my factory-- or less than is required in my factory, in exchange for which he'll do a lot more than is required in his factory. He'll do more than he would have done.

And those are very complicated negotiations that happen in Los Angeles heavily, because you couldn't build in Los Angeles. You couldn't add anything new in Los Angeles unless you shut something down. So if you happen not to have anything to shut down, you did a deal.

And the local regulators would either approve it on the grounds that you were actually reducing emissions over there more than would have happened or they'll disapprove it. Because what the typical thing is, you take an old factory, and you pay them to shut down.

And the regulator would say, but that's an old factory. It would have shut down anyway. So prove to me it wouldn't have shut down if you hadn't paid it. Well, that's either impossible if the burden of proof is set high, or easy if it's set low.

Bubbles are where you take an area, and you worry about emissions within the area. You put a bubble over it. Some experiments were done.

Banking is where I'll do more than I have to today in exchange for less than I have to tomorrow-- very little of that was done. So these are kinds of trading that the regulators fiddled with early on, but not in high volume except for netting, and not much impact.

So let us go to-- oh, one last thing before I go to the case. I want to say a little bit about cost-benefit analysis, just a very little bit. We talked about it early on. But it comes up sort of in the case, sort of.

EPA has to produce a cost-benefit analysis of defending any regulation at issues. That's been a requirement-- really, the case talks about the first sort of instances of it under Carter. It's been-- every president has revised this rule for executive branch agencies.

Usually, however, the agencies make a decision and then do a cost-benefit to prove it was a good idea, which drives other people crazy. It's supposed to be used to make a decision. It's generally used to defend a decision. You never ever have EPA produce a rule and say, well, we have to produce this rule, but in fact, it has no benefits. There's always a benefit.

Some controversies, some of which are mentioned in the text, EPA having found carbon dioxide emissions to be dangerous is legally obliged to regulate it. EPA has issued draft regulations for new power plants. Those regulations are being challenged in court for, among other reasons, being arbitrary and capricious because they will have no benefits.

Regulation of carbon dioxide from new US power plants in a slow growth period when we're a small part of the world will have no detectable benefits. True fact. EPA is legally obliged to issue a regulation, however. It will be very interesting to see how the court rules on this one, which is now before the DC Circuit.

There are a set of controversies about, well, when you do a cost-benefit analysis, what discount rate do you use? What do you-- do you value carbon dioxide emissions as a cost? And how do you value a life saved?

There are White House Office of Management and Budget directives on all of those that tell agencies how to proceed. You could imagine those are the outcomes of significant fights within each administration.

Another significant fight is the senior discount, which the text talks about. And the way to think about this one is, do you count small particles that are-- small particulates that result from sulfate emissions cause acute respiratory episodes under certain conditions. Those tend to kill elderly people.

So if you value the average life saved at, say, \$6 million, how do you value the life of an 85-year-old? Some people say, well, you shouldn't do lives, you should do life years. That 85-year-old is only expected to live a few years. If, in fact, you killed a teenager, you're costing a lot more life years.

The EPA discussed this at one point and proposed to do it. That was the senior discount. Who votes? That proposal died. I think most economists think, although we're a little uneasy about this, that it sort of makes sense to ask, are you killing somebody two weeks early or 50 years early?

How you want to deal with that difference you can argue about for days, but it sort of seems to matter. But the 80-year-old votes, so the senior discount seems to have vanished from government decision-making. It appears all the time in academic analysis.

Contingent valuation-- just one last topic. It's not quite as hot a topic as it used to be. When we had the big Exxon Valdez oil spill in Alaska that was notorious, the question was, what are the damages? The damages were mostly to wildlife in the natural environment, and nobody lived there to a first approximation.

So it would be hard to say that a lot of people were directly damaged. So if you ask-- loss of fishing revenue, \$6; loss of campsites, \$12. So the following technique was adopted.

They sent out a survey to people in the lower 48 states. How much would you be willing to pay to undo the damage caused by the Exxon Valdez? And then they would list a bunch of things.

And you get a really big number when you ask that question and add it up. Because most people-- a lot of people will pay zero. That's the most common answer. But among those people who would pay something, a standard answer is \$20.

So since it's not real money, you multiply that across 60, 70 million people, you get a-- and a few people will put out \$1,000, \$2,000, \$5,000-- you'll get hundreds of millions of dollars easily with a question like that. Does that mean anything? This one was also in court in a number of cases. Does that mean anything?

One response to it was to do surveys where they took-- they asked other people the same kind of question, but they doubled the number of birds killed. And then they asked other people the same kind of question-- they cut the number of birds killed in half. That didn't affect the answers.

We say, oh, maybe what I'm getting is general environment sentiment that has nothing to do with this accident. But then how do I value the fact that there was enormous damage to natural systems in wildlife if I can't relate it to people and the birds don't vote? I'd say that remains an unanswered question.

This notion of asking people how much would you pay to save a million birds gives answers that seem quite unreliable, because you get the same answer for 1,000, and you get the same answer for 10 million. So you say, I don't know what that means, but I don't think it's a real answer. But then how do you value the birds?

So a number of questions, lots of fun. Let's go to the case. We passed the 1970 Clean Air Act amendments and instructed EPA to do a lot of things, including the 1971 New Source Performance Standard for coal-fired generators.

We talked last time about who were the interest groups review the bidding. Who was involved in setting the '71 standard. Who were the interest groups? We did this last time. Consult your memory.

**AUDIENCE:** Earth Day treehuggers.

**RICHARD** What?

**SCHMALENSSEE:**

**AUDIENCE:** [INAUDIBLE] Earth Day [INAUDIBLE].

**RICHARD** Well, treehuggers were very heavily involved getting the act passed, but you don't hear them much mentioned in

**SCHMALENSSEE:** connection with making this administrative decision. This was lobbying. Who are the lobbyists? EPA made the decision. Casey?

**AUDIENCE:** The utilities and the coal producers.

**RICHARD** Were all the coal producers in agreement?

**SCHMALENSSEE:**

**AUDIENCE:** No. Because eastern coal has a higher sulfur content than western does.

**RICHARD** So you had eastern coal and western coal, and I'm about to lead you to the next question, which is, why did that

**SCHMALENSSEE:** make it hard?

**AUDIENCE:** Because eastern coal producers were afraid that if EPA put a standard in place it required heavy emission cuts without setting a specific technology in place to achieve those cuts, and people would just switch to using western coal instead of eastern coal.

**RICHARD** That's the problem. The coal in the US differs dramatically in sulfur content. There's a range, particularly in the

**SCHMALENSSEE:** East. It tends to be low in the West. So if you say, you have to have low emissions per kilowatt, per megawatt hour, kilowatt hour, whichever, then for a lot of people it'll be cheaper to switch to western coal.

If you say, what you have to do is scrub-- that is to say, remove sulfur from the exhaust, then particularly if you say the percentage you have to remove, it may be cheaper to use eastern coal. And the people in the west will go nuts. If they're burning really clean coal and they have to also clean the stack, they get angry.

So you have these two very clearly opposed interests. The ones in the east favored a scrubbing standard. The ones in the west favored an emissions standard.

The '71 performance standard was an emission standard-- 1.2 pounds of sulfur dioxide per million BTU burned, of coal burned. What was the cost-benefit analysis behind that standard? Yeah.

**AUDIENCE:** People in the west can burn their clean coal, and they don't have to do anything with it.

**RICHARD** You're giving me a political answer. You're not giving me the cost-benefit. Did they do any cost-benefit? Does the

**SCHMALENSSEE:** case mention any analysis of costs or benefit? No. No, they didn't.

They just kind of casually-- you're-- the answer they gave was, you can burn most-- you can scrub most eastern coal and meet that standard. That was the thinking, which was very, very casual, very casual.

This was challenged. Does anybody recall what the court challenge was all about? Wyatt?

**AUDIENCE:** The Navajo tribe sued--

**RICHARD** Later case. Later case. The challenge of this one was--

**SCHMALENSEE:**

**AUDIENCE:** It was like the sludge.

**RICHARD** The sludge challenge, yeah. That EPA didn't adequately consider sludge that would result. When you take the  
**SCHMALENSEE:** junk out of the emissions, you get sludge. And you've got to treat that or worry about it. And it went back-- they didn't adequately consider it, and it was sent back to consider it. And they considered it, and didn't change the rule.

The requirement isn't about outcome, the requirement's about process. Did you adequately consider? That requires somebody to write something that says, here's what they said. Here's what we think about it. Here's why it doesn't change our conclusion. You delegate that somewhere down in the organization. Deal with this. Write me five pages.

OK. Would you have done anything else? The case makes the interesting point that EPA was doing a lot of stuff. Congress does this all the time. You set up a new agency, or you pass a comprehensive law like Dodd-Frank. And you say to the agencies, we need the following 5,000 rules issued within 18 months. And the agency says, I've got six people.

And you do what you can, but you don't spend your lifetime on this one, because this is new coal-fired power plants. We've got this whole problem with dealing with existing sources with SIP plans. What's a SIP look like? What are SIP reviews, State Implementation Plans? What's all that about? What are our air quality standards?

And oh, by the way, we've got to do this thing. So they did it pretty casually. Would you-- is it obvious that there was a better approach? Would you have done a scrubbing standard, Casey? I mean, you were--

**AUDIENCE:** I think I probably would not have done the scrubbing standard.

**RICHARD** You probably would have done what they did and said, yeah, this is OK. We'll kick the can down the road. OK. So  
**SCHMALENSEE:** this cruises. This cruises along. Now, Wyatt, what put scrubbing on the table?

**AUDIENCE:** So the Navajos sued. And they said if they had made everybody install scrubbing technology, the people in the Southwest would still buy the [INAUDIBLE] coal because it's cheaper to ship it, and then that would overall reduce total emissions.

**RICHARD** Would reduce pollution in their area. They were particularly worried-- maybe came a little later, but they were  
**SCHMALENSEE:** particularly worried at this point about haze. And you still see it in the West, that you get a lot more haze than you used to have. And it's not hazardous to human health, but it's obnoxious. Haze in the Grand Canyon means you just don't have those wonderful views.

So the Navajos sued. They lost. The environmentalists-- the other issue was the court. Some states in the West that were in full compliance submitted state implementation plans that let them get dirtier, but still be in compliance with the law. And the courts rejected those.

So what do you do about that? Because you'd like to develop in the West. You'd like to grow. You'd like to build stuff. The court says, even if you're clean, you can't get dirtier. And people were installing-- the air quality standards were nearby.

So one of the ways people were dealing with sulfur dioxide was to build these monstrously high stacks, which would just let the stuff diffuse over a wide area. So the standard which is about concentration wasn't violated.

The environmentalists were not happy, to say the least. That just didn't seem like the right approach to the problem. That's take the dirt, spread the dirt. It's not too dirty any place, see? Same dirt, spread.

So everybody-- the Navajos wanted stuff scrubbed. The scrubbers were a potential way of dealing with this Western states problem. There may be other ways, but in any case, you had to go-- you had to reopen the law to deal with Western states, to deal with that court decision that basically didn't let them build anything.

OK. Who are the interest groups here? We're in-- we're now in the process of writing-- it shouldn't say NSPS, it should say Clean Air Act legislation. So we go through '76, '77 amending-- the process of amending the bill.

And I left all that stuff in the case because it's interesting, I think, to see it once, to see the process of trying to write something. It gets passed here. It gets rejected there. The session ends. You start over again. You try.

Issues get debated multiple times, often, before things are finally passed into law. And this is an example. There was the '76 process, then there was the '77 process. Who are the players?

**AUDIENCE:** Sierra Club.

**RICHARD** Sierra Club, or the environmental groups, generally. Notice they're not marching in the streets. They're lobbying.

**SCHMALENSSEE:** So we've sort of seen the environmental movement transformed in part into something that looks more like a conventional interest group.

They have lawyers. The lawyers are in the details. The lawyers are in the lobby talking to people. They threaten we could have nine million people write their congressmen about this because we're a grassroots organization. So they're a little bit of a social movement still, but they're lobbying. Who else? Anybody else? Environmentalists wrote that law. Coal producers fell asleep.

**AUDIENCE:** So I guess coal producers in the East would be--

**RICHARD** Both sets-- East and West. I mean, we're now back in play. We're now back in play worrying about scrubbing,

**SCHMALENSSEE:** worrying about high-sulfur coal, low-sulfur coal. And of course, the people-- well, in the Western states.

Also the utilities. I'm not quite sure why I put the utilities there-- I didn't have the utilities there. But the utilities are also involved because they're going to bear the cost of all this. Scrubbing is not cheap.

So the question of, do you scrub? Don't you scrub? Can you develop in the West? OK. Where was the Carter administration? You recall? Yeah, Rory?

**AUDIENCE:** They wanted to spend-- solve energy problems, and to do that easily they couldn't sidestep the environment.

**RICHARD** So they were willing to scrub.

**SCHMALENSEE:**

**AUDIENCE:** [INAUDIBLE].

**RICHARD** So they wanted to scrub, to sell the environmental movement on the use of coal for energy security. If you made

**SCHMALENSEE:** coal too expensive, people were still generating a lot of power from oil, and they really wanted to move away from oil for security reasons. So, hey, scrubbing costs money, but it's a security issue.

OK. So you have the Carter administration kind of positioned in favor of scrubbing, at least at the White House. You got Eastern coal that loves scrubbing, Western coal that hates scrubbing. Environmentalists have come to love it, because it's now a technology solution. It's a standard. It's the kind of thing they tend to like.

Put the thing on the smokestack. Make sure it's running. That's swell. Don't give me any nonsense. The Western states say, well, whatever you do, we have to be able to grow. We have to be able to build things in pristine areas, at least some of them.

So what's the final outcome? Well, we talk about the outcome, but who favored it? What did we get? We got confused language, right? We got confused language as the final outcome. And the confused language, if you read that, and I actually-- I did this case out of a larger piece. I left out a lot of detail because there-- this also happens.

Legislation goes to staff, and you do not see senators at 3:00 in the morning rewriting details of 1,000-page bills. You see senators giving instruction to people saying, look, the bill has to get this done. And so at 3:00 in the morning over pizza, people are saying, well, let me just add this.

And then it goes from the Senate to the House, and somebody in the House says, no, we can't have that. Let me just take that out. I'll put this in. And then the bill gets passed. And then somebody says, well, but that doesn't read right, so let me make sure the report on the bill says what we really mean. And then somebody else says, no, no, no.

So what you got in this case was confused language that sort of seemed to favor scrubbing, but was sufficiently ambiguous to give some leeway. Who liked that? Who was in favor of that? Who pushed-- who was happy at the end of the day? Who felt they'd won?

**AUDIENCE:** Western coal? Because they weren't shoehorned into using scrubbing they didn't need.

**RICHARD** Western coal, you're saying? Nah, it kind of favored scrubbing.

**SCHMALENSEE:**

**AUDIENCE:** The ambiguity-- ambiguity.

**RICHARD** Oh, the ambiguity. Yeah, yeah, yeah. But they would rather have had, oh, nothing-- that it's the administrator's

**SCHMALENSEE:** job to set a standard, and the administrator had done it once and that was a performance standard.

This now said the administrator also has to set a percentage removal-- doesn't say it has to be positive, but has to set a percentage removal, has to consider costs, has to set a percentage removal, has to at least look at scrubbing. The earlier law didn't say it had to look at scrubbing. Who would like that? Yeah.

**AUDIENCE:** The utilities, because [INAUDIBLE].

**RICHARD** Utilities sort of liked it. Eastern coal sort of liked it, because the Eastern coal liked anything that moved toward  
**SCHMALEENSEE:** scrubbing. And environmentalists liked it because it favored scrubbing.

So that's the interesting little irony, right? I mean, you had environmentalists and Eastern coal favoring the use of a dirty fuel. That's an alliance. And the great quote in the case-- you almost never hear anything like this, it's just amazing-- says, "It made sense for the dirty coal producers to abandon their campaign to weaken standards and support the most expensive possible clean air solution, universal scrubbing," which is what they thought they got from Congress. They thought they got universal scrubbing. You could read the law that way.

And this is a Sierra Club-- a lawyer on behalf of the Sierra Club. He condemned that 1.2 pound standard because, quote, "Eastern high-sulfur coal, which is now available, is having a hard time getting a market because of the comparative cheapness of bringing in Western low-sulfur coal." Eastern dirty coal isn't selling well because Western clean coal is cheaper, says the Sierra Club.

OK. This is a picture of politics. People are getting what they can get, building coalitions. This is not the Sierra Club trashing the environment, this is the Sierra Club pushing scrubbing. The Sierra Club wants scrubbing, and to get scrubbing they have an alliance with Eastern coal producers who also want scrubbing.

You might say, gee, wouldn't the Sierra Club serve the environment better if the Sierra Club said, just tighten the standard. Well, they weren't going to get it because Eastern coal producers were too strong. So what they thought they could get was scrub the dirty coal-- maybe cynical, maybe not cynical.

Was it irrational? Well that's-- people jumped up and down about this. What a bizarre alliance. The environmental interest groups, arm in arm with the dirty coal producers. Well, they both got what they wanted-- scrubbing. Or they thought they got scrubbing.

OK, I'll walk a little bit, just in the interest of time, through how we got to the New Source Performance Standard, because I want to spend more time on 1980. So what you had in the administration was a split. The air office says, these guys won in Congress.

They went in trying to get scrubbing, they got scrubbing. Let's give them a scrubbing. We'll set the New Source performance Standard as requiring 90% scrubbing.

The economists, always the heroes of my story, the Department of Energy, the planning office in the EPA said, why don't we just tighten the standard? The law says we have to consider a percentage removal. We'll make it zero.

Tighten the standard from 1.2 pounds per million BTU to 0.55 pounds per million BTU. You do it in the West, with low-sulfur coal. You do it in the East-- it's a little tough to do it in the East, but we're going to tighten the standard.

That's the split within the administration. EPA's rules are reviewed by the White House. The Department of Energy gets to sit at the table. Everybody has fun. Would require scrubbing, yes, but not with Western coal-- not much scrubbing with Western coal. You could-- some Western coal you could meet that straight. Most of it you'd have to scrub. But you wouldn't have to remove 90% of the sulfur to get it.

How had they shifted? Well, this gets interesting. The environmentalists could count the 0.55 standard as a win. So they now didn't much care about scrubbing. What was on the table now, both of those were wins. The 0.55 would probably be cleaner-- would be cleaner than 1.2. So the environmental movement switched.

Eastern coal wanted scrubbing. The utilities, for some reason that I don't quite understand because I didn't think it was the cheapest alternative, the utilities sided with Eastern coal. So you have a switch when it went from passing the law to making the rule.

The environmentalists switched sides. They were allied with the Eastern coal interests in the legislative process. They switched in the administrative process as the agenda changed. Again, this is not a picture-- this is kind of a particularly striking case, which is why it's here, and it matters for energy, which is why it's here.

But it's not that unusual that interest groups switch sides for tactical reasons. This is-- there's no religious issue here. This isn't pro or anti. This is, how do you get forward?

They wanted cleaner air and they wanted scrubbing. OK. Once you get really clean air, we'll give up on scrubbing, let the Eastern coal guys go. The utilities now have a distinct point of view.

The new NSPS, just to go to it quickly, we had a two-tier solution. You could either scrub 90% and emit 1.2 pounds, or you could scrub 70% and emit 0.6 pounds. It's a little weird if you look at it. Why not just require these plants to be clean?

It's a political solution. It made Eastern coal economical in the East, and Western coal economical in the West. Nobody's thrilled. Not clear that those 70% scrubbers actually work. People have a tendency to do this in Washington. They've heard about a technology. They'll require it even if it's not necessarily proven.

That's a political-- I won't press you on that one. What would you have done instead? Who knows? It's a political answer. It's a political answer.

OK. Let me go-- after that, let me pass out the B case. New sources under this-- we talked about this-- under the '70 act and today have to meet stricter standards than old sources. Old sources have to be approved by the state. There are plenty of really dirty power plants still running.

So by the mid-'80s, this is called new source bias and leads to this wonderful question on which I spent some time in Washington, the outcome of which I cannot remember because it was so stupid. What changes can you make to an old plant before it becomes a new plant?

The Environmental Protection agency's position was if you replace a piece of capital equipment like, oh, say, a faucet, it's a new plant. It's not the same as it was. It's a new plant. It has to meet new source standards.

The Department of Energy's position was, well, if there's still a brick from the old plant, it's an old plant as long as there's something left. We reached a compromise that was challenged in court by both sides and upheld.

And I cannot tell you what it was, because that's a question that has no answer. What can you do in old-- that's-- there is no principled answer to that question. It's a compromise answer-- an enormous waste of time.

But in any case, so by the mid-1980s, we had more than 80% of the SO<sub>2</sub> emitted was emitted by power plants that failed the '71 standard. Because people-- and this is ages of power plants. We saw that at the start of the semester. There's an awful lot of coal fired. It's black, for symbolic reasons-- a whole lot of old coal-fired plants put in place before 1970 still. There were a lot more in 1985.

So all this hullabaloo about the New Source Performance Standard isn't actually going to do much. You know, you're not huge growth in capacity here in the '80s. It's growing, but not rapidly. So nobody-- people want to extend the lives of old plants. The old plants are dirty. People aren't building new plants. And acid rain gets to be an issue.

So acid rain says, particularly with high smokestacks-- the stuff blows hundreds of miles was the argument, and damages lakes in the Northeast. So what do you do? Well, in the '80s, what you did was debate legislation that required old plants to scrub. And those laws didn't get anywhere in part because the costs varied so enormously.

You have to have land to put a scrubber in. Some plants didn't have any land. They just have to shut down. Does that make any sense? And then the question was, how are you going to pay for this monstrous thing? How about we put on a national electricity tax?

We didn't burn much coal in New England, so you could imagine the New England response to that. Let's see. You're going to tax us so Ohio can clean up. Good idea. Hmm. No.

So the politics were bad. And of course, the Senate Majority leader was from a Eastern coal-producing state, and the president was Ronald Reagan. So nothing was going to pass, and nothing was going to be signed.

But it was a question to do-- what do you do? So that case, the B case, which you have, describes the process that got us to the trading position, the trading provision, title IV, in the 1990 Clean Air Act.

One environmental group, the Environmental Defense Fund, decided the only way we could deal with this problem was to put in place trading, which the environmental movement had traditionally hated because it removed stigma, license to pollute, trading and filth, et cetera, markets and garbage, all kinds of great slogans. But once they saw there was no other way to do it, and we suddenly had a Senate Majority Leader from Maine who cared about acid rain, and a president who had a summer home in Maine who cared about acid rain, we were going to get a bill.

So this was the way forward. It was a wild scramble for the tradable things. I was involved in this. It was horse trading at its worst, but didn't affect equal marginal costs.

We talked about national trading for some pollutants. It doesn't make sense for all pollutants because of the hotspot problem. But in any case, this law, which was a national cap and trade for sulfur dioxide, which by the way, doesn't mix like carbon dioxide. It doesn't mix around the globe. It travels maybe a few hundred miles.

Sulfur dioxide emitted in Miami does not affect the forests in Maine at all-- affects the oceans, but doesn't affect the forest in Maine directly. And sulfur dioxide emitted in Arizona, boy, there may be a few molecules who get east, but not that-- that get east, not that many. So it took effect in 1995.

So we're now after that B case. If you have any questions about it, about the case, let me know. I've got a bit to cover, and I want to make sure I get it done.

So here's what happened-- one thing that happened. The law created an asset, this tradable allowance, and it gave it away. Now that's interesting, right? That's interesting. It gave away the rights to emit sulfur dioxide.

Now, if it were a competitive market-- let's suppose it took one of those things to generate a megawatt of electricity. Then you'd expect the price of electricity to rise by the cost of an allowance on opportunity cost, on an opportunity cost basis.

If you give it to me for free, but if I don't use it myself I can sell it-- so the cost of using it is the price on the market, even though I got it for free. So what you would expect is in a competitive market, it's a gift. In a regulated market, it's not so clear. And states had different ways of dealing with this.

This picture illustrates sort of the distinction between the value of the allowances and the cost of cleanup, which is often a confusion. So we have allowances to emit sulfur dioxide. Each one gives you the right to emit a ton. There's a demand for those. What's the demand determined by? Well, it is determined by the marginal cost of cleaning up.

If this is what I would emit-- this is what the industry would emit if there were no price on allowances. And this is what they emit when the price is higher. This curve must reflect the marginal cost of cleanup. Because you will emit until the cost of cleanup exceeds the costs or the-- you'll clean up until the cost of cleanup exceeds the value of an allowance because I have a choice. I can reduce emissions or buy an allowance.

So the area-- if this is the cap, the area under the curve to here, and if this is the price, this area must be the cost of cleanup. Just like the demand for a good is the marginal value consumers place on it, here the marginal value is the cost of cleanup. So the cost-- the area under this curve from here to here is the cost. This rent is the value of the allowances that were given out.

Now, if this were a competitive, unregulated market, and that picture were right-- well, I don't have the rest of the story so I can't say that. Normally, however, it's a gift.

You probably haven't followed this, but there's a controversy about the European carbon trading system is now being expanded to include airlines, which requires airlines flying into Europe to buy allowances to cover the carbon they emit flying in. Airlines, including US airlines, are being given allowances. Not enough, but they're being given allowances to cover most of their emissions.

The US airlines are berserk about this. The administration is berserk about this. You're taxing our people.

The analysis done over in Building E19 concludes very persuasively that the US airlines will, in fact, make money because they're being given almost enough allowances, and the price of airline fares is going to go up to cover the opportunity cost-- not the out-of-pocket cost, the opportunity cost. Even if I've been given it, the cost of using it to me is the market price. The price I charge will have to cover that. My profits will go up.

US airlines hate this analysis. They paid for it. They now reject it as fatally flawed. It is, if you think about it for a little while, pretty simple economics, a little more complicated under regulation.

So what else happened? Question on this? OK. What else happened? Well, this is the pretty picture. These were-- this was actual emissions, US emissions in millions of tons. These were-- you can estimate that pretty well by the fuel they burned. After 1995, they had monitors on the stack, so we know it for sure.

Here's the cap, this line here. It went down over time. It's a little complicated because more units were covered, which is one reason-- a lot of things happened, but this is the aggregate cap pretty clearly. These are some estimates of what might have happened absent the law. The law was passed in 1990, but there was some anticipation of it and some investments made.

But the key thing is in the oval. Look at what happened to emissions. Environmental programs don't do that. People litigate. They resist. The devices don't work.

Look at that drop. It dropped below the cap-- way below the cap. Why did that happen do you think? Well, I'll give you the-- yeah, go ahead, Jacqueline.

**AUDIENCE:** Was it banking?

**RICHARD** It was banking. Exactly. There was banking. The cap gets pretty low out here around 2,000 A lot of people said,  
**SCHMALENSEE:** all right, I'm going to look to 2,000. I'm going to overcontrol. I'm going to do more than I need to do now, so that when I come here, I can notice emissions are above the cap here. I can draw down the bank. I can draw down.

And that makes sense? Yeah, it probably made sense. Because you got early emissions reductions. You got early control. Cumulative emissions were the same. Eventually, the bank is exhausted. The other thing you saw, this business about always having an incentive to cut. The incentive to cut here was the value of the banked allowance later on.

The other thing that happened that you wouldn't have had happen in standards is people innovated. Well, you know how I'm talking about burning high-sulfur coal and burning low-sulfur coal. People say, wait a minute. High-sulfur coal is now really cheap because it's really dirty. But I can mix it.

It's not a trivial thing to do, but it's not that hard. People figured out how to blend it in, which lowered their costs while still keeping under allowances. People invented new ways to scrub. Didn't remove 90%, but were lots cheaper.

People did a variety of things. Railroad deregulation brought Western coal east. So we had this huge reduction in emissions, and you saw it on the ground.

Now, it turns out acid rain wasn't as damaging as people thought. There was a large study funded on impact of acid rain. It wasn't finished before the bill was passed-- hey. But in terms of deposition, you saw a great reduction in the Northeast-- still some hot spots, but nothing like what they were before.

This was why the fiction worked. It was going to be cheapest to control in here and everybody knew it. So if you had-- even if you had a national regime, and yes, you could control down here. You can control over there. You can control up here. It was going to be cheapest to make reductions here. And so that's where they were going to get made.

All the models said that. Everybody was very quiet about the fact that this stuff doesn't mix. Because the models were pretty clear that we're going to get what we want because here's where it's cheap, and here's where we want the cuts made.

But the different-- but the point to keep in mind is even in these regions, the costs of control differed enormously among plants. So yeah, regionally it's cheapest in there, but not plant by plant. So trading worked. It got it where it was cheapest, and where it was cheapest was where we wanted it.

This is the price. These are the price of these rights to emit a ton running through the end of 2003. The initial estimates were higher. The initial estimates were about \$300 a ton. So some mixture of innovation and cheap Western coal held the price down. But you will notice the price bounces around. People were making a living trading these things.

How could you make a living? Well, why did they bounce? Well, if you think about it for just a minute, it's sort of like we talked about oil. There's a demand for emissions.

It depends on the economy. It depends on coal prices. It depends on a lot of things. But in the short run, it's pretty inelastic-- short run, a few months. You don't change a coal plant in a few months.

The supply curve is that vertical line. It's a cap. So the supply is really inelastic, the demand is pretty inelastic, and the price bounces. So if you look at it, you say, well, all right. The price moved from, say, \$75 to \$200 over a period of a few years-- terrible, horrible.

Oh, by the way, there were speculators. Of course there were speculators. How could there not be speculators? Did the speculators do this? Not really. They may have amplified, but the main story was inelastic demand and inelastic supply.

Industry hated this, as you could imagine. Not such a big deal for sulfur because it's a small cost, but makes it hard to plan when you don't know within a factor of three what that cost is going to be.

The alternative-- and I will say we were asked a lot, those of us who were involved in doing this thing, why didn't you do a tax? Tax would avoid that kind of uncertainty. You buy-- the government would buy or sell. You just put it-- in effect. You just put a tax on SO<sub>2</sub> emissions. Wouldn't that be better? Yes and no.

It would mean there was a risk-- the risk would transfer, as you can see, to quantity. The environmentalists hated that. You don't know how much is going to be emitted? Rather not know the price.

And the utilities really hated it because instead of being given these rights, you'd actually have to pay out of pocket. No, no, no. No, no, no, no, no. So that was a non-starter. That was a nonstarter.

OK. Let us now go-- I think this is where we go-- to the C case. So what the C case tells us is the game shifted in the early '90s. People worried less about acid rain, and they worried a lot more about small, fine particulates. Began to get epidemiological studies that said that fine particulates kill people. Mostly they kill old people, but old people vote.

So EPA had to-- EPA issued a standard for fine particulates in 1997, and it had to figure out how to meet that standard, the problem being the acid rain problem in different clothing. Small particulates are caused by SO<sub>2</sub>, among other things, and thus, they travel. In effect, they travel. So EPA, which has interstate authority, had to do something about fine particulates.

So what it tried to do was brilliant in a way. It said, we'll tighten the acid rain program. How do we tighten the acid rain program? We require I think it was two allowances to be emitted now for every ton instead of one allowance. How perfect is that? We just cut the ceiling-- cut the cap in half. Surely that's going to reduce emissions enough to cut these particulates way back.

Well, here's what happened to prices. Yeah. What I showed you early on, ran up to about there. This drastic tightening was being debated. And that must be somebody cornering the market, but run-up-- or trying to. But the run-up to the shoulders was fear of this regulation.

So again, if you read the C case, this was a brilliant idea to keep the trading system intact, to make it deal with the new problem by tightening it. If you want to read-- oh, I didn't put the citation in. If you want to read something really depressing, read the circuit court opinion that dealt with the maybe 40 people who challenged this rule.

Hundreds of reasons why you couldn't do this, why it was arbitrary and capricious and an abuse of discretion. And what the court did was throw it out. And by throwing it out, threw out the acid rain program.

You see the little quotation there. It said, "Sources in Alabama which contribute to nonattainment of the fine particulate standard in Davidson County, North Carolina would not need to reduce their emissions at all." They could just buy the right to emit. "Therefore, they could keep contributing to nonattainment in North Carolina. Therefore, a rule that allows that is invalid." It doesn't solve the North Carolina problem. You've got to come up with something that does.

And what EPA has come up with and what's in process is something that basically eliminates interstate trading. So this is the short happy life of interstate trading of sulfur dioxide allowances. It worked. It didn't in the eyes of the court solve the next problem that came along, but it worked.

So let me say a little bit generally about the Clean Air Act from some EPA propaganda. Stepping back from this program-- and I'll let you digest this stuff, and we'll have a few minutes for questions. If you look over the long term, from 1970 to 2005, real GDP almost doubled. Vehicle miles traveled almost doubled. Lead emissions went almost to zero. Well, that was easy. We phased lead out of gasoline. That was a good trick.

But large particulates went down by 83%, but the small particulates not so much. So this problem is still with us. The small particulates turn out-- the big ones you see. The small ones kill you, as a shorthand.

Carbon monoxide is down better more than half. Sulfur dioxide is down half. Oxides of-- these are national emissions, not concentrations. Oxides of nitrogen-- 30%. That's stubborn because you get it from automobiles, and you got that doubling of vehicle miles traveled. But still down a third. Volatile organics down 52%, and that's catalytic converters.

So if you look at that-- again, if you look at that relative to that paper that was so pessimistic about environmental progress, that's not bad. If you hadn't had EPA, it would have been worse. Most of this stuff would have gone up with GDP or vehicle miles traveled. Not great. Not great.

You still have ozone, which involves small particulates-- stubborn, stubborn-- the Eastern Seaboard, and of course, Southern California. But you'll notice Cape Cod is a nonattainment for ozone, not because of the terrible things they do there, because it moves. Yeah?

**AUDIENCE:** What's a random [INAUDIBLE]?

**RICHARD** The random what?

**SCHMALENSSEE:**

**AUDIENCE:** [INAUDIBLE].

**AUDIENCE:** In Colorado.

**RICHARD** In Colorado?

**SCHMALENSSEE:**

**AUDIENCE:** Yeah.

**RICHARD** That, I believe, is carbon monoxide, and it has to do with automobiles I think. I don't think it's ozone.

**SCHMALENSSEE:**

**AUDIENCE:** Is there an Air Force base there?

**RICHARD** No, no, no, no, no. This is Denver. This is Denver. Do you have a clue what that is? I know there was some there

**SCHMALENSSEE:** was some issues with fuel formulation there in particular.

So I think it's a-- it is a-- I think it's an ozone or a carbon monoxide problem. I could be wrong. But there are people there. There are people there. It's not just skiing. Skiing's farther west.

So there are parts of the country where the air still counts as dirty. And that's ozone and other criteria pollutants are, again, in some places. You've got the-- well, some of these are quite unpleasant. Southern-- not unpleasant, but Southern California, for instance, persists, as for that matter, does the Pittsburgh area in nonattainment for a number of pollutants.

So let me pause there. That's a lot of ground to cover and I rushed through it. So let me see if you have questions on any of it. Oh, yes.

**AUDIENCE:** Can you go back one slide?

**RICHARD** Absolutely. That's easy.

**SCHMALENSSEE:**

**AUDIENCE:** So in California, like, along the border of California and Nevada, it looks like pretty much all of that border in California is really bad. But then in Nevada it's only at the southern tip.

**RICHARD** I think what you have here is-- is this maybe Imperial County, which is gigantic? So it may be that the problem is  
**SCHMALENSEE:** over here. So it's being done by county. It's being done-- there's certain monitoring stations in each county. And my guess is Death Valley is probably not a nonattainment area for much. But over here near LA, I'm guessing.

**AUDIENCE:** Part of the county.

**RICHARD** Yeah. Yeah. It's a certain number of monitoring stations sort of thing. Yeah.

**SCHMALENSEE:**

**AUDIENCE:** Can you [INAUDIBLE]? Like, what would happen if you had like a quantity control up to, say, 80% of the cap and then set a tax?

**RICHARD** Sure. Sure. You could even do better than that. Let me get there. Yeah, here. Oh, or here, but rather here. What

**SCHMALENSEE:** people did talk about in the context of CO2-- so we talked about there was a cap and trade bill.

And environmentalists said, well, the price could get so low there wouldn't be any incentives. And industry said, the price could be so high it would kill us. If we had sudden economic growth, we could get really high prices that would choke off growth. Or if the growth was slow, you could have what you have in Europe, which is really slow prices, really low prices.

So people proposed, how about we have a floor and a ceiling? The floor would be if the price drops below this floor, some agency starts buying these things on the market. If the price gets above the ceiling, we start selling them at the ceiling price. So you stand ready to buy at the floor price and sell at the ceiling price to limit the fluctuations. And if the floor and ceiling are close enough together it looks like a tax.

So that was a serious set of proposals in the climate context for exactly the reasons I think you're thinking of. Too low removes incentives; too high is very expensive. You give up quantity control, but you give up quantity control sort of at the edges.

If growth is really slow, then emissions are going to be low. The problem is up here, if growth is really fast, you're going to let emissions grow some. So maybe you want this curve to be steep up here, a supply curve. But you could-- there are very-- there are ways to combine these two and variations on a theme. Yeah. Anything else? OK.