Transcript of CleanLaw Episode 27: Joe Goffman Interviews Kathy Fallon Lambert on Increased Emissions under ACE, October 8, 2019

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Robin Just: Welcome to CleanLaw from the Environmental and Energy Law Program at Harvard Law School. In this episode, Joe Goffman, our executive director talks with Kathy Fallon Lambert, Senior Advisor with The Center for Climate, Health, and the Global Environment at the Harvard T.H. Chan School of Public Health, and co-founder of the Science Policy Exchange. Kathy was part of a team of researchers who evaluated the regulatory impact analysis for EPA's affordable clean energy rule to determine whether it incorporates the best available information, and whether its predictions are fully supportable.

Robin: She and her colleagues also perform their own analysis using EPA data. Using more realistic assumptions than EPA used, they found that EPA overstated the likely benefits of ACE and that ACE could lead to increased pollution in several states.

Robin: Kathy and Joe discuss EPA's assumptions in the RIA, the impact of EPA's current and expected changes to New Source Review that EPA failed to account for, and EPA's inconsistency in calculating the benefits of reducing fine particle concentrations. Kathy has spoken with us previously about the Mercury and Air Toxics Standards rollback and the benefits of policy relevant science. We hope you enjoy this podcast.

Joe Goffman: Hello, Kathy, how are you?

Kathy Fallon Lambert: Good Joe, how are you?

Joe: I'm fine. I'm particularly fine because you have agreed to come back and join us again on the CleanLaw Podcast episode. You are responsible for, I would say depending on how you count three of my favorite episodes when you were here, talking about the Mercury and Air Toxic Standards, then proposed Affordable Clean Energy Act, Clean Energy Rule, sorry, and about how science and policy can and should work in partnership.

Joe: So you're back today to talk to us about the final action the agency took in promulgating the affordable clean energy standards, which extensively address CO2 emissions from coal fired power plants. When you were here last time, one of the things you discussed is an independent analysis that you did that was peer reviewed of the proposal, focusing on the rebound effect, and the likely

increases in emissions, if not of CO2 then of other air pollutants in almost half of the states. And it sounds like from reading your latest paper, that you continue that analysis applied it to the final ACE rule and discovered similar results. So without further ado, what are you seeing this time when you look at the final ACE rule?

Kathy: Sure. Thanks, Joe. So our team, which included myself, included colleagues from Syracuse University, and Resources for the Future and Harvard C-CHANGE took a look at the final ACE rule and the underpinnings of that rule, which is the regulatory impact assessment, and we were curious, first off, what does EPA say the rule will accomplish? What are the underpinnings for that? And then what's our own independent sort of perspective on those underpinnings? And does that change any of the conclusions? So when we look at the ACE rule itself, I think the top line to remember here is that this is a rule that would do very little to address climate and would make air quality worse in several states. So we have something that does very little on climate change, and makes air quality worse, and that's by EPA's own conclusion.

Kathy: So we see a decrease in CO2 emissions of greenhouse gas pollutants of less than 1% compared to no policy and similarly nationwide, a similar change in the co-pollutants of SO2 and NOx. But, importantly, when you drill down at the state level, there are several states including, for example, Ohio, Georgia, and Florida, where those co-pollutants of SO2 and NOx actually increase and they increase enough that the concentrations of ozone and fine particulate matter which are harmful to human health increase in those states. And in the case of Florida and Ohio, they're increasing in states where the National Ambient Air Quality Standards are already exceeded. So in counties where people are experiencing unhealthy air, their air will become even more unhealthy as a result of ACE.

Joe: When we opened up, I made a reference to the term rebound effect, and that's probably worth explaining because as I understand the paper and as I think the paper explains, that's the mechanism. That's the mechanics by which these emissions increases are seen.

Kathy: You're right, so emissions rebound is absolutely the way that this happens, and so when you think about the ACE rule, I like to think of it as if you were trying to construct a rule that would have as little ambition as possible and might stimulate investments to extend the life of coal plants, you get something like ACE, and the way it's structured is that it identifies a number of measures or technologies that could be implemented to improve the heat rate, or the operating efficiency of coal plants, and that's beneficial to the industry because you've now stimulated some investment and you've extended the life of that plant, and as a result, it tends to run either more often or for longer periods of time.

Kathy: Unfortunately, while that improvement of inefficiency might reduce the amount of CO2 per unit coal burned, it doesn't reduce the absolute amount of emissions of CO2 or co-pollutants, and so by running more, you can increase emissions and that's what EPA itself projects will occur under ACE in some states at some plants.

Joe: If I recall correctly, the EPA's regulatory impact analysis, not your paper but the EPA's own penciling out this thing said that in somewhere like 20% of power plants by their projections would increase emissions?

Kathy: Right. Exactly. If you look at it at a unit by unit level, about 20% of the plants could actually see an increase in emissions under their scenario.

Joe: This isn't the first time people like you and me independently, I think have observed this. But often when rules come out, it's easy to tell right away, or maybe I'll put it another way, intuitions about what the administration's really up to come immediately to mind, and then it turns out that if you sit and you do a careful analysis of the way they argue the law, or if you do an analysis of what's hiding in plain sight in the agency's own regulatory analysis, those intuitions turn out to be supported by the subsequent analysis.

Joe: The reason I'm harping on this is that, from the moment the proposal was announced, it seemed to a lot of people that this was a thinly disguised or barely disguised coal plant life extension subsidy program masquerading as an air pollution rule. And it sounds like the analysis implied in the agency's work and made explicit in your work validates that intuition. That the rule asks states to engage with their utilities and guide them, if you will, to make investments that they might otherwise not be making in the operations of their plants. Which investments in turn the PUCs and the utilities will want to get full return on which means the plants will run longer, and if those operational changes make them more, in fact operate more efficiently, the dispatch protocols will turn them on more frequently and for longer periods of time, and the subsidization comes not so much in the form of the state level regulatory process but the subsidy is paid for by air quality degradation. Is that a fair way of putting it?

Kathy: Yeah, I think that that's the externality that's not fully accounted for in EPA's analysis and so when we saw those results, and we dug into the RIA, it really read as if it were a document of convenience or expedience, rather than a document of rigor, and that's what prompted us to not just accept EPA's conclusions for what ACE would accomplish but to actually walk through it high point by high point and question those assumptions and see if we came out with the same answer.

Joe: Or a low point by low point, depending on your perspective.

Kathy: And there's some interesting things that EPA decided to do in its regulatory impact analysis that I think we take issue with in our working paper, and if you were to think about it from a reverse engineering perspective, it reads like the analysis had to be put together in a way that the benefits of a very low stringency unambitious rule that extends the life of coal plants has to outweigh the costs of the investments in those heat rate improvements in a situation where the administration is only willing to consider the domestic social cost of carbon.

Kathy: So you've got unlimited universe of benefits to begin with, and then there needs to be a way for them to pencil out enough benefits to outweigh the costs. So, the first thing that jumped out to us when we looked at it was how low the heat rate improvement is across the fleet in the RIA. They estimate about a 1.2% heat rate improvement.

Kathy: That's actually pretty low for what most people expect could happen and would happen if you incented these kinds of investments, and it's more likely that their ranges would be what's in their draft closer to what the values in their draft, over 2% or even up to four, 4 1/2% heat rate improvement.

Joe: So you're saying that to your eye, to your expert eye and your team's expert eyes, it looks to you like they low balled the efficiency improvement in the final analysis.

Kathy: Right, and the reason they come to that conclusion is a bit complicated but basically they make a set of assumptions about a loophole that they're working on called modifications to a New Source Review, and which technologies would be implemented. So when we and others have looked at what's possible for heat rate improvements, considering what other units in the fleet have achieved of similar type and age, we come up with levels that are more in the two to 4 1/2% range.

Joe: Now, what is that stating the heat rate improvement at the lower percentage as opposed to the higher percentage that your analysis indicates? What does that do for them in terms of the result they get?

Kathy: Sure, the net effect of that, that we and others have shown is that you get a lower emissions rebound. So, oddly enough, the more you implement their best system of emissions reductions, or the greater the heat rate improvement, the higher the emissions rebound is likely to be, and therefore, the lower the benefits of the final rule are likely to be. And so if you're trying to foresee how this math might pencil out for a rule like this, there would be a benefit to having

a low heat rate improvement because you'd have a lower likelihood of emissions rebound, which has a cost.

Joe: Right. So am I right to hear this as that's the sort of central contrived assumption that is contrived in order to engineer a specific favorable result? Is that assumption about that low balling of the expected heat rate improvement?

Kathy: I certainly think that that has the largest effect on the end result, and it's pretty hard to read intentions into a document like this. But I think what you would want to see in a more rigorous analysis is at least a sensitivity case. So if we know that New Source Review might be modified so that there is a loophole that would allow more technological improvements with a lower regulatory burden, and we know that's coming, let's take a look at that to see what the added effects of that might be on a rule like ACE.

Joe: Right. So I think what brings what you just said to a sharp point, would be going back and looking at the proposal because in, I think it was August of 2018, Andrew Wheeler, the administrator signed a proposal that included both the heat rate improvement requirements for or proposed requirements for coal plants, and in the same package, a designed in loophole that would allow these plants to make the changes without having to undergo New Source Review and permitting that might require they're putting additional SOx and NOx pollution controls on and they analyze that package as it was proposed and came up with a higher numbers for the heat rate improvements. And I think the paper you did at the time saw a higher rebound effect in terms of the operation of these plants and a higher rebound effect in terms of emissions.

Joe: So let's just say by convenient coincidence, they made the decision to separate the front final ACE from finalizing the NSR, which they stated they intended to do, but didn't do, or at least haven't done yet. And then they did the analysis as if they never intended to change NSR but we're all operating with the assumption that they will make good on the promise they made to finalize that. Sounds like what you would like to see or if you were the person running the analysis for the agency, you would look at both the package that Wheeler signed without NSR and the eventual NSR loophole and its effect and give the public a sense of that range.

Kathy: Yeah, absolutely. I mean, you have sort of compounding uncertainties here and what you lose through all this is a line of sight to the public health effects down the road and the consequences and the economic value of those and whether or not the rule actually have benefits that outweighs the costs. So in our working paper, while we didn't have exact apples to apples comparisons, we did have a number of other cases that we could compare the final rule to. To see at least directionally, how would we expect things to change if you did a more

complete analysis, and we compared it to three different approaches one, just a slight heat rate improvement to the 2%, which was in the draft rule, to up to a 4 1/2% with the NSR reform., and then a 4 1/2% with the NSR non-binding or like a reform and the tax credit for carbon capture.

Kathy: So in all cases, the SO2 emissions rebound went up substantially by two upwards of six times what's reported in the final ACE rule, and the number of states affected also increased. And so at those levels, is if you think of SO2 alone, that's the driver of fine particulate matter, which is the largest driver of premature deaths. So you have a pretty wide range there of possible outcomes if you were to take a look at some of the uncertainties around how this standard could be implemented.

Joe: But let's be clear, the uncertainties involve scenarios that are not necessarily low probability. I mean-

Kathy: Oh, not at all, yeah.

Joe: ... It tends to be this administration's, or at least this EPA's habit to actually follow through on their promises. If they follow through on the NSR promise, then what it looks like an uncertainty now is going to eventually or more likely to eventually, in terms of the higher level of investment in operational efficiency, and therefore, the greater presence of these plants, high in the dispatch order, running more and emitting more and maddeningly enough, doing so without having to be subject to the program, New Source Review, that otherwise would be responsible for addressing the expected increases in SOx, NOx, and fine particles.

Kathy: Right. I mean, I don't think reform of the New Source Review would be proposed if it weren't going to be utilized. And similarly, I don't think some of these technologies would be included in the best system of emissions reduction if they weren't of interest to industry. So I think we can expect that when all the pieces are in place, things are likely to play out. In terms of higher heat rate improvements, greater emissions rebounds, larger health effects, and again, compared to a benefit that's calculated by EPA's method only on the domestic social cost of carbon. So having adopted that protocol, then you have to, I mean, I think there was a lot of care taken to make sure that the health side didn't cause too much air quality impacts on paper, and therefore, the benefits would pencil out as we see.

Kathy: Now, interestingly, I think another little breadcrumb in the RIA, that supports this thinking that maybe this is a document of political expediency is the fact that the calculation of the health benefits is done all the way down to a concentration of zero for fine particulate matter. Despite the fact that as you

know, Joe, in their MATS roll back, EPA suggested that that should only be calculated back to the threshold that the National Ambient Air Quality Standards.

Kathy: So in this one document, we've got adoptions of methodologies that on the one hand are consistent, on the other hand, are not consistent with EPA's past statements and proposals.

Joe: Right, look, it's tempting to ascribe extreme motivated reasoning on the part of this administration, which I think heretofore was considered a kind of cardinal sin when the government and in particularly the EPA did this kind of analysis. It sounds like it's very good practice for professional analysts like you and your colleagues to do your work, blind to the question whether there's motivated reasoning at work in the agency.

Joe: But it sounds like there's some circumstantial evidence that there is. The Mercury and Air Toxic Standard proposal, which was issued, I think, in the spring proposing to withdraw the finding that it was appropriate and necessary to regulate mercury and other air toxics seemed to take a stand on the question of when you stop counting the benefits of fine PM reductions, and I took a stand at the current National Ambient Air Quality Standards threshold, which is not zero. It's a number higher than zero. And for a long time, there's been a constituency that argues that when the agency counts benefits, that's the right place to stop counting the benefits.

Joe: What you're saying is that this RIA, the agency didn't stop counting the benefits at the next threshold. It went to zero. I'm afraid that does strike me as just a classic piece of motivated reasoning and in positing an assumption.

Kathy: Yeah, I mean, we may never know. In our job is to sort of sit back and look at the numbers and ask, do they add up? And I think when we did that, for our team, they didn't add up. We would expect a much higher heat rate improvement, therefore greater emissions rebound. We'd expect that the benefits would be less than what's in the RIA, if you took account, New Source Review, the technologies that would be implemented, and basically you're left with a rule that accomplishes what would happen with what the market is doing anyway, and doesn't actually lock in those emissions reductions. And so the last thing we did was actually to compare what would happen for a rule like ACE compared to a rule like CPP if the market conditions changed to sort of test out how durable is this kind of market based, or market driven outcome with a slight technology driven benefit of less than 1%. Does it hold? And that was the last part of our analysis, which to us was very interesting.

Kathy: So we ran a scenario with what we viewed to be a reasonable expectation for a rule like ACE which was a 4 1/2% heat rate improvement, without NSR being binding. So with something like NSR reform, and we modeled that out into the future with higher demand, higher natural gas prices. Say for example, there became some constraints that states or communities put on fracking and natural gas became more expensive and higher cost of renewables. And all of our assumptions were within what the Annual Energy Outlook projects as being plausible.

Kathy: So when we did that, what we found was a substantial increase in CO2 and co-pollutant emissions under a rule like ACE because there's nothing that's binding compared to a CPP that was updated to the current measure and had caps in place. And so you have this interesting comparison of two policy pathways, one that asks the state to set some mass or rate based standards and provides a lot of flexibility and then one, that has a very modest technology suggestion but no requirement. And in fact, when market conditions change, that ACE rule doesn't do so well, and you see a much larger increase in emissions under ACE than under anything you would expect to see under a Clean Power Plan type rule.

Joe: Right, right. There are a couple of aspects to this, that either need to be noted I think or perhaps further explored, when the agency did the Clean Power Plan, it did put a premium on exploiting to the greatest extent possible the momentum of the electricity market towards clean energy, which was created by state policies and other federal policies to lock that in, which was done by the mechanics of sending a numerical standard that the fleet in each state had to meet. And then adding to that standard or if you will, as a second and final step, tightening that standard to the extent that the rule would kind of function as an accelerant of the direction that the market was already going in.

Joe: So that there was a, what looked in 2015, a pretty high floor for the number of emissions reductions that the public can absolutely count on occurring in the 10 or 15 years after the rule was signed. And if the accelerant element overperformed, or stimulated the market to overperform, you'd get even more emissions reductions. And that was in keeping with the fact that the agency had applied other authorities under the Clean Air Act targeting air pollution from the power plants sector, like the Cross-State Air Pollution Rule, and the Mercury and Air Toxics Standards, that for the targeted pollution in those rules, achieved significant reductions and reductions that really matched the environmental problem that EPA's authority was created in order to solve and we looked at, or we saw those rules producing millions, not 10s of millions of tons of reductions.

Joe: The regulatory impact analysis identified the public health benefits in hundreds of millions of dollars, if not billions of dollars. And what ACE is, is a real anomaly. It's a real disjunction because it produces puny levels of emissions reductions by

the EPA zone account. Then have a puny dollar value, and the paradox is that the ACE analysis is even more optimistic about what the market will do in terms of shifting to clean energy than the Clean Power Plan analysis was. But instead of following the logic of the Clean Power Plan, which is that that shift, that projected shift should be harnessed and accelerated, it arguably slows it down a bit, because it says now we're going to intervene via a Clean Air Act rule, to have the states look at something that the market wouldn't otherwise do, that is invest and extending the life of these coal plants. Which investment is going to, at best have no effect on CO2 pollution or other pollutants, and in some cases, in least 20% of the cases result in higher levels of pollution. No wonder I drink.

Kathy: Yeah, it certainly doesn't seem to promote that transition. It seems to have an effect of promoting that reinvestment in the fossil units, and I mean, you see that just by the fact that it's less than a 1% from what would happen with no policy. Whereas at the time that the Clean Power Plan was envisioned, the difference between what would happen with no policy and the CPP was much larger. And so in fact, when we said, we sort of did a hypothetical that asked, well, if you were to implement something like the Clean Power Plan today, taking the advances that have been made, what kinds of additional reductions might be achieved? And we did this because there was this interesting thing that also happened in the RIA, or in the ACE rule where they repealed the Clean Power Plan and basically said, well, that's been achieved. And so we're appealing that first and then we're finalizing ACE, and that removes the need to compare the two.

Kathy: So we thought, well, let's just look at that and do that comparison, and if we're going to update ACE, then we're going to update its baseline and its assumptions, let's do the same for the Clean Power Plan and then put them side by side. And when we did that, the example of the ACE that we ran, that controls for leakage, that controls for new units, that applies the standard that basically implements it the way that EPA intended back in 2015, you achieve another 35% reduction in CO2 emissions from 2005 and 2030.

Kathy: So you get to a total of emission reductions of 60% from 2005 by 2030. So, one, that calls into question really how legitimate is it to dismiss the Clean Power Plan and saying it's been achieved? And also, it just provides an important comparison, what could we be doing now, if we were moving forward with a Clean Power Plan type approach, rather than the fossil fuel Reinvestment Act? And I think it's useful when we did that, we also then kind of put them both through the rigors of seeing how they would do if market conditions changed. And again, because of the Clean Power Plan set binding requirements that hold even when market conditions turn for the worse or if they were to in the future, whereas the ACE rule does not.

Kathy: You see emissions increase right back up again with the price of natural gas and changes in demand, and at a time when we're promoting so much move to the grid for decarbonisation, I think the expectation, that demand for electricity might increase is at least a reasonable assumption to look at.

Joe: Well, that last step in the exercise you and your team's analysis did is super important. Because as I read your report and listen to you just now, one of the points you made was that even if we get lucky, and the ACE rules assumptions about what the market will do prove out that they actually happen, you're still doing a rule that grossly under achieves what up until this point EPA understood to be its obligations. Because your analysis basically said, if we just take the principle that we need to lock in the expected shift to clean energy that the market and other policies will produce, and we accelerate that or amplify it using our rulemaking authority, it sounds like you would still get a significantly larger reduction from an updated approach, that updated to reflect the new understanding that emerged between 2015 and 2019.

Joe: It would still be significantly greater than the EPA claims to expect under its projection, and that's really important because it could turn out I think there are a lot of technology optimists who would at this point, from what they know now, kind of vouch for EPA's optimistic projections explain why though plausible pessimistic factors would still not play out in a very effective way. But also, ultimately, agree with you that even if the agency's simply the failure to update, even if they're right that they don't need to lock anything in using rules, but simply the failure to update is a pretty significant underachievement.

Joe: We've been talking about your scrutiny and analysis of the EPA's regulatory impact analysis. But as of September 6th, which was the deadline for the public to file petitions for a review with the DC Circuit, challenging the repeal of the CPP and ACE, there's potentially a confluence or a convergence of the work that you've done over on the analysis side with some of the arguments that the challengers will present to the court. The EPA's approach in the repeal in ACE was to rely virtually exclusively on a legal interpretation, and they took a very particular strategic or tactical approach, instead of engaging with the question of whether or not generation shifting, writing a standard that was based on moving generation from a high emitting plants to lower zero emitting sources, by way of saying that was the best system of emission reduction, the agency didn't argue with the commenters about whether or not that was reasonable.

Joe: It simply said, we're going to stare at the language of the statute until we reach the conclusion that we simply don't have the legal authority even to think about generation shifting or other measures, and you end up with what really is an anomaly that the agency has defined the term best system of emission

reduction in a way that by its analysis permits it only to set standards that result in no reductions, or as both the agency's analysis and your analysis shows emissions increases.

Kathy: I think when you look at these numbers for a long time as we have, it's pretty challenging to look at results that lead to an increase in the target pollutant CO2, at 20% of the affected units, increase emissions of the target pollutant at 20% of the affected units and consider that a best system of emission reduction. Regardless of legal readings, that outcome is pretty hard to square I think with the alternative of getting broad scale emissions reductions of 35% beyond what ACE would do. Using measures that utilities have used in the past that have resulted in emissions reductions.

Kathy: It doesn't rely on even technological optimism to get there. It's relying on measures that utilities have implemented in the past that have resulted in emissions reductions. So, we look at the numbers and we take a hard look at the assumptions because we want to know whether or not we have confidence in the results, and this was a really hard one for our team because at the end of the day, we had to say that no, actually we don't believe that the numbers and the assumptions upon which they're built are sound enough to support the conclusions.

Joe: I think that's an important thing for people to realize that you and I, Kathy and I, I'm going to get some members of the team that you work with have a pretty cynical view about the agenda. Not just the agenda of the administration, but the extent to which the administration will get engaged motivated reasoning to fulfill that agenda. So I think it's particularly important that you all started out, taking the assumptions underlying the EPA's analysis. Taking the results and the analysis at face value, and then just asking responsible questions that anyone would ask, which is do these hold up? Do they match up with what we know about how this sector operates, and do they match up with what we know about other actions the EPA is taking or is about to take that will affect how the industry responds to the ACE standards?

Joe: We talked about what you and I refer to as the NSR loophole that was packaged in with the proposal and is promised into a separate but imminent final action, the agency has issued a bushel full of changes in the NSR program completely separately from the proposed NSR loophole or off ramp that was part of the August 2018 package. And those changes too could have a pretty significant effect on whether utilities that otherwise wouldn't adopt a more rather than a less aggressive heat rate improvements will do so.

Joe: So I think there's an argument that even if the agency doesn't get around to finalizing the particular change in NSR, that it proposed in August of 2018, they

still low balled the level of heat rate improvement investment and we'll see in response to ACE and therefore the size of the emissions rebound that's directly attributable to ACE.

Kathy: Right, I certainly think that's true even to go from 1.2% to 2% heat rate improvement could make a substantial difference in the emissions of co-pollutants, going all the way to the 4.5% with no New Source Review and with the 75 Q tax credit, certainly makes it even worse. Reality is somewhere, probably between that two and 4 1/2% and our team is going to be taking a deeper look at scenarios like that in our next round of analysis, but directionally what is in the RIA would represent sort of the lowest possible emissions rebound that might occur under a rule like ACE. And I think it's unlikely that it would be limited to that once all of these changes occur, and even that's if market conditions hold. So if you add in the possibility that we can't predict exactly what will happen, how durable even that will be is questionable.

Joe: Right. So I don't think it's illegitimate or maybe I can put more directly. Given the track record of this EPA and under the leadership of Pruitt, and Wheeler, I think it's legitimate to really at least catalogue the instances where the agency has engaged in the appearance of motivated reasoning. Our program's certainly looking at what's going on, on the science side and with what's going on in, I'm going to say the NACS process, but I think here, are two really interesting coincidences. One is an agency that's so committed to really loosening up New Source Review, through a number of actions seems to have ignored that by way of a very convenient low balling of the heat rate improvement percentage and the resulting emissions rebound effect, and an agency that's deeply committed to cutting off the calculation of benefits at the NACS threshold, going to zero and calculating the benefits of this rule. Oh, well, it can be passed off as inconsistency, but because that inconsistency is so convenient to a particular outcome, I think it's legitimate to put it on the side of the ledger of circumstantial evidence of really motivated reasoning across disciplines, whether it's legal analysis or economic analysis or science, that should have no tolerance for motivated reasoning.

Kathy: Yeah, I think when the health and safety of the public and of the environment is at stake, we should be concerned when the rigor of the analysis used to support federal decision making appears not to be sound.

Joe: Yes. Well, I think what you and your team are doing, by way of providing an antidote to that is absolutely invaluable. I think we're lucky to have you as someone who's willing to come on as a repeat guest. We're lucky to have you to come on with new work and new insights and new analysis every time but obviously the public is really lucky to have you and people in your field and the members of your team keep at this.

Kathy: Well, thanks, Joe. It's great to be here, and I definitely want to credit the team on this too because it's been a group that has been working over years and years to sort of understand and and analyze the numbers behind the policymaking. So thank you for letting us share it.

Joe: Yeah, and again, thank you for producing it and sharing it with us.

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