Joint City, County, and Local Affairs Committee
September 7, 2022

L Fite We'll call this meeting to order, the City County Local joint meeting. Today, what we will be looking at is an interim study proposal 2021-099. This was-- I had a bill that I had in the last session and we ended up putting it in an interim study. And also, we did a little bit of changing in it when we did that at that time. We're going to look at the disposal of-- disposing of solar panels. It has become a issue across the nation and it will be an issue here before it's over within our state. Any comments from my co-chair here?

Stubblefield No, Mr. Chairman. Thank you. I'm good.

L Fite Okay. All right. Well, let's get started. We need a motion for the approval of the July 27, 2022, minutes. We got a motion. I got a second? Second. All in favor, say aye. Those opposed, say no. All right. At this point, what we'll do, we're going to start with Item E, Environmental Impact of Solar Panels-- of Solar Power. Glen Hooks, policy manager for Audubon Arkansas. I met Glen back during the last session, and we've had several discussions since then. And he made a request today on this interim study to be on the agenda. So, Glen, if you would, identify yourself for the record and you may proceed after that.

Hooks Good afternoon. Chairman Fite, thank you for the invitation. Thank you, committee members, for inviting me today. As always, I'm honored to be here in your presence. My name is Glen Hooks. I am a native of Gravel Ridge, Arkansas, and I'm policy manager for Audubon Delta. Audubon Delta is a regional office of the National Audubon Society covering Arkansas, Louisiana and Mississippi. As you may know, Audubon is the nation's largest bird conservation organization with almost 500 local chapters, 23 state offices, 41 nature centers, including one here in Little Rock, and hundreds of thousands of members. Our mission at Auburn is to conserve and restore natural ecosystems, focusing on birds, other wildlife and their habitats for the benefit of humanity and the Earth's biological diversity. Now, that's a fancy way of saying in short that we care about birds and bird habitat and we work to preserve and protect them. One of the ways that Audubon does that is by advocating for strong, clean energy options like solar, which we're here to talk about today. Strong clean energy options result in cleaner air, healthier bird habitats and more resilient forests. So you'll frequently see Audubon at-- working with the state legislatures, working with the public service commissions, utilities and other agencies to help promote good, clean, common sense, clean energy policy that helps us all. As a native Arkansan, I'm very proud of Arkansas's excellent and forward thinking policies on clean energy. This legislature and our Arkansas Public Service Commission are to be sincerely commended for fairly and thoroughly exploring every angle of clean energy policy over the last several years. I think legislative and PSC action have resulted in solar energy benefits that are being felt all over the state. And one thing I'd like to note in particular as we kick off here is that solar energy in Arkansas is being embraced by not just environmental advocates like Audubon, but by our state's largest corporations, by electric utilities, by cities, counties and school districts. I'd sure like to think that this is all because everybody cares a lot about birds and climate issues. But I recognize also that people are saving a lot of money when they're moving towards solar. It's really indisputable that our regulatory framework here in Arkansas on solar is structured in a way that benefits everyone's bottom line. It's a huge net win for consumers, for ratepayers, for businesses and for public agencies. So over the next few minutes, I'd like to explore some of the benefits for our home state here in Arkansas. So, for most of our history, when we're talking about generating electricity, we're talking about burning something, right? We need

to burn something to generate heat, to boil water, to produce steam, to turn a turbine that creates electricity. And sometimes that thing would be-- that we'd burn would be oil. Sometimes the thing we'd burn would be gas. Sometimes the thing we burn would be coal. And that would help produce electricity, but it would also create immense amounts of air pollution. For instance, when we're talking about burning coal, that emits more than 30 hazardous air pollutants, things like mercury, things like lead, cadmium, sulfur dioxide, nitrogen oxide, particulate matters. These are the kind of emissions that not only lead to climate change, but also lead to smog and elevated ozone levels and human health problems like asthma or heart attacks or neurological problems or early death in a lot of cases. It's been a big trade, really. We need electricity. I don't think anybody disputes that. That's a huge positive to our lives. But historically, it's come with a serious downside in terms of pollution. So to give you an idea of how much pollution we're talking about, I refer you to the handout that I hope has been distributed. We're talking about pollution from traditional power plants. And so I've included in my handouts government statistics, U.S. government statistics from the U.S. Energy Information Administration. The first page is our state's electricity profile. And you can note the emissions for 2020, which is the latest year for which we have data, and you can see those amazing emissions for sulfur dioxide and nitrogen oxide and carbon dioxide listed there, both in actual emissions and emissions rate. So it's quite a bit. In the second hand out there, I've included a breakdown of these particular emissions broken down by fuel source and also by the year from 1990 to 2020. And I think what you will be able to see there is that even though we're improving over time, largely because of retrofitting our power plants with scrubbers and other pollution control devices and also just dispatching less coal power, we still emit millions of tons of CO2 and other pollutants. I should also mention that our largest power plants have historically emitted hundreds of pounds of mercury every year as well, which we all know is a known neurotoxin and not the kind of thing we really want in our, in our environment. So I mentioned earlier that, historically, dirty power plant emissions have been a harmful downside of producing electricity. But when we deploy solar power, we eliminate this downside. We eliminate these harmful emissions. And we're harnessing the power of the sun that's free fuel to create electricity. So either way, when we deploy solar energy, we aren't burning anything. We're not emitting any pollutants. That means cleaner air and healthier citizens here in the natural state. Now, I know that some of my fellow panelists are going to be talking about this a little bit more soon in greater detail. But I'd really be remiss if I didn't at least briefly salute the amazing economic benefits of solar energy here in Arkansas to residential ratepayers, to businesses, to cities, to counties and to school districts, just to name a few. I think that's largely because this legislature very wisely passed the Solar Access Act in 2019. That's Act 464 of 2019. Because of that, we've seen a gigantic boom in solar in the last few years here in Arkansas. That act improved our net metering system. It raised the cap on the size of solar facilities. It allowed for third party leasing of solar panels. It created a mechanism by which nonprofits like Audubon and other government agencies could share in the tax benefits and incentives for solar. So since Act 464 became law, homeowners have been adding solar in record numbers. Here in Arkansas, cities like Clarksville and Fayetteville have invested in solar. They're going to save their ratepayers a ton of money. Pulaski County's government has gone solar. The Batesville School District saves so much money by going solar that they were able to give giant raises to their public school teachers. Central Arkansas Water just cut the ribbon on their facility. And Cabot, their power-- their facility is solar. Just this week, if you've been reading the news, you've seen Lyon College and the University of Arkansas investing in solar as well, and they're going to be saving a ton of money on their power bills. So it's meant a boom in the solar industry as well, with new companies opening with real jobs, real payrolls, increased tax revenue. So there's a lot of net positives, I'll say, for the solar industry here in Arkansas, both in terms of the environment and in terms of economics.

And one thing that I think we should all note always is that when we're talking about producing electricity of any form, any form of electricity production is going to have some impact on our environment. Right? Whether we're burning coal, whether we're creating solar panels, anything, it's going to have an impact. That's just a fact. And from my point of view, the realistic goal is not to have zero impact with our electricity production. The goal is to have the least impact with the most benefits. I believe that solar energy falls into that category, certainly when compared to some of the large-scale burning of fossil fuels. So just to conclude my remarks, one of the things I've often said in my almost 20 years of doing this kind of work is that we really don't have to choose between a healthy environment and a healthy economy. You know, we can have both. I think the Arkansas solar industry has proven that. So it's my hope that this legislature will continue to wisely encourage the deployment of solar energy in our state. It's really good for Arkansas, and I'm proud to see it happening here in my home state. Thank you for your attention. I'm happy to take any questions that you may have.

L Fite Okay. Before we get to any questions here, I need something I need to do. Representative Cavenaugh is not going to be able to be here today. And with us today, we have the Ralph Joseph Youth Leadership Program. Would you, would you all please stand up? Maybe we don't have them here with us today. Well, if they come in later, we will address it then. Okay. All right, all right. All right. Questions? Senator Stubblefield.

Stubblefield Mr. Hooks, are you-- I assume you're familiar with the emergency energy alert that was issued yesterday in California.

Hooks I'm not familiar with that, but I'd be happy to learn more about it from you, sir.

Stubblefield That, that was issued by the governor yesterday in California. Basically, what that says is they don't have enough storage to store enough energy from solar panels or windmills, which, by the way, you're from the Audubon Society?

Hooks That's true. Yes, sir.

Stubblefield And do you think windmills are good for birds?

Hooks It is a position of the National Audubon Society, yes, that they are if they're properly sited. And so we work a lot with wind manufacturers to properly site them outside of important bird flyways. [00:17:28]They definitely do hurt some birds, but significantly less than, say, cats or air pollution. [5.2s]

Stubblefield Are you aware that California's shut down its nuclear-- I noticed on this, this handout you've got, you don't have nuclear energy on there.

Hooks I wasn't asked to discuss nuclear energy. No, sir.

Stubblefield Why isn't nuclear energy on there?

Hooks I wasn't asked to discuss nuclear energy, Senator, but I'm happy to have a conversation with you about it if you like.

Stubblefield Well, what I want to ask you is, how can the United States, if we shut down all of our coal fired generating plants, which I've been to a number of them, and there's nothing coming out of those stacks but vapor. I mean, you can eat off the floor. I've been to

them. The scrubbers and the filters that have been installed over the years-- and aside from that, you have countries like Pakistan and India and China that are building thousands upon thousands of coal fired generating plants with no filters, no scrubbers, nothing to take the carbon out of, out of the pollution. Do you think that will work its way around the globe and affect the United States?

Hooks Do I think the pollution from other countries will work its way around the world?

Stubblefield Yes.

Hooks Of course. Yes.

Stubblefield So we would be the only ones that would be suffering from brownouts to blackouts because the transition to these renewables in California is the main reason they're having brownouts and blackouts.

Hooks I'd like to address a couple of things you said, if I may, Senator. One is that China for sure is, is really ratcheting down their coal plant production. That's something that's happened in the last couple of years. They've realized it's not good air quality for their citizens and they're moving in different directions. I can't speak to every country that you mentioned, but it's been a-- it's a policy of, of the country of China right now to really ramp down the production of coal plants. They were doing quite a bit. As to your point that, you know-- I've been to a lot of coal facilities as well over the years, for sure. There are quite a few hazardous air pollutants that come out of the smokestacks. Now, a lot of things are scrubbed now. That's resultant from, I think, a lot of good people putting pressure in the form of, you know, lawsuits and advocacy and so forth in favor of clean air. That's why you have sulfur dioxide scrubbers. That's why we don't have acid rain like we used to have because advocates said we needed to clean up these plants. But even so, these plants, coal plants, specifically, emit upwards of 30 hazardous air pollutants as defined by the federal government. Now, I would love to see the trend of, like is happening here in Arkansas, the trend of us increasing our renewable energy production while we are shutting down some of the larger coal plants. As you are no doubt aware, the two largest coal plants in the state of Arkansas are now scheduled for retirement. And they are Entergy power plants, and at the same time, Entergy is investing heavily in utility scale solar, which I think is a good thing for Arkansas for our air quality and for human health. So I definitely support that if that's your question, sir.

Stubblefield All right. Mr. Chairman, can I-- I noticed something-- and I follow this very closely-- that much of the solar panels that are put in across the country are put in, in productive land areas where they can grow crops, land that grows our food. [00:20:52]And instead of putting those in places where the land is really useless as far as producing crops and food for our citizens, they put it on-- so we're losing tens of millions of acres every year to solar panels. And when you combine that with the, the Jeff Bezos and Bill Gates buying up-- and these other billionaires-- buying up millions of acres of farmland, where do you think we're going to get our food one of these days? [28.6s]

Hooks [00:21:22]I think it's worth pointing out, Senator, that leasing land and selling easements, farmers selling easements to solar companies, is an additional revenue stream for many farmers across this country, including the state of Arkansas. I should also mention, while I'm not at all an expert like you are in foreign policy-- I admit that-- I do know that there's a beneficial use. There's a lot of times you can put solar panels on, on farmland and still grow crops in addition to having solar panels. I think what we're talking

about, largely, at least in the way I understand your question, sir, is that, should we allow American farmers to maximize the use of their land and maximize income streams if they want to sell an easement and allow solar panels on their, on their farm? They should be allowed to do that. They should be encouraged to do that, I think. And so if some private landowner wants to do that kind of thing, I support it. And I know some of my co panelists will be talking a little bit more about some of the agriculture policy, but that's my initial take on your question, sir. [62.3s]

Stubblefield [00:22:25]So you have no problem with us importing most of our food at some point in the future from other countries? [5.8s]

Hooks [00:22:31]I certainly didn't say that, and I didn't understand that to be your question, sir. [2.4s]

Stubblefield I will-- by the way, one more question. You know where you get-- where we get most of our solar panels?

Hooks I do. Right now it's from China, as I recall.

Stubblefield And why is that?

Hooks I think it's largely because they have made a government scale investment in technology and development of solar panels in the way we used to and which we are now starting to do again, which I'm encouraged by. We're going to really jumpstart American solar panel production the way it used to be. It takes a government level investment to do that. I think that's what's happening now with some recently passed legislation.

Stubblefield [00:23:13]So it wouldn't be because China has 80% of the palladium and cobalt in the world? [4.8s]

Hooks I'll trust your statistic on that, sir.

Stubblefield [00:23:22]Well, that's, that's, that's the statistic. They, they can they have most of the Palladium and Cobalt that's used to make solar panels on the planet. [7.3s]

Hooks I'll trust your statistic on that, sir.

Stubblefield So we're not only relying on them for drugs now. We're relying on them for solar panels to heat our country.

Hooks You know, we're importing some solar panels from China right now. I think recent legislation is turning that around and we're going to see more American jobs invested in not only making solar panels, but also deploying and installing solar panels, which is, I think exactly the right direction for us to go. Yes, sir.

Stubblefield All right. I'll have some questions later on. Thank you, Mr. Chairman.

L Fite Yeah. Mr. Hooks?

Hooks Yes, sir.

L Fite As you know, the president recently came up with the Defense Production Act with-- on mining.

Hooks Could you say it again, sir, I missed the first--

L Fite Having trouble hearing me?

Hooks Just half that first sentence.

L Fite I'll get a little closer.

Hooks Thank you.

L Fite Is that better?

Hooks Yes, sir.

L Fite Okay. Anyway, he just signed in the Defense Production Act where that they're putting batteries and new cars in the production, and, and they're talking about 40% of that will come in the continental United States. That's a lot of mining that's about to start happening. And we're also creating environmental issues in mining. Do you agree?

Hooks Certainly. As I mentioned in my remarks, sir, I think that any time we, you know, produce electricity or do any sort of industrial work, we're certainly having an impact on the environment. My goal is to make sure that we have as least, as little impact on the environment as possible with the greatest amount of benefits. And so when I'm thinking about the impact of mining or whether I'm thinking about recyclable solar panels or any of the things that we're going to talk about today, I have to not just think about that in a vacuum. I have to think about it in comparison to our other options and the things that we've been doing for decades. What is more harmful? Is it more harmful to do Option A or option B? Certainly we've had a lot of harm from some of the things we've done over the years of our history. Now, if we, if we have some mining problems, I think they definitely need to be addressed. We shouldn't ignore them. But we should compare them to what we're doing now and measure the harm.

L Fite [00:25:51]Right now, mining permits are about 10 years to receive a mining permit. Now, under this Defense Production Act, that may change. But they're also talking about getting on federal properties, too, on which they mine these heavy metals that are needed in batteries and also solar panels. And I believe we'll be creating environmental issues when we start this heavy production and to, into batteries and also solar panels. Okay. Would you like to respond?[39.5s]

Hooks Oh, I didn't, I didn't know that there was a question, but I'd be happy to respond to it, sir. You know, Audubon Delta and, and just myself, for sure, I think what, what I will say to what you just said is that, you know, [00:26:45]I've been doing this, as I mentioned, for almost 20 years. And what I've come to realize is that everything has an impact. There's never a perfect thing at all. And I'm trying to make sure that we have the best options possible. So as things develop year after year and we have new ideas and new technology, I think you can count on the Audubon Society and environmental community to weigh things fairly and to look at everything and say, this is a better option or this is a worse option, and weigh in and participate in the democratic process like we all have. So

I'm not here today to say any one form of energy production is perfect. Everything has its flaws. I'm looking for the best options, and I hope you are as well. [36.2s]

L Fite Okay. Thank you. Representative Ray, you're recognized for a question.

Ray [00:27:29]Thank you, Mr. Chairman. I think at some point in the meeting we're going to talk about recycling solar panels. But I think it's, it's relevant when we talk about the environmental impacts of solar power. So I want to ask you about it. In July, the Los Angeles Times put out a really lengthy piece about this problem that California is finding themselves in. As you know, I'm sure in the early 2000s, they really pushed residential solar panels, adoption of that. I think they subsidized it heavily in order to encourage adoption. And now that these, these first wave of solar panels are reaching the end of their life cycle, what they're finding out is that only about 1 in 10 are finding their way to a recycling plant and that the rest of them are ending up in landfills. And the report goes on to say that there's a lot of potential for contamination of groundwater because of toxic heavy materials such as lead, selenium and cadmium. I'm not sure if I pronounced that right. But they-- the report says that the National Renewable Energy Laboratory estimates that it costs roughly $20 to $30 to recycle a solar panel versus $1 to $2 to take it to a landfill. So I guess I'm curious, is your, is your organization concerned about the potential of contamination of groundwater as a result of, as we have more adoption of solar panels, them ending up in landfills. [98.3s]

Hooks [00:29:08]Yeah, I think that's an excellent question. I'm really glad you brought it up because I wanted an opportunity to talk about this. So, thank you. We have, we have an industry that's certainly changed a lot in the last 20 years. You mentioned 2001-2002 era solar panels. They've only gotten more efficient and only gotten more technologically advanced. What hasn't caught up quite yet is, is the industry to recycle solar panels. Right? And I think that's the kind of thing that is emerging. Right? It's a problem that needs to be dealt with. And it's certainly an area in which a lot of the solar panel industry and the recycling industry is spending a lot of time and energy right now trying to figure out this problem. My understanding is that solar panels, modern solar panels are more than 90% recyclable. Right? And we definitely would need to look into some, some ways to either encourage or require that solar panels be recycled. You mentioned a statistic that 1 in 10 makes it to the solar recycling facility and the rest go to the landfill. That's the wrong direction, in my estimation. So what I would support and I would I hope this legislature would definitely support is looking into ways to make sure to encourage the recycling of solar panels, to support an industry that's able to do that. And I think some of my co panelists are going to talk about this in a little more detail, but one of the encouraging things right now is that, if you're talking about the lifespan of a modern solar panel, it's, after 25 or 30 years when their warranty's expired, typically, they still can produce at about 80% capacity. So it doesn't mean they automatically go into the landfill. It means that they are producing at a lesser amount and that the warranty is over. So the reason I bring that up is because we have some time to fix this problem. It's a recognizable problem. It's something I support. Audubon is a recycling supporter. I personally am a recycling supporter, and we should totally do that. I think working with each other and realizing that we have a little bit of time. We should take the time to fix the problem. But I think it's, it's industry, both the solar industry and the recycling industry, that's going to be the ones that come up with the best ways to do that rather than, you know, government, in this particular respect, figuring out exactly how to do it. There are a lot of really smart people doing a lot of really good research right now on how to do that best. And so I'm going to continue to pay attention to that, and I certainly hope you as well will do that because it's something we should pay attention to and not ignore. [143.3s]

Ray Well, and again, maybe we'll address this later, but, in your opinion, is it going to-- do you think it's going to become commercially viable to recycle these solar panels or do you think it's going to end up being subsidized by the government like so much else?

Hooks I think it be commercially viable, but certainly my, my opinion is just a layperson on that particular issue. I think it's a, it's a market-- as you mentioned, more and more solar panels are being deployed, certainly here in Arkansas and around the country, so there's definitely a business opportunity there that's emerging that's only going to get more productive. So I think so.

Ray And then last question, is your organization doing anything or what steps are they taking to make people aware of potentially toxic materials in their solar panels and making them aware of the need to recycle them and not just take them to a landfill where they may end up contaminating the groundwater?

Hooks Yeah, that is, that's something that I'm specifically doing. As I mentioned, you know, we are having this kind of real boom in solar in Arkansas. Right now, we have, I think, at least 25 or 30 years before this becomes a gigantic problem here in Arkansas. I don't want to wait 25 or 30 years. But it's really just an issue that, that people are starting to talk about in the last year or two. I certainly had a conversation with Chairman Fite about it earlier this year. And so I'm learning more about it. I think my organization will learn more about it. And we'll support positive efforts to make it not only commercially viable, but also educate Americans about the right way to handle the solar panels, much like they handle, you know, other other toxic things that they need to get rid of. So it's, it's a long education process. We can be part of that.

Ray Okay. Yeah. Well, if you're, if you're encouraging everyone to adopt these, you may want to encourage them not to throw them in landfills.

Hooks Thank you for that.

Ray Thank you, Mr. Chairman.

L Fite Okay. Representative Ladyman, you're recognized for a question.

Ladyman Thank you, Mr. Chairman. Mr. Hooks, I know we're here to talk about recycling solar panels or working on-- I'm over here-- on the waste issue. But since you talked about other forms of energy and the pollution associated with those different types of power production, I want to talk about that a little bit before I ask you a question. I've worked at a coal plant. I've done the air emission reports for coal plants, natural gas plants, wind, wind farms and petroleum plants, and there are emissions from that. But when we look at any form of power production, we need to look at the total environment, and we need to look at that clear eyed. [00:34:16]When you make a statement like 'immense pollution' from these sources, I think that's taking it a little bit far. You're using these adjectives to make it-- I mean, it sounds worse. Let's, let's, let's look at the facts when we do this. We talked about these panels going into a landfill. And I'm not clear-- I haven't studied this on what heavy metals are in those panels, but I know there are heavy metals in there. Selenium, I'm pretty sure. I don't know about lead. Cadmium. These are hazardous materials, hazardous waste. So if they go into a landfill and they would contaminate the water, that is a much bigger problem than contaminating the air because the dispersion in air is safer than in water. [52.4s] So we need to look at this as all of the above and look at it clearly. Because

when you're talking about solar panels, as Senator Stubblefield mentioned, you're using up land. So let me ask you a question. If you close down a 500 megawatt coal plant, how many acres of solar panels does it take to replace that 500 megawatts?

Hooks Yeah, that's a question that obviously I'm not prepared to answer, sir.

Ladyman It takes 500 acres, I'll tell you.

Hooks Thank you.

Ladyman Okay. So for a farm, that's a lot of acres. So we have to look at that. That's a cost. And then recycling would be a cost. Is it economical to recycle these panels? Yes, we have the capability to do that. But is it economical? You know, we're looking right now at recycling nuclear fuel rods, but we don't know whether it's economical. That raises another point. When you're looking at all the different types of production, nuclear needs to be on that list. And nuclear is the cleanest energy out there. It produces water. And the fourth generation, the new nuclear, does not have meltdown issues like the old nuclear. So it's definitely something we need to look at. And when we talk about solar and wind-- and I'm not opposed to solar and wind. I may sound like I am, but I'm not. But we cannot operate on solar and wind alone, because, California, they're having blackouts right now because they don't have enough baseload to do that. So let me ask you a question.

Hooks Okay.

Ladyman What percent-- let's just look at Arkansas as an example-- what percent of power produced in Arkansas should be-- should come from solar? Do you have an answer to that?

Hooks You asked me which, which percentage--

Ladyman What percent?

Hooks --should come from solar?

Ladyman Yeah.

Hooks The way I can answer that, I think, is as much as possible. I can't give you a number. I'd be pulling it out of my--

Ladyman So you don't know what's possible?

Hooks Well, no, I said as much as possible. It's in response to your question. You said, How much? I say as much as possible.

Ladyman Okay. So let me ask you one more question. Mr. Chairman, for my-- [00:37:31]should there be a limit on the amount of power produced by solar panels? And I would throw wind in there as well, so that we don't have blackouts like California's having today. Should the states set a limit on that? [14.8s]

Hooks [00:37:47]I don't think the state should set a limit on that. No, sir. [1.6s]

Ladyman [00:37:52]So you're okay with if we have blackouts? [1.5s]

Hooks [00:37:54]That's absolutely not what I said. But what I am saying is this. I support responsible development of solar and wind energy and other renewable types of energy. Technologically, it's advancing at leaps and bounds. I'm not saying tomorrow let's go 100% solar. I'm saying responsible development as we ratchet down fossil fuel production and move towards a stronger renewable energy future. I think we can get there. I don't think we're going to get there tomorrow. But that's the goal, you know. [26.6s]

Ladyman But it can be tomorrow. If you shut down a thousand megawatts of power from coal or natural gas or whatever, you got to replace that. And if that's baseload, you can't replace it with intermittent load.

Hooks Senator, I, I, I'm, I'm trying to answer your question as I understand it. So I hope I'm not coming off flip. I really am trying to answer your question. [00:38:46]I think in my career of working in energy, and I respect that you've had a career working on energy as well, I think I've taken a responsible stance very purposely and very consciously of saying, let's not shut something down tomorrow. Let's be really responsible as we transition to different sources of fuel. I mentioned in my opening remarks that there are a couple of large coal burning power plants operated by Entergy in Arkansas that are scheduled for retirement. I was involved in that effort to move those to retirement a few years ago, and they are retiring in 2028 and 2030. That settlement was in 2018, as I recall. So that is a 10 and 12 year path to where we're getting to where, not tomorrow, but a 10 or 12 your path, which I think is the responsible way to do it. And to answer your larger question, I'm not trying to turn everything off tomorrow. I am saying that we need to commit as a legislature and as a people to cleaner sources of energy. We're doing it in a way right now in Arkansas that I think is very good for solar. I think it's very good for ratepayers, and I think it's very good for businesses and cities and counties and school districts across the state. Now, if there are going to be some problems that we can address, count me in. I will be-- I'll work with anybody in this room on addressing actual real problems, for sure. [78.1s] And there will be real problems. But I think it's a net plus. And, you know, the University of Arkansas and Wal Mart and Lyon College and Batesville School District and all those places I mentioned, I think agree with me that solar is a really good option for them, not only in terms of saving them power-- excuse me, money on their electric bills, but also across the state, creating jobs and creating tax revenue. So I think there's a really-- this is a really good development for Arkansas, and I'm going to continue to support it.

Ladyman Well, I agree with you that solar has its place. And I'm not saying solar is bad, but we have to look at this with clear eyes. One more question. You mentioned that the disposal of panels is 20 years down the road. I don't think that's the case. If we have solar panels in California that are lifing out right now, are you aware of any law that would stop them from shipping them across state lines and putting them in a landfill in Arkansas?

Hooks I'm certainly not aware of that, but some of my panelists may be able to answer that question a little bit better. I was focusing my remarks on solar panels in Arkansas and modern solar panels, sir, and so we're really experiencing that boom in just the last few years. I think it's ratcheting up. So those are going to have a long lifespan. We have the luxury of having some time to address this problem properly for the state of Arkansas. And if there's efforts to to do that, I'm going to be involved in it as much as I possibly can because I support making sure that these things don't go to the landfills and we recycle. But I also trust that the solar industry, the recycling industry, very smart people right now are working on this problem very diligently. And I will-- I want to know what they think is the right thing to do rather than just me saying, hey, you should do it and here's how. There

are a lot of smart people working on this right now. And I'm, I'm looking forward to their solutions.

Ladyman All right. Thank you for your answers.

Hooks You bet.

Ladyman Yes. At this time, we have the Ralph Joseph Youth Leadership Program here, do we not? Please stand if we do. Representative Cavenaugh is not able to be here today, but she wanted to make sure that you all were recognized. We're glad to have you here today. We hope it gets a little more exciting here. All right. We have four people in the queue right now. And I would-- we're running a little over right now, so I would ask that you shorten your questions if you can. And, no, we're not ready for y'all yet. No. And if you would, shorten the answers if possible. And next up is Rep. Beatty. You're recognized.

Beatty Thank you, Mr. Chairman. One, I want to thank you for providing the information to show us what a great job Arkansas industry is doing in reducing the emissions that are being released into Arkansas airs and airways. So I appreciate that information.

Hooks You're certainly welcome.

Beatty One thing that I was looking for in, in your presentation is if you're going to talk about the benefits of a particular type of energy, I would also expect a little bit of concern from Audubon related to loss of habitat and also avian death due to the lake effect or other things caused by these solar panels. I understand that that is less than maybe a, a power plant and the actions there. But right now at this level of implementation in the state, you know, a coal fired power plant takes up how many acres on an average?

Hooks It would depend on the size. We have them here that are 1800 megawatts. We have them here that are less than 500 megawatts.

Beatty I'm talking about like land area that's utilized. I mean, we're benefitting in the Crossett area from a new 800-acre power plant. It's a solar power plant that's going in and it's going to be a benefit and provide benefits. But right now, the technology is not at a point where we're replacing anything. We're actually taking up land. It's replacing some of the output from our, our current facilities. So I would also think that Audubon would have-- you kept saying the word responsible and placed in certain areas. But the impact of this on habitat depletion, and, and, you know, because we're not replacing transmission lines or plants right now. We're just adding to the capacity in the system. So at some point, you know, we have to define that word responsible. And I think that's what some of my colleagues were, were asking a question regarding. And also congratulate that you guys that, what, you're the first 100% renewable nonprofit in the state with your 35 kilowatt plant. And my question would be, how is your organization funded?

Hooks How is Audubon Society funded?

Beatty Yes.

Hooks Yeah, we receive private donations, certainly. We're also a membership organization. And we receive grant funding from, from foundations, much like, much like a lot of other nonprofits.

Beatty Okay. So solar energy? Receive some funds from solar energy and some of those?

Hooks Sorry, I'm having a little trouble hearing your question.

Beatty Receive funds from solar energy and some of the providers?

Hooks No, not necessarily. We have a solar array there at our center that powers everything. But we mostly just, you know, there are a number of foundations around the country that are interested in bird conservation and also clean energy work. And so, you know, like any other nonprofit, we apply for grants and some of them we receive.

Beatty I still would like you to maybe address the habitat depletion aspect of the solar farms.

Hooks Yeah. Thank you for giving me the opportunity to do that. That's one of the things that Audubon Society does that I'm really proud of. And it's not my particular area of work, but some of my colleagues really work on habitat issues. You know, we work closely with the Game of Fish Commission. We work with state agencies on rehabbing land. We have a lot of native plant work that we do around the country. We work with farmers around the state trying to increase the use of native plants across Arkansas. And so I think that the way I should answer your question, Rep. Beatty, is that Audubon is committed to preserving bird habitat and protecting birds in this country and in the state, for sure. At the same time, we also recognize there are a lot of threats to birds, one of them being a lot of pollution from certain dirty power plants. Trying to make the best use of, of habitat and also figuring out ways to protect bird and bird habitat, we've come down on the side of that, you know, really working on clean energy issues helps birds quite a bit. You know, there are differing opinions in this room, I'm sure, on the causes of climate change, the existence of climate change. We believe that climate change is a real issue. And one of the ways that we can combat that in a way that helps birds and bird habitat is by promoting clean energy, you know, that doesn't have the kind of emissions that we've been putting from coal power plants, from gas power plants and others. And so we work on preserving habitat, right, we also work on installing-- or excuse me, advocacy and policy work that will allow more clean energy to be deployed at the same time. So I think we-- I think if I understand your question, the best way to answer it is we are concerned about habitat. We do a lot of work to expand habitat for birds. And at the same time, I think it's also possible to work on clean energy that helps birds in that way.

Beatty Thank you.

Hooks Thank you, sir.

Beatty Senator Sullivan, you're recognized for a question.

Sullivan Thank you, Mr. Chair. Right here. I was really intrigued by a few things you said. I'm sorry the folks left. I was going to try to make it exciting for them. You talk-- so you're talking about the trend of government support for the industry, correct? It sounds like the trend that you're describing is for the government to invest through incentives and other ways for this industry. Is that correct?

Hooks That was a big part of the Inflation Reduction Act is a lot of incentives, not mandates, but a lot of incentives to do good, clean energy work around the country. Yes, sir.

Sullivan So that's a correct assumption?

Hooks Yes, that's a fact. Yes, sir.

Sullivan Okay. So and we are competing against a communist socialist country who's now the leading producer in the nation for these products. Is that correct?

Hooks If you're asking if we're competing with China, then yes. The answer is yes.

Sullivan Yes. [00:48:48]And so we're going to compete with incentives. It sounds like that's really a struggle for a capitalistic society to come out on top when we're competing with that group. [9.9s]

Hooks [00:48:59]Senator, and again, I don't mean to sound flip. I just want to ask the question. You know, in today's political climate and certainly, you know, in this chamber, I would think people would be more in favor of incentives than mandates. And so the Inflation Reduction Act, I think, kind of walk that line pretty effectively on the clean energy side. [20.7s]

Sullivan [00:49:21]I guess that's where I would disagree with you there. You know, incentive is essentially-- that's what's caused all the inflation is the incentive, billions of dollars that we're putting into this. Let me go a little bit, change lines here. [13.0s] So you talked about a timeline also. You know, that's one of the problems is we're trying to decide how quickly we can do this. I think most people agree this is a viable good thing for our nation to look to do the things you're describing.

Hooks Are you talking about solar, sir?

Sullivan Yeah. So what's the timeline you're working on?

Hooks Yeah, the timeline that I'm working on is largely science driven. Audubon is a science driven organization. And I've been down here at this Capitol--

Sullivan I want to cut it short. What's the timeline you're working on? It seems kind of hard to, since you have no outcome. Since you when you were asked the question, what percent should we get to, well, as much as we can. So if you have no goal or target, how is it possible to come up with a timeline?

Hooks Well, as I was trying to answer your question, let me see if I could do it a little bit more quickly. We are a science driven organization. We pay attention to the idea that we need to switch completely off of fossil fuels as quickly as possible. Most of the science is saying that we really need to reduce our emissions by 80% or more by the year 2030 or 2035. And that's where I'm kind of gauging that as a goal. If you're asking a year, now things change over time. But we are-- the goal is to reduce harmful emissions that are driving birds to extinction, driving habitat to extinction. And we're doing it-- we want to fix that in a way that makes sense environmentally, scientifically and also economically. I think solar industry in Arkansas was a great example of how that can be done.

Sullivan Thank you. Thank you, Mr. Chair.

L Fite Representative McGrew, you're recognized.

McGrew Thank you. I won't-- I had some statements, but I think it's already been covered. I think the concern about building in China instead of America is a great one. But since you-- we're here more to talk about environmental, I just looked at putting solar on my house. Solar only works when the sun's out. [00:51:36]So if we're going to have solar to help us with the blackouts, we're going to have to have a way of storing that, which is batteries. I'm building my house. Generac, Tesla both sold battery banks here. There's some other manufacturers. Is there any thoughts about the concern of that on our environment when those batteries go into our landfills and the minerals that are being mined for those batteries and all that? Have you, have you given any thought to that at all? [24.6s]

Hooks I have. And other people who are smarter than me have given more thought to it. You know, and I think some of my, my panelists that are coming later can tell you a little bit more about that specifically. I do think that it's, you're raising some important things. You know, I will say that solar works on a cloudy day. Solar works on a snowy day. Solar works-- it doesn't work at night as well, for sure. Right? But there's a lot of, a lot of production that goes on beyond noon on a summer's day, for sure. So the thing I heard in my early years of working in this kind of industry is, hey, this is intermittent, you know, what do you do when the sun goes down, there's no way to fix that. Well, the way to fix it is exactly what you're talking about-- battery storage, both on the residential level and on a utility scale level. And so that technology is advancing by leaps and bounds. So it's getting to the point now where you can have enough battery power, store enough power from your solar during the day to run everything at night and not have that problem anymore. So I heard that this is a problem years ago. That problem is getting fixed. Are there some environmental impacts? Absolutely. [00:53:09]Just like I mentioned in my remarks, it's always something, right? No matter what we do, there's going to be some impact. I want to minimize that impact as much as possible, but I'm glad that you recognize that it's a problem because I'd love everybody in here who recognized problems with solar or problems with wind or problems with anything to work with, work together with us on fixing them. But it doesn't mean we get rid of the entire industry or ignore it or say we can't do it because there's some small problem. We fix the small problem. [24.6s]

McGrew But when you say solar, it snows and when it's cloudy, it diminishes by a tremendous amount. So the land area-- and if we're going to do it with batteries, that's even more area that's going to be taken up and more impact on our landfills. When you bring us statistics, you didn't bring us the statistics on here, first of all, I think nuclear, you also didn't put hydro's on there at all.

Hooks Yeah, I was asked--

McGrew And also you didn't put the statistics of what, what the environmental impact was of mining and manufacturing the solar panels. So I'm kind of, I don't like it when we just get one side of the argument which just benefits you. We need to look at the whole impact. But thank you for your time.

Hooks Representative McGrew, just the last thing I'll say to that, and I respect you and your position and thank you for sharing all the information with me, I was asked to come and talk about the environmental benefits of solar power. And that was a one line

description. So I didn't talk about nuclear and I didn't talk about some of that other stuff. But I wasn't prepared to do that, nor was I asked. But I'd be happy to come back any time and do that, if it would please the committee.

L Fite Representative Rye, you're recognized for a question.

Rye Thank you, Mr. Chairman. Sir, Mr. Hooks, in the beginning, let's just say a person wants to put this in their house. What is the cost percentage wise to the people that are actually living in that home? And question two, down the line, let's just say 10 years or something like that, something kindly fouls up and, you know, they have this on the top of their roof. What do they do to get that out and they've left a big hole in their house? I just, I've wondered about this for a while, and I know you've probably got an answer.

Hooks Sure. Representative, if I may, there are panelists that are coming up after me from the solar installer industry and who do this for a living. I might, if you, if you're alright with it, defer to them on that because they can give you the proper answer. I would speculate a little bit. Is that all right? Thank you, sir.

L Fite Representative Hammer, you're the last question.

Hammer Thank you, Mr. Chairman. If you don't want, don't want to or cannot answer these, you want to kick it down the line, it's fine with me. But let me go ahead and get them out there. This is the sheet that was attached to your letter, correct? It's a spreadsheet with all the numbers on it.

Hooks Yes, that's from the U.S. Energy Information Administration, federal government. Yes, sir.

Hammer Okay. And am I interpreting it correctly if I see that the numbers are reducing from where they started keeping data until 2020, that as far as the numbers moving in the directions that you would feel are the right direction? They are moving in the right direction?

Hooks I did mention that in my remarks. Yes, sir. It's largely because of pollution retrofits like scrubbers and lessening the dispatch of coal power.

Hammer Okay. So the numbers are substantiated by the fact that there is improvement in the industries that are listed on the sheet to become more effective, efficient and environmentally friendly. Is that an accurate statement?

Hooks Yes. They are required by law in lots of cases or legal settlements to install certain pollution control retrofits, and they have done so. They've complied with the law.

Hammer Okay. And do you know, with regards to the solar industry, is there a percentage of the energy pie that you have to get in order for the industry to be sustainable and be able to survive? If it's a matter of everybody working together to get to the common good, which is better environment, safer environment, what percentage of the overall energy pie do you have to have a piece of in order for the solar industry to be able to survive and be sustainable without tipping the scale too far to where, if we had a Texas experience, we'd be vulnerable?

Hooks Just so I understand the question, are you asking how much of the energy pie needs to be solar so that they could survive without any sort of government subsidies? Is that what you're asking?

Hammer Well, I mean, the list, and as was pointed out by the representative a while ago, it doesn't have like, you know, the nuclear or the, the other forms that he mentioned. I mean, there's got to be a piece of the pie that you, that you have to have in order to be able to survive as an industry. If, if a pie is 100%, and coal's got 10% of that, and the other ones have different percentages, is there, is there-- what's the point that solar is going to be happy that they've got enough to survive and all the other ones be able to survive, too, so we're not too dependent one way or the other?

Hooks Yeah, I, I thank you for giving me the opportunity at the beginning of your question to kick this down the road a little bit. Okay. I would defer to the solar companies that are here in the audience if that's okay.

Hammer Thank you. Thank you, Mr. Chair.

L Fite We appreciate you being here.

Hooks All right. Thank you, Mr. Chairman. Thank you, everyone.

L Fite At this time, we'll have Lauren Waldrip. And she's the executive director of the Arkansas Advanced Energy Association. And she has three of her colleagues with her today. And we would ask that you all come in and introduce yourselves for the record. And then after we get through, if you have an opening statement, proceed with it, if you would.

Waldrip All right. Thank you, Mr. Chair.

L Fite Please turn on your mic there.

Waldrip Is that better? Thank you, Mr. Chair, members of the committee. In full disclosure, I feel honestly bad for Glen. He kind of got thrown to the wolves on some, some topics that are outside of his purview. But, but I'm hopeful that we can clarify some of that for y'all here today. Again, my name's Lauren Waldrip, and I'm the executive director for the Arkansas Advanced Energy Association. We represent over 100 members, both private and publicly, from solar developers to energy efficiency companies, even to private companies who are becoming bought into these technologies. So Wal Mart, for example, is one of our members that's engaging in these technologies. I'd like to start by introducing our other panelists and subject matter experts. First, immediately to my right, I have Jade Anuszek. She's the co-founder, president and contractor for Arkansas Solar Power. Jade will speak more specifically to the recycling components of solar panels. I also have Adam Ness, who is in business development with Entegrity Partners. He'll illustrate the existing programs in place that run some of these recycling processes. I also have Heather Nelson, finally, who is the co-founder and president of Seal Solar. In the interest of time, I don't know that Heather is, is planning to provide testimony. But as a business owner in this space, she can certainly address some of the questions that you all have already asked here today. Heather also serves as chair of our, of our board of directors. So I don't know that she had a choice other than to be here today. So for your reference, I think there's a lot of things for us to touch on today, but I'll give you a small piece of my background as it, as it relates to solar. [01:00:45]I previously worked in public affairs, primarily representing farmers, mostly row crop and poultry. But I started in this role just over one year ago after

noticing the increased adoption of solar energy production among those producers. Arkansas growers now see this technology widely as a tool that they can utilize, which allows them to control just one of their inputs. I know many of you represent rural farm communities across this state, and so I don't need to explain all the different variables that a farmer can't control as far as their inputs go. But this is, is one thing that they can take control of. Their choice to produce power helps reduce the significant amount of risk they're already forced to absorb in order just to grow a safe and quality food supply. That was mentioned by Mr. Stubblefield earlier. Again, this takes more of a free market approach by giving, not just farmers and ranchers, but consumers a choice to produce their energy. I myself am a fifth generation farm family, and we're actually putting solar on our farm right now. Even as a Republican, I saw that this was a bipartisan issue, and it ultimately helps provide Arkansans like my dad as a farmer with affordable energy. So thank you to the members of this legislative body who have enabled net metering and ultimately helped to save Arkansans, including our farmers and ranchers, money. Sometimes this can even help keep them in business as farmers. [91.3s] I would like to address-- I made a couple notes earlier while Glen was speaking when, when Mr. Stubblefield was concerned about taking-- you know, as you all know, Arkansas has some of the most fertile farmland in the nation. [01:02:30]Agriculture is our state's largest industry, and we're certainly very proud of that. But I would say that, you know, 40% of the nation's corn crop is, is used to produce ethanol. So if we grow 90 million acres of corn across the U.S., 35 million acres of that is used to produce ethanol. And I know that you as a legislative body have no interest in telling our farmers what they can and can't grow what's most profitable to them. And so I think, you know, in the same way that we wouldn't tell farmers that they can't grow corn, you know, I think they're interested in looking into growing solar. [39.0s] And I think that we've seen that on the farm. Also, the issue of, of China was raised, and I would certainly agree with that. You know, our rice farmers, unfortunately, have to deal with illegal subsidies that the Chinese government gives to their farmers, which makes it very hard for us to compete with them. And so I think it's good that through the IRA, we're seeing an investment in our domestic manufacturing of these products so that we don't have to account for those illegal markets that we currently can't compete with in the future because we certainly would prefer not to. Okay. So I'd now like to move into just what net metering is generally. This can get a little bit complicated. So I want to just give you all an overview for your reference and a recap from some of your previous actions. So based on Act 464 that Glen already mentioned, a customer can generate all or part of their energy needs behind the meter through a personal solar array, and then they export any surplus energy that's not consumed back to the grid. Under the current method of net metering, which was selected by our friends at the Public Service Commission, if the net metering customer exports surplus energy to the electric grid, the net metering customer is given a kilowatt-- I'm sorry, a credit in kilowatt hours. That's on their next bill. This 1 to 1 credit is then used to offset any future usage that that customer might have. So right now, this 1 to 1 rate structure can be grandfathered or frozen in time for a period of up to 20 years. And so if you're going to come in and invest in this project, you need to know for the life of the project what your return is going to be. I mean, that's just good business and good policy. And then depending on the size of that project, you know, as how grandfathering is current, current, determined-- currently determined. I did mention exporting that surplus energy back to the grid. And so I did want to address one thing that was, that was mentioned in the ISP. You know, Mr. Chairman, you seem to have significant concerns regarding the selling of that power that Arkansans choose to produce. And that was mentioned numerous times in the ISP. But I just want to clarify that net metering laws do not permit power to be sold back to, to utilities. So there's no monetary transaction. But net metering actually does allow-- I'm sorry, it does not allow power to be sold back. So the solar producer is allowed to receive that credit for their harvested

energy. I would also point out that, interestingly, the wholesale price of power today is higher than the retail rate of power. So any power that is produced outside of that wholesale market is a win for everyone. But it's certainly not something that leads to an undue financial burden on either the utility or non-solar producing ratepayers. So solar is currently the most affordable way to generate power, especially for our part of the country. But to address previous conversations, is solar going to fix all of our problems? No, it is not. And we are not here to say that it is. It is, however, part of a bigger solution that will help increase our energy independence and national security as we, we produce it ourselves. The adoption of these advanced energy technologies-- I was asked to talk about growth-- has grown significantly in very short order. Since its inception, installations in Arkansas had grown 2,489% at the end of last year. That number was forecasted to increase by 84%, up to 3,540% in this year alone. We now know that that will be even higher in light of this historic investment we're seeing on the federal level. I was also asked to talk a little bit about subsidies. There's not-- I will say there's not really much to report on that front. Arkansas is one of five states that does not provide any sales or property tax relief for solar. I have a lot of farmers ask me all the time, you know, we get these exemptions for, for these different things that we're doing, conservation measures, you know, that they get, they get payments from the federal government for doing that. And we're one of-- I say, I'm sorry, we're one of the states that doesn't have anything for you. But I will say-- so we're not competitive on that front. But a federal tax credit does exist, which is consistent with the subsidization of energy across the board. I think we all know and can agree energy is subsidized. That's why we pay $4 a gallon for gas here compared to $9 in Germany. So just, I guess on that front for a reference for, for this body, [01:08:11]in 2020, fossil fuels received-- I'm sorry, received $662 billion in government handouts and the ITC incentive totaled $6 billion. [15.4s] So just for comparison. And then I would just kind of wrap up by saying, you know, by saying through my capacity, I've had the privilege of facilitating meetings with lots of county judges. Mr. Chairman, I think you can relate to that role. You know, facilitating meetings with, with landowners and farmers and county judges and solar developers. And we discuss these plans for these multimillion dollar projects that are in small rural communities in Arkansas. You know, one specifically happened to be in my home county of Lee County, and it makes me proud to be able to help facilitate economic developments that will result in dozens of new jobs in these communities, revenue streams to a county that so desperately needs these type of activities. I'm pleased today to be able to brag on the work being done in our industry regarding end of life cycle treatment and plans for solar panels. We actually don't refer to it as recycling. Both the federal government and the industry have entire plans and programs surrounding what we refer to as end of life management of these, of these panels. You know, the ISP mentioned that the federal government and industry stakeholders have not considered a plan for end of life management. And I'm happy to be able to communicate for your reference today that they have. The Department of Energy has a plan. The EPA has a plan. The Edison Electric Institute, which is comprised of investor owned utilities, which includes our friends at Entergy Arkansas and SWEPCO, earlier this year released a plan in conjunction with the National Solar Group. And that, to me, really just illustrates that all industry stakeholders are on the same page as far as addressing what this will look like in the future. I'm certain our friends at the utilities have their own specific plans to recycle as they themselves have significant ownership of solar through, you know, entities like Today's Power. All of these plans are readily available just through a simple Google search. I'm happy to provide those for you all as well. So the renewable energy industry was founded on innovation, and these private companies will continue that trend as they expand a secondary market for panels, which to a large extent already exists. And I'll turn it over to Jade so she can elaborate on that.

Anuszek Thank you, Lauren. Hello. My name is Jade Anuszek, co-owner and founder and president for Arkansas Solar Power. We specialize in residential, commercial, and industrial solar installations in Arkansas, serving our state since 2017. I'll be speaking on solar installation materials, their life cycles, recycling and false statements regarding such mentioned in the ISP. Outside of residential installs, Arkansas Solar Power is projected to install 7.45 megawatts of solar for commercial clients in 2023. That's roughly 13,000 solar panels, 60 inverters, 83,000 feet of wiring, 22 acres of installed racking and fencing collectively, all of which will be sourced here in the United States from U.S. manufacturers. The fate of these materials used at the end of their life cycles is known with decommissioning and recycling plans outlined within the project contracts. In terms of material life cycles, I think it's important to note end of warranty and end of life are two very different categories. Most year one solar panels are warranty by the manufacturer for 30 years, and at year 25, most panels are still producing at 92% efficiency with very little degradation by year 50. At the time of decommissioning, typically occurring year 25, panels are recycled or refurbished. Most manufacturers have recycling protocols established with their installers, and Arkansas Solar Power currently recycles all panels through our manufacturing partners. The cost of decommissioning does not fall upon the community and some landowners. Rather, it's the responsibility of the project owner. Typically, there's a low cost and sometimes profit of project decommissioning due to the salvaged value of panels, racking steel posts, copper wiring and extractable precious metals that can exceed the cost of equipment removal and land restoration. According to the International Renewable Energy Agency, by 2030, the cumulative value of recoverable raw materials from end of life panels globally will be $450 million, which is the equivalent to the cost of raw materials currently needed to produce 60 million new solar panels. Diverting solar panels from landfills to recycling saves space in addition to capturing the value of raw materials. So let's talk about the recyclable components of a solar installation at time of decommissioning. About 85% of the weight in solar panels is glass and aluminum. This silver dollar coin here represents a little over 20 grams of silver, which is the amount of extractable silver in each panel. On a larger spectrum, at decommissioning of our 2023 commercial installs, we'll be able to roughly harvest 260,000 grams or 573 pounds of silver alone. The inverters and transformers are dismantled and various parts are refurbished, recycled or deemed landfill appropriate. Inverters and transformers are typically bolted onto concrete or steel foundations, which are then broken up and removed to be recycled or sold as scrap. And a similar process occurs with the wiring and fencing components of the install. So the big question that everyone asks, so can solar panels be sent to a landfill? In the U.S., waste is separated into hazardous and solid waste based on a series of tests developed by the EPA. A solar panel's waste status is determined by the outcome of the toxic characteristics leaching procedure test or TCLP test. This test, developed by the EPA, is designed to simulate landfill disposal and determine the risk of hazardous substances that leach out into the landfill. And with that being said, most modern tier one solar panels pass the TCLP test. I'll briefly touch on battery recycling. Growing demand for electric vehicles and off grid battery backup projects across the globe are some of the key factors driving the market for lithium ion battery recycling. North America dominated the lithium ion battery market in 2020 and is projected to lead the project forecast period 2021-2030. The U.S. is one of the major lithium battery recycling markets in the North American region. Lithium ion batteries are made up of materials such as cobalt, graphite and lithium, which are considered critical minerals. Critical minerals are raw materials that are economically and strategically important to the United States and have a high risk of their supply being disrupted and for which there are no easy substitutes. When these batteries are disposed of in trash, we lose these critical resources outright. The global lithium ion battery recycling market is projected to grow from $4.6 billion in 2021 to $22.8 billion by 2030, at a compound annual growth rate of 19.6% during

that forecast to 2030. As stated by US Secretary of Energy Jennifer Granholm, battery recycling doesn't just remove harmful waste from our environment, it also strengthens domestic U.S. manufacturing by placing these used materials back into our, into our supply chain. The Department of Energy just took a first step towards launching new lithium ion battery recycling programs in the U.S., and it just issued a request for information a little over a week ago on August 29 to ask the public for input on how to spend $335 million in federal investments for battery recycling that was included in the bipartisan infrastructure law that was passed last year. Lastly, Arkansas Solar Power is partnered with local Arkansas based recycling companies for all of our jobsite waste and decommissioning obligations. With that being said, we are working with our partners to establish future panel and battery recycling protocols to accommodate the anticipated demand in our state. I believe it is imperative to work together as a whole in our industry to work towards a common goal for Arkansas to establish renewable recycling procedures. Not only will it allow us to have a manageable approach to our anticipated demand, but it would also position Arkansas as a leader on the forefront of a national goal and presents a significant economic impact for Arkansas. Thank you.

Ness Good afternoon. My name is Adam Ness. I am in charge of asset development and structured finance for Entegrity Energy Partners. Entegrity is an energy services and solar company headquartered here in Little Rock, consisting of over 100 people employed throughout Arkansas and the surrounding states. Thanks to enabling legislation in 2019, we have over 70 megawatts of solar projects in various stages of development throughout Arkansas, providing over $3 million a year of savings for our clientele, which is primarily public entities, including schools, cities, counties and state agencies. The savings realized by these clients are used to accelerate economic development throughout Arkansas, thanks to teacher raises, stabilized water cost, city upgrades and other necessary savings in operating expenses for these public entities. I just have a couple of quick items I want to hit on today. The first is just clarifying one of the items around the life cycle of these arrays.

L Fite Adam, could I get you to speak into the mic, please? Pull it up to you there.

Ness There we go. Is that better? All right. So the first thing I just want to clarify is the lifecycle of these items. Entegrity has structured over $1 million of finance into rural communities throughout Arkansas using these power purchase agreements. They are on contracts typically of 20 to 30 years. The panels are warranteed for over 25 years. They are appraised out to 40 years, and we and our investors have guarantees far exceeding 20 years in place for the various folks within the capital stack, particularly around the-- you know, from the investor perspective, they are-- the capital that is coming into these is extremely long term oriented, life insurance companies and people of that sort that have 30, 40, 50 year time horizons and are looking for very low return, very low risk assets. And so these are, you know, I want to emphasize that these are very long term players involved in these projects that are going to be in place for decades and decades compared to other energy infrastructure that we see, such as HVAC, light bulbs and hot water systems that have life systems, life cycles and financing terms far below 20 years. The second thing I want to hit on is discussing the end of life for the panels. [01:20:38]For Entegrity, in particular, we use First Solar modules. First Solar is the leading domestic manufacturer in the United States. And, you know, in part due to the Inflation Act passed a few weeks ago, they now are actually eligible for an additional investment tax credit if you're using enough domestic materials on your installations, which is going to further drive interest in First Solar and other domestic manufacturers throughout the country. And, you know, they are looking to site a newer factory somewhere in the southeast. And I'm hopeful that will land that here in Arkansas. The Waltons are 20% owner of First Solar. [36.0s] And I want to call

out First Solar in particular. You know, they're not just a market leader, but they are-- you know, in market share-- but in terms of their environmental practices. [01:21:24]They have stringent environmental requirements and they recycle about 95% of the material, which is included as part of their standard offering. They will come to the site, transport the materials back for recycling to recover those key materials and remove the burden off of whoever the array owner is. [18.1s] Additionally, other materials on solar sites are the steel piles are driven in the ground. Steel is a fairly easy thing to recycle, close to 100% recyclable if the array is ever decommissioned. And again, emphasizing from the investor standpoint, you know, the folks that are financing these arrays do not really see an end of life as far as, you know, they are, they're planning on being a partner for decades ahead. [01:22:07]So big picture, comparing this to recycling rates for other large installations, automobiles, electronics and coal ash are 80%, 20% and 64% recyclable. Only 32% of materials in the U.S. are recycled, whether or not they're able to be. There are very few resources in our world that are 100% recyclable. But the key components within solar are approaching it at 95% for the modules in 100% for the piles within the ground. [29.6s] My third point here I want to make, my third and final point here, is emphasize that the key parties and the key stakeholders within these solar transactions, whether it's us, you know, we're a Annapolis-owned company, been in business for over 70 years. Our investors, life insurance companies that have been around for decades looking out for folks' retirement for decades more to come, have really long term orientations. And we approach the marketplace and we approach our material selection and we approach our construction with that extreme long term orientation in mind. There's been a lot of thought about doing things sustainably, which improves our bottom line and also takes care of these communities that we're serving because we will continue to serve these communities for decades to come. And good material choice and recycling is a part of that, you know, customer lifetime value strategy that we're oriented towards. So in closing, you know, Arkansas is praised nationwide for solar policies. We talk to folks in all the surrounding states and everybody has their eyes on what we're doing here and trying to recreate it in some sense. Let's continue to focus on moving forward, removing artificial barriers to that, and allowing Arkansas to be a winner in the energy transition of the 21st century. Thank you.

Waldrip We're going to open it up for questions now.

L Fite Senator Stubblefield, you're recognized.

Stubblefield [01:24:18]Thank you, Mr. Chairman. Lauren, you made the statement, you said that transitioning to renewables would help us get out from under our dependency on fossil fuel. Is that true? [13.6s]

Waldrip [01:24:32]I did not say that. No, sir. [1.1s]

Stubblefield [01:24:35]You didn't say that? [0.6s]

Waldrip [01:24:37]I said that producing our own power through solar would help us increase our energy independence. [4.3s]

Stubblefield [01:24:43]Well, as of 2020, we were energy independent. [3.5s]

Waldrip Well, I think in light of current wars that are going on around the world, I mean, in 2020, you know, we weren't seeing the rising energy prices that we're seeing now. We weren't seeing inflation as it's directly tied to those rising energy prices. I think we can all

confirm that right now is not, you know-- we're seeing more blackouts, as you mentioned earlier. You know, I think we can all confirm that since 2020, you know, the status of our energy industry to those extents has not been positive.

Stubblefield [01:25:19]Are you aware-- what percentage of the entire planet has renewables, solar and-- do you know how much energy the entire planet gets from renewables? [10.2s]

Waldrip [01:25:30]I don't. I can say that in Arkansas, we're looking at about 1 to 2% of our energy. [4.8s]

Stubblefield [01:25:36]So it's about 2 to 3% for the earth, for the entire planet. Why would it only be 2 to 3%? [5.7s]

Waldrip Well, solar has just recently become more affordable. You know, when, when our public service commission first promulgated the rules for net metering, gas prices were a third of what they are now. And even now, with rising gas prices, it's become even more affordable and more attractive. You know, you heard me talk about our adoption numbers. And so I think that's why we're seeing those numbers growing. I would also like to point out that, you know, a big piece, again, of net metering laws in Arkansas is to give consumers a choice so they can choose to put the pencil to it and decide that it's more economically feasible for them to, to have the power to produce their own power. So I think that's an important component of this as well.

Stubblefield [01:26:32]Do you own an electric car? [1.0s]

Waldrip [01:26:34]I do. [0.2s]

Stubblefield [01:26:34]You do? Do you, do you realize that it takes four times more energy to charge that car than it does to run your air conditioning in your house all day? [8.7s]

Waldrip [01:26:44]Well, what I do know is that traditional combustion engines we know are the number one polluter of our environment. I also know that I really like to save money, and I didn't like spending $100 at the pump to fill up my Chevrolet. I was raised in a very Chevy loyal family, but it occurred to me that there's got to be a better way to do this. Right? And so what I do know, Mr. Stubblefield, is that I like spending $10 to fill up my car as compared to $100 to fill up my car. [30.9s]

Stubblefield [01:27:16]Have you replaced the battery in your car? [1.3s]

Waldrip [01:27:18]No. [0.0s]

Stubblefield [01:27:19]Do you have any idea what the price of a lithium battery is? [2.9s]

Waldrip [01:27:23]I do. I suspect it's about the same price as replacing an engine in a traditional combustion engine. [4.4s]

Stubblefield [01:27:29]Much higher. Much higher, depending on what model you get. [3.9s]

Waldrip [01:27:34]Yeah, I think, I think it depends. [0.9s]

Stubblefield Yeah. We've seen, we've seen prices of $15,000 to $30,000 for a battery. How many people you think can afford that?

Waldrip I didn't know--

Stubblefield [01:27:47]By the way, Mr. Hook made this statement when he was asked about renewables, solar and wind that he would be in favor as-- in Arkansas, as much as possible. In other words, he would be in favor of covering every acre, every catfish pond, every cattle pasture, every row crop acre with solar panels. Would you be in favor of that? [26.9s]

Waldrip [01:28:14]I'd be in favor for Arkansans to have the choice if that's what they want to do with their land, if that's what they want to do with their pastures, if that's what the--y I mean, again, to me, this is about free markets and it's about choice. [10.3s]

Stubblefield [01:28:26]Right. So you would be in favor of doing away with the largest industry in the state? [3.2s]

Waldrip Well, I think if it's, if it's the most economically beneficial. Right now, agriculture, as you know, has a $21 million economic impact to the state. But I also know that a lot of farmers have-- [01:28:43]I mean, I think farmers are smart people and I think they have put the pencil to it and they've decided that they can grow a safe and quality food supply while also saving money on their input cost in a field that very well could have lost money, I mean, if you've seen commodity prices lately. [18.4s]

Stubblefield Do you farm?

Waldrip I-- we have a farm at home, yes.

Stubblefield Have you talked to other farmers?

Waldrip I talk-- yes.

Stubblefield [01:29:10]I've talked to a number of farmers. The only ones that would even consider a proposal like this are those that are 75 to 80 year old who can't really farm anymore. Their children are not willing to take over the farm. And the younger guys, the younger guys that I've talked to, farmers, they said my dad would roll over my grave-- in their grave if they knew they covered their land with this glass-- [24.1s]

Waldrip Well, and I think you're right. I think what we're seeing across the board, you know, Mr. Stubblefield, from a mindset change is a different point of view. We're seeing that younger-- I mean, in the same way that we're seeing newer conservation practices implemented on these farms. You know, I know, I know that Jade had a meeting with a farmer that I guarantee you every person in this room knows earlier this week about new blood that's coming in that's looking for ways to save money because they have to save money in order to stay in business. [00:00:37]And as I said earlier in my testimony, and I kind of looked up at you, I don't know if you heard, but we are putting solar on our farm. My father, who is near 70 years old, that's a choice that he has made to take that land out of production and to offset our energy costs in that way. [17.2s]

Stubblefield Now, I understand that from, from the older farmers. I just, just have a problem with-- I don't think most Americans want to import their food from countries that have much less safe standards for, for food than we do.

Waldrip Well, let me be very clear. I don't, I don't want to do that either. That's not what I'm saying.

Stubblefield Well, let me ask you a question. The subsidies, how much, how much are these solar companies subsidized by the federal government?

Waldrip Well, like I said, there's not a state subsidy, but there is a federal tax credit of, of up to 30%.

Stubblefield 30%. So if you take away those subsidies, how much would that increase the price that an individual has to pay for their electricity?

Waldrip Are you talking about taking away all subsidies farmers receive?

Stubblefield All subsidies. Because when you look at ethanol, ethanol is one of the most heavily subsidized fossil fuels that we use, and yet farmers are paying. When ethanol started getting popular and guys in Iowa and Missouri and Indiana started planting every, every hilltop, everything they could plant, it was because of the subsidies. [00:02:17]And because of those subsidies, beef cattle farmers and food production, it costs us more and more and more for our feed to feed the cattle that feed this country. [12.2s] And you're seeing more and more beef cattle producers go out of business because they can't afford to feed the cattle because of the corn is going for. [00:02:42]It's being subsidized by the federal government along with these solar companies that are being subsidized by the federal government. [6.2s]

Anuszek [00:02:50]I just want to speak on my experience with local farmers. It's not a question of, I'm taking my full 100 acres and converting it to a solar farm. It's, I'm going to take this 40 acres of soybeans that make $250,000 a year and install solar and harvest sun for a multi-million dollar revenue for that farm. I don't think the question is, Are we depleting our agricultural demand and production for our state. I think the question is, How do we gracefully merge that so our farmers save money off a portion of their farms in order to utilize that in savings for fuel, cost and overhead. I think that there's a fine line in our farmers' decisions, but it's like Lauren said, who's to say you're able to install solar on your land if you want to? Are we able to take that away? No, it's a choice. And so we need to be an educational source of that fine line of maintaining and protecting our agricultural production, also giving them the choice of making those financial decisions. [65.4s]

Stubblefield [00:03:57]I, too-- I, too, agree in the free market. I believe in the free market. I believe in freedom. But you're not saying 40 acres produces multiple millions of dollars of soybeans, are you? [9.4s]

Anuszek [00:04:07]No, I said 40 acres generally brings in $250,000 annually for soybean production, but with solar harvesting--[7.0s]

Stubblefield [00:04:14]Above the cost of--. [0.6s]

Anuszek [00:04:15]--it could be in millions. [0.0s]

Stubblefield [00:04:15]Above the cost?[0.0s]

Anuszek [00:04:19]That's just on average in my experience. [1.2s]

Stubblefield [00:04:22]Okay. That's all I have now, Mr. Chairman. [0.9s]

L. Fite Senator Sullivan, you're recognized for a question.

Sullivan [00:04:29]Thank you, Mr. Chair. A follow up on what the senator was saying. You talk about free market, but then you talk about subsidies and we eliminated fossil fuels. And if the goal is to eliminate a fossil fuel economy, then that doesn't sound very free market. [17.9s]

Anuszek [00:04:49]I don't believe anyone said eliminate fossil fuels. I believe what we said, Representative Sullivan, was that that renewable energy is a piece to the big-- [11.0s]

Sullivan [00:05:01]A portion. You're saying you're going to eliminate a portion of fossil fuels. And when you talk about the topic and why solar has become more attractive, it's only become more attractive because we've eliminated a big fossil fuel production. That's why it's attractive. [15.8s]

Nelson [00:05:18]That's actually not true. The reason it's attractive is because the technology has gotten better and better over the years. And as that technology-- [6.2s]

Sullivan [00:05:25]Okay, just a minute. [0.1s]

Nelson [00:05:25]--has gotten better, the price has gone down. [1.4s]

Sullivan [00:05:27]I'm not here to debate that right now. I think we, I would disagree that people can't afford gas right now. We're seeing the inflation. But that's not where-- I don't need to go there. [10.4s]

Anuszek That'd be like asking an auto dealership, what are your plans for your recycling of your automobiles you sell when we have no need for fossil fuels. I mean, I don't think that--

Sullivan Let me, let me ask this. So we're going through this, you've mentioned a couple of times the federal government's, the, the anti-inflation bill as our inflation is the highest it's been in 40 or 50 years, and we're seeing the highest inflation around the globe, the highest in years. [00:06:16]As people are cutting off energy sources to Europe, energy is more and more expensive. So at what point do we start trying to work towards lowering these costs for the consumer? Because the consumer is really suffering right now. And all the bills that you're talking about helping so much don't seem to be having that effect. That seems to be having the opposite effect. [29.2s]

Ness I mean, Senator, we have folks in the solar industry that are more conservative than anybody else in this room that can have some feelings about the Inflation Act and its, you know, how much it was truly needed. But the reality of the situation is it's in effect now. We have 10 years of federal incentives in place. And [00:07:09]whether or not we politically like that reality, I think it's the job of Arkansans to benefit from the existing program that's in place and to help us use these tools that are provided to drive down the cost of living for consumers in our state. And I think, you know, there's been a clear signal from the federal

government now through the Treasury to use renewable energy as a tool to do that, including, you know, increased incentives for investing in low income communities and struggling communities and to use domestic materials. [32.2s] So, again, whether or not we like the politics of the bill, I think that we have a real opportunity to use it.

Sullivan I agree. We're in a rock and a hard place, and that's a tough spot for everybody and especially for the consumer. So let me ask you this, this, and I'll wind it down. I'm really interested in at what point, we talked about solar, we talked about other renewables, do you have an idea of what percentage we're looking at of our total energy consumption to be produced by solar in the next 10 years? And I know it's, it's not a hard answer because we're always going to be adjusting that as science continues, as we learn more what works, what doesn't work. So I know it's a difficult shot, but there has to be a number out there somewhere that we're looking to move Arkansas. And you talk about plans for our, our electric producers around the state. They've got to have an idea at what percentage they're looking at to produce by solar in the next decade. Do you know what that answer is?

Ness I'm struggling with the mic here. You'll have to talk to the resource planning folks at Entergy and otherwise. I've heard estimates as much as one gigawatt of solar being added in Arkansas. And I believe Arkansas is about a six or seven gigawatt state, so maybe reaching double digits in Arkansas. But, again, we're part of a larger grid system. And, you know, the utilities and the RTOs will be better positioned to answer that question for you.

Sullivan [00:09:16]I appreciate that and I sure hope we don't-- we stop looking at people as yourselves coming before the wolves. We are the representatives of the people. And the questions that we're asking are the questions we are being asked. So to look at us as the opponents and the wolves, it's just not a good way to come before the legislature. [20.0s] Thank you. Okay.

Nelson I would just like to quickly address that, that that's not our feeling at all. I think that, that our position is to try to help. I'm sorry? I think that our position is to try to help answer questions and really educate on something that, you know, there's probably less than a thousand people in a state of 3 million that, that know what the members of the Arkansas Advanced Energy Association know. And our job at AEA is not just simply to represent solar developers, but we also represent the lithium industry, the electric vehicle industry, we've got two big manufacturers coming in to energy efficiency. And I just want to restate that again, because utilities are a member of AEA. Nobody up here or the consensus of our organization is that it needs to be 100% renewable by any such date or 100% renewable all the time. I mean, we have been preaching, so to speak--

Sullivan Listen, I'm in agreement with you.

Nelson --a diversification model for years.

Sullivan And I think we are all, most of us here in this room are in agreement. But there is the stated goal from the president to have a fossil fuel free economy. That's what the goal is and that's what the goal of the act was. Now we're in a rock and a hard place and for us to come at one another-- the opening statement was that the beginning witness was thrown to the wolves. And, other than Senator Stubblefield, all respect, Mr. Chair, you know, that is not going to solve the problem for us to have these, have these issues. I hope we can work together better. But I agree with you. There's a lot of people in this. The consumer is the one being hurt the hardest.

Nelson And we would concur with that.

Waldrip Yeah. And, and Senator Sullivan, I would just clarify. I'm the one that said, 'thrown to the wolves.' I really meant he was being asked questions that were outside of his purview. But my point was that I was hopeful that we could provide some clarity for the body, you know, as you were acting on behalf of your constituency. Yeah.

L. Fite Senator-- Representative Dalby, you're recognized.

Dalby Thank you, Mr. Chair. I'm right here. I really have two questions. One, are there any penalties, either criminally or civilly, for individuals who improperly dispose of your product? Do you know of any on the books? I couldn't find any on a quick look.

Waldrip Not that I'm aware of, but I'll definitely look into that.

Dalby And the second question I have, [00:12:22]would it be an accurate statement that the more individuals who move toward solar, does that then push the cost of traditional electricity, the increased cost of traditional electricity to those who are not on solar? Seems like those who are not on solar are going to be penalized by the cut rate that those who are on solar. [26.0s]

Waldrip [00:12:49]We have heard that argument. In fact, I, I know that that's going to be likely discussed later in the agenda. So in the, in the interest of time, I'll allow our, our future panelists to address that. But in short answer, I can say that we know without a shadow of a doubt, there is no undue financial burden that comes as a result from a solar user to their non solar using counterpart. [25.8s] And I know that, you know, the Public Service Commission has done a lot of work into that. [00:13:21]There was an opportunity for the utilities to prove that alleged cost shift. That did not happen. [5.2s] But again, I know that will be discussed later.

Dalby A follow up real quick. So I want to go back to my first question. The second panelist had said that you have a program that you work with people that you sell your product to to recycle. Did I understand that correctly?

Anuszek We have a process in place for panel recycling to our panel manufacturers.

Dalby Okay. [00:13:55]So, say if I have solar on my house and I have all these panels and then one day I decide, no, I don't really, don't want to fool with it, don't like it, makes my house look ugly or something and I get them taken off. Right now, I could just go dump them in the woods somewhere if I wanted to and there are no penalties, correct? [18.1s]

Anuszek None that I'm aware of.

Dalby Okay. Thank you.

L. Fite Representative McGrew, you're recognized.

McGrew Thank you. Again, I come from electrical background, so when they first, manufacturers first came out with LED lightbulbs, they prompted that there was a 20 year life on those LED lightbulbs. You put them in and you will not have to replace your lightbulb for 20 years. The end user, of course, come on us the contractors to want a warranty for

that 20 years. When I went back to the manufacturer-- I was working with the Housing Authority, a big project-- and said, Okay, you've, you've went out and sold this. Now I'm having to furnish it. You sold it on a 20 year warranty. Give me the 20 year warranty. They would only give me a 5 year warranty. So my question is, on solar panels, what is the basic manufacturer's warranty on the panels? You're saying there'll be 30 to 50 year life. What is the warranty that they will replace the panel when it fails? Is it 30 years?

Dalby Sure. So the relationships we have with panel manufacturers, it's a 30 year warranty on parts, performance, and labor. So at year 25, if it's not producing at 92% efficiency, it's a warranty claim and [00:15:26]you get it--[0.3s]

McGrew [00:15:28]Okay. Thank you. [0.5s] Second question, chairman? It's my understanding that due to our legislation here in Arkansas that we do kilowatt for kilowatt. So when we overproduce, then the, the energy company has to pay the full retail price for that. You're saying that's not true. Is that not true?

Waldrip They don't, they don't pay. It's, it's in the form of a credit. So the credit is applied to their, to their next energy bill. And like I said, those retail rates that they're crediting are lower than even the wholesale rates as of today.

McGrew All right. So when you say credit, it's still a kilowatt that they're crediting you for that they couldn't sell for and they're crediting it at a full retail value. So if they're selling that for whatever the full retail value is, they can't sell it because you're producing it. Whether they need it or not, you're still producing it and putting it back on the grid. So my question is, and that's my full understanding and a lot of research in that, I do believe that solar is the future. In the electrical field, I've been hearing about solar for years. Probably 10, 12 years ago, I looked at getting into solar to make money doing it. It didn't make financial sense. It didn't make financial sense just a few years ago. Solar is gaining, but it's been years and years. So hopefully it'll get there further. When I looked at putting my house on solar because it was a brand new house, I wasn't subject to some of the tax credits that were available. So I was essentially looking at when I looked at the cost of it compared to what my-- I'm 65-- to what my life was supposed to be, I couldn't even pay for the system, much less get return in my lifetime. So I hope that it'll get better than that. But, but the other, the question is, if that retail for retail goes away, because I'm already hearing some phone calls from area companies that want to be able to buy at the true wholesale instead of having to pay that and be able to sell it, if that goes away, what will the financial impact be on your industry? Because that is kind of a form of subsidy.

Nelson I think it could definitely have an impact on the industry. I think that, one of the things that, you know, [00:17:47]to your point, Representative McGrew, is that this is an industry that's in its infancy. I mean, it's an industry that's come onto the scene in Arkansas truly over the last 6 to 7 years. I don't think that any of us like the word subsidy. As a fiscal conservative, I hate that word. But-- and I don't think that the industry looks at it as a subsidy. But I understand your point, and I respect that. And, but I also, we need to look at every industry in its infancy that's come in this nation. And our government, locally and federally, has subsidized those industries to help them get off their feet and launch. And that's exactly what's happened over the last several years with our industry. And so these subsidies are not forever. [47.8s] Nobody's anticipating that they are. And we can certainly debate on whether or not the Inflation Reduction Act was good. I could have a very feisty debate about that as a fiscal conservative. But I think, to Adam's point is, what we're trying to do is there are-- the money and the funding and the subsidies, to use your words, are there. [00:19:00]And we have 3 million Arkansans who deserve, just like every other

American, to utilize those in order to get the state of the art technology, to get that on their home, their farm, their business, their school, and to utilize that to save money on their energy bills, to have the surety of what that line item on their budget is going to be over the next 10, 20, 30 years. I think that's the overarching point. [31.6s] And maybe I'm a Pollyanna and maybe a little too simplistic, but I think that gets lost in the discussion of what is here and how do we, how do we deal with what is here and how do we take care of Arkansans in the process.

McGrew I understand that. I guess my counter to that would be-- and I'm not saying I'm against that. I'm just trying to figure this out what's best because if that percentage of Arkansans that are on solar are getting that advantage, the ones that are not on solar are having to pay a higher bill to pay for that. And so, like I say, I'm just trying to figure it out. Thank you. Thank you, Chairman.

Nelson If I could just address that. The, the discussion point around cost shifting could take an entire-- we could have a, just a hearing on that. There is-- we have data-- we actually presented data from a cooperative, Ouachita Electric Cooperative back in the 2019 session, which helped to convince, I think, the Legislature to pass SB 145. That data is growing with every year that solar can shave demand for the utilities. And so I think that that is a discussion worth having. I have many, many friends on the utility side. And we have debates about this. But, and I think that's a debate that's worth having. I don't want to sit here and say I'm right and they're wrong or vice versa. But that is a hearing all unto itself when you talk about cost shifting, because there's a lot of, there's a lot of engineering and technology that need to be discussed on that.

L. Fite Okay. Senator Hammer, you're recognized.

Hammer Thank you, Mr. Chair. Just real quickly. Could one of y'all tell me-- over to your right there-- or to your left-- the, the amount of subsidies, federal percentage versus state percentage, that is essential for your industry to survive, how much are you dependent upon those federal subsidies percentage wise?

Nelson Number one, the industry survives whether or not there are subsidies or not. There is a federal tax credit. There is not a state tax credit of any nature. We-- Lauren, in our opening statement discussed, you know, there's not anything around property tax or sales tax or anything like that in the state of Arkansas.

Hammer All right. And then, I think you were in the room a while ago. The gentleman passed it on. The piece of the pie for the industry to get you as far as if you, you know, if you got this big piece of pie and solar's got part of it and, you know, petroleum, natural gas, everybody's got a piece of the pie, what percentage do you forecast that you have to get to in order to sustain the industry long term? And the reason I'm asking that is because if, if the fossil fuels continue to go away or there's political pressure to do away with them, somebody's got to absorb that spot. So I guess in the industry, what's, what's the imaginary percentage that you're trying to get to or is there no limit to the top of it?

Nelson I thought I had the answer to that, and then I, then I paused for a minute. As a capitalist, I mean, I think that, you know, we don't know what that limit is. But I think that right now our position is that solar is a very small sliver of the pie, and certainly that sliver has to grow. We're seeing that from the utility partners. A piece of their pie is, is more and more dedicated to solar. So I don't know that I can definitively tell you what that cap is or what that percentage is in a free market system. I mean, our goal is to deliver on that

technology and to give the public what they, what they want. And so I don't know that we really know what a top end is going to be. I think what, in order to not sound ridiculous with that answer, I would say that one of the things that's problematic when you try to answer that question, sir, is the fact that our nation is becoming an electrified nation. I mean, from EV chargers to electric vehicles to the games that our kids and grandkids play. So we the need is growing for more and more electricity. And I think that that has got to be taken into the mix.

Hammer Okay. And part of the reason I asked that question is because you mentioned a while ago about this industry is in its infancy, kind of like, I would compare it to like broadband. You mentioned, you know, what's being done to help broadband, get it stood up because everybody needs it, wants it, the new electrification, if you would, of the century. So somewhere out there, then, you recognize that that is going to stop. Are you looking at, you know, and I understand that goes administration, administration and all that stuff. But as far as where it would get to the point where you wouldn't have to be dependent upon any kind of tax credit or any of these other things that you're dependent on now, how far out would you project that is, or is the industry even talking about that?

Ness If I can tackle that, you know, kind of hinting to the prior question a little bit. At the very macro scale, we have very efficient markets ...Southwest power pool that have capacity auctions and 15 minute energy markets and standby reserves. And we have lots of markets that, you know, effectively set that rate and make sure there's always, you know-- the projected demand is met based by an auction style. So that's going to really tell us about when new generation sources will replace less efficient sources just by, you know, cannibalization through markets, which, you know, kind of what would make Milton Friedman very happy. As far as the tax credits go, we continue to see the cost curve driven down on the solar side. And now we're starting to see it on the battery side. So we've got 10 years of tax credits in place. I don't have a crystal ball, but I would think that if batteries mirror the solar cost curve we've experienced in the past decade, we'll be seeing different forms of storage really starting to plug gaps and start taking intermittent resources into eating away at those later solar hours.

Hammer All right. Last question is, I've had comments from realtors. I'd just like some clarification. As far as like a home or a place that has the solar panels on it, the limitations of the ability to sell that home-- greater? Less? Any impact? I think sometimes they take out second mortgages to be able to afford the system. Maybe that depends on the company you're dealing with. Can you speak to the limitations that if you own a home and you've got a solar system installed on it, how is that impacting the realtor's market?

Nelson I think right now what we're saying is it depends on the appraiser. I think that, again, not as an excuse, but again, there's a lot of education that needs to be done both with banks, appraisers, real estate, the real estate industry. But if you have the right appraiser who understands solar, if you have a real estate agent that understands solar, if you're dealing with a bank that understands solar, then you're not going to have any problems. There's actually a supplemental document that appraisals can use. It's called a green doc. And it's not just for solar. It's actually for energy efficiency appliances to windows to if you added extra insulation to your home. And so that documentation and those processes actually exist and it's just a matter of, we need to all do a better job of educating those industries to let them know because there is value to that if you encompass it. As somebody who was in corporate finance for a couple of decades, if you look at that when you're selling a home or a business and you're not taking into account

what the utility cost is, and that's going to be reduced if there's solar tied to that project. So it's just taking a holistic approach to the value of that property.

Hammer All right. Thank you, Mr. Chair.

L. Fite Senator Stubblefield, you're recognized.

Stubblefield Thank you, Mr. Chairman. I want you guys to understand I'm not totally against solar. I believe it has its part. It plays a role in our energy supply. But there's something that's troubled me for a long time, and that is the fact that the vast majority of these solar panels come from China, a country that gets only 3% of its energy from solar panels, and yet is currently building thousands of coal fired generating plants. That troubles me. I mean, the very company that produces the most of the world's supply of solar panels only gets 3% of its energy from those solar panels. And yet they're building, at the same time, coal fired plants that's going to pollute the atmosphere. And the last time I checked, Plymouth Rock is still at the same place it was in 1620. I have a friend who used to be the Governor of Texas whose name is Rick Perry. I'll never forget what he said. He said it in a speech, but he told me one night. He said, "We need-- you said you're physical [fiscal] conservative. We need to make sure that the federal and state government are as inconsequential in our lives as possible." And what's happening now is just the opposite of that. It's just the opposite of that. And one more thing. [00:29:20]It's odd to me that the only states that have experienced brownouts and blackouts are those states that transitioned to alternative energy very quickly. Even our state of Texas decided to go that route. And you know what happened last February or a year ago February. [20.8s]

Anuszek [00:29:43]Just to speak on that point, I think that's an unfair assumption just due to the size of our grid capacity compared to those larger states. I think that's a factor that a lot of people don't take into consideration. California's huge. Their grid capacity and sector is, you know, 3 to 5 fold of what Arkansas's grid capacity is. And to your point of sourcing panels in China, all of our installs for 2022 forward, panels and materials, all materials used for our installs are sourced locally here in the U.S. I think that it is evolving our industry in manufacturing in the United States. I think that it's just a false claim that we're not utilizing our manufacturing and expanding that in the U.S. I think that it needs to be developed further for our capacity. But I think that's a conversation that needs to be had. I think it's just false that it's said that it's sourced straight from China. [56.8s]

Stubblefield [00:30:40]Well, having said that, solar has still has two major problems. One is the sun only shines 9 to 10 hours, 12 hours a day. That's it. You don't produce electricity at night with solar panels. I know I drive by-- some of them are pointed this way, some of them are pointed this way. And the second is the capacity for storage. We still do not have the capacity to store the electricity that 40 million Californians can use. And tell that to those people out there now that have been told to turn thermostats up to 78. This is a state that transitioned to alternative energies way too quick. Now, I'd rather pay a little more for carbon based energy as long as I've got it. If I can turn the faucet on and have hot water or have heat or air conditioning. So I think we need to slow down and take a look at this before we just rush into something and then later on pay the consequences to our citizens. [65.4s] Thank you, Mr. Chairman.

L. Fite Representative Ray, you're recognized.

Ray Okay. Thank you, Mr. Chairman. I think my question is probably best directed at Ms Anuszek, but anybody can answer it if it makes sense. I'm trying to get a better

understanding on two two points. One is the ease of recycling with regards to solar panels, and I know you don't like the term recycling, but that's what I'm going with for simplicity's sake. The second is the point on suitability for landfills. You had mentioned that there were two classifications of waste for that and that most modern solar panels were suitable for that. The report that I was, that I was referencing in my question with Mr. Hooks was from the Los Angeles Times from July. And it was saying basically the opposite. And that's why I'm having a hard time trying to figure out what is accurate here, because this report says that in most states, panels are classified as hazardous materials, which require extensive restrictions on packaging, transport and storage. So that's on the suitability for landfills question. On the ease of recycling, the report said, in part, that although 80% of a typical panel is made of recyclable parts, the disassembly and recovering the silver and glass and silicon is extremely difficult, requires highly specialized material and workers to separate the frame from the box, etc., etc. It goes into detail on that. Is that just a distinction between early model solar panels and more current models? Or is there a reason for the discrepancy between what you're saying and what I'm reading here? Or?

Anuszek Well, first, I'd like to speak on the discrepancy of your source, L.A. Times, and how credible that source of information is. [00:33:52]As far as recycling and ease of recycling, any commercial and most of our residential installs over a certain kilowatt has recycling or end of life outlined in that contract. So our customers are going into this knowing what those processes and procedures are and look like from the very beginning. [20.2s] As far as the waste, you are correct that older models are not up to standard and codes that would pass the TCLP test that the EPA developed. This test stemmed from the EPA's resources in figuring out which panel is able to be recycled versus the waste and hazardous substances that would leach out of those panels. And yes, I did reference earlier most tier one solar panels do pass the TCLP test. So the EPA is already on as well as other government agencies--

Ray When you say Tier one, what do you mean?

Anuszek Tier one would be-- when I think of tier, it's quality, so the top quality material. When I think of quality, I'm looking at their performance, their efficiency, their degradation rate and things of that nature. So tier one is the best of the best on the market. And our codes and protocols for our panel manufacturing has changed with the evolution of times and development.

Ray [00:35:15]Okay. And what was your-- I didn't catch this at the beginning. What was your critique of the story that I was referencing? [6.4s]

Anuszek [00:35:23]The source, the credibility of the L.A. Times. [1.8s]

Ray [00:35:26]Okay. Are you familiar with the report I'm talking about? [3.7s]

Anuszek [00:35:31]Yes. [0.0s]

Ray [00:35:32]Okay. Is it not accurate or what's the issue? [2.5s]

Anuszek [00:35:36]There's discrepancies and, you know, whenever I look for research and citing information, I personally don't use The L.A. Times. [6.7s]

Waldrip And I know that our, our national solar group had put out a response about a lot of the discrepancies that were in that article, because they were highly debatable. And I'd be happy to send that to you.

Ray Okay. All right. Thank you.

Waldrip You're welcome.

L. Fite Senator Johnson, you're recognized.

M Johnson Thank you, Mr. Chairman. And hopefully I can inject just a little bit of levity into this. I know my friends Representative Ray and Senator Stubblefield are probably itching to pull my Republican Party membership card after some of the things I've done and said in the past. But I'll, I'll jump right in here. Personally, I support free markets, and like Ms. Nelson, I'm a capitalist. And also I-- but [00:36:34]I also believe that we need diverse forms of energy. I'm not against coal. I'm actually very much for coal. And I believe that we need to do things not to phase out our Arkansas coal fired power plants, but to save them and keep us from going near the situation that Texas dealt with winter before last. [23.9s] But that's an argument for another day. [00:37:01]I do want to correct a few things, and I remind my colleagues that you are entitled to your own opinion, but I don't know that you're always entitled to your own facts. And I've heard so many factual errors that have been brought up that I had to correct some. Senator Stubblefield, I'm going to keep my electric car because it really doesn't take as much to charge it as you said. Because if it did, I would be, you know, looking at getting something else. But I want to hang on to it. [28.9s] But, but I might work out a deal with you on my red pickup that you seem to covet that has a diesel engine that you'd ask me about. So, but, but to get back to this, 15 months ago, I would have been as ignorant about a lot of these issues as anyone else in this room. Probably worse. But because of some things that happened to me in my life and things I'm exposed to, I've learned a whole lot about electricity, about electric cars, about battery storage, about solar energy. And I give credit to, among others, Ms. Waldrip, my daughter, who's been involved with an electric truck manufacturer, some of the solar panel installers like you are. But really what I've learned is that this is an evolving technology. I looked at solar for my home 20 something years ago, and it seemed the only thing that had any kind of viability was water heating. And I kind of blew it off. I said, no, this, this just doesn't work. But I've learned that a whole lot has happened since then. [00:38:44]Now, yes, we subsidize a lot of things. And we could spend days and days talking about subsidies-- everything from when we passed a half cent general sales tax to build highways, were we subsidizing the trucking industry? Because that's money that they're not having to pay in diesel fuel cost. [21.3s] Now, we could talk about things like that all the time. And we do cost shift. We do it. We as a legislature do it. And the federal government certainly does it. But I want to get back to this whole thing about the real world and where we are, not the way it ought to be. Our panelists, you made reference to the recent legislation Congress passed on that had the unfortunate title of reducing inflation. I think, like Ms. Nelson, it's going to have the opposite effect. But it did put some things in place, and certain, as we all do, I mean, you take advantage of what the weather is and what the political climate is. [00:39:51]And I don't blame anybody for taking advantage of subsidies that come up with this. I mean, we're, we're sitting here in this legislature, and I don't even want to talk about how much money in ARPA and CARES Act funds, you know, we distributed across the state. And while some of it was probably needed, I can't help but think how many times I shook my head when I saw money flying out of this room for dubious projects that seem to have little or nothing to do with COVID or helping people get back on their feet. We did it. We had it. We were asked to do it, and we spent it. [34.0s] So

I'm not going to defend what we did any more than I'm going to defend some of the bad actors that every industry, including solar and battery industries, have. But I just want to ask you all about a couple of things. One is, and I'll start with Ms. Waldrip, I know there are new battery technologies, and I think for good reason. Scientists that didn't pay attention to this field are now looking at it very seriously because there's a demand and a need for it. And again, that's capitalism at work. But I know Arkansas has some interest in this because of the development of lithium that is extracted from Bryant and South Arkansas. Could you touch on the way we're going where hopefully some of the environmental concerns like cobalt and and things like that could, are being addressed? Not that they're there yet, but technologies that are being developed, including how Arkansas's involved.

Waldrip Sure. [00:41:25]So I'll just kind of start with the Standard Lithium project. I had a reporter from Fox News call recently and ask, you know, what is it that you all have going on down there in El Dorado? And I was able to explain to her how this is a situation where Arkansas has taken a seemingly worthless byproduct that was a result from the mining of oil, which is obviously not the case anymore. You know, this product is thousands of-- this bromine water is thousands of feet below the earth's surface. And we have figured out a way to extract that bromine water and then further extract the lithium before replacing it back into the earth's surface. You know, that's something-- that's an economic development that is welcomed by that community. This has repurposed the jobs in that community, and it's essentially taken an older form of energy and made it new again. As you all know, lithium is a significant input that's required for batteries. Senator Johnson, you mentioned batteries, and we know that, again, the domestic development of things like batteries that include these inputs is becoming more important all the time from an economic standpoint. You know, we're looking at developers here in the state of Arkansas that will utilize these inputs and these batteries, companies like Canoo, companies like Envirotech. And so I don't know if that is kind of painting the picture or if that answers your question, Senator. [90.8s]

M Johnson It does. And I'm glad you mentioned those companies. Those are Arkansas-based truck manufacturers, or at least they're startups-- they're getting started in doing that at least. But I'm just-- one of the most important-- I will just say, I have learned more being a member of the Joint Committee on Energy from some of our presentations, including some of our national meetings we've gone to and you've learned about how energy can be stored in ways that I had never imagined. For example, you have an overabundance of power at a certain time of day. You pump it on top of a mountain into a, into a lake. And then if it's got enough head, then the time will come, you can open that same thing and run that water back down through a hydro generator and generate more electricity. So there's more than just batteries involved in storage. [00:43:56]I'm excited, actually, about some of the technologies. But more importantly, I'm excited that we're seeing a resurgence of American manufacturing, not just in the solar panel field, but in others, simply because, A, we need it, and if we didn't get any other lesson out of the pandemic it's we don't need to be dependent on China for anything that's of strategic importance. [23.4s] And so I thank you all for doing that. I just-- I want to touch, if I could, briefly, on the issue of, of the net metering. And, and, Lauren, help me if I'm misquoting you. And Representative McGrew was asking about how that works. It's a kilowatt hour for kilowatt hour credit. It is not a dollar for dollar credit. Is that the correct way to describe how that particular thing works, that if you put one kilowatt hour into the grid, you don't get any money for it, but your, your bill for, for using from the utility is reduced by one kilowatt hour.

Waldrip Yes, sir. That's exactly right. It's just a credit. So there's no monetary transaction. But yes, you are credited for one kilowatt hour on your future energy usage.

M Johnson So theoretically, if my-- okay, it's a hot day in August and the solar panel is is cranking away and sending juice back, then I could-- if mine's really doing a great job, my bill that, the energy portion could theoretically go to 0, but I won't get any more than that, monthly, that is.

Waldrip That's right.

M Johnson Okay. All right.

L. Fite Thank you, Senator.

M Johnson Ms. Anuszek, did you have-- you were about to ring in. I wondered if you had anything you wanted to add on that.

Anuszek Sure. I was just going to follow and say the goal of solar is to offset your annual usage, you know, 100% capacity. So utilizing those credits, you know, credit for credit per Kilowatt, the goal in designing a system is to offset that 100% for the homeowner.

M Johnson Thank you. And, I'm sorry, Lauren, you--

Waldrip That's okay. I was just going to add that the net metering law doesn't allow you to produce more than 10% in excess of your energy needs. So for whatever that's worth. You're not going to get more.

M Johnson But you can store it if you had batteries, for example?

Waldrip That's correct. Yes, sir. Absolutely.

M Johnson I have a friend that has a farm in western Arkansas and he is very interested in this. He thinks he can, while still being connected to the grid, probably be self-sufficient there where he's located. So I'm, I'm encouraged to see some of these, these things come along. And I, I just, I just want our, our laws and our technology and our, really our regulation to be consistent with what the new technologies are allowing. [00:46:54]And I want to close, if I could, Mr. Chairman, just to mention that you're seeing the free market at work. And I'm not one of these people that thinks that alternative fuels are going to replace traditional fuels any time in my lifetime. And I think that's as politically irresponsible as to say that we don't need any of these things. I think that we need a real diverse energy mix to protect us from any one category, any one cartel like OPEC or something having an inordinate amount of leverage on our country. [36.5s] So thank you for all you're doing.

L. Fite Representative Beatty, you're recognized.

Beatty Thank you, Mr. Chairman. I believe it was Ms. Anuszek that mentioned a focus on U.S. sourced materials and panels. My question is, could you educate the, the committee on Arkansas manufacturers that are manufacturing panel components within the state that, that you try to increase that industry and give us some information there?

Anuszek Sure. So currently in Arkansas, there are no specific panel producing manufacturers. There are racking manufacturers. We're partnered with PLP out of Rogers,

Arkansas, who basically manufacture aluminum racking for the solar projects. As far as sourcing them here in the United States, their U.S. manufacturing sources are expanding their manufacturing capacity to meet the domestic demand in the United States. So that is the ultimate goal is to move all of our manufacturing availability to the U.S. to utilize that.

Beatty Well, the reason I ask that is that in Crossett, I'm on the Economic Development Foundation there and we actually have a manufacturer that's there in Crossett that's manufacturing components that go into solar panels, Primoris Renewable out of Colorado. So I was, you know, maybe some information that would, would help with the industry by noting, you know, I'm about economic development and putting Arkansans to work, that this industry can employ more Arkansans. And also from an economic development standpoint, national corporation, international corporations are looking to Arkansas and our access to solar panels, trying to reduce their carbon footprint. So I think that should-- you, you've got any more information on that that you'd like to speak to?

Nelson I would just say I think one of the most exciting things about the renewable industry is the use of steel and the fact that, you know, Arkansas is, you know, one of the top steel producers in the nation before and after the latest investment. We were really excited to do a couple of different projects for Lexicon Steel. And on the one up in, both in Blytheville and in Carlisle, we were able to utilize Nucor Steel for the first time. And so I think that that is what, to your point, I think that's a, that's another exciting piece of this for Arkansans and for the state of Arkansas is, not just, you know, economic development for if you think about developers, but all the different industries here in Arkansas that can or already do touch these industries and how we can continue to grow jobs for all of those. And so I think that's a really exciting thing that, that we need to talk about more.

Anuszek And to feed off Heather's point from a recycling standpoint, Arkansas is a leader in recycling currently. We're partnered with Arkansas based recycling companies. And I think that to utilize the job corps increase and full life cycle of manufacturing and recycling here in Arkansas, more conversations need to be had to develop that, facilitate that. We want to be leaders in our nation as far as manufacturing and recycling.

Beatty And just one follow up on a completely different subject. [00:51:12]You know, we're here to look at the end of life policies and things on solar panels. I think right now, what, are there five states that actually have an end of life policy for solar panels? Based on your research, which of those five state policies would you direct the committee to look to you as being a model policy that we could, we could look to embrace? [21.7s]

Waldrip So I would just say, you know, if there's only five, there's not a whole lot of benchmarking we can do. But the majority of our conversations, [00:51:43]as far as the industry goes, really have been about allowing the free market. You know, our, again, our industry was built on innovation, and our members like Jade, for example, are going to use this as a springboard to expand their offerings and to be more complete, you know, full service for their customers. I'm also just personally not a fan of additional regulatory actions or red tape. And so, you know, I'm hopeful that the majority of, of these plans will be outlined in the contracts that are finalized before a project is ever built. [36.5s]

Beatty Thank you.

L. Fite All right, Representative Love, you're recognized. Excuse me. Excuse me. Representative Ladyman.

Ladyman Thank you, Mr. Chairman. I'll try to be brief, because I know it's running late. But just, I want to ask this question to clarify. You've partly answered this. But, you know, I think the question this ISP is trying to ask and answer is, you know, the boots on the ground question here is, the county judges and the waste districts want to know, can they accept these panels in their landfill and not have to dig them up in 10 years because they're hazardous? I think that's the question in my mind, at least it is. And y'all have touched on this, but I know there's recycling and that's great. I'm all for recycling. But in manufacturing and recycling, there are issues where maybe it's capacity, maybe it's access. So there are times when end users are going to try to take these things to landfill. It's just not-- you know, in a perfect world, they would all be recycled. They're not going to be. So these are going to show up in a landfill. And I know you mentioned the TCLP test was run on certain models. So if I'm running a landfill, I don't know which models had the TCLP test run and they're non-hazardous, you know. So, the question is, can they take these panels and bury them in their landfill, and who is monitoring that? I know that goes back to EPA, but even our Department of Energy here in Arkansas probably has questions about whether these can go in a landfill or not. You know, they could be defined as an article. We all may be familiar with that. You know, you can throw something away if it's a component and it doesn't leach. Right? So what does EPA say about this? I mean, is there a clear answer as to whether we can put them in a landfill or not?

Waldrip Right. So I'll answer the first part of your question and then I'll let Jade answer the rest of the first part of your question, which was about-- what was the first part?

Ladyman Last count. But the real-- there's only really one question. Can you put them in a landfill, and what are the limitations if you're running a landfill?

Waldrip Sure. Well, sure. Well, I mean, our plan as of today is, you know, our hope was to have this conversation and not even mention any of those 19 solid waste districts. I know that there's future panelists here that have very close connections to those solid waste districts and can shed more light on, on, on what that looks like to the extent that that does occur. You know, my thought is that that can be actually potentially an additional revenue stream because these do have so much value. But I'll let Jade speak to that.

Anuszek So, you know, the whole purpose of outlining the decommissioning and recycling plans in contracts is to anticipate the weight, the process and things for the actual consumer, the person who owns the project. Our job and our role is to take the foundations set by the EPA and use that as an educational source. That has not been developed. That's the process and purpose of these conversations. Now, the EPA has developed the TCLP test to aid in those processes. Now, where a regulatory side would come in is we take the TCLP list of appropriate solar panels that meet their testing requirements and are able to be disposed of. Where the question lies is who's going to be that regulatory committee? How are those regulatory processes going to be handled and who are they going to be routed to? And that's the conversation that we should be having, right? We take the recommendations from our agencies and then utilize that in Arkansas processes. But with that being said, any commercial or some residential installs, as far as speaking with my company, those plans are already outlined for them. My purpose as an installer in contract is to educate on those processes, but also the financial gain from that as well. Decommissioning used to cost money for our installers to decommission and repurpose the area. And now we're being-- we're able, and we should set our state up to receive the influx of panels being decommissioned to truly recycle them and gain economic impact for our state.

Ladyman Thank you for that answer. One quick question, Mr. Chairman. This is really a technical question, but I worked at a number of wind farms, and our turbines were high in the air. Most of them were installed on cattle ranches, and so they continued to run cattle. They didn't lose any ground or very little ground because they were high in the air. Is there any technology work being done-- I viewed some of these solar fields and they're like three feet off the ground. Why could those not be raised up and that land still produce crops?

Ness So I'll, I'll tackle that. We've got, I guess, close to a thousand acres of solar at this point with Entegrity. And we're having a lot of fun starting to run sheep out on a couple of the arrays, particularly for schools. Schools like to combine their FFA programs with raising Dorper lambs and, you know, kind of helping the kids learn how to run an agri business through them. So that's a particularly strong use case for getting dual uses out of that land. In different climates, you're starting to see some new forms of agriculture within the ground that like shade like broccoli. And I guess to your second question there about raising them off the ground, it just raises the upfront CapEx significantly. It would make them less economic. But I think at the end of day, the constraint on the ground underneath is, you know, whether or not there's enough sunlight to grow crops, and, and also, you know, make sure they don't reach 3 feet in height. It's amazing how quick grass grows underneath these arrays.

Ladyman Well, I've noticed the grass does grow under them, you know. And I mean, if there's a solution there, it would reduce the costs associated with solar. Thanks for your answer.

L. Fite And we thank you today for being here. And you are now dismissed. Next up is Ted Thomas from the Public Service Commission, the chair of the Public Service Commission. Ted, as you know, we are running really late here. And so all my colleagues here are going to ask you yes and no questions. Okay? All right.

Thomas All right. Thank you, Mr. Chairman. It's good to be here in front of the legislature. I see new faces from not the normal committees I present before. Earlier this year, I got a call from one of your colleagues with a constituent problem regarding interconnection to the solar system. Like all of your constituent calls, I take that seriously. And we had a conversation. The result of that conversation, there was a legislative hearing on these issues that I testified at Joint Energy Committee. Well, a few weeks back, one of the warring parties in the solar, a group of co-ops, filed a recusal motion because of my testimony in the legislature. Now, when I come to you, I feel like I have an obligation to answer you, your questions truthfully and say what I actually think. Now they're using that as a basis for recusal. So I can't do my job at the commission. The Public Service Commission is a mix. Our core function is rate making, which is a legislative function delegated by the legislature, and the Arkansas Supreme Court has defined the Public Service Commission as a legislative agency. We also have authority to investigate, which is typically the purview of an executive branch. And we have hearings that we call quasi-judicial, which looks like a judicial branch. We have three branches of government, and the public service commission does stuff that looks like each of these things. By seeking recusal, six of the 17 co-ops, they seek to exclude me from the legislative process. This is an effort by private interests to exclude the public interest from legislative discussions. During the last eight years, you in the Legislature have trusted my views as stated or negotiated with others on nearly every single issue in the energy space. Together, we have been consistently right. It was right when I said the purpose of the Solar Access Act was to give consumers an option to avoid potential high natural gas prices when natural gas prices are used to generate electricity. It was right to give options to deal

with EPA regulations. There's a new CSAPR regulation that could cost us a significant amount of money. It was also right to seek to use Arkansas's cost advantage in solar because of its flat, relatively inexpensive land and higher radiance as a driver of economic development. It was right when I said those things, and you, the legislature was right when you passed the Solar Access Act. We looked for opportunities to hedge the cost of natural gas when it was cheap. This stuff moves really slowly. If you wait until it's expensive, you're behind the curve. Now we see how expensive it is. That's what happens when we're ahead of the curve. 18 months after my testimony, Amazon.com and General Motors announced plans to build large scale solar facilities in Arkansas. Large, sophisticated corporate interests saw what I saw, that we had a cost advantage. That was presented to the legislature 18 months before those corporate entities saw the opportunity. We've been right again and again and again. Now they want to exclude that. They don't want you to hear from me. Entergy, which doesn't like third party solar programs, they'll testify themselves, ramped up their solar in response to the competition from third parties. This was a design feature of the program. This was how it was supposed to be. Because Entergy ramped up its solar capability, when US Steel came calling, they were ready to meet the moment. US Steel, when they announced its location in Arkansas, used the word sustainability in its press release seven times. We won on sustainability because our utility was aggressive on solar, and they had to be aggressive on solar because the Solar Access Act allowed scaled third party competition. So what you were told about economic development when you passed the Solar Act, it happened. Largest project in our history. Entergy adapted to the policy. Some of our co-ops have adapted to the policy. Today's Power is a leading solar vendor owned by the co-ops, or the profits-- it's a for profit company owned by nonprofits, dumped back in and inured to the benefit of our ratepayers. Ozark, a co-op in Northwest Arkansas, was among the leaders in doing what our policy wanted them to do, take the cost shift and mitigate it with storage. They did that. Our new solar companies are adapting. And they're not just solar companies. Some of them started as energy efficiency companies. They're moving into the EV space. They're moving into demand response. They're looking at storage stuff. What we've done is we've placed entrepreneurs in the energy space in and around our regulated monopolies to make them more responsive to customers. And it's working. They're growing great businesses. But some cooperatives refuse to adopt. They have a different policy. Here's their policy. They say that the Solar Access Act is preempted by federal law. They filed that in testimony that you can't do that because it's controlled by federal law. We'll see how that works out. But one thing they don't seem to understand about that is the seminal United States Supreme Court case on federal preemption is Grand Gulf, where the FERC forced us to pay for something that we didn't want in a huge political thing from the '80s. But guess what? When FERC forced us to pay for that, the utility filed what's known as a tariff, which is the rules-- I know we talked about tariffs, we're not talking about that kind of tariff here today, the fee people charge for imports. The tariff are the rules that you take service by. They filed a tariff. So even though it's federal preempted, there's a tariff at the State Public Service Commission. Well, the co-ops say it's federal preempted and are charging stuff that's not permitted in the tariff. They're charging a fee that's not permitted. They're charging insurance that's more than the bill, utility bill total. They're saying, we don't care if you have homeowner's insurance that says they cover it, we want you to buy. They're trying to kill it. Another thing they've done with this constant spirit of contention other than the recusal, last week they filed a motion to strike testimony filed by State Public Service Commission general staff lawyers because it was 2 hours late. 2 hours in a procedural schedule that had months and months and months. Unnecessary, expensive and guess who pays for all this? The members pay for it. They will sit here and tell you, Well, the members can vote. The members can do that. The members have to pay for this litigation garbage. The members can't see the book. And if you look at the levels of solar

penetration in these areas and compare the cost shift that they allege to the lawyer fees, you'd probably be stunned. It's constant, constant contention. They seek to substitute their judgment, those who have always been wrong and don't have a plan, with my judgment with this recusal motion. I won't testify anyway today. I'll say what I think like I always do. I will answer your questions and the questions of your constituents to the best of my ability like I always do. These are mixed questions. The governor appointed a future mobility counsel. I'm on it. We discuss policy issues. Entergy, they have a docket on charging stations. If you apply the standard that the co-ops buy, they would toss me off that docket. They and every other utility entity have the good sense and judgment not to do that. Now to the cost shift. The politics of subsidy always involves a combination of self-interest and the public interest. Too much subsidy results in a government substituting itself for a market full of consumers in picking winners and losers economically through political muscle rather than what the consumer wants. But a rigid zero subsidy policy will result in scaled incumbent businesses crushing or absorbing new ideas from small businesses. Because of scale. Scale is the key. A big business with scale will crush a little business with a better idea if you're not careful. This kills innovation. And as Senator Johnson mentioned, the last organized opposition to the Interstate Highway System was proposed in the Eisenhower administration, which were the railroads, which said building highways is a subsidy for the trucking company. You have to be careful with the subsidy debate because of the economic interest involved by all parties. It's also applicable in solar. We're one large solar facility where the utility testified there is no cost shift. There is zero cost shift. Solar, the storage offset some of the cost shift. But something we call OIS, an interruptible tariff for large industrial customers, offset the rest of it. When you look at the scale of OIS subsidy, it dwarfs the scale of the solar. But here we are talking about the solar. If we were talking about industrial, the room would be filled with the state Chamber of Commerce. Everybody hates subsidies except theirs. And in the political debate, when you mix all of this up, you can lose the public interest to special interest in the subsidy debate. So, we've got to balance it. There's ‘too much subsidies is bad.’ If you have zero subsidies, you get no innovation. And that's bad. So how do we do that in the context of our solar program? Well, first, we define the cost shift on a cumulative basis rather than on a transaction by transaction basis. That we would define cost shift in this manner was specifically stated in the legislative committee. You'll hear, why would I buy something for $0.09 when I can buy it for $0.03? If you only have one unit sold, you don't care because it's $0.06. And if you have 100,000 customers and a subsidy of $0.06, you can't carve the pennies small enough to distribute it to the customers. That's the reality. Also, who says it's going to be available? You presume that you can buy it at whatever, if there's nothing available, what do you do? Well, if there's nothing available, you can still get the solar that's sitting in your state. You should also include potential benefits. So what we need to do is define the cost shift on a cumulative basis for what the benefits are and deduct them. The wrong way to handle a subsidy is to ban a transaction. Two people want to do a transaction, a solar transaction, don't ban the transaction. Measure the detriment, and then go back to the people and say, will you pay that detriment to keep your transaction? That's how you get the best of both worlds. You allowed the transaction to go forward, but you mitigated with a cost shift. And this is why we created in 2020 our order, the grid access mechanism. [01:11:49]Utilities were given the option of stating all of the cost shift that had happened from day one until the date of that order and cumulating it. And then we're going to-- for future solar installations, we're going to put a fee on them that get us back to flat line where the industry is standing up on its own after it scaled. June of 2020, we put that out there. Some of you know the answer to this question. But guess how many utilities have filed for a grid fee? Not one. They charge fees that are illegal to charge. They charge insurance. They file for recusal. But they won't file their data so that other people can look at it and we can examine what the proper grid fee should be. [56.7s] In fact, the lead of this

utility group, Petit Jean Electric Co-op, said, we don't want to measure. We know it's wrong, but we don't want to measure. Back in the day before I had this job, I was a recreational reader. I would go read a book. I don't read that anymore because I read all day long. When I'm on vacation, I don't read at all. I've read for eight years. The dumbest single thing I've read in eight years is that you shouldn't measure. How can you do policy when you don't measure? And these people, with the recusal motion, want to substitute their judgment for my judgment. That's bad for you. The evidence was presented in the PSC hearing. Okay. Let me reorganize my thoughts. Okay. So we set up a grid fee. Nobody applied. Now Entergy is negotiating. They've sought to negotiate. They have a good reason for not. They're trying to work something out. I suspect the reason nobody else has filed is because they would be embarrassed if they stated what the fee is. They would come to you and say, we've been in the hearing for how many hours and you're talking about $0.05 a month per customer. I think that's why they haven't filed. I don't know that for sure. Perhaps that'll tell you why they haven't filed. They'll say, Well, we didn't trust him. That doesn't make any sense. I've beaten them over the head with the fact they haven't filed a grid fee for, for two years. The reason their legislative approach last session failed is because they hadn't filed a grid fee. And I said, We've got it covered. We've got it covered. You don't have to change the law. They'll file the grid fee and we'll work through it. They could have filed the data so you'd know the data and I'd know the data. They chose not to. What did they choose to do? They chose to appeal. They appealed the PSC ruling, and some solar folks also appealed for balance. Because if you appeal, and the other side doesn't, then, you know, you have no reason never to dismiss your appeal. I was hoping there would be a trade off. I worked for two years to engineer that trade off and it didn't happen. The solar people were ready to drop their appeal but the co-ops were not. So the appeal went forward. I stated in a legislative committee on two separate occasions, the biggest risk we have in cost shift is this appeal. That's the biggest driver on the cost shift is this appeal. They should drop it. I gave a public speech. The Internet virtual part of the speech was sponsored by the, by the lawyers for the co-ops. And they laid out the specific risks. This is what can happen bad to you if you continue with this appeal. Of course, they continued with the appeal, continuing their record of poor judgment. The appeals court ruled against the co-ops on every single issue and because the solar people put theirs in, the solar people won their issue in front of the co-ops. You've heard people testify to you that we gave them all the data in the PSC hearing. Well, guess what the appeals court found? When the Public Service Commission-- this is what we found. We found there was some evidence of cost shift for the grid fee, but as it accumulates over time, then you have an unreasonable cost shift. Well, the appeals court said, no, there's no evidence of cost shift. There's none whatsoever. So they took our 2020 date away. They took the date that gave us the ability to consider any cost shift where we could put a fee on any solar installation after June of 2020 and make the cost shift go away. That disappeared with the appeal court decision, the appeal court decision that they refused to drop. Five conversations minimum with senior members of the co-op leadership. Oh, we don't see any risk. This is the risk. Two legislative hearings. This is the risk. This is the risk. Now we have the risk. In June of 2020, when we imposed the grid fee, natural gas prices were low. The solar industry was smaller. We didn't have a federal government with a shovel shoveling your money and more subsidies on solar. That's when you fix the problem. Now it's open ended one to one on into the future with gas, natural gas prices at $9, which drives solar demand, a federal government with solar subsidies and a scaled solar business. [01:17:39]They've cared about the cost shift. Oh, they bawled about the cost shift. But their incompetence and idiotic legislative strategy has made the cost shift materially worse. Now, what do we do? You can tell I have a good attitude about this, because the single thing on this planet that gives me the worst attitude is when I don't want to shovel a big pile of manure. And I tell everybody in the world how you can avoid

having to shovel it, but they don't listen. And then I'm standing there with a shovel, having to shovel it. [30.7s] The whole reason I tried so hard to get them to drop that appeal is because I didn't want to have to shovel the big pile of manure that left me-- that they've left us all with. [01:18:25]Three years ago, I came to the legislature and I served. And when I started serving, I would get mail. Well, that was back in the day. I don't know if you all get-- I'm sure you get more email now than mail. And I would get these charts and every chart would say-- you'd look at the chart-- where are all the states, where are all the states. After a while, you learned you had to look at the bottom of the chart to find our state. How does that happen? How are we at the bottom of so many categories of economic development? There isn't a bill to be 49th. It happens by accident. It happens by unintended consequence. It happens by a failure of leadership. And the failed legislative strategy, the failed PSC strategy, and the failed appeals court strategy, and the failed strategy to kick me off of this case, that's how you get 49th. In fact, I've got a new term for it. I call them 49ers. It's this mentality that keeps us at the bottom. [58.0s] And that group seeks to substitute in front of you their judgment for mine. So what do we do? The first thing we do is we need data. Now the PSC has been working for nine months to file something, asking people to file data even if they're not going to do a grid fee. Of course in all the contention, we're always pushing back the optional stuff with the mandatory stuff because everything's so contentious. But we need data. The utilities have the data. They're the only ones with it. It's got to come from them. A second thing is is we need the solar experts and other experts that have a different view than them to go over that data and then have a debate between the solar companies and the utilities in front of the PSC to come up with the right answer on the grid fee. What's the right answer on to mitigate the cost shift without killing the industry? We're in the early innings because of our cost advantage in solar, particularly in the Delta driving economic development if we don't screw it up. There's some people that are just trying as hard as they can to screw it up. They're the 49ers. We need to keep the program, balance the cost shift. But we don't have the data yet. Then if the PSC makes this decision, then you come back to the legislature. That doesn't have to be the final word. They have a right to appeal, as they should. If we screw something up, y'all need to look at it. Right now, we have no data. They're going to bring you a bill with no data, and they're going to try to kill it. We need the data before we resolve this legislatively. And we need to think about where we could have been had they just left it alone, had they worked with me and filed their grid fee. They could have appealed and filed a grid fee. Think how smart that would have been. You guys get it right or the appeals court is standing there with a hammer. If they didn't like what we did, they could have kept the appeal. And if they liked what we did, they could've dropped it. And they can always come to you with documentation of what the cost shift is. It's been scrubbed by experts with a different view. That's what we need to do. But in the meantime, someone needs to put the dog on a leash before the dog tears up more stuff than it's already torn up. And this is blunt talk and you should read my refusal notice. It's got some blunt talk in it too about both them and their lawyers. Because I'll tell you about members. There's one member that's waited since 2021, June. A year and a half with their solar panels on their roof, and they still haven't been interconnected to the grid despite the law that says you shall interconnect. They don't represent members. They have contempt for members. They want to subject members. There was another member who told me I couldn't get to come to a board meeting. In the energy committee room, there was a very wealthy farmer. I like wealth. Wealth is good. I like it when people succeed. They hooked up his solar. Why do you think they didn't hook up his solar? They're listening to the muscle. But for the person that's been featured in Arkansas Business, a Vietnam vet who's 18 months into a solar investment, they won't cook. They don't listen to that guy. They don't want him in his boardroom. And they darn sure don't want him looking at their books so they can see if their attorney fees are more than the cost shift. We can have our cake and eat it too. We

can have a successful-- with $9 gas, everything is successful. [01:23:02]With $9 gas, I want to build solar as fast as we can because $9 gas is going to tear your constituents' head off. Now, here in Arkansas, mostly OG&E in Fort Smith is a little overexposed, our co-ops are a little overexposed on gas, but we're better on gas than most. We're eating it, but we're better than most. But this winter, we got no place to hide. When that first home heating bill comes out, our reliance on natural gas for home, your constituents are going to feel it and your phone's going to ring. [28.6s] That's what we need to be thinking about, not kicking testimony off the record because it's 2 hours late and then sending a bill back to your so-called members to pay for it. It's time to get real if we're going to take care of our people. And this kind of litigation garbage isn't how you do it. So that's what I've got to say. We had cost shift under control until they messed it up after repeated public warnings. You're going to mess it up, you're going to mess it up. They did it anyway. Now it's messed up. But we still need data. You need to start with data. And it ain't $0.03, $0.06. We need to know how many transactions there are. We need to know how much the cost shift causes each consumer's bill to go up. And if it's $0.02, you need to laugh. Why are you wasting my time? Entergy, I estimate is $0.50 to a dollar, and that's when you start paying attention. We were paying attention. We had the right program. It was well-balanced. So you get the innovation with a little bit of subsidy and a way to flatten the subsidy out over time. We had that and they screwed it up with a no merit appeal because they wouldn't dismiss it. That's where we stand on this stuff. Now it's hard to fix. It was easy to fix with a grid fee, $2 gas and a small solar industry. Now we have a scaled solar industry, $9 gas and a ton of federal subsidies. Now the ball is rolling too fast. Not because the policy was wrong. Because they screwed up the policy with a no merit appeal. That's the reality. That's exactly what happened. Somebody needs to put the dog on a leash or it'll happen again. Thank you, sir, for your time. I'll be glad to answer any questions.

L. Fite All right. Mr. Thomas, could you tell me how many states have the one for one on net metering?

Thomas I don't know the precise number. Almost every state has it when it's small scale. Very few states have it when it's large scale. But the problem with the whole conversation on the one for one, the purpose of our program, all the heat and none of the light is in rooftop. What's magical about our program, in my view, is the scale where you have demand charges that cover the fixed costs that drive the cost shift. So if you have a 1 to 1 where the customer is paying a demand charge and 1 to 1 when they're not, they're not even the same. So to me, we need to measure the cost shift for the one for one for residential where the deal's probably too rich. And my solar colleagues could throw a recusal at me, but they had the good judgment not to do that. But we need to preserve our scaled program and mitigate that cost shift with, with storage mitigating the demand charge. But it's small scale. What I want to do, and I told the folks I'd do this, we'll go to whatever you want for rooftop solar, but this is what I want. I want community solar. I want somebody to be able to build a big facility in a field and get the cost advantages because they say rooftop solar is too expensive, rooftop solar is too expensive. But when you say, let's build it in a field and do it, and they say, oh, no, no, no, we can't do that. They propose stuff, limitations to keep it expensive, and complain to you that it's expensive. What we should do is take scaled, same scale, 20 megawatts roof residential grouped together with storage and see if that can do zero cost shift. That's the deal I proposed, but they rejected it. That would solve the rooftop problem overnight. But they don't want consumers to have the option of community solar. That's the problem with that.

L. Fite Thank you. Yeah. Senator Stubblefield, you're recognized.

Stubblefield Thank you, Mr. Chairman. Ted, you know I've followed the natural gas industry for a long time. For 12, 15 years, we've seen natural gas 1,000 cubic feet?

Thomas Yes.

Stubblefield Dollar to dollar.

Thomas Yeah.

Stubblefield All of a sudden, it goes to 9. Tell us, what drove that to 9? I think you know what drove it to 9.

Thomas [01:27:45]What drove that to 9, okay. Imagine if you have a pickup truck that you just bought and somebody says, we're going to ban pickup trucks in 10 years. What do you start thinking? I need to get rid of this pickup truck. I don't want to be in the pickup truck business. When the federal government said, we're phasing out fossil fuels, people quit making the investment you need to get fossil fuels and the price shot up. The price went up to $6 in December of last year before the Ukraine invasion. It wasn't the Ukraine invasion that drove the price. Now the price-- the Ukraine invasion took it from $6 to $9. It had already spiked. [44.5s]

Stubblefield [01:28:32]So, so you're saying that the Russia's invasion of Ukraine had nothing to do with it? [5.4s]

Thomas [01:28:38]No, it contributed to it. It went up a whole lot without the Russian invasion. And then the Russian invasion added some to it, but we already had a natural gas problem. [9.3s]

Stubblefield What percentage of Western Europe has, has an alternative solar panels, energy?

Thomas They haven't done that much solar. Actually, what they've done is a whole lot of wind. In my view, I could put a hamster wheel right here and spin it with my finger when I'm talking to you. Not very reliable, but that doesn't cause reliability problems. Intermittent resources don't cause reliability problems. What causes reliability problems is premature retirement. What the Europeans did was a whole lot of reliance on wind. Then when the Fukushima incident happened in Japan, they shut down their nuclear in Germany. And they wanted to do a substitute for gas. So what they did was they made a noose. They put it around their neck and they handed the other end of it to Vladimer Putin.

Stubblefield And they became dependent on Russia's natural gas.

Thomas Yes.

Stubblefield Which is, which is exactly what I've been saying. They rushed into alternative energy way too fast.

Thomas I don't think rushing into alternative energy way too fast is a problem until--

Stubblefield Until you're at war.

Thomas No, it's until you start premature retirement of other units.

Stubblefield Which is exactly what California's done.

Thomas It's exactly what they've done. And now they put them back on. And that-- there's two things about California that baffle me. The first thing about California is that 10 years ago, they said we're shutting down these gas plants because of climate change. Ten months ago, they said we're turning on these gas plants again because of climate change. Now I accept climate science and I think humans are causing it. I've made that very clear. But when-- science doesn't work that way. Okay. At some point, science got left behind and it was politics, because science doesn't tell you to do the exact opposite thing at the same time. That baffles me. [00:00:52]The other thing that baffles me is why those people, the people that think like that, have won the popular vote in seven of the eight last national elections. It's the John Kerry question. If John Kerry didn't think much--[17.9s]

Stubblefield [00:01:10]Well, you left out one--[0.7s]

Thomas [00:01:11]of George Bush-- [0.5s]

Stubblefield [00:01:12]You left out one-- [0.0s]

Thomas [00:01:12]How are we losing to these idiots? How do we lose to idiots? And I'll tell you how. By getting labeled as climate deniers, we played ourselves right out of the arena. And now the crazies on the other side are threatening viability. That's what happened, in my view. [15.9s]

L Fite I would ask that we stay a little more focused. Senator Johnson, you're recognized.

M Johnson Thank you, Mr. Chairman. Chairman Thomas, first, thank you for your presentation. It picked up where our Joint Energy Committee meeting a few months ago left off. [00:01:55]And I'm sad to hear, and correct me if I'm not hearing it right, that no progress has been made on this issue with the co-op's institutional resistance to individuals' rights to put solar panels on their own property. [17.9s]

Thomas [00:02:13]Not all the co-ops. [0.4s]

M Johnson [00:02:15]Well, I don't want to indict all of them for sure. So if you can help me sort that out, I'd be grateful. [3.7s]

Thomas There are six of them that are on their motion to recusal, represented by the lawyer that was the author of the failed appeal strategy. What I hoped to achieve at the Energy Committee was some degree of publicity that would help them do the right thing. Because if you've already waited 18 months on your solar panels not being hooked up, another eight months at the PSC and another 12 months of the appeal court doesn't really help you. I was trying to move the process along. Of course they know that and that's why they filed a motion to recuse.

M Johnson So is this more of a-- it's-- they consider it in their interest to drag their feet on any solution?

Thomas That is my view. And the only way to change that, if they don't catch some political heat for it, they're going to keep doing the same thing.

M Johnson Well, I always believe government, including the PSC, should be the, the, the-- it should not be a player. It should be an arbiter. And obviously we set policy based on reality and not our own whims. And if I like gas, natural gas and I don't like solar or vice versa or whatever, that shouldn't be the driver of policy per se. It's got to be what is good for the state of Arkansas in this particular case. But to clarify what you just said to me, they're slow walking this thing because there's an economic reason for them to drag their feet or slow walk it. Am I hearing that correctly?

Thomas That's my view. Now they'll tell you we're not for profit. Well, $250,000 a year as a chief executive, it's profit for you.

M Johnson Well, not for profit. It's like hospitals and other big, huge organizations. You know, I mean, and I don't fault anybody for that, but that's just an organization. That's no different from LLC or, or S corporation. It's just another way to do business. I follow all that.

Thomas [00:04:13]But service to members doesn't include not hooking up members that want it. It doesn't include excluding them from board meetings. It doesn't include, like, it doesn't include management or running up huge attorney fees and then sending the bills back to those members and not disclosing it to them. That's not in the co-op model. As I said, at Entergy, they have a great history. They electrified places that the IU wouldn't do. This is a stain on that history and they should fix it. [25.6s]

M Johnson [00:04:39]Ted, is there a-- again, we're staring down the fall and a new session in January. Is there a legislative solution that we need to be putting in the pipeline to be dealing with when we come in in 2023? [16.6s]

Thomas [00:04:57]What I think we need is the data first. File the data. [3.6s] Let the people with a different view, let the PSC have a bite at it and come up with something. And then if y'all don't like it, then I want you to fly with the data. [00:05:14]Not that, we don't like this because it's a subsidy and ban the transaction, and then, you know, we, we shoot at a transaction, you know, identify people with a losing record, and then we accidentally hit a big economic development project later down the road, that, that's the 49er. That's what they do. We need the data first. And then we can figure out the legislative solution. [22.9s]

M Johnson Is there a legal rule or other institutional barrier that-- maybe I should turn it in backwards-- or facility that allows them to deny the data? Should they, should they provide it to you today under current law and rules?

Thomas I think so. Given the howling they did about the cost shift, I thought that the day we set after a grid fee they'd come running in with the data. That didn't happen. And I'm sure that as soon as we file a docket that we intend to do to ask for the data, even if they're not going to file for grid feed, you know, day after that, they'll recuse because I had the audacity to talk to members of the legislature about the cost shift. I expect that.

M Johnson Okay. Thank you for your testimony. Thank you, Mr. Chairman.

L Fite Representative Rye, you're recognized.

Rye Thank you. Thank you, Mr. Chairman. Ted, thank you for being here today. I got a couple questions, and maybe you can help with this. Because I'd like to know, and I think the people of this state would like to know a couple of answers here. Do we subsidize the federal government for fuel for the gasoline we use right now? Except--

Thomas There, there are some limited subsidies, mostly related to the timing of depreciation with large investment. But in my view, if you're looking at federal subsidies for, for fossil fuels, you should also subtract from that the taxes that you pay when you fill up at the pump. There are some subsidies, but when you look at fossil fuel subsidies and you spread that out over all the fossil fuel industry, and then you say, well, here's the wind subsidies and try to compare them. Well, one's for 5% of the energy and the other is for 95%. So it's not apples to apples. There are some limited fossil fuel subsidies, mostly related to the investment of timing and depreciation and stuff like that.

Rye Okay. And, Ted, let me ask you this. We know that we've got about 30 stations across the state that, where you can charge a car. Okay. Now, if it was where every town had four or five or six of them-- and that's what you would have to have-- if you had that and you wanted to charge that vehicle enough to go 300 miles, do you have any idea what the electrical cost would be for that?

Thomas Yes, that's actually a very good question. The problem with electricity-- and when you talk to your constituents and they drive by the gas pump and they see $4 a gallon, and then they drive by it the next day and they see $4.20, they're like what's going on. It shouldn't move that much. When you look at the price of electricity, it goes up and down like a roller coaster. When you try to take electric field charging costs and convert it to a gasoline per gallon equivalent, if you charge at night at home, the per gallon equivalent is like $0.70, $0.80, $0.90. But if you charge on peak at 4 or 5 in the afternoon whenever the peak usage and the cost are the highest, it's like 15, 16, 17. So what we need are rate structures and incentives so that you do that when it's cheap and not when it's expensive. You talk about cost shift. You know, if you're paying, if you' you know, that, that cost shift, if you charge and you're not paying the full cost, everybody else is. And that's cost shift. This is a, this is a very difficult thing that we're sorting through. We, again, we need data. We need to know the usage. The key thing is the usage, because if you use a lot more of it, it brings the cost down because of scale. So we need to know the usage. I know that, I think Ozark has a time abuse rate. Ozark Electric Co-op for EVs. I know other utilities are looking at that. We're looking at what you charge. Entergy has a proposal to try to flatline the price so the price doesn't move, but it's high enough to cover those costs. But it's a projection based on usage. But you can save a lot of money if you're doing it at night. Of course, if you're, you know, trying to get far away from home, if you're trying to go to the beach or to the to the mountains or to your grandkids, you know, you're going to pull up at whatever time you've got to pull up, you're going to plug in. And if it's 3 or 4 in the morning-- or 3 or 4 in the afternoon on a hot day, you know, you don't get the cost savings. The time variation of electricity is extreme, not every day, but a lot of days. And that has to be accounted for in terms of charging EVs.

L Fite Excuse me, Representative Rye, are you through? All right. All right. Thank you. Mr. Thomas, we appreciate your time here today, and I appreciate you coming.

Thomas Thank you.

L Fite Thank you. Up next, we have John Bethel, director of public affairs with Entergy Arkansas Inc. And John, we're going to ask you yes and no questions. Okay. I appreciate you being here. If you would, state your name for the record and you may proceed.

Bethel Yes, sir. Mr. Chairman, members of the committee, I'm John Bethel. I'm the director of public affairs for Entergy Arkansas. And I appreciate the opportunity to speak to you

today. It's been a long afternoon I know, and I'll try to do my part not to make it unduly longer. And hopefully you will ask me yes and no questions, but we'll, we'll get started. And I want to tell you, Entergy Arkansas and Entergy Corporation support sustainability and we support renewable energy. In fact, we've been acting on providing sustainable options for our customers for over 20 years. In 2000, Entergy was the first U.S. utility to voluntarily reduce its carbon emissions. Entergy was one of only-- is only one of four electric utilities listed on the Dow Jones Sustainability Index, and we are the only company in our sector to be on that list for 19 consecutive years. Our record is strong in this area. Our generation portfolio is recognized as one of the cleanest in the electric utility sector. Today, our customers are reaping the benefits of Entergy Arkansas's efforts. Entergy Arkansas customers have some of the lowest rates in the, in the country. We are the largest solar provider in the state of Arkansas. And our renewable portfolio is expected to continue growing. Just to be clear, the chairman, I think, misspoke because he indicated our interest in investing in solar and providing that to our customers started with the Act 464 in 2019. Actually, we were investing in solar projects well in advance of 2019. We had two projects that were proposed and approved by the Public Service Commission in advance of that. So our efforts began pre-2019 and continue and were not the result of Act 464 because it addresses net metering and it doesn't address utility-scale solar projects. And so our projects and our commitment to that had begun and continues. 70% of the energy consumed in 2021 by our customers was from zero emission resources that would include nuclear, hydro and solar power. And we have partnerships with some of our largest customers to help them achieve their sustainability goals. And those are driven by utility-scale solar, not by net metering for those customers. Our investments in renewable energy, coupled with our existing emissions-free resources, have helped promote and support economic development projects in Arkansas, as well as retaining existing businesses. We have done all of this while maintaining affordable and stable rates for our customers. Our customers also benefit from our investment in a diverse fuel mix for electric generation. Entergy Arkansas has generating resources that include nuclear, coal, natural gas, hydro and solar. The significant investments to build, acquire, operate and maintain these generating facilities are a key element in maintaining safe, reliable, affordable and sustainable power for our customers in Arkansas. Our plan is to continue to maintain a diverse portfolio into the future. Our investments in utility-scale solar, which includes plants that Entergy Arkansas owns, as well as the power we purchase from others, have helped to meet the needs of several economic development prospects. Utility-scale solar facilities provide a cost advantage and are positioned to deliver greater benefits to customers. In general, utility-scale facilities present the potential to deliver the most solar resources to the greatest number of Arkansas customers at the most affordable cost. As we have said clearly for many years now, and to be clear on this, as we support our customers' right to invest in private solar facilities. We're not opposed to customers being able to participate in net metering. For the good of our customers, those pursuing private facilities for their individual financial benefit should pay their fair share of the costs of the utility system that continues to serve them, including cost recoveries through riders and surcharges. We recognize that some customers, including private businesses, school districts and government entities, have opted to invest in private third party solar, solar facilities and may experience some bill savings as a result of those investments. [00:15:51]Specifically, a significant portion of the savings that those customers realize from their existing net metering facilities are driven by the existing net metering structure, rate structure in Arkansas that unfairly provides a large part of their savings at the expense of all of their customers, including many who struggle to pay their bills. [21.9s] These net metering facilities are solely for the purpose of the individual customer that owns them or subscribes to them. And in some cases, the renewable credits associated with those facilities may be sold and do not serve those individuals and only accrue to the benefit of

the third party developer. Those private facilities are designed only to provide all or part of a customer's needs and are not a resource that the utility can use to serve its other customers. The utility doesn't have any control over those resources, where they're-- or where they're located, when and how they operate and when, if any, power is delivered to the utility. Net metering is a billing function for individual customers, and it's not a resource available to the utility to serve other customers. Additionally, because those individual net metering customers rely on Entergy Arkansas to provide them power, and because solar is inherently intermittent and the sun doesn't always shine, we still must ensure adequate resources are available to serve all of our customers, including those who net meter. Further, the Commission has determined that the statute permits a customer to locate a net metering facility wherever they want, and that those facilities can be remotely located from the from where the customer's load actually is. For example, a customer in Little Rock can locate a net metering facility, a solar facility over 50 miles away. In that instance, the net metering facility simply puts power to the electric utility system and is simply a generator sitting in a field. In those instances, the net metering facilities look like miniature versions of a utility-scale solar farm except the cost of those kilowatt hours to our customers is significantly more expensive than any other kilowatt hours generated by the utility or made through wholesale market purchases. And we, and consequently our other customers, have no control over that facility when, when it puts power to our system. Consequently, this unfairly increases the cost to the rest of our customers. Net metering is a billing policy under which the customer owns a qualifying generating facility and in other instances are able to purchase power from a qualifying facility and to supply all or part of their needs. Almost universally, those generating facilities are solar powered. The customers that use the electric produced from their facility to offset the electric energy they purchase from the utility that serves them, such as Entergy Arkansas, their local electric cooperative, SWEPCO, or OG&E. In months when the customer generates more kilowatt hours than they consume, those kilowatt hours flow back to the utility. [00:19:09]And in Arkansas, the customer receives a credit at the full retail rate for those kilowatt hours. Because those customers receive a full retail rate credit for those kilowatt hours, they're not paying the full cost to serve them and are causing other customers to pay those in for infrastructure cost, which causes the cost of electricity for all other customers to be higher. [22.2s] The retail rates of electricity include the cost of generation, transmission and distribution, basically the cost of power plants, poles, wires, vehicles and people required to provide service. Whether the net metering customers are consuming power or putting power back to the utility, the utility is using its system to provide service to those customers. By avoiding paying their fair share of the cost of the utility infrastructure necessary to serve them, the net metering customers are being subsidized by the customers who do not or are not able to participate in net metering. Arkansas has among the most generous net metering policies in the country that provide the greatest benefits to the owners of private third party facilities. In recent years, many states have revised their net metering policies to address the issues that we are facing in Arkansas. The 1 to 1 retail credit is a policy that should not continue, especially in light of other net metering policy features, like allowing meter aggregation, generators to be located remotely, and facilities as large as 20 megawatts. In totality, Arkansas's net metering policy is the most generous in the South and among the most liberal in the United States, far surpassing what is allowed in states like California and New York. From its beginning, net metering was intended as a billing option available to customers who want to consider these private renewable agreements to meet all or part of their electric needs. [00:21:07]We at Entergy support customers who want to pursue that billing opportunity, but not at the expense of other customers having to pay higher bills. As such, it is important to establish rates for those customers installing solar systems beginning on and after January 1, 2023, that ensure that they pay their fair share of the cost of the infrastructure required to serve them.

[24.4s] Entergy and other public utilities in Arkansas have previously submitted information to the Arkansas Public Service Commission, illustrating the significant cost shift that occurs when 1 to 1 retail credit is in place for net metering customers. We've also presented information to the commission that shows how a properly designed grid charge would help recover at least the costs of the distribution grid that serves the net metering customers for which they avoid paying their fair share. The data has been presented to the Public Service Commission and it's been subject to critique and debate by opposing parties. And so the information has been presented. We've documented that there is a cost shift and we've quantified what it is. So importantly, the Commission has also said that it would initiate a proceeding to consider whether certain utility charges should be non bypassable. But it has yet to open that proceeding. Given the more than two years that has passed since the commission said it would take that step, we strongly urge the Commission to follow through and open that proceeding. Similar to the infrastructure costs, customers with private net metering facilities are able to avoid paying their fair share of important initiatives like the energy efficiency programs. [00:22:55]Finally, we support establishing a rate structure for net metering customers that come, that come online after January 1, 2023, that recovers the cost of serving those customers from, from them and to assure, ensure basic fairness for all utility customers in Arkansas. [20.4s] And I can touch a little bit about why we didn't initiate a separate proceeding for a grid charge is, one is the commission's rules under which they-- an order under which they set forward that schedule, that-- those rules and that order are subject to a legal challenge and are, and are under appeal and are still subject to a legal challenge, so that's not been resolved. So we were reluctant to move forward with a case that was on appeal. And also the rule itself was unclear as far as what, what steps were going to be required. And so we were waiting for, for action. And as I mentioned before, we had previously submitted that information to the Commission. On Entergy Arkansas's system alone there are more than 4,000 net metering systems currently connected that account for 64 megawatts of installed capacity. Since the legislative changes implemented in 2019, those numbers have increased exponentially. [00:24:16]In 2019, there were 289 facilities added. In 2020, there were 565 facilities added. In 2021, there were 1,471 systems added. And so far in 2022, there have been 1,326 systems added. [16.8s] As the number of systems and the capacity of those systems continue to grow, the unfair subsidy of customers with private solar generating facilities from customers-- from all other customers grows as well. In addition, the Commission has nearly 80 megawatts of net metering projects that have sought approval or have been approved since the passage of Act 464 in 2019 that may not be included in the numbers above. Additionally, to the extent the owners of these private facilities sell the renewable attributes of those facilities in other states, these facilities may not actually be considered renewable facilities for Arkansas purposes. As I noted before, we are committed to providing safe, reliable, affordable and sustainable power to our customers in Arkansas. Utility-scale solar facilities are a part of our diverse fuel mix that we use to serve our customers and allow us to try to deliver the most renewable power to the largest number of customers in Arkansas at affordable rates. Thank you again for the opportunity to address the committee, and I'm available for questions.

L Fite Senator Johnson, you're recognized.

M Johnson Thank you, Mr. Chairman. Mr. Bethel, thank you for your testimony. It was very informative. And there's a lot of issues that I can see coming up on the horizon that you raised. I'm not really going to jump on any of them today. I do have a question peripheral to that and a similar question as I asked Chairman Thomas. You're familiar with the policy, I guess is the right word, by some, emphasize some, of the electric co-ops in Arkansas to put technical restrictions, including commercial liability insurance on

individuals who put solar panels and solar facilities on, in their home or household, farm, whatever. The excuse or logic for it seem to be that there's some possibility of some backfeed damage or something that could go to the, the equipment owned by the utility. Do you concur that that is a major possibility? Are you aware of lots of cases where-- a significant number of cases where that's happened that would justify either severely limiting that or this level of insurance? What, what is Entergy's view on that? And do you require-- does Entergy require similar type insurance or whatever?

Bethel We don't have a similar insurance requirement. And I know Mr. Hasten is following me on behalf of the electric cooperatives, and he can probably address their insurance requirements much, much more clearly and better than I can, because I'm not really in a position to do that. I can say that safety of the interconnection of the net metering facility and any other facilities that are connected to the electric system is important. And you want to make sure, and that's part of the commission approved interconnection process that we use is to-- and part of that is testing and inspection of that facility by a qualified third party to make sure that it is installed properly, that it doesn't backfeed to the electric utility system in the event of an outage, because that's necessary to protect the safety of our workers who are out working to restore power and to take care of our system. So the system will support that the safety and the integrity of the interconnection process is very important, and that's something that we make sure of as a part of our work with those customers of ours that choose to install those facilities. But as far as the insurance requirements, ours are-- we don't have that on our system. But Mr. Hasten can address that from the co-op perspective.

M Johnson Let me follow up, if I could, Mr. Chairman. I'm one of your customers, and I have a propane backup generator. And sadly, John, out where I live sometimes we have blackouts. It's much, much less than in some areas, but more than we like. And that's a part about being in the country, which is why I have a generator. My generator, I presume, could create the same kind of hazard for back feeding that you were, you were discussing related to solar or whatever. So I like to think that a competent electrician that wires it up right, as we used to say, this should be negligible. And I guess the other part of my question you didn't quite address is, is there some history of problems or significant, I mean, a significant enough number of these kinds of problems that have come from solar installations in Entergy system.

Bethel There, there is a history of of backfeed, of things such as generators and things that propose or--

M Johnson No, I'm talking about solar. I'm talking about installed by these companies who obviously have some liability, I would think, if that occurred.

Bethel From the outset, we established the interconnection requirements for those solar facilities and, again, it was through a PSC approved process. But part of that, again, is to inspect those facilities and make sure that they are safely installed to avoid that. Because we, we, we-- safety is paramount in our industry and we want our employees to go home in the condition in which they showed up for work. And so we strive very hard to practice and engage in safety. And one of those things we do to protect our workers is-- and, and the commission saw the value of that. I don't think anybody disputes the value of making sure that that interconnection is done in a safe way that protects others associated with the system. And so that's our, that's our approach. And it's been been that way from the outset. And that was one of the things from the outset that the Public Service Commission adopted where those interconnection requirements that include the, the safe and the

inspection of those to make sure that they are ready and safely operational before connecting to the system.

M Johnson And, John, that's why a licensed Arkansas electrician wired in my generator and not me. And that's good. That's what we want. But I guess I'm trying to pin you down on this. Have you-- assuming that people follow the law, the code and the interconnection requirement as set forth, has there been any instance outside of that of any real-- is there a real problem out there? How many times has this happened as opposed to, theoretically, of course it could. And we could all think of ways that people could get around the law. But has this been a real significant statistical problem?

Bethel And I'm not aware that it has. And again, as I said before, the reason why is from the outset, those interconnection requirements were there before the net metering systems began to interconnect. That was part of the whole starting process. So fortunately, there's not a history because fortunately we started at the beginning and implemented those requirements. And so I don't know that there's a history of operating-- I don't, I don't believe there is a history of operating net metering facilities without those requirements in place. So I guess that would indicate that those requirements are are effective in terms of--

M Johnson I'm not talking about the requirements. I'm talking about actual incidents of something back feeding since this was put together. Obviously, if you don't follow the code and you don't follow the rules, you can have a problem.

Bethel Right. And I'm not aware that's the case. But that's that's something that the rules require. And we, we require is that that facility be inspected before interconnection.

M Johnson I'm all for that.

Bethel So we can avoid what you're talking about.

M Johnson I'm all for that. If everybody follows the rules, we don't have a problem. I just can't see a million dollars of commercial insurance required when you've had practically no problems, or certainly not problems that couldn't be pinpointed to somebody screwing up, someone that should have a bond or liability insurance on their own. I think I made my point Mr. Chairman.

Bethel Again, I can't comment on that because, you know, that's not an Entergy incident. That would be something for Mr. Hasten to address.

M Johnson Of course. Of course. Thank you, Mr. Bethel. Thank you, Mr. Chairman.

L Fite Okay. Mr. Bethel, we have no more questions. We appreciate your presence here today and your testimony. And thank you very much.

Bethel Thank you, Mr. Chairman. Thank you.

L Fite You're dismissed. Yes. Up next is Buddy Hasten for the president and chief financial officer-- excuse me. I'm reading on the wrong line here. Yes, chief financial officer of Arkansas Electric Co-op. I apologize to you for being so late in getting you to the table. But if you would, please identify yourself for the record, and then you may proceed with any testimony you may have.

Loiacano Hi, I'm Jennifer Loiacano. I'm senior counsel for Arkansas Electric Cooperative. Thank you for allowing us to speak to you today.

Hasten And I'm, and I'm Buddy Hasten. I'm the chief executive officer of Arkansas Electric Cooperative Corporation.

Shields I'm Robert Shields. I'm the senior director of regulatory rates and compliance at Arkansas Electric Cooperative Corporation.

Hasten Good afternoon. It's a pleasure to be here. And we didn't mind waiting. I learned a lot sitting in the back of the room, so. The electric co-ops of Arkansas, just to recap, they're our-- AECC we're the wholesale provider, so we are the G and the T, generation and transmission. We provide wholesale energy to 17 distribution co-ops in the state. Those distribution co-ops are located in 74 of 75 of Arkansas counties. And when you just sort of look at opportunity or who, you know, we serve about 1.2 million Arkansans. And Entergy and the other utilities would serve the rest. And so I kind of look at us as we have-- we're about one third of the population. We provide their electricity, but we're, we're spread out into all 74 of 75 counties. So as far as our approach to power supply, and I know I was asked to testify about sort of the impact of net metering policy on those that don't have it, and we'll get there quickly. But we do we subscribe to a balance of power, and that's kind of been our, our, I guess, our mantra here lately. And so to say that, we do believe in a diverse power supply. So we are not anti-renewable. We're not anti-solar. We believe that having a diverse portfolio helps you in all times. Coal prices are low, you can burn coal. If your gas prices go low, you can transition to gas. There is a certain element of renewables that are low cost energy. But a really smart guy named Robert Bryce has-- and I won't quote him exactly-- but I think this is a fundamental reason we're talking today, too. As he says, electricity is not a commodity. It is a essential service critical to human life. And the issue is today the organized markets and our regulators treat it as a commodity, and it's really not that. And so you got to physically be able to separate a low cost electron from being able to keep the lights on 24 hours a day. And that reliability piece is sort of being left out. And so that's why we've been preaching balance of power. But our balance of power message in no way is anti-renewable, anti-clean energy or anti-sustainable. And then just to address the comments earlier about, I guess, chaining me up. Or maybe it wasn't me, maybe it's a different co-op guy. But I'll wear the suit today since I'm here. I view the government as being in power. And this is a society of laws and we follow the laws. And I believe in the rule of law. And so if a state trooper pulled me over on my way home from this meeting today, I would pull over. No matter how irritated or grouchy I was, I'd presume that state trooper would very calmly and very quietly ask me for my license and registration. Should I give him any guff he would probably reach over to his microphone and quietly call for backup and he would deal with me in a very calm and controlled, I am in control, manner. I believe that the PSC has all the power it needs to do that. I believe the PSC-- and I would echo John Bethel's comments. Although we're different business models, I don't know if I would change anything about his testimony about us. So everything you heard from Mr. Bethel, I wouldn't change a word of that. I'll just add to it. But I do believe we have provided data. But I also believe that the chairman of the PSC has the power invested in him through the state of Arkansas to ask for anything he wants. And we are obligated to provide it and will. So I'll just leave it at that. But the law assumes a cost shift. So to say that there's absolutely no cost shift is probably a fallacy. Me and the chairman have talked many times about that cost shift. So I don't think we're here today to debate whether there is a cost shift. The law prohibits unreasonable cost shift. And so here today, we're probably trying to discern what's an unreasonable cost shift, how much is it? And so I sent you all a presentation and I'm not clicking slides, but I'm

going to kind of walk through it. But, but I think there are really five forms of subsidies that come in through-- that people that participate in net metering enjoy, that people that do not participate in the net metering or solar do not enjoy. One would be the federal incentive, the 30%. Whether any of us in here have solar or not, we pay taxes. If you pay taxes, some of that tax money goes to those federal incentives. So there's 30% of the capital cost of that installation you are paying for. But that's applied everywhere, not just in the state of Arkansas. I think our rate design, the way I think about electric rates is the city was built 80 years ago with all one-way streets. So the electric grid was built 80 years ago and all the streets were one-way. Today we're being asked to modernize that city. And we are. But we're being asked to convert all the streets from one-way to two-way. Right? And so that is essentially what you have to do to allow a net metering account. And to maybe speak to the technical difference, and I did want to answer the Senator's question earlier, a generator is very different than a net metering account, fundamentally and technically. I have a gas generator at my home too. I don't know if I should say that. My bosses are probably listening. But the house came with it, and I didn't tear it out. But if it kicks on, there are fundamental switchings that happened that prevents me from back feeding to the grid. I cannot turn on my generator and feed the grid today and make money off of it. It's only there for my family's use if the power goes out. If I'm a net metering customer, by definition, I have to move power two ways. It has to dump out on the grid. Therefore, it is a fundamentally different machine. And therefore the rules are fundamentally different. From a safety perspective, it's different. And from a ability to damage a system it's different. So I think, I just was going to speak to that just for a moment. But our rate design, these one-way streets in the early days, it didn't really matter what was demand and what was energy because you got it all from us. We split it up in rates to try to make it fair so that people that used more electrons would pay more. But it wasn't an exact science. And it still to this day is not an exact science. And so a lot of the cost of keeping the lights on every day of the year, not just when it's sunny, are baked into the energy charge that goes out. Whether that's right or wrong, I don't know. Whether the rates should fundamentally be fixed, that's probably something for the PSC to discuss. But it is a fact of the economics today. So if I, even if I never over generate, even if I only generate for my own house and I push back on the electric system perfectly so that it's zero, we know that when storm Uri comes, that won't be the case. And when Storm Uri comes, you're going to be cranking on your house and you're going to look to me to fill it with electrons. And that is what you're avoiding. Because if you pay zero electric bill, I still have to have enough horsepower, I still have to have enough power, enough transmission lines, enough transformers to feed everyone in the family when they ask for it. And they're going to ask for it in the dark of night, in the cold of winter when there isn't a ray of sunshine to be found. And that is what drives the cost. That's what drives how big I have to be. I don't want to be any bigger than I have to be. That's why we do integrated resource planning. That's why we do these power studies. That's why we submit data to the PSC to make sure we're not overbuilding and overputting costs. But if you can push back on your energy, then you don't pay your fair share of that. So that's a subsidy. If you get overcompensated for that energy-- I can buy energy from a solar field at 3 cents a kilowatt. I turn around and sell it to my members at about 4.4 cents because my salary, my building, everything is a markup. So there's something called avoided cost. So a distribution co-op CEO can buy an excited electron from me for 4 to 5 cents -- let's say 5 cents. And he turns around and sells it to a retail customer for 10 because he's paying for that whole markup of the distribution system. But now if he's forced to purchase it and it's a nuance to say whether I pay you a dollar or I give you a coupon, they both work the same way, a credit or a dollar. It's a credit on your bill that you don't have to pay. And so the fundamental concept that a distribution co-op is forced to pay double for an energy supply than they would need to pay-- and the concept of pay is they're putting credits on their books, but it's revenue they're not collecting. It's a

nuance, but it's the same thing. And I'm an engineer, not an accountant. So the reality is that is a-- that overcompensation is a subsidy. And then another big one is the time shift of energy use. What sets the size of a net metering system is about how big your home is, but that's set on sort of your basic engineered, here's how much you use. Your time that you're going to overgenerate or make more power than your home uses is going to be in April, May and June and probably into September, October, early November. It's cool. It's relatively mild, humidity's low. You're not burning lots of energy at your home, but your solar arrays are still getting sun and you're stacking up credits on your utilities' books. When you call back for those credits, it's going to be in the dark at night during Storm Uri. Today, if I'm making power for the co-ops, I'm making it at $50 a megawatt. During Storm Uri, I was buying power from SBP at $4,500 a megawatt. So you're putting it on my books when I'm paying $50, but I'm paying it back to you and I'm paying $4,000. That's a time shift of energy that is valuable. The only other way to achieve it without using our accounting system is to buy a battery. Now, if you put on solar panels and you install a battery and you disconnect from the grid, there is no cost shift at all. You are fully independent and I would agree that is a perfect ecosystem of zero cost shift. But nobody does that because it's freakishly expensive and hard to do with today's technology. Maybe someday it'll be easier to do. I'm a, I'm a nuclear power guy. I'm an energy guy. I'm a Jetsons, want my jetpack guy. I can't wait til that day comes. Well, it's not here. And then the fifth subsidy that's probably not in your presentation is taxes. Everybody pays taxes. Every time meters spin, what they pay for me pays taxes and what the people buy from them tax, tax, tax. But none of this is taxable. None of it's taxed. It's all living under the tax. You don't-- there's no tax on any of this energy. So that is a subsidy that a solar user gets that a non participant doesn't. And then why do we get sort of passionate about it so that we're referred to as dogs that need to be put on a leash? The most common scenario for people that can afford to net meter, they do have land, they do own property. And the most likely scenario for people who cannot enjoy these subsidies are people that live in manufactured homes and people that rent their property, and therefore they do not have permission from a landlord, nor would it make any financial sense to spend $80,000 improving your landlord's property. And so for us, being a co-op and looking at every member fairly-- and I do believe we do care about our members, no matter how how we're characterized-- we have fundamentally pushed back on the, I would call it the morality, of having a regressive subsidy where the wealthiest people in our system-- and I love wealth too, and I think everyone should aspire to get as successful as they can in our state as possible-- but to have that payment really coming from the pockets of those that can least afford it because it has to come from somewhere. The power plants I operate have to be there for that dark, cold night and they're not going away and somebody has to pay the bills. And if other people avoid those bills, it sprays out over under the other people. And that's exactly what John told you in much more elegant language. So the-- if you want to compare and contrast, when you talk about the full retail rate, we've advocated for avoided cost. You hear people talk about two channel billing, but avoided cost takes the wholesale price and adds a bit to it. And I think we've advocated for that versus full retail. Arkansas is full retail. California is 2 to 3 cents below full retail. I think California is always used as the canary in a mine shaft for net metering policy. New York is avoided cost. Missouri is avoided cost. Mississippi is avoided cost plus 2.5 cents. Louisiana is avoided cost. Oklahoma is avoided cost. And Tennessee does not have a net metering law. So I think John was very correct to say that we have a very generous policy in our state. If I look at the overcompensation, like I said, it's about 10 cents per kilowatt. If you're paying-- if you're, if you're crediting at full retail, we would say it's about $5.4 cents to credit it at avoided cost right now. And it'd be about 3 cents if at my cost. So the-- when you talk about the concept that the co-ops are not supporting solar, we're converting our city with one-way streets into two-way streets. I would add-- I would enter this into my testimony

today: [00:49:27]Today on co-op wires, we have 3,376 net metering customers. I am one third the size of Entergy. That's the 800 pound gorilla in the room. I'm the little gorilla in the room. Entergy has 2,767. [14.9s] Now, this is data as of the end of 2021. John brought some more recent data that includes this year. We haven't accounted for the eight months of 2022. But little old co-ops that have one third of the citizens of the state have more net metering customers than the largest utility in the state and almost more net metering customers than all of the investor owned utilities combined. So I think we've embraced the technology. We're embracing the challenges of upgrading and modernizing a grid that was built for power to go to homes, and we're trying to deal with it the other way. A more-- a question you asked me was, what is the subsidy? I would tell you that at the wholesale level, because I do not have visibility into my 16 owners. They're independent companies. They have their own CEOs, their own boards of directors. I can speak for AECC and then I can become a good engineer and I can use the law of ratios to get you close. But what I can tell you is that as we measure it, the revenue we're not collecting by having these net metering customers, in 2015, we said it was $195,000. And to Mr. Chairman Thomas's point, probably in the noise. By 2018, that had grown to $940,000, probably still in the noise. By 2019, the year Act 464 went in, it popped up to $3.3 million. In 2020, it's $5.1 [million]. In 2021, it's $8.3 [million]. And these are not additive. These are each year. So it's going up. So you would add all these numbers together to say this has been the total revenue lost. And probably by 2022, using John's math, we'll probably be looking at $10 million and I represent half of the cost. So if you were to just do a ratio to say I'm 5 cents of the problem. The distribution costs add the other 5 cents. What's that total impact? You could probably do something to double it and get close. And so I think that is in general what we would say. That's the impact that has to be made up by the customers that do not have the solar panels. When you look at another piece of our policy in Arkansas, we allow up to 20 megawatts. And as John said, it can be located-- it doesn't have to be near your load. Most states say you can net meter, but your panels and your house and your meter and everything have to be co-located. They have to be on the same piece of property. If you can put it 50 miles away, then you're able to take your product to market using all that copper and transformers along the way and pay nothing for it. That's why there's a co-location law in most states. You can't just put it anywhere and it can't be aggregated. You can't aggregate every meter in the state against a bunch of solar panels somewhere else in the state, because it really, really uses the infrastructure at a much higher level than just a homeowner putting it behind the meter. So if you look at our state, we allow up to 20 megawatts and that is huge. One of my smallest power plants has 20 megawatts. So that's a power plant. That's what, that's what we have up at Elkins. PURPA, the federal government, says I have to mandatorily purchase up to 5 megawatts. So if anybody wants free access to the system, the federal government says, I am obligated to take their power, I have to pay them avoided cost and I have to do that up to 5 megawatts. Beyond 5 megawatts, different rules kick in. But here we allow up to 20 megawatts, which is four times the federal limit. The other states, the highest I can find, was Delaware that allows 2 megawatts. Other than that, California allows 1 megawatt. Hawaii, 100 kilowatt. New York, 2 megawatt. Washington, 100 kilowatt. Louisiana and Oklahoma, 300 megawatts. So to say that you can get these really, really big systems up there, it is, it is, it's a significant way to push a lot more of this a lot faster. And I understand there were rationales and reasons for wanting to diversify and get solar started in the state. And I think I would agree that these policies did that. I've shown that, I think. But the question is, where do you go? Today we have 65 megawatts as of 2021 of capacity of net metering accounts installed on co-op wires. All the other utilities in the state combined, all of the utilities combined, have 63. So the co-ops have more solar energy rolling on our wires than everyone else in the state combined. So if you use my peak load, my summer peak this summer was about 2,600 megawatt. Even if I use the highest we've ever seen during Storm Uri, and I'm just

going to say 3,000, we would say solar penetration at these numbers, we're at 2.5% penetration. That means of my peak load ever, how much of that can solar push against? It's at 2.5% as of the end of 2021. At the current growth rate, we believe it's going to hit 5% in 2024. Mississippi as a, as just a reference, they're next door to us, they capped their solar penetration at 3%. So beyond 3%, that's the cap that you can't put no more in. Today I was doing some Googling while I had time available to me back there. California's penetration is 13 to 16%, depending on which region you're in. And that 13 to 16% resulted in all the alerts that were coming out last night where people were holding on by their fingernails to hope they didn't have to shut off the juice. So what's the right number? Because I've heard that number. I don't know. Most of the states tend to be 3, 5, maybe 5%. And then you shut it off because it should be full mature. If you go beyond that into the realm of Colorado's, if you go into the realms of Texas, if you go into the realms of California, you probably start to see some erosion of these other issues of reliability. And finally, I think the last point for us is, where do these programs end? And I can't find a state in the union, I can't find a nation on the globe, and I was in the Navy 20 years and I've sailed around the world, but I am not aware of a place in the universe that has pushed itself away from diverse power supplies and went all in on renewables where they have a cheaper, more reliable system. Both of those metrics get broken. California's rate for electricity is 23 cents a kilowatt. Ours is 10. This is an area that I would love to be a 49er, low cost, reliable power. It helps Nucor. It'll go help Big River Steel. We're not foolish. We understand the need for sustainability in this and the need to modernize. And I think we're doing that. But I do believe that how we do that matters and who pays for it matters. And that has been the sole issue and why we would probably get caught up in some of the things that we traditionally really have never come out of our quiet, sleepy boroughs for. And so I just appreciate your time today.

L Fite Thank you. Okay. Okay. Senator Stubblefield, you're recognized.

Stubblefield I just have one question. Can you tell me what the typical coal fired plant, how many megawatts they produce versus, let's say, a 2,000 acre solar farm?

Hasten So another data point. I took a lot of notes. I don't want to bore you. We have a solar company as well, so it takes 6 to 8 acres to make 1 megawatt of power. So the gentleman that asked the question earlier, if we replaced a 500 megawatt power plant, coal or gas with solar, that would take 3,000 to 4,000 acres of land. That's just-- it's just-- the density of the sun is only so dense. There's only so much voltaic energy per square foot. So it takes, even with modern solar panels, 6 to 8 acres. I am building a 122 megawatt solar field right now in Woodruff County. Modern technology. Best you can buy. And that property, we purchased 800 acres to build that for 122 megawatts. Because not all of it can have solar panels. You've got to have a fence around it. You've got to have roads to do maintenance. You've got to-- you know, so it can't just all be solar panels. You have to have a facility there. So we took 800 acres of cropland because it was crop land owned by a German agricultural conglomerate that owned land there that we're taking out of commission to use it for power.

Stubblefield And the average coal fired plants produce 600 to 800 megawatt.

Hasten The-- it depends on the age of the plan. In Arkansas, Entergy's plants that we are co-owners with them, White Bluff and Independence,they are each 800. So Independence's 1 is 800. Independence 2 is 800. They're like 830. White Bluff 1, White Bluff 2, they're 800 each. I heard a question asked about China. China is not walking away from coal. China is not reducing emissions. And as you and I sit here right now, China has

33,000 megawatts of coal under construction. They have 946 coal plants in operation, and they are moving toward 1,100. So they'll have 1,100 before their, their build out plan is done. China currently emits more CO2 from coal than all the rest of the world combined, going up hyperbolically. [00:59:28]So to say that that, that Xi Jinping, his energy strategy is, I am not going to let go of my baseload resources until all this other technology is proven to be good. I don't subscribe to the Chinese president's political or social agendas, but I would tell you that his energy policy is spot on. [22.4s]

Stubblefield Thank you.

L Fite Senator Johnson, you're recognized for a question.

M Johnson Thank you, Mr. Chairman. Mr. Hasten, thank you for your testimony. It was very good, and I appreciate it. I don't want to get into the full regulatory thing about how-- you made some great points. I want to concede those to you. I still come back to the thing that I'm looking at when you're talking about your avoided costs or what's retail and what-- all this net metering. Basically, it's a number and that number moves without being-- my wife tells me I use too many rude analogies, but I think you've heard the one about this fellow that asks a lady if she would go to bed with him for $1,000,000. She says, I don't know, maybe. So what about for $1? And she says, What do you think I am? And his answer, Well, we've already negotiated that. Now we're just working on the price. I know this is a lot more complicated than that, and I don't want to get into the numbers part, but I do want to get into the process part because that's what we're really I think working on today. Chairman Thomas and the PSC are-- they, they have the leash because they're the judge. They're the ones that when, I'm gonna say, the consumers-- and a lot of people claim to represent consumers. I think 135 of us actually do. But others claim to say we have some moral authority. But, and then the utilities, both the investor-owned, the member-owned, the communities, they come in and talk to the-- utilities talk to them and then they balance these out. So he should and does have the leash. But the thing I really want to bear down on and ask you and I haven't been able to really get a satisfactory answer yet. And you telling me you're an engineer makes me hopeful that I might actually get it from you.

Hasten I'll try.

M Johnson What is the technical justification for telling these customers, specifically some who are indeed members of a co-op, that when they've made these huge investments in solar equipment, that they can't hook them up without some ridiculously, to me, high insurance requirement. Can you tell me why that is? And why, when others, including Entergy, don't have that, how you can justify that?

Hasten Yeah, I think I can get you to why it's required. I don't know if I can get you to the exact amount or what that insurance costs or who could provide--

M Johnson I won't argue with you over the numbers if we can get close enough on concept.

Hasten But Entergy is a, is a shareholder, stockholder owned company. All their capital is raised that way or through debt service. But it's all, it is all shareholder based. As a cooperative-- and so that's all their capital is coming out of the commercial markets.

M Johnson Well, I understand, but let me clarify my question. I'm not asking about the business model difference between a co-op and an investor-owned utility. I understand that part. I'm asking, as an engineer, the technical difference of why you can justify it. This is about electricity and, and how, how current flows and flows back. How can one seller say we need a $1,000,000 insurance policy to let you do this, and the other seller says we don't need that?

Hasten Yeah. And the fundamental difference, and it does get to business model, which gets to funding streams that we can use, the co-ops have traditionally been able to use USDA funding, so federal government funding. And Chairman Thomas alluded to this in his comments. There is a requirement in the RUS financing that says you have to have an IDR. In your IDR, you need to have an inspection program and insurance. Now, it doesn't specify the dollar amount, but there is a reason why these certain co-ops, because there are U.S. borrowers, they do have the requirement. It's, it's, it's new. The city used to be one-way streets. We're finding our way with two-way streets. I think there's still a lot of discussion on what is reasonable insurance, what the carriers provide. And since most of-- the bigger company in the state is Entergy and they don't have that requirement, then therefore you don't probably have a very mature insurance market that's used to just providing this product. And for products that are less common and more rare, the underwriters probably don't understand the risk profile with it. But it's not zero risk or they'd be giving it away. So what you can say to this-- when you asked the question, What's the probability of this happening? Ask an underwriter. Ask the guy that's insuring your house. I have never suffered a home fire. Yet by law I'm required to carry insurance on my home if I want to get a loan on it. I've never suffered a home fire in my 54 years on the planet. Doesn't seem real probable to me but I'm required to carry insurance. But how much I have to pay for insurance is all driven by underwriters and risk. So whoever's offering these products, they've priced the risk. Not me. I'm not the risk expert. I'm not in the insurance industry, but the products that are put out there, this is what they charge. And I would say they probably charge a lot for industries they don't have a lot of data on. And I would, I would submit that that's probably why some of these rates seem very high compared to a homeowner policy. And I think that's, that's the rub. And trying to figure out what's the right amount of insurance, I think that is probably something that everybody's working through. But I don't think there's an intent to create this, you have to have a billion dollars of insurance so that you can have solar on our, on our, on our co-op wires. And I would just tell you, the numbers speak for themselves. We got more net metering accounts than everybody else individually and darn near everyone else in the state. So I just don't think it's a fair representation to say that we're, we're these horrible people pushing back against solar. My job is not to look to my members and take something out of their hand that they want. My job is to give my members the best education possible so they want the right things, and that's how I approach it.

M Johnson I appreciate your answer. And Mr. Chairman, with that, before I yield back my time, I want to say that I feel like I am like Diogenes. I am still wandering around with that lamp. Maybe in Joint Energy Committee, I'll continue to seek the answer to my questions. Thank you very much. Thank you for your time.

Hasten And thank you. And I probably just wasn't prepared to give you that exact data. But if you asked me again in public, I'll probably have it. Thank you.

L Fite Thank you. We appreciate your testimony today and you are dismissed.

Hasten Thank you very much, sir. You all have a good day.

L Fite Up next is Joe Tucker, vice president of ESCO Processing and Recycling. Joe, I think you should be Job. You're a patient man. ESCO is a well known recycler in the state of Arkansas. And we appreciate you being here today. And if you would, please state your name for the record and, and have an opening statement. Go ahead.

Tucker My name is Joseph Tucker. I'm vice president of business development for ESCO Processing and Recycling. I appreciate the time to be here. I realize it's late and so I have some prepared thoughts, but I'd rather just dispense with them and answer your questions if that's all right with you. I think the gist of what I was going to say is that, you know, solar panels are electronics. And just like televisions, they are considered universal waste, as we heard before. So they are not prohibited from going into the landfill. And we think that's probably all right. But we should also regulate other electronics from staying out of landfill, might be the simple way to solve it.

L Fite Okay, Joe, do you know anybody that is recycling panels in the United States right now?

Tucker Yes, we have-- it's a robust market right now. It is not locally something that's robust. What we hear is that, you know, people are taking-- and we are participating in parts of the market, small sectors of the market, but essentially manufacturing agreements are what is handling on the, on the large scale the, the decommissioning of panels.

L Fite Now is recycling, is it cost prohibitive? I mean, can you-- we heard testimony earlier today about the cost was way more than what was-- you were able to-- minerals and metals-- you were able to get out of it.

Tucker Well, the challenge with recycling anything is that you're talking about basic commodities. You're also talking about products. So we're on sort of the razor's edge in electronics recycling between, is this a microphone or is this a jumble of copper and magnets? Right. So if this is a microphone, maybe somebody wants a microphone. If not, I've got to tear it apart, unscrew it, hit it with a hammer and then put it in separate boxes, which are much less valuable than the original microphone. So, as mixed elemental products, it is difficult to-- it's not quite like paper, cardboard, aluminum. Right. We have to put high inputs of labor or mechanical devices to bear to, to separate them all. So, to say that the recovery of a panel today is going to be the same as what it was five years ago or what it will be 20 years from now is almost impossible without tracking the device market, you know, model by model by model. So that's a long way to say nobody knows exactly what the recovery value of a solar panel will be 10 years from now or 5 years from now. Right. So a lot of the-- in Arizona, we have a partner that specializes in solar decommissioning and recycling, and they are making most of their money from solar panels, not from the recovered commodity value, but from service agreements and actually from, you know, unit redeployment, parts harvesting or aftermarket resale of the units.

L Fite Is this the one that was in the Los Angeles Times, the article?

Tucker I don't believe so.

L Fite Okay. They were in Tucson and they were shipping from California over there. And they were saying they would cost $25 to $30 a panel to recycle them.

Tucker I mean, by the time you take shipping in and, and depending on you parse out which specific model they were talking about recovering from, I'm not going to judge somebody else's statistics on that until it's our crews and our lines that are processing that material. We actually don't focus on it right now. We really focus mostly on data security and data destruction and, you know, data bearing device computing, remarketing and refurbishing. So it is a market we're watching pretty carefully. And we do know that it's going to grow. You know, I think Arizona estimates they're going to be putting online-- they have been putting online about 200 megawatts a year. And by 2030, they think they're going to be taking out of service and into the waste stream approximately that much, maybe more per year. So the cumulative total of deployed panels is going to eventually create a fairly significant waste stream. Now, is that waste stream more problematic than any other uniform universal waste that we already have unregulated? And the answer is no. If we look at these television panels. Right. There's no rule in Arkansas that says I couldn't take a flat screen TV that went out and chuck it in the landfill. And so the recovery of that is something valuable is in there and something, you know, toxic is in there. Both materials are in there, valuable and toxic. And the truth of-- I think most of the truth lies in, in the weeds with electronics, including solar panels, that there is both high value recovery. There is also problematic chemistry in, in electronics.

L Fite Representative Beatty, you're recognized for a question.

Beatty My question, I guess, with the gasification plant that we're working on in South Arkansas in Chico County, are there regulations or would there be a problem with taking these solar panels and running through that gasification process that in turn generates and produces electricity back?

Tucker That's a dangerous question to answer. So I'm going to defer to somebody who knows more about gasification than I do.

Beatty Well, I mean, I was just thinking that there are alternatives that are less expensive than the manual process of disassembling electronics and, and things along those lines. So I just didn't know if that would be a viable process for the disposal of solar panels.

Tucker It could be. It's more likely that that would be a way to, that we would lose some value from the materials in them in that way. So economics is going to drive the recycling of panels, right? Right now, what we see is producers or manufacturers want to recover their own materials because the value of those materials is worth putting the cost into for them directly. What I would caution against is painting all of the devices with a broad brush. So if I say the word 'televisions' when I'm talking about recycling, that's-- you know, you have to think of the history of televisions to say, what problem is recycling handling when it talks about televisions? And I think we will be quickly-- and we already actually are-- in the situation where not all solar panels are the same. So there's thin panel. There's the significant portion I think are still, you know, the crystal and silicon thin wafer. And so the way we handle them is different depending on how we do it. And in tearing them apart, we actually expose some of the most valuable parts of them, the silicon, to contaminants and render it valueless. [01:15:40]So you have to be very careful when we say, is there a problem with solar panels because I think there probably is less of a problem than is perceived. In general, electronics waste-- I'll just get this out there-- we only make up about 2% of the landfill volume. But in electronics themselves accounts for about 80%, between 70 and 80% of the toxic metals. So electronics in the waste stream is a problem. It's admirable to be dealing with it. I don't think that solar panels in and of themselves are more problematic than the other devices we have out there. [47.0s] All right. Thank you.