

Deployment of Renewables to Support Regional Economic Development  
NREL Solar Technical Assistance Working Group  
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Meeting Transcript

*Joyce McLaren:* So this topic today, he's going to be talking about maximizing the economic benefits of solar sort of from a state and local perspective, hopefully. And so I'm not going to – I'll let him do more introduction if he would like to, but I'm just gonna really hand the microphone over to him.

*David Keyser:* Okay, great, thank you, Joyce. This is David Keyser. I'm an economist at NREL. I've been here a few years now. But just to give you a little bit background about myself so that you can understand my perspective a little bit more.

Prior to coming to NREL, I was an economist for the State of Colorado for about six years – a little bit less than six years. And during that time I did quite a bit of work with regional local governments, economic development groups, some stakeholders, quite a bit of work with local.

And Colorado is a really diverse state. We have population centers along front range in places like Denver and Fort Collins, Colorado Springs, along that area. But we also have rural, agricultural communities. We have tourism communities. We have communities that are based on natural resources. We have retirement communities, places that are supported by schools, Federal government, the gamut.

And so I've worked with a lot of different groups and a lot of different agencies. And so that's kind of in forming my perspective. I was in the State Department of Local Affairs, so I was working with Local Affairs. So that's where I'm coming from.

Here's the quick overview of what I wanted to cover today. First of all, just generally speaking, I want to go over a summary about how regional economies work. And this isn't specific to renewables. This is just economies in general, because I think this level of background is really necessary to introduce what I'll be talking about later on when I talk about renewables.

And when I talk about renewables, certainly this is a solar working group. It is applicable to solar, but it's applicable to a lot of different other technologies as well, including wind. And so one that I also want to introduce and talk about towards the end are

additional resources and regional contacts that are in the area where you're operating, who can offer additional help in this area about economic development related to renewables. And then at the end we'll have some time for discussion.

Even though we'll have time for discussion at the end, I would encourage you during this presentation if you do have a comment or a question, please do go ahead and interrupt me. All of you are unmuted on our end. I'm not sure if you're muted on your end or not, that's up to you.

But there are several different ways that you can interrupt me. You can either just start talking, which is perfectly okay, or you can also use the webinar dialogue to either raise your hand or type a question in the chat box.

And Joyce is kind enough to be monitoring the chat box and so if you do ask a question there, she will interrupt me and ask that question. And I actually think that's great, because I apply something that I'm thinking about, things that I want to talk about, but I'd rather talk about things that you're interested in and come up with some examples or talk about things that are really specific to your communities.

And there are a lot of different ways, there are a lot of different directions that that could take I think you'll see in just a minute. That said, I will dive right in.

Was there a question? All right. So there's a lot going on in this first slide. But this is the first thing that I want to introduce. It's how regional economy works, because this really feeds into a lot of the other concepts that I'll be talking about later on in this presentation. And I'll probably come back to this slide later on as well. And Joyce will be sending out a copy of this presentation, so it certainly isn't something you have to memorize. There isn't a quiz at the end.

But what this shows is really kind of a simplified view of what supports the regional economy and how regional economy works. You see who main players on this screen. You see local businesses and you see the local population.

The local population works for businesses. Business give them wages and property income. Property income isn't just people owning property and getting rent, and things like that. Local population could be investors in a business. They can be earning

profits from that business. There's a lot of different ways that a local population could be earning money from businesses.

Then that population will go out and make purchases at those businesses. And that in turn provides further support for those businesses. Those businesses make purchases from each other as well. And that further supports local economic activity.

But you see arrows that are coming out of this big oval. This is areas where money enters an economy and areas where money leaves an economy. And probably the most important one, especially that you can think about from a regional perspective, is the one on the top left, where it says exports and money flows in.

So for example, I live in Denver and I work in the Denver area. If I go out and buy a Chrysler – Chrysler used to have that commercial. I don't know if they still do. I haven't watched TV with commercials in a while. But I don't know if they still have that commercial that says "exported from Detroit." But they used to have that.

So think about that Chrysler being exported from Detroit into the Denver area. And I pay for that Chrysler. I'm spending money to Detroit. I'm supporting a job on an assembly line in Detroit. That person in that assembly line in Detroit goes out and spends money in Detroit. That supports other economic activity in Detroit.

The people who own that business, they're going out and spending money on input that they get from Detroit. And maybe that business has an accounting firm in that area. They're supporting that business, and so all of this starts with that, those exports, with that money coming in.

But money leaves the region too. People buy things that are made in other areas. People go out and buy a TV maybe that's made in China. That's money that's leaving the community. At the same time, businesses import inputs that they use from outside of the region.

Certainly with that Chrysler example that I got, a lot of the components from that are imported from other areas. So that's money leaving the region as well. But at the same time there are other ways for money to come in to a region besides exports.

So for example, if you have a lot of retirees in your community, they're drawing on retirement plans. They're not working there,

but they're still making money and they're still spending money, so that's money coming in.

There's also things like involvement income and businesses that are outside of that region, things like that. So this is just a simplified look at the way that an economy works. The most important thing that you can take away from this though is you need to be thinking about money coming in; you need to be thinking about money coming out; and you need to be thinking about how that circulates within the region, how that population is related to those businesses.

And I'll tie this in with more concretely with renewables and with the other things that I talk about later on. You don't need to memorize this whole thing, but just conceptually speaking. I'll be coming back to this. Before I move on, are there any questions? Okay.

So here are a few of the main implications from that. First of all, a larger, more diverse economy can better capture revenue from those businesses. So for example, if you think about those businesses going out, buying and selling from each other, the impact is gonna be much bigger in a place like California that has a really big economy than some place like Rhode Island that's a lot smaller and a lot more concentrated in manufacturing. Rhode Island is a manufacturing state.

So if you have a bigger economy, you're gonna have more localized spin-off activity from economic activities. The other thing that's important, especially when you think about things like community solar, or community-owned wind, is that if returns on involvement accrue locally, so if you have local investors who are earning money from local projects, it's gonna have a greater local impact. That money is accruing locally to that local population, who can then go out and spend it locally. That's a bigger impact.

The thing to consider is that it's not just about *[tape damage]* what happens in your region. It's about what happens outside of your region too.

You better believe that winds in Brighton and Pueblo care a whole lot about things like wind policy or renewable portfolio standards in surrounding states, and things like that. It's not just about what goes on in Colorado to those manufacturers and to those local economies.

So that matters as well. Remember, is that just because your economy has resources does not mean that developers and customers are gonna use them. So just because you have local solar installers and maybe you incentivize solar for a dollar, water, something like that on rooftops, that doesn't necessarily mean that people are gonna use your local installers.

But I do want to make a note about that, because it seems like a lot of people realize this and the knee-jerk reaction is to do something like what Ontario did. They had a speeding tariff, and with the speeding tariff, they attach local content requirements. And I think somewhat predictably, the World Trade Organization didn't like that very much, to say the least, and basically made Ontario stop.

And there are any number of issues with that. It could potential violate any kind of rules, like interstate commerce laws. So it's not always a good idea. It could increase prices. And if that is something that you want to pursue, *[tape damage]* to talk to a legal counsel first. Any questions before I move on? Okay.

Going back to that other slide, regions are very different too, is another thing. The diversity of local economies, even if you have diversity in one place and diversity in another place, that can mean very different things, just depending on what's located there.

So each economy is gonna be different. And I'll talk more *[tape damage]* major ones and especially one that I worked with in northern Colorado is that if you have a goal, if you have a policy and you want to increase supporting renewables and you're thinking about this as an economic development tool, you have to think about your local economy.

So for example, do you even have the local businesses that can meet the anticipated demand? And maybe you do and that's great and you don't really need to think much beyond that. But maybe you don't. Maybe you don't have the businesses that can meet that local demand, and so this has its own whole set of implications and economic development implications.

So if you do have those local, maybe businesses can drive up there. Maybe businesses can come from out of the area, serve that population, install the PV or distributive winds, or whatever else they're doing, maybe they can do that and drive in.

Or maybe it will cause growth in your area. Maybe you'll have businesses popping up around there, maybe businesses that wanted

solar before. Like maybe you'll have roofers that start installing solar panels.

But then there's a big question around that is where are they going to hire workers? How is that growth gonna happen? Especially in smaller communities, you'll basically have two things happen: You'll either have people commuting in or you'll have empowerment-driven population change.

And there's been a lot of economic studies about this, but generally speaking, people follow jobs. And as jobs grow, the local economy grows. And so if the local economy grows, is that something – I know a lot of you are with local governments that are thinking about fiscal issues – is that growth something that you can accommodate?

One of the things that I worked on in northern Colorado was tied to economic development incentives of businesses. And so, for example, businesses would come in and say, "We want this economic development incentive. We're going to be creating jobs in this region." And then the City would come back to us and say, "Well, they want this amount of money. How much is it gonna cost us for this business to be here and how much is that actually gonna make us?"

And so this is, I think, for local governments, a consideration that's important to make. Some people do, some people don't. It just depends on, I think, really heavily priorities of the citizens in that area. In this case, citizens weren't necessarily pro growth. They were really cautious about it and so that's why they took that approach.

So this is just something to think about that I think isn't immediately intuitive. But it is associated with growth.

I'll go back. Any questions before I move along? I think this is something – getting back to this issue of unique regional considerations – I think this is something that's really ripe for discussion at the end of this presentation. If it is something that you're interested in in talking about, characteristics of your specific region, and how these growth considerations might change with these characteristics, I think that's something that would be really interesting to discuss at the end.

So there are ways to estimate the impacts, especially the job impacts, that are associated with energy development projects, and

that's what I'm gonna focus on for the rest of this presentation, is primarily energy development projects.

And we make it freely available to the public. It's downloadable on the NREL website and it's called the Job Economic Development Impacts Model, or JEDI model.

And JEDI is, just generally speaking, it's a tool that's out there that allows just about anybody – it's very approachable, but at the same time it's very customizable. It allows just about anybody to estimate growth impacts from development of renewables or energy in general, or fuel production.

And you'll see growth is underlined here. I'll get back to what that means later on. It is important. But generally speaking right now, I'll just talk about the JEDI model.

As I mentioned, it is something that's really approachable. It's something that you can know a whole lot about a project, or it's something that you can know just a little bit about a project and come up with some general estimates of impacts.

The neat thing about JEDI is that it was originally developed to fill a hole that – it's \_\_\_ a gap that existed. There were great economic tools to access impact of development in general, but there wasn't anything out there to really look at renewables. And so JEDI came in to estimate these renewables specifically.

As I mentioned, it is free. If you go to our website, you can go to [analysis.nrel.gov/jedi](http://analysis.nrel.gov/jedi) and download the model there. And Joyce will send out that link with the presentation. I neglected to put in this slide, so I apologize.

For the solar PV JEDI, there's an alternative. You can go to [jedi.nrel.gov](http://jedi.nrel.gov), a little bit easier to remember, and there's a web-based version that we're currently updating. I'm not sure what the status is of that, but it's undergoing a little bit of a change.

So we try to make it easy to do. And there are lots of different technologies available, not only solar affordable \_\_\_, but also a lot of other different renewables technologies. You can see a lot of different biofuel technologies, several different types of wind, geothermal. We have a transmission line model. And then also some \_\_\_ model. We have a pulverized coal model and a natural gas model as well. So there's a lot there.

And we'll hopefully have a distributed wind model up in March or April and we'll have a fast paralytic \_\_\_ refinery model. I have to admit I don't know what that is. We'll have that up probably today or tomorrow, so some great things going on in that area.

What JEDI does though, is first build the project in terms of expenditures, and then it takes those expenditures and feeds that into what's called an input/output model to estimate impacts. And I'll get into what an input/output model is in just a moment.

The expenditures for a project, they can either be something that you go out and talk to developers, talk to operators, talk to homeowners, and installers get a really detailed idea about what that is. I know that some places, when they do incentivize things like PV, they'll require developers to report this.

I think Federally there is what's called a Section 1603 program. They require people to do this and so that's great material that we can feed into the model about really detailed results. But at the same time JEDI has a set of default expenditures that are based on us going out and talking to people in the industry, trying to get as good of an idea about what's going on as we can, using that default information in the model.

Some of the models are a little bit more theoretical. For example, the offshore wind model, we don't have utility offshore wind in the United States, so we have to use engineering models to come up with default cost in that area. Same with our conventional hydropower models, since there really hasn't been a whole lot going on in that area in a long time.

So it really varies, but we try to keep it as accurate as possible. And we have done some ex-post analysis going back and looking at things like press releases from sites that we did not consider in the model when we were coming up with cost estimates and looking at how closely job estimates from real-life projects, especially in major technologies like wind, solar, and ethanol, how close they come to JEDI results. And they're very close. That's what we found.

The input/output model right now we use a commercially available model, the In Plan model. You have the ability to enter in your own input/output data though. You're not stuck with that. You can use things like BEA has a \_\_\_ model. Or at least they used to. I'm not sure what the status of that is anymore.



But you can use different input/output models. I mean, we've even fielded inquiries from people in other countries to use these models. But at the local level, you can put in county level data, and we've done that before. You can buy it from other places. I know that In Plan has it. You can buy it from In Plan and come up with really detailed county level estimates or sections of counties with the model. So its default geography is state and national, but you can really dial that down to a much more detailed level of geography.

Any questions before I move on to input/output models? Okay.

I have to explain what these are just to give you an idea about why the results are the way that they are. And I'll talk more about results in just a minute, but this is just kind of an introduction.

Input/output models capture what's going on in an economy at a single point in time and it's a really comprehensive look at this. It looks at a set of sectors in the economy. So these are industries that buy and sell things from each other. They use labor. They take investments. Then you have households that supply labor and they go out and spend money in the economy. You have capital. There's an investment sector of government, both operating in investments. Imports and exports are considered in there. And then a few other things are in there as well.

And everything is represented. It's based on a big matrix. So anything that's consumed by one industry is an input is sold by another industry as an output. So for example, generator manufacturing uses copper as an input. So that generator manufacturer purchases copper from that copper supplier. And that copper that's supplied to the generator manufacturer is an output from that copper supplier.

So by capturing all of these linkages, these models capture all of this feedback within the region that could occur as a result of an expenditure. So going back to – I'm gonna go back to the original slide where I was talking about what goes on in the economy with all of these flows.

You have an expenditure, so you can think about this as maybe an export. So that's the initial expenditure that gets things started. And so the input/output models captures all of these flows, these wages and property income, business purchases from other businesses, local consumer purchases. It captures all of these

flows that occur as a result of that one dollar item that you specify as that export.

So you get all of these spin-off effects, you get all of these spillovers, the ripple effects, whatever you want to call it. You get all of this feedback. Any questions about that before I move on? Okay.

The results generally right now, some models report three results, some of them report four. If you want the most up-to-date version, I encourage you to either go to our website and download model. If it only has the three, please e-mail me and I'll send you a more recent update.

But basically it looks at job earnings output and value added. And value added is basically the same thing as GDP. Jobs in the model are in order full-time equivalent. So full-time equivalent is just the same as one person working full time for a full year. So if someone works six months out of the year full time, that would be half of an SGE.

Earnings are all income from work, so they include the wages and salaries, what you see on your paycheck. But then also the employer provided supplements to wages and salaries, so these are things like retirement, health insurance payments, things like that. So earnings is basically the employer's payroll or income.

The other measure is gross output. Output is just a measure of total economic activity. So if you think about a business that has – it isn't losing money. You can think of gross output as its revenue. So that revenue is the amount of money that business pulls in, and that includes all of the money that it pays for inputs that it uses in the business, and then it also includes what they're paying to their employees, what they're paying in taxes, and what they're paying to investors.

It's not the same as GDP though, because it's including all those inputs. Now, remember, that the input/output models represents in purchase outputs from other industries. And so if you look at gross output as a measure of GDP, you'll be double counting expenditures from other industries.

Value added is gross output minus all of those expenditures. So this is the same as the industry's contribution to GDP. So if you're using JEDI it calculates GDP in your state or local area, you want to look at value added. I think they say GDP and value added, but

I'm not 100 percent sure. The value added is basically the same as GDP. It's one way of calculating GDP. Any questions so far? Comments, concerns?

Okay. JEDI reports three types of impacts as they relate to a project. The first is the very closest to the project, and these are the most localized impacts. If this is a type of economic activity, if these types of businesses are in your region, these are the most localized, these are the people who are actually on site do things. These are the solar PV installers, the roofers, the electricians, the people who are providing retail sales of the equipment for solar.

For other technologies, these might be things like construction, things like that. So this is actual on site. You'll see this in your community.

The next level removed from that are the local revenue. These could be turban. These could be module different supply chain impacts. In solar, these could be things like polysilicon manufacturers if you have that. Most people don't, but it could be module and component manufacturers, again, if you have. Most for people don't for modules, components. I mean, you might have inverters or something like that manufactured locally. There's one of those down the street from where I live.

So that can be some level of manufacturing that's locally. It could also be the things like the people who are making money from – it could be accountants, it could be other type of business-to-business services, legal services, surveying, any number of different things like that. So one step down the supply chain. These could also be consultants, contractors, and that kind of thing.

And then the next step out are induced impacts. And these are impacts that result from these population expenditures that you saw in that flow diagram. So the on site, the supply chain workers, they go out and spend money in the local community and so induce impacts or impacts that rise as a result of those local expenditures.

So these are the basic types of impacts that arise as a result of these projects. And you can also think about this, broadly speaking, also as a type of economic development strategy, because maybe you don't have installers locally, and that's kind of a temporary thing and you don't think that that's something you'll have. But maybe your suburb or something like that, and most of those are located in the more industrial area outside of your town.

But maybe you have a population that's making some money off of that, saving some money on your electricity bills. And maybe they're going out and spending money in the community. So maybe an economic development strategy might be encouraging more of these induced impacts to stay local in your community, encouraging things like doctors and dentists to be local or local shops, things like that. Certainly that's something that we've seen a lot of communities do. I'm sure if you're involved in economic development in your community you've seen that as well. So that might be another strategy.

With JEDI, though, you will see some variability in projects. Fundamentally, these are due to the initial input. It's initial information that you're putting in the model. Those are both the expenditure information and then the amount of it that's actually purchased locally that you specify as purchased locally.

So more expensive projects, those are assuming that you're spending more on labor. They're assuming that you're spending more on input. I mean, that money has to go somewhere. And so as much as that accrues locally, you'll have a higher impact. But that's where that local content comes in.

If people aren't spending money in the community, if you're hiring installers from outside of the community to come in, or importing components, it doesn't really matter whether they're more expensive or not. That money is leaving the community and it's not gonna really affect the project very much.

So expenditures and the amount of that money that's spent locally are the two biggest things that you input into the model that can affect it.

But the other thing is something that's just a part of the input/output models in general, and this is just the size and diversity of the local economy, just like I mentioned before. You can have the exact same project in California and it'll have a bigger impact in the model than that project in a smaller economy, like South Dakota or something like that.

So the size and diversity of the economy is important. Developer preferences are important. And the magnitude and allocation of revenues. So I mentioned this already. Community wind, community solar, those kinds of projects will have a bigger local impact, because the money that's made on those projects after they're paid off is accruing to your local population. That local

population has more money. They can go out and then spend more money in the community, if you can capture that.

And that leads me to some important considerations about interpreting these results. And I'm gonna get back to that whole idea about JEDI results being gross and not net. You can think about JEDI as explaining what a project would need. It tells you how many jobs a project would need to be installed.

What it doesn't tell you are more far-reaching impacts. If you have to change utility rates to fund a big solar project or a big wind project, it's not factoring in impacts from those changes in utility rates. It's not looking at things like property value that might change as a result of this, climate effects, health effects, things like that.

You'll need separate models to look at those kinds of things. And when you get into that, it gets really tricky really fast. So this is just looking at job needs about that.

The other thing is that there are certain changes that models like JEDI can't look at. You can't look at JEDI to look at things like changes in technology or what would happen as a result of taxes or subsidies. Again, it's just looking at those impacts that would be needed by the project.

It also doesn't estimate whether a project is feasible or profitable. So I could tell JEDI that I'm going to install a terawatt of offshore wind in Nebraska, and JEDI will estimate what you would need to install a terawatt of offshore wind in Nebraska. It might not – at the end of the year we're doing some big updates to the offshore model, but if you download it right now, that's what it will do. So it doesn't evaluate whether you can or can't do it, or whether it's profitable or not. It's kind of a dumb animal in that way. But we're making some changes on that. But overall, it doesn't do that. And that feeds nicely into this next point, that we're not responsible for how models is used [*tape damage*] interpreted.

A lot of people e-mail us, call us, sometimes they're irate about somebody else's analysis. They want us to critique it. Sometimes people have their studies and they want us to look over it and sign off on that. That's just something that we don't have the capacity to do. You can always just sign up for a technical assistance thing and we could look at it. Joyce, do you want to say anything about that technical assistance, signing for it?

*Joyce McLaren:* I think all the participants are probably familiar with that, but there is a quick response technical assistance. So if a question is related to solar, that's available for everyone.

*David Keyser:* Right, so if you do have questions about that, you can sign up for that. But it's not something that we normally do. We don't have the time and the funds to respond to everything, especially giving it the rigorous attention that it deserves. So if you do want us to do that, I would encourage you to sign up for the technical assistance fund.

But there are some resources in that area and I'll get into that in just a little bit. So given all those caveats, *[tape damage]* JEDI inform economic development. I think that's an important question. But the thing is that it can describe the scale of the tax and different ways in implementing policies.

And a lot of people are gonna be interested in that, especially local businesses and local stakeholders. If you're doing something that's gonna move the needle in the economy, especially if you're going out and spending a lot of money, those businesses are really gonna be interested who their potential customers are gonna be.

And JEDI describes the timeframe of these as well. It describes them over a construction period and an O&M phase. So these are ongoing jobs, so people can have an idea about, "Okay, these things are one-time jobs," or, "These things are ongoing jobs."

And that's something that sometimes is really difficult to plan for. Out on the western slip of Colorado, for example, during the boom, there was a lot of energy development out there, a lot of oil and gas drilling. And now you see really big hotels out there. That boom is gone and those hotels are just sitting there.

So if you have something where you can get an idea about one-time vs. ongoing, that will really help out the local community planners. They'll help out local businesses to understand what it is that they're in for.

The other thing about this is that, yes, JEDI impacts are gross. But there has been research, and this research – I'll give you a couple caveats \_\_\_\_ in just a second. But this research does show that at the county level is what they looked at. The order magnitude of impacts that JEDI says will happen are very close to what we see actually happening in counties. And was found in a study conducted by the USDA.

Jason Brown was the primary author on that, although I will say that there were people from NREL involved in this project doing the JEDI modeling and other national labs involved in that as well. But it as an econometric analysis, so they used a statistical study. you go through and look at this. But there certainly are *[tape damage]* that others have taken with this study, because the study only looked at counties for land base when it was installed, not counties outside of that.

And remember, all of these economies are linked, and so there could potential be negative impacts from this land-based wind that wouldn't be included in the study, because they were felt in counties that didn't have that wind. So that's certainly something to consider.

But and it's also important to remember that just because that's what this study found still doesn't change what it is the JEDI is saying. It's not saying that they're next effects. Well, what they study does say is that, hey, these gross spec's kind of what we saw in these counties.

The other important thing about this is that the methodology used by a JEDI is input analysis. Input/output analysis is used all the time by economic developers. It seems like I'm always opening up a newspaper to see a study that says, "The value of this industry is such and such." It just seems like somebody does one of these every month.

Oil and gas does them all the time. Here in Colorado we have the brewing industry. They do it all the time. Other industries in Colorado that I'm not gonna go into to do this kind of thing.

*[Crosstalk]*

*Joyce McLaren:* Thank you.

*David Keyser:* NREL does it. So you see these all the time from economic development groups. Is there question? Okay. So that leads me into this next section. They're really, really resources nationwide through wind energy resource centers. And I no this is a solar technical assistance group.

But these money are \_\_\_ resource centers. They are funded by the Department of Energy Wind Exchange, Wind Program. But some of them will provide technical assistance for solar as well. And if

they don't, they may be able to put you in contact with people who do.

And they'll have a lot more localized knowledge than we will. And their mission, what they do and the reason they're funded, is to provide assistance in this area. And some of that is economic development assistance.

So if you are interested in learning more about this, I encourage you to participate in the discussion at the end and I encourage you to reach out to these folks and maybe see if you can pick their brains, see what they say. I don't know if there's someone.

*Joyce McLaren:* There are two on the line that I know of. Maybe we can open it up to them \_\_\_\_\_.

*[Crosstalk]*

*David Keyser:* Yeah, would anyone who's involved – I have some contacts in the next slide for all these sections. I'll go back to this macro really quickly though and just – would anyone from these energy resource centers like to say anything here? Do you have any additional comments or anything that you'd like to add or plug?

Well, I will just say then that these are great resources and these are staffed by really great people who are willing to help out with these things.

*[Crosstalk]*

*Joyce McLaren:* \_\_\_\_\_.

*David Keyser:* This resource contact slide has contacts for each region. Or you could just Google wind exchange regional resource centers and that'll take you to this web link at the bottom. Or you could click on this link. And there are actually far more contacts than what are on this slide for each region, including phone numbers and things like that if that's your preference.

So these folks are great. They are funded by the Department of Energy. I think NREL funds them too, so they are fantastic resources.

So that said, we have some time. We have a lot of time for a discussion. And I don't want to lead the discussion. I think it's best for you all to have some questions or comments or things that



are relevant to you. I know that when I was talking about this earlier I said that these impacts are really gonna change quite a bit and these considerations are go change quite a bit. There are a lot of moving parts, especially when you get down at the very local level in economics.

And so I think I would really encourage you if this is something that you are interested in to ask questions or give some details about your local economy, some things that your population is thinking about, some things that maybe some folks in your communities are thinking about.

Maybe other people haven't heard or maybe haven't thought about – or questions about that that you would like answered. This is your opportunity. I think that would be valuable.

*Joyce McLaren:* And I just want to add that Megan from one of the resource centers from Utah, the Utah Clean Energy, was trying to speak up but apparently wasn't able to get through, 'cause she's just listening on her computer, but encourages everyone to contact her. And I will send out her e-mail address. She said to check out the four corners research center website at [fourcornerswind.org](http://fourcornerswind.org).

*David Keyser:* Right. And all these centers have website. Again, you can go to this link that's at the bottom of that page or just good wind exchange, regional resource centers, and they'll take you to the individual pages for each of these regions with a lot more contacts.

*Joyce McLaren:* So is there anybody else that has questions or comments that can't get through, please just send a chat or write in the questions box and I'll see if I can get you unmuted. And if not I'll read out your question.

*David Keyser:* Folks should be unmuted, right? They can just talk.

*Joyce McLaren:* I believe they can unmute themselves.

*David Keyser:* Well, let me ask this. I haven't been privy to a lot of these meetings in this group, but I do feel that a lot of questions from people around the country I answer the JEDI support at [NREL.gov](mailto:NREL.gov) e-mail address and it seems like this is something that's of interest in some areas.

Maybe it's something that city council is interested in, if they are talking about a resource. So maybe an interesting topic of discussion would be how might your region use this kind of

information. Is this something that would be useful? And if it useful, what could we do to make it more useful or how might it be used? Maybe share some ideas about that.

*[Silence from [0:43:26 to 0:43:57]*

*Joyce McLaren:* So I have a question for you, actually. So if you're a state decision maker, how might you use JEDI, or any of this information that you just presented, to create policies or to make suggestions to maximize the impact of solar in general, not just of one particular project? Can you use it in order to understand what are the factors that would maximize the benefit to your state? Was that clear?

*David Keyser:* That's a good question. I don't hear anything, so I'm going to jump in with an example. Maybe I'm just chatty.

As I mentioned, I used to work for the State of Colorado, but I also worked with local communities. But I was still employed by the state. And in Colorado about 90 percent of the state's population lives in basically one area along the front range and then the remaining ten percent are scattered everywhere else.

And that remaining ten percent tends to be, shall I say, feisty? *[Laughs]* Very vocal. There was some talk a while back about our state being split into two. So there are a lot of division there. And when you think about majority elections, majority votes, a lot of it comes down to what happens in the urban dense corridor in Colorado.

And a lot of people outside of that corridor feel really neglected, because there isn't a whole lot of communication that's going on and they have a hard time understanding the reason for policies that are enacted at the state level. And when policies are enacted at the state level, they kind of feel left out in how those policies are implemented.

So you could use something like this to come up with a better idea about workforce needs that might be associated with a project. Most regional areas in the state have workforce centers that you could work with. I know that RF funds put together a lot of those workforce centers and give people a lot better in those communities, how they could go through those workforce centers and maximize the impact from these projects.

And that's something that could be done at a state level that's really good at communicating to people who are at a local level to

support state initiatives and support things that the State is doing without seeming draconian. That's something that we would have done in Colorado with some of these things, although obviously we didn't do a great job of it or a complete job of it, let me say.

But that's one way that you could use something like that, or it's just an idea.

*Joyce McLaren:*

So a follow-on question that I have would be say that you use the model to come up with an estimate and you're communicating those at an early stage to potential stakeholders and a portion of your state.

Some people are pretty wary about models and the outputs of models. So have you ever come across that instance where you're using this to explain some of the benefits and people say, "Oh, it's just numbers and we don't believe you."

How would you deal with that wariness of modeling?

*David Keyser:*

Oh, yeah, so you should be wary of models. That's a good thing. That's a really good thing. You always should be wary of models. And a lot of people are wary of *[tape damage]*. We're not backing salesmen, but maybe close.

And going into communities and talking about this, I think this is really kind of a community-based approach. And this isn't just about renewables energy. This is about economics in general and helping people understand how their communities work, because everything is gonna be different.

For example, there is a town in the mountains that my office worked with that was building a lot of second homes and growing really fast. But then it was finding that it couldn't support its services being provided by government.

And we went in there and we were using one of the models that we had that's kind of similar to an input/output model – t's not exactly the same – just to look at what was driving that economy and then after, what was driving that economy. How does that relate to the money that's coming in to the government? And by the way, you can estimate that with JEDI too. But broadly speaking, how that's coming into the government.

And what we ended up finding is that it was relying on a mix of property tax and sales tax that was a little bit too reliant on sales

tax and sales tax was something that you have to collect when people are out there and spending money which is a problem when you're at second homes.

And so the school town had to go in there and figure that out. So they had a choice of putting a moratorium on these second-home developments, because it was physically not sustainable and that was certainly in line with I think the attitude of the local population who lived there year round or coming up with a different way to rely, have the government rely on a mix of property tax and sales tax.

So that's an example of using a similar model in a local community where you really drill down and tailor it to a question that that community had and the specific issue that that community is facing. But it's really hard to answer that question when you're talking about economies in general, because there are so many different moving parts and so many different variables, even at the state level.

I'll give another example: Back in the 1990s – well, I won't go with that example. Never mind.

*Joyce McLaren:* [Laughs] So is there any way to apply this information as you're just lining a policy? So if you're just [tape damage] community \_\_\_\_ policy, for instance. Is there a way to use some of this information to design a better policy, a more impactful policy? Or is it really most applicable when you are communicating with stakeholders about the benefits of perhaps a policy you've already established and is leaving the project.

*David Keyser:* I would tread lightly on using this for policy just because what is policy? There can be so many different types of policies. Some of them you could kind of come up with gross impacts. Again, remember, these are gross impacts that come out of JEDI, not necessarily net. And some policies that are – JEDI results would not be relevant to.

So I think the best use of it, if I had a choice between using it for as kind of a generic any kind of policy – some policies it might be useful to help out; it just depends on what priorities and what the policy is – but I think it's always gonna be a good tool for communicating with stakeholders.

And people are gonna come up with other questions about it inevitably. And it's a good thing to get the conversation started.

*Joyce McLaren:* Does anybody else on the line have any questions or comments?

*David Keyser:* All right, then.

*Joyce McLaren:* All right. Well, thanks so much for joining us, David, and I'll send out the slides as well as a few more e-mail addresses and links from today. And feel free to contact either me or David directly if you have any questions that come up later.

*David Keyser:* Great.

*Joyce McLaren:* Thanks so much for joining us.

*David Keyser:* Thanks, everyone.

*Joyce McLaren:* Thanks, everybody.

*[End of Audio]*