U.S. EPA
State Climate and Energy Technical Forum
The Emissions & Generation Resource Integrated Database (eGRID): Potential Uses for State and Local Governments

Moderator: Robyn De Young
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Operator:	Ladies and gentlemen, this is the operator. Today's conference is scheduled to begin momentarily. Until that time, your lines will again be placed on music hold. Thank you for your patience.
	Good afternoon. My name is (Misty), and I will be your conference operator today.
	At this time, I would like to welcome everyone to the U.S. EPA State and Local Climate and Energy Technical Forum Conference Call.
	All lines have been placed on mute to prevent any background noise. If you should need any assistance during the call, please press star then zero and an operator will come back online to assist you.
	Thank you.
	Ms. Robyn DeYoung, you may begin your conference.
Robyn DeYoung:	Thank you very much. This is Robyn DeYoung from EPA. And I want to thank everyone for joining us today for the EPA's Joint State and Local Energy Technical Forum on EPA's eGRID, the Emissions and Generation Resource Integrated Database.
	And before I get started, I'd like to turn it over to our facilitator, Catherine Morris, for instructions.
Catherine Morris:	Thank you, Robyn. This is Catherine Morris with the Keystone Center. I'll be facilitating the q-and-a sessions of this Webinar. It's our monthly State Climate and Energy Tech Forum.

I wanted to just remind those of you who may not have participated before – on the State Tech Forum we use Go To Webinar technology, and it allows you to interact with our speakers by typing in questions to the question box. So I would ask you that as our speakers proceed through their presentations, if a question should occur to you, please type it in. You've obviously noted that you're muted, so this is the way that gives you an opportunity to find out how their experience or – relates to what you're doing, and maybe ask more specific questions about their presentations.

What I would ask you to do is wait until – we won't actually get to your questions until the end of each speaker's presentation. So at that time – we often are not able to get to all of the questions. We'll hold off some of them until we get to the very end of both speakers, and then we'll have about 15 minutes of discussion.

One of the first questions we always get is, "Where can I get the presentation materials?" Please – and I'll type this into the chat box so you have the address – but if you haven't already downloaded the materials, they can be found at www.epatechforum.org. And I will again type that into the chat box so you have that access and you can get that information. You can download the presentations now or after our – after our – after we close out the Webinar.

I think that should have everybody in good shape to start with our presentations, Robyn.

Robyn DeYoung: OK, great. So, before we start off, just a little mention about eGRID and its importance, and why we decided to talk about eGRID for this Tech Forum today – eGRID is maintained by EPA, and it is a globally recognized source for emissions data for the electric power sector in the United States. Both state and local governments could use this information found in eGRID to achieve clean energy, climate and air quality objectives such as developing a greenhouse gas inventory of indirect emissions from electricity purchases to estimating avoided greenhouse gas emissions, criteria air pollutants and mercury emissions as a result of clean energy policies and programs.

So for our presentation today, Art Diem from EPA will walk through the wealth of information found in eGRID. And then I will show how state and local governments have applied eGRID to analyze the emission impacts of a state energy efficiency resource standard, a regional greenhouse gas inventory and a local energy efficiency program.

So now I'll transition into introducing our first speaker, Art Diem.

Art has been with EPA for 10 years. And he currently works in the U.S. EPA Clean Air Markets Division. He's been managing the eGRID database since 2006. Prior to his tenure at EPA, Art worked at the New Jersey Department of Environmental Protection Air Program, serving in a regulation development capacity. Art earned a bachelor's of engineering degree from Stephens Institute of Technology in Hoboken, New Jersey.

Go ahead, Art.

Art Diem: All right. Thanks, Robyn.

[slide 2] Good afternoon and good morning, ladies and gentlemen. I'll be going through details about eGRID – basically a database of power plants, emissions, generation, and resource mix. We've stitched together a bunch of information from many sources from EPA to EIA. And a lot of this information is very difficult to put together. So we'll go through a bunch of details and go through a walkthrough.

[slide 3] OK. So, we've got three related tools. First – the eGRID database. We have data for emission years 1996 through 2000, 2004, 2005 and 2007. Those are the only years of data we have published in eGRID. Although, a lot of the source data does exist for these missing years, but they're not put together.

eGRIDweb – that's something we have put together recently that's an online application that lets you go through the data without having to slog through the spreadsheets

Power Profiler –is an online application that lets you find your eGRID subregion. Basically, you enter a zip code, pick a utility that serves that zip code, and then the application will display the eGRID subregion, emissions information and resource mix for your area of the country, and let you do a few extra things as well.

[slide 4] So eGRID began in 1998. It was developed by Rick Morgan. E.H. Pechan & Associates has been the contractor doing the leg work for all the years of eGRID; We put eGRIDweb online in 2009 – a much needed user interface to help improve accessibility. And Power Profiler began back in 2003 and was updated a bunch of times.

[slide 5] So, talking more about the data sources that go into eGRID – we get our information from the Clean Air Market Division and from EIA.

From the Clean Air Market Division, we've got about 1,500 plants that submit hourly data to EPA. And for eGRID, we sum all this up to the ozone season, for just NOx and heat input, and for an annual period for everything else. Most of this information is based on continuous emission monitors or CEMs; although some of the information reported is gathered from other measured and monitoring devices – for example oil and gas fuel flow – measured fuel characteristics – and for certain low-emitting units, the default emission rates are used in there.

So we also get a vast amount of information from EIA. We've got about 5,200 plants in the current edition of eGRID. These include all the additional plants that don't report to CAMD – all the non emitting plants, and all the plants that are too small to fit into these regulatory programs. And all this is surveyed information. There's no specification on how the information is gathered, collected, measured, compiled or reported. It's just basically surveys to EIA. But it's very extensive on the electric power sector.

So, for plants that we don't have Clean Air Market Division data, we use EPA emission factors based off of their fuel and reported control devices, et cetera. We have all this documented in excruciating detail in the eGRID Technical Support Document, and I advise looking at that for more details.

[slide 6] Basically, the data is set up in three different spreadsheets. This is the current year. Actually, the first one should say "plant" instead of "aggregation" there. So, basically, we have plant level detail – at the plant, boiler and generator. We have an aggregation sheet that has all the other files. And then we have this other state import-export file as well.

We've got a lot of PDF documents – again, I mention our Technical Support Document. There's a lot of data in the summary PDF on there. So, if the spreadsheets are a little intimidating, a lot of useful information is on the summary data – not at the plant level, but at some of the other levels of information. Our eGRID subregion greenhouse gas emission reads are in a one-pager. And we have our representational maps of some of the grid boundaries.

I mentioned our user friendly application, eGRIDweb. Right now, that still only contains the 2004 and 2005 data. We hope to get 2007 data uploaded sometime.

I just want to note – this is something that trips up a lot of people – the name of the eGRID edition, eGRID 2010 – the 2010 is referring to the set point of the industry structure. We update company information and all kinds of mergers and buying of power plants. So we have the industry structure current up through 2010, even though the emissions and generation year is 2007, in this case.

[slide 7] All right, jumping into the data elements – we have a bunch of, plant identification and location information. We have a county centroid flag for the lat-long coordinates that are based on a county centroid. For some plants, we have actual coordinates. Other plants, we don't. For the ones we don't, we'll use a county centroid.

The owner and operator information is very useful. There's one operator at each plant and up to 16 owners, any of which may or may not be the operator. We give percentages of ownership as well. So – that's an interesting feature. Plant capacity and other plant information are shown.

[slide 8] We have some flags about whether it's a combined heat and power plant. If it is CHP, we have some further information on that. Whether it burns any biomass or landfill methane or pumped storage facilities – we have those flags. We have a flag if it burns any coal. Then, of course, a key part is the emissions information.

All the data years have NOx, SO2 and CO2. We added mercury in 1998, added methane and nitrous oxide, the other greenhouse gases from combustion, in 2005; for 2007 – this most recent edition – we did the math for the CO2 equivalent. And also we took out the mercury data because the basis for that was very old and isn't as accurate as it used to be.

We have all the information that is based on the emissions associated with electricity generation. So we do some adjustments of emissions. So, we also explicitly have unadjusted emissions listed there. For example, CHP plants – we've split up the emissions between electricity and useful thermal output. And the electricity is, you know, the main number that we have. But – in some other fields, we show what the total emissions of the plant as well. And that's the unadjusted emissions.

[slide 9] Of course, we have net generation and heat input. Net generation can be negative. Basically, if a facility uses more electricity than it produces, they'll have a negative net generation. And in that case, you'll see some negative output emission rates. So, if you see that, initially, it won't make sense, but that's only in cases when the net generation of the plant is less than zero – or it's negative.

The input emission rates – heat input is always positive, so you'll never see a negative heat input emission rate. The combustion output emission rates are useful for plants that are, like, for maybe part nuclear, part coal. And so you'll see the output emission rates for them just on the combustion part as well.

[slide 10] We have resource mix. Basically, we put the generation by resource type together. We have that in megawatt hours and percent.

And we have eGRID plant sequence number – that's useful when trying to link plant information from different years. Sometimes the plant names change. Sometimes, even the ORIS plant code will change. It shouldn't, but in rare cases it does. So, we have this field to help link the plants between different years.

[slide 11] On our unit-level data, we have a little bit of boiler-level data that's mostly emissions and heat input. We'll have some generator-level data. Those two are not linked together. It's very difficult to link those together on a unit specific basis. So we link them together basically starting at the plant level.

So, if you go into the boiler level or generator level data, those aren't necessarily going to add up to what the total facility is, just because sometimes we don't have unit specific data and we have to use prime mover level data.

Then, on the other side of the plant level, we'll take plants and we'll bunch them all together. So we'll take, you know, all the plants, to make a U.S. total. Any plant that's located in each state – we'll basically aggregate those together at a state level. We do aggregations at three different grid region levels. And I'll talk about that in a second. Also we do company-level aggregations – company – be it an electric generating company, or EGC, both at the operator and ownership level of each of the plants. And then we also look at parent companies, too. We spend a lot of research on what the parent companies are.

[slide 12] So when I talk about the different grid levels, in the continental U.S., there are three interconnections. Basically, in each of these interconnections, all the electric generators are synchronized with each other. And basically it's kind of difficult or expensive to transmit power outside of those synchronized interconnections.

So we have the eastern grid, the western grid and ERCOT. There are some AC-DC ties between them that allow a little bit of power to go. But generally, electricity can pretty much freely move only within each of these interconnections.

[slide 13] So the first grid level that we use in eGRID is NERC region level – NERC is the North American Reliability Corporation, formerly Council. They oversee the reliability requirements for each area of the country. And so basically these are the NERC regions. They are established by NERC. And we aggregate plant-level data up to the N.E.R.C. region in eGRID.

[slide 14] We've developed eGRID subregions. These are subsets of the NERC regions, except for ERCOT and the Florida area.

[slide 15] And one level below that – these are the power control areas – also sometimes known as balancing authorities. This is the level at which load, or demand, is balanced with generation – that is the level at which power is dispatched. So each of these power control areas can meet demand within its area by dispatching generators from within its control, or calling on imports available from neighboring power control areas. So this is – this is where the dispatch level happens.

This is a rather old map. The new PCAs are not quite the list here, but it's OK. It gives you an idea of what those are.

[slide 16] So within the aggregation level data, we have many of the plant fields. Plus, we have input and output emission rates gathered on fossil, coal, oil and gas plants. And so basically we look at a plant's primary fuel. If it's oil, we're going to put it in this plant in the oil category. The plant may burn a little bit of gas, too, but we're throwing all of that plant's information in the oil category. And also – in the aggregation levels, we have non-baseload output emission rates. Basically, these are a refinement of fossil fuel output emission rates that people were using when they were trying to figure out a good estimate of what happens when you reduce the demand for grid supplied electricity.

We go into detail about how we put this together in the Technical Support Document. But, basically, we take out the non-combustion units within that region, look at the capacity factor of different plants as a surrogate of dispatch. It's basically akin to a deep marginal emission rate.

[slide 17] So about the emissions in eGRID – we're not including any lifecycle emissions – extraction, processing or transportation fuels – just what's going up the stack. The actual values within the eGRID database do not include transmission distribution line losses. They're generation based, so they're looking at the generators within that area, and not accounting for imports and exports into and out of a particular area.

And if you want to account for line losses for things like – say, "OK, I used a certain amount of consumption. What does that mean as far as generation is concerned?" – we have gross grid loss factors and we added them most recently to the summary tables. And – here's an equation to get from consumption to generation for that.

[slide 18] Here's the illustration of the CO2 equivalent output emission rates and pounds per megawatt hours. So we get all the plants, look at all the greenhouse gas emissions, all the generation in each of these areas, and do the math. So you can see the values range very greatly. And that's due to fuel mix. If there's a lot of non-combustion resources going on, like in the Pacific Northwest, you're going to have a lot lower CO2 output emission rate.

This is the eGRID subregion level. This is the level in which we try to strike a balance between areas that are way too big – so if you consume electricity in an area – we're trying to characterize the indirect emissions from that. You don't want to pick the U.S. total. That's a little bit too big. There's a lot of generation that really isn't affected by what you're doing in a particular area of the country. And we don't want to pick an aggregation level that's too small, where you're ignoring a lot of importing and exporting. So this is the aggregation level where we try to strike that balance.

[slide 19] OK, so new this year in eGRID – we have some new generation-based plant primary fuel category. For example, if you had a facility last year, in the last edition, that was part nuclear, part coal, we're looking at plant primary fuel based on heat input. Nuclear has no heat input. So that was listed as a coal facility even though the nuclear part may be generating a lot more. So we added a new plant fuel category based off of generation.

We are more explicit about the biomass adjustment that takes place. Basically, for biomass, we adjust the CO_2 emissions down to zero on the premise that had the electricity not been generated from the combustion of this biomass, the biomass would have otherwise decomposed into greenhouse gases anyway, and it's a net zero there. That's been a policy – an adjustment in eGRID since pretty much the beginning. Before, this adjustment was still embedded even in the "unadjusted" emissions. The year 2007 data is the first year where the biomass emissions are better shown in the "unadjusted emissions."

We did a refinement of the coal flag and we added the CO_2 equivalent. So we did the math for you on that.

[slide 20] Let's see – we added a lot of lat-long coordinates for a bunch of plants. The new electric generating company type – it's either going to be nonutility or investor owned utility, federal, state, political) subdivision, a muni, a municipal marketing authority, or co-op. And we're using a lot more CAMD data than we used to. We used to use just the acid rain program data. Now we're using a lot more.

[slide 21] As far as uses and users – here's eGRID and Power Profiler in the center. The circles close to those are a lot of EPA tools that use the eGRID data from EnergyStar Portfolio Manager, Climate Leaders protocols, Personal Greenhouse Gas Calculator, Greenhouse Gas Equivalency Calculator – a lot of stuff out there. But beyond EPA, the big use of this is for carbon footprinting, greenhouse gas registries and inventories, including the Executive Order 13514, which requires federal facilities to prepare GHG inventories.

So we have a lot of NGO, academic, and consultant research on this. A lot of state and local governments use the information for various purposes. Environmental disclosure, certificate tracking systems use eGRID. It's also used as an emissions component for detailed dispatch models. There's a lot of uses. I probably not even aware of everything that it's being used for, but it's a really rich data set used for a lot of things.

[slide 22] So pointing to the primary use that I'm seeing out there for inventories and for estimating emission reductions from clean energy projects – I definitely recommend reading this paper here. We recommend using the eGRID subregion level output emission rates. If you want to include the transmission distribution losses, please go ahead and do so if you want. And if you're looking at carbon footprinting or inventories, we recommend using the total output emission rates. And if you're doing avoided emission calculations, we recommend the non-baseload rates. And that's the short of that paper.

[slide 23] So what's next? We're already starting on the next edition of eGRID, with 2009 data. We're going to skip over year 2008. We have the data. We're moving forward. And pending any budget problems, we should get it out within a year or so, I think. And the eGRIDweb application – I really want to update that with year 2007 data – the current data. But right now, there's a lot of budget uncertainties. So I don't know when that's going to happen.

[slide 24] OK. I can go through a very brief walkthrough of a few things.

[www.epa.gov/egrid] OK, here is the eGRID web page – all the files are here on the bottom. If you pull this first file here, that's everything. And if you want to selectively pull pieces of the data here, you can go ahead and do that. We have a link to the eGRIDweb application. We have a "frequently asked questions" – definitely recommend looking there or the Technical Support Document.

We have the archived edition of eGRID. This is where the 1996 through 2000 data is located. But, back on the homepage, this file will give you the 2004, 2005 and 2007 data. We have a feedback page. If there's things you like about eGRID, if you want to tell us how you're using it, if there are things that you don't like, if you have questions, if you just want to sign up to get updates – please use this. I'm definitely looking for, good examples of people using eGRID, and good feedback on its use – that you like to see it; you find it a valuable resource. If that's the case, feel free to send that in.

So back to the homepage – we have the quick links here. Here is the "all files." Here is our greenhouse gas output emission rate page; so that has the information on a – on a subregion level – that's your one-pager. We have the summary tables here. This is about 12 tables of summary information at aggregated levels. And here's the paper I referred to, as well as the Technical Support Document.

Now, when you look at the spreadsheets – like I mentioned, there are three basic spreadsheets here. There's a plant, aggregation and a state import-export file. They might be a little intimidating at first for those who aren't used to big spreadsheets. But we have a table of contents here. I definitely recommend looking in that.

Here is the plant file. [eGRID2010V1_0_year07_PLANT.xls] And you can go through it. And – you can filter a lot of the different fields. So if you just want to look at all the plants within Alabama, you can do that. You can come over here and say, "Oh, I want to see just the combined heat and power plants." You can do that. So, you know, there are lots of ways to look through the data here. But it is a lot of data. It goes out to column FF– It's hard to see a plant all at once.

So that's why we created the eGRIDweb application. [http://cfpub.epa.gov/egridweb/] Like I said, it only has the 2004, 2005 data. But you can toggle between the two. If you want to look at a power plant, you can view the data. You can look at the emissions generation resource mix; other characteristics – ownership, the different boilers that might be there, and the different generators.

So there's lots of really great filters here. One thing that you can filter here, at the plant level, is you can filter on company level – parent company data – and this is really hard to in the spreadsheet – and you say, "OK, I want to know all the plants that are owned by a certain company." And a lot of these are front companies, too. So, for example we've taken all the AES nonutility plants and put them all together.

OK. Let me go back here to the eGRID page. Let's go to the Power Profiler site really quickly.

[ww.epa.gov/powerprofiler] From the Power Profiler site, you just put in your zip code, pick a utility that serves that zip code, and it'll give you the eGRID subregion information for there – the fuel mix and emissions and compare to the U.S. Total. The eGRID subregion information is in blue and the U.S. average is in green. And then you can go and look at your emissions and put some consumption information, and it will give you the emissions there.

[http://experience.sap.com/experience/html/Pages/egrid/] Another really interesting site that a company out there did – a company, SAP, has an interesting platform where they can take lots of information and kind of let you slice and dice it. And they basically came and took the eGRID data and put it up in a pretty user-friendly format. So here you can look at state-level data. You have the resource mix here – emissions – renewable versus non-renewable.

And so you could look at the different states, look at what's going on in the different subregions, and also at the NERC region level. It also has a more detailed reporting function. So you can go in and look at plant-level data – any of the aggregation level data and really slice and dice it very quickly and easily. And this should be up – they said they're going to put the 2007 data within the next week or so.

I think that's just about it.

So I'll open it up to questions right now.

Catherine Morris: Well, we have quite a few – a couple just clarification questions regarding some terminology. Control areas – you talked about that as one of the regions that you can find the eGRID data aggregated. Is that the same as the RTO/ISO level of data? Is it like me pulling – or excuse me – ISO New England or PJM?

Art Diem: In a lot of cases, the power control areas are ISOs or RTOs; but in some cases, the – in parts of the country, don't have ISOs, so to speak. But, you know, those are the areas where electricity dispatch going on.

Catherine Morris: "So are the carbon emissions data in the – in eGRID – based on fuel type – calculation based on fuel type? Or are the based on CEM data?"

Art Diem: Where we have CEM data, we use it, and we'll use that first. If we don't have CEM data or we don't have the data submitted to CAMD, then we'll take the EIA fuel use and use the greenhouse gas emission factors per the U.S. greenhouse gas inventory that's using the IPCC methodology. That's what we'll base it off of, fuel use, if we don't have the emissions report to us directly.

Catherine Morris: "How does EPA recommend handling emissions for a customer who is connected to the grid but has – also has a power purchase agreement or power coming from an on-site distributed generator or EGC?"

Art Diem: Yes, the eGRID emission factors are basically for generic power. If you have a source of electricity that you know of, and you know it's specifically coming from here, if you're directly connected to a certain plant, you can use that. If you have, on-site solar panels, you can basically call that zero emissions. So, basically, in the absence of better information, eGRID shows you how to value generic grid supplied electricity.

Catherine Morris: The question is how – what advice you might have or "How could you use the eGRID system when your look – when you need to have data on plants that are added – newly added to the system?'

So you have new power plants coming into the system. That obviously isn't being captured on the most recent data in eGRID. What – how would you advise the states that are trying to do analysis, say, on complying with the Transport Rule, and need that kind of information?

Art Diem: There are two places to go to – If there is a new plant that's reporting to CAMD, you can pull the hourly emissions data from the CAMD Website –

that's epa.gov/airmarkets, and just go to data and maps on there. If it's a facility that's not reporting there, then you'll need to go to the EIA data and pull from the source data – the EIA-860 and EIA-923 forms. So that will get you – as most recently as they have reported there. That's probably some good places to start, although it won't be stitched together like it is in eGRID. You'll have to put the pieces together yourself.

Catherine Morris: Somewhat related question is, "When would it be useful for somebody who needs the data to actually go directly to the utility or electricity distribution company to get more customized emission rates?

Art Diem: Well, anyone has the option of doing that, if they feel that that's more advantageous – if that is a more accurate representation. That's something we can't do in eGRID because we don't have access to all the wholesale power transactions that take place. A lot of those are very difficult to get, and it would be hard to do the calculation even if we had them.

So if you have more specific information from your utility, you know, look at whatever greenhouse gas protocols you're using. See if that's an option for you. I think, in most cases, the eGRID information is a default. If you have better information, and it accounts for the utility's entire portfolio including self-generation, imports and exports to meet customer demand, then go ahead and use that information.

Catherine Morris: "Does the Power Profiler use total output or non-baseload output for its calculation?" In other words, is it better for footprinting or for avoided emission?

Art Diem: It uses the total.

Art Diem: OK, so – yes, we use the total output emission rates for Power Profiler – that's more like an inventory context than an avoided emission rate information.

Catherine Morris: OK.

One – two more very quick questions – "Does eGRID go to a monthly characterization of emissions?"

Art Diem: No, for NOx, we have ozone season, which is May 1st through September 30th; but that's as detailed as we get as far as a timeline, otherwise it's annual emissions.

Catherine Morris: And one more – "Are the spreadsheets that are on the Website – the eGRID Website – are those downloadable?"

Art Diem: Yes, they are. The eGRID Website, which has the new data, basically – you know, I showed that. That's epa.gov/egrid – grab the zip file, and zipped in there are all the spreadsheets. If you go to the eGRIDweb application, which has the 2004 and 2005 data, you can select whatever you want and then you can export and print those as well.

Catherine Morris: OK. Well, we do have some more questions, but I'm going to hold on to those until after Robyn has finished her presentation, and we might have a chance to come back to them.

Art Diem: Thank you.

Oh, yes – let me introduce Robyn.

OK.

Robyn DeYoung: OK, great. Thanks, Art.

(inaudible) everybody can hear me.

So, my name's Robyn DeYoung. I work in the State and Local Climate and Energy Program. I started at EPA in January 2010. And I work with state and local governments, helping them with technical assistance and quantifying greenhouse gas emissions – criteria air pollutant emissions for different projects. Before joining the U.S. EPA I worked at Ohio EPA in the air division where I developed an emission offset program for New Source Review permitting. I also provided climate change policy analysis and kick started our greenhouse gas inventory development while working for the state.

So, today, I'm going to talk about two different examples and really touch on how state and local governments have used eGRID for specific analysis.

So, first, I'll discuss how EPA has helped New Mexico estimate the energy and emissions impact of an adopted energy efficiency resource standard. Then, I'll show you how the Delaware Valley Regional Planning Commission has quantified their greenhouse gas emissions related to their electricity consumption for their regional greenhouse gas emissions inventory, as well as their electricity reduction, from their LED change-out program.

So, right now, at EPA, we're focusing our resources to help state and local governments incorporate energy efficiency and renewable energy policies and programs into their state implementation plans. And a while back, New Mexico expressed interest in learning how to do this, particularly for the upcoming Ozone Air Quality Standards, expected to be finalized this summer.

So EPA staff from region six and headquarters in the Office of Air and Radiation – we all came together to start providing technical assistance to New Mexico. And one of the first steps in the process is to estimate the potential magnitude of emission reduction that they could account for in their forthcoming ozone SIP.

I should note that it's unclear which areas in New Mexico, if any, will be designated nonattainment for the new ozone standard until the rule is finalized. So this effort is really just to help New Mexico be prepared prior to final rule promulgation.

We've been analyzing multiple energy efficiency and renewable energy policies and programs with New Mexico. But, for today, I'm going to focus on New Mexico's Energy Efficiency Resource Standard. And in 2008, New Mexico adopted the Efficiency Use of Energy Act, where, in House Bill 305, it requires investor owned utilities to achieve a 10 percent reduction from 2005 total retail electricity sales by 2020.

It's always important to refer directly to the Energy Efficiency Resource Standard statute, and any regulations that came out of that. And that helped us

start putting together the pieces to estimate the energy impacts from the law. And we highly recommend, in all cases, to getting in touch with your public regulatory commission at the state level if there are any uncertainties or nuances within the law, and to ensure that you have correct assumptions. And it's good to build those relationships.

So the next slide is how we estimated the energy impacts of New Mexico's Energy Efficiency Resource Standard – I'm going to do a tiered approach on how you would estimate the energy impacts.

So first we identified the affected entities. And it's important to know which utilities are subject to the rule. And in this case, based on the last slide and the rule – how the rule is read – investor owned utilities were the affected – there are normally three main categories. There are the investor owned utilities, municipal utilities or cooperative utilities.

Next, we identified the investor owned utilities that were located within the state. And these are the three investor owned utilities that we found. This information could be found from the Public Regulatory Commission and the Energy Information Administration; and eGRID has that information as well.

For step two, we identified the base year for which the law refers to. And this will be the baseline year we obtain total retail electricity sales. So 2005 is that base year. And then that moves us to the next step, step three, from 2005, we obtained the electricity sales for each of the investor owned utilities, which you can see directly below each of the utility names. And the total utility sales in 2005 from these three investor owned utilities was 12.9 million megawatt hours.

And I provided a source here, on the left-hand side, where you can easily do a look-up for on EIA's website, in the tables.

Then the last step is really just easy math, where you take 10 percent of the total retail sales in 2005 and estimate the savings we should expect in 2020, which is 1.29 million megawatt hours. So basically we took the rule and the statute, and then we applied how it's applicable – and we came up with the

estimated energy impact – or state – electricity savings that we should see in 2020.

So now that we have the electricity savings resulting from the Energy Efficiency Resource Standard, the next step was to obtain emissions and plant information from eGRID. And what we found is, as we mine through eGRID – is that there can be multiple plants generating electricity for each investor owned utility. And what I really liked about eGRID is that it's very easy to drill down from the operator-owner level all the way to the unit level – at the (boiler) level.

So for this analysis, we looked at all of the plants that were connected to the investor wned utilities – and which eGRID subregion they were in. And we found that every plant associated with these IOUs generate electricity in the eGRID subregion AZNM

And there is one plant, Luna Energy Facility, who is not in this subregion, but just for simplification purposes, we were only estimating the magnitude of emission reductions. We were just going to use one subregion for now.

OK. So these are the two different quantification approaches that I'll go through. The first is eGRID's subregion, using the AZNM average non-baseload emissions rate. And you'll notice that we're using the average non-baseload emissions rate in this analysis because this rate more closely coincides with the power plants that would most likely reduce generation from the EERS policy, as Art mentioned earlier – just hitting that point home.

This is just an illustration to show you which subregion we're looking at for this analysis. Next slide is just a summary of the non-baseload output emission rate. And a little bit more detail about what non-baseload emission rates represent – it's the generation from all plants within this region that most likely would change generation as electricity demand changes in the region.

And what it'll omit is that it does not have emissions from plants that generally operate at all hours of the day, because the operating costs are low and plants are not suitable for responding to demand fluctuations. And those types of plants are generally called baseload plants.

And I also wanted to mention, on a side note, that you can actually see a pretty huge difference between the NOx emission rates and the CO2 emission rates. So I thought that was interesting.

OK, next slide - now we're getting into the actual equation that we would use. We have all of the data. We have the electricity sales saved from the EERS. We have the eGRID emissions rate, after we look through all the plant data. And we also, in eGRID, have a gridloss factor. So you multiply those together. I supplied the units that you would use in this equation. And then I have an example here of how you would get NOx emissions.

So for the New Mexico EERS, in 2020, we estimated that 705 tons of NOx emissions would be avoided as a result of this energy efficiency policy. And then, on this slide, is a table that shows how much emission – total emissions would be avoided from the New Mexico Energy Efficiency Resource Standard in 2020. And you can see these are annual numbers.

So if you think about it, if you added up each year of savings from the beginning of the policy implementation to 2020, you'd even see more savings if you did it on a cumulative level – or a cumulative basis.

And here I've listed some benefits and limitations to using the eGRID approach – the average non-baseload emission rate approach. You can see here it's very easy, back-of-the-envelope type estimate. The non-baseload output emission rates reflect the plants that would most likely get displaced in the eGRID region.

It is important to note that not all the New Mexico plants are included. You can't really do anything – in terms of future-looking. We don't know what types of plants will be online or retired in 2020. So it is a static analysis. It doesn't show where the (EGUs) would be displaced, which would be important when we do go deeper for the (SIP) implementation. And we assume the New Mexico policy will affect all non-baseload plants equally.

OK. So now let's get into the other approach, which is an eGRID plant-level data using capacity factors. And this is a little more of a rigorous analysis, compared to the first example.

So a capacity factor is an indicator for how likely a plant is to be displaced from an energy efficiency or a renewable energy policy. And basically what it is, is the ratio for how much a power plant generates within a given timeframe, compared to the maximum continuous generation capacity within that same timeframe.

And what eGRID does is it assigns annual capacity factors for each power plant, and it is also possible to calculate the capacity factors during the ozone season. You'd have to do that offline. But the information is there, in eGRID, to do it. So you could have two different capacity factors – ozone season versus non-ozone season –that's especially important if we're looking at how New Mexico could use this information to decide with the ozone standard.

And then, below, are two contrasting examples to help illustrate this concept a little bit better. So if an EGU or a power plant had the high capacity factor – for example, above 80 percent – then that could mean that this plant is operating at least 80 percent of its maximum capacity. And it's pretty safe to say this type of plant is a baseload plant, where it won't fluctuate generation in response to changes in demand.

And then, on the other hand – or the other end of the spectrum – you also have EGUs or power plants with low capacity factors, below 20 percent, let's say. And that means that this generator is generating much less than its maximum capacity. And it is pretty safe to say, on this side, that it is one of the first generators to be displaced in response to lower demand on the electric system.

So now that you guys have a better understanding of what a capacity factor is, we have this capacity factor rule of thumb. And then I've applied it to the plants that we identified as the ones that are affected by the Energy Efficiency Resource Standard.

So on the left-hand is a sample curve for relating generation displacement to capacity factor. On the X-axis is the capacity factor and on the Y-axis is the

percentage of a plant's generation that could be displaced. And so you see that linear relationship.

And then, on the right-hand side, are the plants associated with the investor owned utilities, like I said. And I'd lined them up based on their capacity factor – their annual capacity factor that I found in eGRID.

And so this rule of thumb is an indicator to determine how much emissions could be displaced from each of these plants. And so based on this rule of thumb, you could say the plants in the – in the blue section could be 100 percent displaced, based on – as a result of the Energy Efficiency Resource Standard.

And then the plants in the purple section could be – would be displaced in a using a linear relationship to the capacity factor. And the displace-ability is shown on the graph on the left. And then, even though the San Juan plant isn't up to 80 percent capacity factor, we could say, that plant has the highest capacity factor, so most likely that wouldn't be displaced. All the other plants would be displaced before that.

It's really important to note that this is just for explanatory purposes only, and that a complete capacity factor analysis would include all plants within the multiple power control areas to properly capture the policy impact within this electric grid. So this is a very simplified approach, just to explain how the capacity factor could be used.

And so what our next step will be with New Mexico is that we'll be looking at a wider analysis of all the plants within the entire AZNM eGRID subregions. And that would be, getting closer to a more complete analysis.

So I don't have any emissions here to show you. I just wanted to give you a feel for the capacity factor approach.

And then I list out of – a couple of different benefits and limitations of the capacity factor approach, using eGRID. For example, emissions could be assigned to each power plant after you get all the capacity factors lined up. So you would figure out how much generation – or how much savings would

happen. You know, the 1.2 million megawatt hours of savings – and then you'd start assigning the amount of savings to each of the different plants. And then you could figure out how much emissions would be reduced for each plant.

It's relatively easy to calculate this, it just takes a little time to set up the infrastructure. But, after that, it's fairly easy. This is still considered a simplified approach, assuming that the power plants have the same capacity factor throughout the year. And then I said you could also get an ozone season versus non-ozone season capacity factor – For the disadvantages this approach does not account for maintenance or outages. Exported power is not considered here, which can be important, depending on the area you're looking at.

And also important to note – it assumes all energy savings or generation affects all the (peaking) units first, and it doesn't affect any of the baseload generation. And sometimes that's not true, if you're just looking at lighting programs or wind power, for example. So those are important factors to keep in mind when you're doing this approach. It is simplified, and there are some limitations.

OK. Now, I'm going to switch gears to a local example of using eGRID. And the Delaware Valley Regional Planning Commission's Office of Energy and Climate Change Initiatives – they coordinate efforts to reduce energy consumption and greenhouse gas emissions in their regions. And right now, they're supporting a goal to reduce regional greenhouse gas emissions 50 percent by 2035.

So first I'll go over how they quantified the electricity consumption for their greenhouse gas emissions inventory, and then I'll move into the LED change-out program.

So another eGRID subregion map that shows the area of analysis this time around – we're looking at the RFC East subregion. And on the lower right-hand side – you can see the total average emission rate that we – that we're

using. And so extensive analysis – oh, another note is that this analysis was for 2005 inventory. These are the 2005 greenhouse gas emission rates.

And we're using the total average emission rates so that we can capture emissions from all the power plants within the region. This is an inventory. And again everything falls within one region, so it's a pretty clean approach.

So to calculate the indirect emissions from electricity consumption, what DVRPC did is that they used the – these following equations for each greenhouse gas. And so for this approach, you'd get CO2, methane and nitrous oxide emissions separately. You'd multiply the electricity consumption times the average eGRID subregion emission rate, and you get your emissions for 2005.

Alternatively –But, alternatively, if you want to do it yourself, you could calculate the CO2 equivalent of the greenhouse gas inventory. And sometimes this might be easier for a community to communicate the impacts of their inventory. Then you only have one number – you only have one greenhouse gas emissions number. But you'll have to do some additional steps on the front end.

So the general approach would be to apply – to multiply the emissions rate times – sometimes you need an energy conversion factor. And then you would multiply by a global warming potential. And I have the units here in the equation. I also have some helpful conversions. And on this next slide, I give you the details of exactly how this would be applied.

So to get the net emissions rate – you know, CO2 emissions rate – that doesn't change. We're keeping that the same. And then for the methane and nitrous oxide, you can see here, for example, for methane, you have the 30.3 pounds per gigawatt hour – is their emissions rate. And if you want to turn that into megawatt hours, you need this conversion factor. And then you multiply 21, which is the global warming potential. And you get the CO2 equivalent emissions rate by doing that for methane. And then you'd apply the same method for nitrous oxide.

And then after you get the equivalent emission rates for methane and nitrous oxide, then you add the CO2 emissions rate with the methane emissions rate and the nitrous oxide emissions rate. I applied the gridloss factor here. So it's one over one, minus the gridloss factor – to capture that (dynamic). And in total, we have 1,224 pounds of CO2 equivalent per megawatt hour. So there's your net emissions rate.

And then after you get that, you would calculate the total regional greenhouse gas emissions from electricity consumption and the DVRPC found, through their analysis, that there is about 54,000 gigawatt hours of electricity consumed in their nine county region. And – you go through the calculations and you get 30.1 million metric tons of CO2 that are attributed to their region's electricity consumption. That would be inputted into their inventory.

So that's how DVRPC did their greenhouse gas calculations. And then, lastly, we have a LED change-out program. And DVRPC estimated the CO2 savings from a region-wide LED program as a part of their application for an EPA Climate Showcase Communities Grant in the summer of 2010.

And so since this is a rough estimate of projected savings, a simplified approach was a good approach. And they just used CO2 emissions, and they didn't account for gridloss factors. So, you know, if you're estimating things, you don't have to cross all your T's and dot all your I's.

And here is what they thought would happen. Their goal is to change out 10,000 incandescent traffic lights for LEDs. And they've projected to save 3,000 megawatt hours annually. They used the non-baseload CO2 factor because this is changing emissions, changing demand. And is how they estimated their CO2 emissions. And you can see the calculation below.

So that's all I have on the different programs. And for the next technical forum, we are actually going to have a three part series that is going to take different pieces of the – "Assessing the Multiple Benefits of Clean Energy" resource that EPA put out in February of 2010.

And so the first Webinar is going to talk a little bit more about – and how the electrical grid works and a little bit more sophistication on how to get energy

impacts from clean energy policies – how to figure that out. Then the next Webinar we're planning, we'll look at more complex emissions quantification methodologies as a result of clean energy policies or programs. So we'll do some more displaced emissions approaches. And then in the third Webinar series, we'll show quantification methodologies or estimations of the economic benefits of clean energy policies and programs. So we'll touch on how to estimate jobs being saved or gained, money saved or avoided from these policies.

And so we're hoping that, looking at all these different benefits will help you in making the case for your clean energy policies and programs.

We also have a survey at the end of this Webinar. And it would be really helpful if you could answer those questions. And that will help inform us in getting the information that you really want and need in this next series.

Here is my contact information. And I want to thank everyone again for participating today. And I think we're ready for any additional questions.

Catherine Morris: OK, Robyn. We have quite a few.

And I forwarded some for you to look over. But in the meantime, let me ask some of the questions that are coming in. A number of them are asking about how to make the determination about whether – when you would use the baseload emissions factors versus the non-baseload emission rates.

One gentleman has actually provided this very lengthy and specific example. But, for instance, on the case study that you provided here, where you are looking at the LED lights and the reductions coming from that – can you explain a little more the rationale behind why you did not use the baseload or you don't think it affects baseload emissions?

Robyn DeYoung: Yes, that's a good question. I – the reason why there was – we used the non-baseload emission rates is because it's more likely that the change in lighting will affect non-baseload generators.

Catherine Morris: So it's – you know, there – the reductions aren't so continuous over all hours that baseload plants would be affected?

Art Diem: Yes. This is Art.

Yes, basically, the – you have a choice of the total output emission rate, which is the whole system mix. And in that system mix, there are some – you know, there's a certain amount of baseload generation. There's generation that's happening –no matter what kind of variations in electricity load are happening. There is a minimum amount of load out there that's happening. All those generators are operating.

And pretty much the rationale, I presume, is that these changes in efficiency – this new efficiency – is going to affect more of the non-baseload facilities and less of these baseload facilities. And that's why things got weighted that way. And that's how the non-baseload emission rate in eGRID is set up – as basically a deep marginal emission rate – looking at what's happening at the margin. And it's basically – any nuclear plants that are – that are running are going to keep on putting their output, no matter what's happening, on the demand side.

Robyn DeYoung: And also, the LED change out program is just such a small amount of change compared to the total electricity consumption. So the efficiency project wouldn't go deep enough to affect any of the baseload plants.

Catherine Morris: Thanks for that.

Another question was whether or not the data is available at a county level. You gave an example in this last local area – and, again, someone in our participant group is apparently in that area and said it – that's basically the greater Philadelphia area – your last example?

Robyn DeYoung: Right.

Catherine Morris: Well, some of the other participants are wondering if it – if you can break it down to the county level if need be.

Art Diem: Well, I mean, you can start with consumption that's taking place at anywhere – a particular building, a group of buildings, a city, a county, a state. And one thing that we recommend is, just because you use, energy in a county, doesn't mean that all the electricity is coming from there. So that's, again, for the quick-and-dirty estimates– why we recommend going to the eGRID subregion level of your county. So if you don't know your eGRID subregion, go ahead and use Power Profiler, put in a zip code and pick a utility. And you'll find out what your eGRID subregion is.

Catherine Morris: OK, thank you.

Another question asks whether or not there – you have some advice about one of the limitations you mentioned. You mentioned that you can't, even with the capacity factor approach, necessarily assume that some of that power that we're – isn't exported out of the region.

One of the participants wonders that, for instance, even after you've implemented an energy efficiency program and you have savings from that, "How do you know that that power isn't, then, going to be exported to, or provided to, a municipal government contract or something else?"

So is there any advice you have about how to control for those types of limitations?

Art Diem: These are estimates, and there are some limitations there. If you want to really get into the details, there are a lot more complicated ways of putting this together. There are dispatch models that will account for things like that. So, short of doing some really expensive analysis, this is kind of a – an easier and cheaper way of doing it that gets you, hopefully, to a pretty close answer – or answer that as close to what you would have gotten if you spent a lot more resources on a more rigorous analysis.

Catherine Morris: Art, I have a question that goes back to some of your presentation materials.

One was – you noted that there were gaps in the data. In other words, you aren't covering every single year. You have some years that you've skipped. Can you just explain why?

Art Diem:	I can explain – year 2006, EIA didn't collect some data, and it made it really difficult for us to actually do anything with it. So we had 2007 data ready to go. And I made the decision that it's better to go with the more recent year of data and start working on that, than to fret over year 2006 data, which was missing a whole bunch of information from EIA. So I kind of made the decision to go ahead on that.
	I think for the years 2001, 2002 and 2003 – that was before my tenure with eGRID. I understand there were some data issues that happened. I'm not exactly sure why those years didn't happen. But if you're really looking at some detailed plan information, you can go ahead to the CAMD Website and the EIA site. And if you're only looking at a few plants, you might be able to filter out what you need from there.
Catherine Morris:	OK.
	Another participant is having problems separating the combined cycle generation from the boiler generation, and would like to know if you have advice on how to handle that through the eGRID data.
Art Diem:	Yes, yes. There is – a combined cycle system is where there is generally, a combustion turbine and a heat recovery steam generator and an additional steam turbine. So those are reported different ways in EPA, in CAMD, and also in EIA. I think EIA will generally, from combined cycle systems, they'll have information on the prime-mover level – prime-mover fuel level in the 906/920.
	I think combined cycle systems – they'll have CC as the code for the combustion turbine part of the combined cycle. And CA is the steam generation that happens there. And so they'll list the different prime movers. So – and that's where – that's where it gets really tricky with eGRID – is when we're trying to combine the information from different data sets together and try to match them up.
	And sometimes we see some mismatches, so we thought, "OK, are those really the same unit, or do they have different prime movers listed, are there

two units? Are they the same unit?" So, yes, it does get very tricky. And I guess, check the prime-mover codes. And if you need help navigating the CAMD data, feel free to give me a call or send me an email and I might be able to help you identify what kind of prime movers there are for the different units in CAMD program.

Robyn DeYoung: OK, Catherine. I can answer the question from (David Alloway).

Catherine Morris: OK. Well, David's asking about a particular kind of situation. He says, "Consider a case where a municipal utility has a different – specifically, a lower – greenhouse gas generation mix than the – their eGRID subregion. Say, for instance, they were getting more of their power from hydro. Using the eGRID subregion greenhouse gas rate doesn't really acknowledge the utility's decision to purchase from lower greenhouse gases. But using the utility specific greenhouse gas rate would send a potentially misleading message that their electricity purchases are low carbon and we don't need to reduce use.   So do you have advice for us how to move forward? Do you use both the sum average – what approach?"

Robyn DeYoung: Yes, so one way that this community could move forward is –if you have utility calculated data for a specific plant, and their purchases, then you can use that to show –what the greenhouse gas impact is from your purchases and generation in your community, for your municipal power plant.

Most communities don't have that type of information and they don't have resources to get that. So that's when we recommend using information in eGRID –that's the time where you would use the eGRID subregion emissions rate. You could even compare the emissions from the two approaches to show how a municipal generation resource is cleaner than the region's average.

And in terms of the perception of not needing to reduce your electricity consumption because you have low carbon generation – there are a number of different benefits that I think would resonate with communities to get them to change their behavior and be more efficient in their energy use. You could talk about lowering your electricity bills if you use less electricity. You're

also avoiding cost of new generation that could come down the line in the future.

And we – even have in our – assessing the multiple benefits of clean energy resource. We talk about how certain clean energy policies can save or create jobs. So that's another factor that could be communicated. So those are some ways that can help answer this question.

Catherine Morris: Thank you very much. Well, we're at the end of the hour and we're also just about out of questions. We've covered most of the questions.

And I just want to remind people that the contact information for both Art and Robyn has been posted on the Website that also has their presentation materials. So if you have specific questions, they've agreed to – I think we have both their phone number and their email so that you can get in touch with them directly, and they'll be happy to follow up with you.

So with that, we're going to close this session. And just to reminder – that you will receive the survey questions at the end. If you can just take – there's only a few short questions. It won't take you more than five minutes. So if – it would be very helpful in planning the next three sessions that are going to be on multiple benefits, and we'd appreciate your input.

Thanks very much. And we'll talk to you again next month.

Operator: This concludes today's U.S. EPA State and Local Climate and Energy Technical Forum Conference Call. You may now disconnect.

<center>END</center>