

**EPA**

**Moderator: Julia Miller**  
**October 11, 2012**  
**2:00 p.m. ET**

Julia Miller: Hi. This is Julia Miller from EPA State Climate and Energy Program. Thank you for joining us for today's webinar on Estimating the Health Impacts of Climate Change and Clean Energy Programs.

For the purposes of today's webinar, when we talk about climate change programs, we mean the clean energy programs that reduce greenhouse gas emissions which include energy efficiency, renewable energy and combined heat and power. These programs reduce criteria pollutants which, in turn, directly enhance air quality, improve public health and help people avoid expensive illnesses and sick days that can affect their spending, productivity and quality of life.

On the webinar today, we're going to take a look at three different tools that EPA offers to help state and local governments calculate the health impact and the related economic value of programs that reduce these criteria air pollutants, such as energy efficiency, renewable and clean transportation programs. Generally, today, the order of the presentations will go from the most basic tool to the most sophisticated tool.

We're going to start with Julie Wang Hawkins from EPA's Office of Transportation and Air Quality. She is going to give us an overview of the Diesel Emissions Quantifier tool. Then, we're going to switch to Denise Mulholland. She is with EPA's State Climate and Energy Program. She's going to go over the COBRA tool, the Co-Benefits Risk Assessment Screening Model. Finally, we'll hear from David Risley from EPA's Clean

Air Markets Division. He is going to give an overview of the Environmental Benefits Mapping and Analysis Program, also known as BenMAP. So, I'd like to thank all the presenters today, Julie, Denise and David, for taking the time to be with us.

You'll see listed on GoTo Webinar and at the bottom of the agenda, which should be up on the screen right now, there's a Web link that you can follow to find all the presentations for the webinar. There are also links to all of the tools, and there will be a recording and a transcript of this webinar. We will post those to this web site in a couple of weeks.

Upcoming webinars that we're going to be doing will be on topics such as key climate change measurements, which we also refer to as climate indicators, including greenhouse gas emissions, heat waves, drought, precipitation and sea level rise. We'll send out a save the date for that in the coming weeks. And we're also planning to do a series of webinars on climate adaptation issues starting around the beginning of 2013.

And, as always, we are looking for new topics for webinars related to energy, air quality and climate change that are of interest to state and local governments. So, if you have any ideas, please submit suggestions. There's going to be a feedback form at the end of the webinar. So, you can submit suggestions there. Or, if you can't stay till the end of the webinar, you can always type in suggestions – you can use the chat box or the question log.

Now I'm going to hand the webinar over to our facilitator, Catherine Morris from The Keystone Center. And she is going to cover some of the logistics and get us started.

Catherine Morris: Thanks, Julia.

First, we are going to launch a poll to give us a better indication of the type of listeners we have, the attendees. You should see a poll in your screen right now with a question about what best describes your agency or organization. We'd ask you, in the next couple of seconds, to please click on your response on your screen and hit Submit once you've hit that response. Our panelists will not be able to respond. This is only for our attendees. But we're going to

launch a number of questions like this throughout the webinar, and I'll bring your attention to it as it happens. And it's going to help us, again, gather some information about your experience with these tools or your knowledge of them and different ways you might find them helpful in applying them to your day-to-day work.

I'll give you the chance to respond. And then, you'll see, as we will hear, the answers shown on your screen. So, you can see, in this case, we have quite a few people that are in the environment arena, eight percent in transportation and 15 percent in energy and 18 –we describe them as in the 'Other' category. So, that is one of the logistics items that I do want to cover. It's how this polling is going to work throughout the webinar.

And before I introduce you to our speakers in a little bit more detail, I also wanted to explain to you what other tools you have at your disposal in order to interact with our speakers during the webinar. We have over a hundred people on the webinar today. So, you'll have obviously noticed that your line is muted. You aren't able to talk.

But, we do want to you to be able to ask question and submit comments throughout the webinar. To do that, you're going to want to use the Question and Answer section of the control panel on your screen. If you simply type in a question – and we've gotten a few already about some of the mechanics – but, if you type in a question there, it will be sent to the organizers. And that includes me as well as our speakers.

And we'll have the chance to look them over and try to answer as many of those questions as we can get to during the webinar. We're going to pause after each of the speakers so that we can address some clarifying questions. We'll only spend about five minutes doing that. And then we reserved about 20 minutes at the end of all of the speakers' time so that we can open it up for more involved questions and some interaction between our speakers.

So, you'll see – again, we're going to launch a poll throughout – a couple of different questions throughout the webinar after each of our speakers. And we're also going to ask you some questions at the end of the webinar. When

you are about to sign off, you'll see some questions pop up on your screen. And please take a few minutes, if you would, just to complete those. It really helps us to plan for future webinars and to be able to customize them to your responses.

I think that's about it. One other thing I should show you is that your control bar is a floating control bar. You can move it around your screen. But, you can also minimize it so it doesn't obstruct your view of the screen. You do that by clicking on the red arrow on the tab on the left side of your control panel. And that will get it out of the way for you. And then, you just click it again to bring it back up so that you can hit it and enter your questions.

So, with that, let me now introduce our first speaker and tell you a little bit more about her. Julie Wang Hawkins has worked with EPA's Office of Air since 2008. And, specifically, she has been working on retrofit technology verification for heavy-duty diesel vehicle and aerodynamic devices for tractor trailers. So, she has a lot of experience on the types of technologies that she's going to be talking about and when she's describing this tool. She's been actively managing the Diesel Emission Quantifier for the last two years and has been spending quite a bit of time making sure that it's usable for you.

So, the first thing she's going to do is just give you an overview of that tool and then walk you through an example of it. With that, we'll turn over the presentation controls to Julie so she can begin her presentation.

Julie Wang Hawkins: OK. Thank you, Catherine. Just giving it a second for the presentation to switch over.

Catherine Morris: Excuse me, Julie. I see we have a new poll that's been launched. And this is, again, just a preliminary question to get some feedback from you on which of these tools that we're going to be talking about today that you're aware of before we actually explain them all to you. So, if you can quickly answer this question. And then, we'll get on to Julie's presentation.

Julie Wang Hawkins: OK. Thank you, Catherine.

Once again, I will be going through this tool in about 10, 15 minutes. And if you do have any questions, please type them into the chat bar. And we will try to address as many of the clarifying questions as we can on the call, as well as a few of the discussion questions at the end of the webinar. However, if we don't get to your question, we will be following up afterwards. The Diesel Emissions Quantifier does publish a frequently-asked-questions document. So, feel free to check there. And all of these links and information will be presented at the end of my presentation.

So, to begin, this is called the Diesel Emissions Quantifier, or the DEQ for short. It's the national clean diesel campaign in the Office of Air for the Environmental Protection Agency. So, here in my overview, I will start with what is the DEQ, a general definition, the overall structure, the types of inputs you will need to do a calculation, an example calculation and the results and interpretation.

So, what is the DEQ? The DEQ is a web-based interactive tool that evaluates retrofit projects for medium- and heavy-duty diesel engines by estimating pollutant emission reductions, cost effectiveness and health benefits. Mostly, this tool is used by fleet owners, grantees, non-profit, as well as state and local governments, which is you guys.

So, types of project for DEQ calculations. This tool was originally designed back in 2005 for the Diesel Emissions Reduction Act, otherwise known as DERA, which is a cooperative grant competition for diesel retrofit projects. Some of you might be familiar with it through either the national competition or the state program.

The types of projects that this tool was designed for include exhaust aftertreatment technologies such as catalysts, filters, SCR systems as well as other devices; engine repowers and replacements; fuel upgrades such as biodiesel and natural gas and idle reduction technologies such as APUs or auxiliary power units, heaters and shore power.

Now, I will mention that when this tool was first designed, it was primarily geared towards exhaust aftertreatment technologies. The other three were

added later on. So, I will say it's probably most powerful for that very first one.

So, what the DEQ is not. I think it's pretty obvious. The DEQ does not currently provide estimates for light-heavy duty or non-heavy duty engines or non-diesel engines or vehicles or any that are pre-1980 or oceangoing vessels (for ports). The DEQ may also not be used for State Implementation Plans and conformity. We've heard stories the people use the DEQ to estimate for SIPs. But, primarily, I believe, for SIPs, you are instructed to use MOVES (Motor Vehicle Emission Simulator). So, consult your regional office regarding the SIP and conformity guidance.

So, now, we're going to go into the DEQ structure. And there are two types of calculations. The first is on-highway and non-road. This category includes all the medium- and heavy-heavy duty diesel engines and equipment, as well as some stationary and rail. So, this is basically everything from school buses to transit buses to construction equipment to stationary generators as well as three different kinds of trains.

The second one is for marine vessels, which only includes C1- and C2-category vessels, which are between 700 to 11,000 horsepower and less than 30 liters in displacement. So, the only one that's been excluded are oceangoing vessels. And we are currently not able to include that right now because their operating cycles tend to be very inclusive. And I think further research needs to be done before we can quantify this.

These are the types of calculations and so, the next step, once you pick your calculation, you get to design your fleet and your vehicles groups. So, this is just terminology. You don't have to memorize this. But, just have an understanding that a fleet is your collection of vehicles or engines and equipment. So, for instance, your state or your local area might have 100 school buses and 200 bulldozers. And that would be your fleet.

A vehicle or engine group, on the other hand, is a subset of your fleet. And they should be similar in terms of vehicle type and age. For instance, model year 2007 school buses. Ideally, a fleet will have many vehicle groups.

Once you are able to design your fleet and vehicle groups, you get to add your technology. On the technology entry, you can apply one or more technology options to your group. These options include filters, catalysts, alternative fuels and more. The thing to keep in mind here is that not all technologies can be put onto one vehicle at once.

A classic example of that is if you're already putting on one filter, it's unlikely that you can put on a second filter. There's usually not enough space. So, the tool would tell you if you cannot or if you are not able to put on a second technology.

Once you add your technology, you can quantify your results and you can view the results and download them in spreadsheet form.

This final part of the DEQ calculation, this was added maybe two years ago. It was one of the more recent additions to this tool. It is the monetary health benefits calculation based on the tonnage of PM reduced. As of right now, we only have health benefits for PM. We are working to get health benefits for NOx and hydrocarbon. But, for the time being, the DEQ can only calculate health benefits for PM, which is particulate matter 2.5.

So, after you've fully quantified the emission reduction, you can choose to quantify the health benefits for up to five counties in the United States. They don't have to be in the same state or in the same state as your fleet because, given the nature of these on-highway vehicles and even rail and marine, a lot of times, these engines and vehicles travel across state lines and the benefits can usually be found across several states.

I'm going to briefly go over some of the inputs that you need to have for this type of calculation. This looks like a lot. But, it's actually pretty simple once you get to it.

The state of your project, number of vehicles, type of fleet, the class or equipment, model year, the year of the retrofit installation, your current fuel type, your fuel volume. For on-highway vehicles, we ask for the annual miles per vehicle and the idling hours. For non-road engines, we ask for the horsepower and annual usage rate.

And then, we ask for the technology details such as how many idling hours are being reduced as well as a new model year if you are replacing an existing vehicle or engine. And then, this doesn't have to be perfect. It's very difficult, actually, to get the exact data for these many variables to do a calculation. Most of the time, if you don't have all these information, we ask that you get – you get as many as you can.

And then, for the rest of it, use an estimate or a default value. We don't encourage that, obviously. But, for the sake of estimates, sometimes, using a default can help you, at least, ballpark your emission. And, obviously, the more accurate your inputs, the more accurate your calculation will be.

Here, I have an example for a school bus idle reduction project. So, here, I'm going to present a series of screenshots. This is, basically, the home page of the Diesel Emissions Quantifier sort of zoomed in to show you what we have available. The link is at the bottom in huge letters. Here, we have a box to the upper right-hand side with a frequently-asked-questions document, a default value, a user's guide and health benefits methodology.

My recommendation is that, unless you really want to learn more about the tool itself including the back-end modeling, the frequently-asked questions is probably enough to answer most of your questions and give you an idea of what the DEQ can and cannot do without getting you too much into the modeling and the back-end equations.

It has three tabs. This will likely be updated with a slightly different format. But, the same tabs will apply. We have the Overview, Use the Quantifier and My Account.

We're going to start with the Use the Quantifier tab. So, first, like I was talking about before, the structure of the DEQ, the first thing you have to do is you have to define your fleet. So, here, I typed in "School Bus" for the fleet name. You can name your fleet anything you want. Make it something that is descriptive of your calculation. The fleet type is on-highway or non-road. And the state – I've chosen Maryland.

And, here, we have a question, “Do you want to estimate the total cost effectiveness of the project?” Yes or No. If you pick No, this area that you see at the bottom will disappear. But, if you pick Yes, this automatically appears, and you can populate the cost, basically, of your project. Usually, this part is used for grantees, grant competitions or grant proposals.

For instance, if EPA is giving out \$100,000 for a particular project and DOE is giving out \$20,000. And then, you can fill in these other ones if you have private matching or your own matching or if your state is putting in more money, as well as other money. What the DEQ will do is add up all these numbers and calculate a final cost effectiveness value that I will get to once we get through this calculation. So, after you enter in this information, you can click Save Fleet.

The second step, as you can see, here’s a bar here at the very top that shows you where you are in your calculation, a Fleet Entry, Vehicle Group Entry, Technology, Quantify Results and Health Benefits. So, this is basically the structure that I presented earlier.

Now that we are at the second step, we get to add a vehicle group. This is what your vehicle group will look like. I gave it a group name. I called this School Buses Test. I have 10 school buses. I have chosen on-highway. The target fleet is school bus. And the class of equipment is also school bus.

I’ve chosen default model year of 2000. And the year of retrofit action, which is the year that I’m actually going to do something to this bus, will be 2012. Here is a little blurb about our modeling, which is about the MOVES versus the MOBILE 6.2 emission factors. The quick background on this is that the Vehicle Emissions Quantifier is based on MOBILE 6.2 up until model year 2010.

And then, from 2011 and forward, we switched to the MOVES model, which is when the MOVES model became the official EPA standard. We chose to keep it in this format because it’s easier for people who are doing back calculations to see the old numbers – compared against the old numbers. But, if you want the better one, MOVES is a more accurate model than MOBILE.

If you want the better MOVES numbers, we recommend that you select 2011 or later. In this case, we're selecting 2012. The type of fuel here is the regular ULSD with 15 ppm sulfur, which is in use for all highway vehicles.

Down here, we have some links for you. And this is a link that will allow you to automatically populate your calculation with a default value if you don't have this data down here available. Once again, we recommend that you use exact numbers as much as you can. If these numbers don't automatically populate, here is a link to a document with all the default values laid out. And you can consult that for looking up other default values.

These question marks – unfortunately, I can't click on them – but, they are, basically, help text to guide you along as you are going through the calculation. They will give you answers to some general questions that you may have regarding this tool. And all of them have a little bit of language to them depending on which part of the screen they are located.

So, once I have populated all of my information, fuel volume, the vehicle miles and idling hours, I can save my group. You'll notice the color scheme here, the brown is for the vehicle and the green is for the technology, just to make it visually pleasing.

Here, you can see that your vehicle group has been saved. If you need to edit or go back at any time, you can click Edit Group to modify what you've already entered. Here, I can add a new technology. This screen will populate and you will be able to choose technology type. Here, I've chosen idling control strategies, and my technology is a direct-fired heater. The number of idle hours that are reduced per year, I have chosen 200. And I'm going to apply it to all 10 of the school buses.

You can also change this number. So, for instance, if I was only going to have five heaters on five out of the 10 school buses, I can change the number to five. And then, I can add the other five to something else. That is another option when you have a lot of fleets in one vehicle group.

And then, here, we have the percent reduction by pollutant for heaters for this number of idle hours reduced. And these numbers, by the way, you can

change. You can – you can click on this and you can change this 98, for instance, to 90 if you want it to. And I will only recommend that you modify these values yourself if you know for sure that your technology is going to give you certain benefits. If you don't know for sure, then you can just use whatever the DEQ already has here.

And then, down here, you can click in the Installation Cost and the Unit Cost. This is optional. But, you can put these numbers in here, also, to help you calculate the cost effectiveness. Once all of this is entered, I can click Save Technology.

Now, I have my fleet as well as my technology. And you can add more technologies to your vehicle group if you would like to. You can add more vehicle groups to this calculation as well. But, for now, I have my fleet and I have my vehicle group. So, I'm going to Quantify Emissions.

This is a screen that you will see. This is the summary emissions results, the first screen that you will see once the DEQ has finished calculating. It looks like a lot of numbers. It is, but it's actually quite straightforward.

We have the calculation divided out into annual, daily, lifetime and cost effectiveness and remaining life. The annual is what the DEQ really gives you. The daily and the lifetime are based off of the annual.

So, for the annual, for instance, we have NO<sub>x</sub>, PM 2.5, hydrocarbons, carbon monoxide, carbon dioxide and the diesel equivalent. These are your five pollutants. And then, this is how much fuel you would save. And this diesel equivalent is based on the CO<sub>2</sub> emission factor.

On this side, we have baseline. The Diesel Emissions Quantifier calculates the baseline emissions for your fleet and then the percent reduced and then the amount reduced. So, you can kind of just eyeball if this is what you start out with. This is how much is reduced – the percent that it was reduced and this is how much is actually reduced. We have that in, again, annual, daily, lifetime.

And, at the bottom, we have some cost effectiveness calculations. There's two different types of cost effectiveness. Unfortunately, I don't have time to

get into this on this particular webinar. The frequently-asked-questions document covers this in detail. Feel free to refer to that.

But, there are two different ways of calculating cost effectiveness. This total cost effectiveness is the one that is used by the numbers that you enter at the very, very beginning. And the capital cost effectiveness is used with the installation cost and the unit cost for each individual technology. That's the biggest difference.

The remaining life, that's calculated based off of an algorithm that we use depending on which kind of vehicle you have. For school buses that were produced in the year 2000, in 2012, they have 17 more years left. And this 17 is used to calculate the lifetime emissions.

So, most of the time, you probably don't want to stare at your computer screen for too long. So, we give you the option to download your results. We have two reports that you can download. The first one is called the detailed report. And this one contains all of your inputs and all of your outputs.

The importance of this report is that is you ever want to redo your calculation, this one has all of your inputs. So, you will know exactly what you used, which numbers and where you put them. So, this is a very valuable report for replicating any future calculations.

The summary report – most of our grantees are familiar with this one because we ask for this one with their grant proposals. If you are a grantee, you might want to consider getting this one because it is a summary. It has only some of your inputs but all of the outputs. So – and both of these reports are available for both Microsoft Excel as well as comma-separated values (CSV).

Whichever one you prefer, sometimes, I advise people to download both versions because once you download the Excel, if you wish to convert it to CSV, it doesn't always work. So, downloading all the reports when you're able is probably a good idea.

Julia Miller: Hey, Julie. I know we're a couple of minutes behind schedule. So, if we can just wrap up.

Julie Wang Hawkins: Thanks very much. Yes.

Julia Miller: OK. Great. Thanks.

Julie Wang Hawkins: Thanks.

OK. So, the wrap up, the very last thing – just going through this really quickly – the health benefits. Like I was saying before, you get to choose five counties. And they don't all have to be in the same state.

For a project in Maryland, I chose three counties in Maryland, one in D.C. and one in Arlington, Virginia. And the percentages refer to how much benefit each of these counties will get.

For these school buses, they will be in Baltimore 20% of the time. So, I gave Baltimore 20 and then 15, 10, 25 and 30. All this has to add up to a hundred. And then, you can click on Calculate Benefits and it will reprint the PM 2.5 reduction and then the benefits in dollar amount. And you can also download this at the very bottom.

And the very last thing – I won't have time to go through this. But, this is very easy. You can save your run by creating a user account. All you have to do is click on the upper right-hand side. There's a place called Login or Create An Account. And all you will need is your e-mail, your name – you don't even have to keep your organization or your phone. But, a name and an e-mail is basically all you need.

So, with that, that's the end of my presentation. Do try the DEQ out for yourself. And if you have any questions, the frequently-asked-questions document is available as well.

Catherine Morris: Thanks, Julie.

We have a number of clarifying questions that we wanted to see if we can answer before we move to our next speaker. One was from someone in Kentucky who said that they are trying to estimate the savings from the use of hybrid school buses – the conversion to hybrid school buses. But, they don't

have a full calendar year of data on these buses in large part because they're coming in to the fleet at different time frames. So, do you have suggestions about how they could adapt the tool to accommodate that problem with their data? Or, is there a different tool that they should be using?

Julie Wang Hawkins: That's actually a more complicated question than one can answer on the call. I would advise this individual – and if you have similar questions – when your data is not complete or your data doesn't quite fit in with what we're asking for, go to our main Web site. That was the very first link that you see. There is a link called Contact Us. And you will be able to send us a specific e-mail and somebody can walk you through your calculation with you.

Catherine Morris: OK. Thanks. That helps. And another one. Is there an air quality modeling tool built into DEQ?

Julie Wang Hawkins: I'm not a 100% sure. That's kind of the background of the DEQ. So, the DEQ uses MOVES and non-road. Those are both models. And we use the numbers from those two tools to serve as the back end. So, yes – as we go through each calculation for all the on-highway vehicles, you're essentially using the MOVES numbers. And for all the non-road, you are using the non-road model numbers.

Catherine Morris: OK. In one of your slides early on, you mentioned that this is not a tool that you should be using for calculating emissions for the State Implementation Plans or conformity determinations. Can you talk a little bit more about that and why it's not appropriate for that use?

Julie Wang Hawkins: Unfortunately, I don't have a lot of knowledge on the State Implementation Plans and conformity. What I do know is that there is very specific guidance on which tool should be used. And this tool, unfortunately, is not one of them because it is not detailed enough. All the estimates that we do here are not really for planning purposes but more for smaller projects on a much, much smaller scale.

Catherine Morris: Let me try to sneak one more question in. This is, I think, a pretty quick one. Could you explain the difference between the fleet capital cost effectiveness and the total cost effectiveness?

Julie Wang Hawkins: They can also refer to the frequently-asked questions because we do go into detail there. For their purposes, the one takeaway for the cost effectiveness is that the total cost effectiveness is based off of these costs that you enter at the very beginning. The capital cost effectiveness is based off of the installation cost and the unit cost of an individual technology.

Julia Miller: I want to mention really quickly. We got a comment in from Alan Powell while Julie was talking about the different ways to download files. And Alan said that folks should probably download the CSV file if they're applying for grants so that they can include it in the work plan submittal so EPA can upload it into DRIVER. So, I thought I'd mention that really quickly.

Julie Wang Hawkins: And yes. He is correct.

Catherine Morris: OK. A well, a number of other questions have come in. But, I'm going to put those on hold and launch our next polling question before we move to our next speaker.

So, the question is, "What have been the biggest barriers for you in quantifying health impacts?" and lists a number of responses. So, I'll give you a second or two to read them. They're a little bit more lengthy than the last poll question. And, if you would, please just click on the most appropriate response. And we'll give you a few seconds and then we'll tally up the results.

And we should see the results momentarily. There you go. So, you can see here that the greatest response was access to health benefits estimation tool. So, actually, access to these types of tools is one of their biggest challenges. And then, understanding how to use health benefits estimating tools which, hopefully, this will give you, at least, a big jumpstart on that.

All right. Let's go ahead, then, and introduce our next speaker, Denise Mulholland, who is the senior program manager at EPA State and Local

Climate and Energy Program. She has been with EPA for nearly 20 years. And, over that period, she has authored and managed the development of a number of guidance documents and software tools to help state and local government particularly in their effort to analyze climate and clean energy policies and to maximize the benefits of those policies to the environment, health and the economy.

So, she is going to walk you through the COBRA tool which is, as Julia mentioned, going to be a little more sophisticated in that it has more applications that you can use it for. And then she will walk you through a specific example to show you how it works.

Denise?

Denise Mulholland: Thanks, Catherine. And thanks, everybody. I really appreciate having the chance to talk to you all today and share with you some information about the COBRA model, the Co-Benefits Risk Assessment Screening Model.

To start off, well, what is it? COBRA is a user-friendly screening tool where you as a user enter a criteria air pollutant emission reduction. So, you enter a particulate matter, your SO<sub>x</sub>, your NO<sub>x</sub>, your VOCs, your ammonia. And COBRA will give you the first order or approximate estimate of air quality impacts that are likely to occur from those changes in emissions and then the subsequent health effects that are likely to occur from those emission reductions and then it calculates the economic value of the health effects.

Where we are now is that policymakers typically just consider the economic cost of policy choices. But, that's just part of the story. And what COBRA does is enable you to estimate the economic value of the health benefits and to provide more balance than your comparisons of the cost and benefit. So, with COBRA, you can better understand and communicate the potential for health and economic benefits from clean air costs – these are policies that reduce these emissions – and determine which options warrant further analysis with a more sophisticated tool. So, it is a screening tool similar to the DEQ.

So, how does COBRA work? Well, COBRA is based on rigorous methods that EPA uses for our own benefit assessment. We've adapted it for use as a screening tool to make it more available to other folks on the outside.

And this is a schematic that shows you how it works. Up at the top left, you have the user input. This is what you need to bring to the model. And what you bring are the emissions changes, the reductions in PM, SO<sub>x</sub>, NO<sub>x</sub>, VOCs et cetera. You enter those into the model for the year 2017 and you pick a discount rate. And we offer you two options.

You'll see. I'll walk you through an example and explain the differences. But, that's basically what you bring here, emissions changes and you pick a discount rate. In some other models – we'll hear from David in a bit where the input starting point is a little bit different. It's air quality modeling. And this is just emissions data.

So, it is the year 2017 in the model. And I just wanted to propose today that we have just released a brand-new version today that is current through the year 2017. So, for folks that have downloaded it previously, we will send out an update notice. But, otherwise, you can get it off our Web site, which is at the end of my presentation.

COBRA takes these emission changes and it has a reduced form or simple air quality model embedded in the tool. It converts these emission changes into changes in air quality. And then, based on population as well as concentration response functions, which are epidemiological equations that EPA uses in our regulatory analyses, it comes up with changes in health incidences that occur, changes in illnesses, deaths, that sort of thing.

And what it does is it applies an economic value to those changes, again, using the numbers the EPA uses in our own regulatory analyses when we're estimating benefits. And so, then, the outputs of the tool are changes in air quality, changes in health effects and the economic value of those changes in health effects.

Here is a list of the different health effects that are estimated in COBRA and it also estimates the related economic value of these. So, what we have: we have mortality incidences (that's death), we have heart attacks, hospital admissions, respiratory illnesses, emergency room visits for asthma cases, restricted activity days. What that is – those are “code red” days – if folks are familiar with daYS where the pollution level is just so high that activity is restricted and they tell the elderly or people that have compromised immune system or have asthma to stay indoors. These are the minor restricted activity days as well as work-loss days. If you're sick, obviously many times, you'll end up missing work. So, those incidences are estimated in COBRA and monetized in terms of the value.

So, what are the strengths of the model? Well, what COBRA does is it really beefs up the benefits side of the cost-benefit equation and helps to support balanced decision-making. It's a tool that enriches this discussion of benefits and helps us look at things on a more balanced playing field or level playing field. That's one of its strengths.

There aren't many tools out there that do that. It's really easy to use. You just bring a couple of inputs to the tool itself. It has canned equations and approaches within it that are consistent with what EPA does. And we have a user guide that walks you through step-by-step how to use the tool.

It's very flexible in terms of how you can enter the data geographically. You can enter it in county level, state level, regional level. You can do it groups of counties, groups of states. You have a lot of flexibility there. And you can enter reductions in either as a percentage, like a percentage reduction that you're achieving, or for a particular emission or an absolute reduction, like for a certain number of times.

It's free, which is a benefit over the more sophisticated air quality models which can be expensive. What we talk about with COBRA is that COBRA is really useful to help you to trim or narrow a long list of policy options down to a shorter list and help you identify those options which might warrant further analysis with a more sophisticated and expensive air quality model.

It's really quick. It just takes a couple of minutes to generate results. And it presents your results in easy-to-visualize map. You can copy these maps. And I'll show you an example of it. But, it helps you really visualize the impacts by looking at it in a map as well as in a table.

There are limitations, of course, to COBRA. It is a free screening tool, and it is screening. So, it's not a highly sophisticated air quality model. It is not appropriate for SIP planning. Again, you can use it sort of to narrow your list of what you might analyze with a more sophisticated tool. But, this is really just a quick and dirty screening tool.

For those of you who do want more sophistication, COBRA can be somewhat limiting. You're restricted to our own baseline emissions that are in there currently for the year 2017. Again – you know, the equations are canned, so, you may want to –

Julia Miller: Can you explain really quickly what “canned” means?

Denise Mulholland: I'm sorry. Canned means we've hard-wired it in there. So, you don't actually pick which equation you would use. You don't have a choice. It's just done for you. We pick the ones that EPA's Office of Air Quality Planning and Standards says is the best one to use and that they use. So, that's what we do.

And the same thing with economic value. You cannot change the economic values that are in the model. You use what's there. And, also, it does not address cap issues. So, if you live in an area where there are controls or caps on the emission, if you reduce emissions under this capped area in one place, unless you retire the allowance for that emission or for those emissions, this is going to come up somewhere else. COBRA does not address that.

And those are the things that you should be aware of as you're using the tool. And there is a final limitation that really relies on inputs generated elsewhere that may be oversimplified. So, while there are limitations, we found in the last 10 years of the tool that our peer reviewers and users found it to be a valuable model that really does help contribute to policy analysis as well as public dialogue on benefits.

So, how do you use COBRA? Here are the steps to running an analysis. And what I'll do is walk you through an example to illustrate this right after this slide. But, it's also detailed very well on our user manual as well as the presentations that are on our website or the COBRA Web site. So, the first thing that you do when you do this outside of COBRA is you figure out what emission reductions will occur and where will they occur.

These are your inputs. And we do provide tips on our website, in the user manual, as to what types of tools and approaches you could use. We have eGRID listed here. There are some other tools. P-PEC (Power Plant Emissions Calculator) is a tool what we have listed in the survey that is one that we are looking to finalize shortly that can help you.

But, you can use a variety of different tools and methods to come up with these emission reduction and that location. And then, you bring them into COBRA. With COBRA, you enter them into the model, you select the discount rate and then you run the model and review the result.

I'm just going to walk you through an example quickly in the interest of time where we will walk through a hypothetical case so you can see how it works. So what we're going to do here is evaluate the health benefits or the potential health benefits of a renewable portfolio standard or some sort of renewable standard that a state or a locality might be interested in implementing.

What a renewable portfolio standard or a renewable standard does would be to require the utilities to switch to a particular percentage of electricity generation that they are doing now to renewable resources if it's not renewable already. So, if what you're switching away from has been generated with fossil fuel, then this new renewable standard is going to achieve criteria air pollutant reduction which is then going to result in health benefits. That's what we're going to look at here in COBRA in this example today.

I picked Michigan arbitrarily. It has established a renewable portfolio standard that says that 10% of their electricity generation must be from

renewable resources by 2015 to 2017. You can also likewise do this for a county.

So, what you do first is to figure out where your emissions are going to take place, where the reductions will be. In this case, it will be national, county, state or regional level. If you know the plants that are going to be affected, you can put them in that particular county. Or you can use a very sophisticated model to try and figure out where these reductions will take place. So, there's a variety of ways you can do this. But, for this example, we're just going to assume that the emissions are going to occur statewide. And that is just a simplification for the purposes of this example.

So, now what we can do is either estimate the reductions as a percentage or we can estimate them in absolute time. So, for this just assume 10% is switched. So, we are reducing 10% of our fossil fuel related electricity emissions or we can actually calculate the number using an emission factor approach, which is a simplified approach, or a more sophisticated modeling approach if you have one.

So, what we did in this example was we take an emission factor approach and we used EPA's Emissions and Generation Resource Integrated Database, eGRID, and followed the number of steps here you can see on the slide. We figured out what the net electricity generation in Michigan typically is.

So, we figured out the output emission rates from eGRID. Now what are the emission factors that eGRID tells us occur with that electricity generation. And then, we figured out how much generation already comes from the state of Michigan. And so, we pulled that out of eGRID and we now are left with 10% minus the 3.1% that we figured out. And there, we're left with 6.9% of reduction.

We want to reduce 6.9% of our current generation. That turns out to be 6 million megawatt hours. And we're going to apply the emission factor that eGRID tell us about to figure out what the SO<sub>x</sub> and NO<sub>x</sub> reductions would be from that reduction in megawatt hours.

Now we have our estimates. We have our emission reductions estimate. And there's a number of ways you could do that. That was just one illustration.

But, what we're going to do now is enter them into the tool. This is a screenshot of what the COBRA model looks like when you first open it up. And so, you would pick that you want to do something for an individual state. You would select the state. You could also select multiple states.

We're just going to do one state. But, if you wanted to do counties – certain counties within a state, it will take you to the next step and you can select only a handful of counties within a certain state. But, we're just going to do statewide for this example.

The next thing you have to do is figure out what emission category your reductions will come from. These emission categories are labels that come from EPA's National Emissions Inventory. And there's a bigger description of what is it and where it comes from in our user manual. But, essentially, you're trying to pick where these emissions are typically organized in our emissions inventory and in our baseline and you're going to affect that.

This is an electricity-related scenario. We're going to focus on fossil fuel combustion, electric utility. We click on that tab. And then we enter our emissions reduction that we just calculated previously.

So, the next step after we hit Apply Edit. And then, it'll ask you to name it. Then select the discount rate. And so, what the discount rate does – people would rather have benefits today than have them in the future.

If the benefits are going to be in the future, you have to discount the value of that. So, what we do is we follow EPA guidelines. We're consistent with how EPA chooses to discount their future benefits. And we offer you the option of 3% or 7%. There's more description in the user manual and here even in the text box that tells you what the implications are. But, essentially, you're discounting it by 3%.

You're discounting the future benefits less so this benefit will be worth more than if you discount it at a seven-percent rate. But, again, there's much more

information about that in the user manual. And what we recommend that you do is to do it both ways, do one with 3% and then go back with 7%, do it again, and then compare the results so you can get a bounded estimate. That's how EPA does it.

You run the model and you output some results. And are the outputs of COBRA. It's what they look like when they come out. But, this is organized in a table. The portfolio emissions reduction that we entered for his hypothetical case in Michigan, the results would be that in the year 2017, you would avoid between 119 and 300 deaths.

This, again, is how EPA does it. It assumes different functions as to the range in terms of the estimates that you get. This number of deaths would be avoided over a 20-year period. So, it's not all in one year for the deaths. But, it is over a 20-year period from these reductions in the year 2017.

The other impacts that are listed there like asthma attacks, heart attacks, hospital admissions, asthma emergency room visits, those are all avoided incidences in that year. So, in the year 2017, you will avoid, you know, 3,200 asthma attacks, 16 to 146 heart attacks, 60 asthma visits. These are the outputs of COBRA.

On the right-hand side, you can see the economic value associated with those incidences. And these are, again, documented in the user manual, what the values are. But, we calculated the instance times the economic value and then you get your dollar value.

My next-to-last slide will give you a visual of what the outputs actually look like in COBRA. And so, top right, these is your tables of results. You can sort them here as health effect tables. And you can pick and choose if you want by economic value, or by a certain incident. But, you can see them on a tabular form. You can export them so you can manipulate them in your own Excel file.

At the bottom left, you can see that it's a map of the different health benefits and it's color-coded. You can even change the color coding to show you the degrees of where the biggest impacts are. And this has been a really nice tool

that folks have been able to use to help them copy these maps into PowerPoint presentations and visually show people where these benefits are likely to occur.

That was just a snapshot or a quick walkthrough of the tool. You can get more information from our website. There, you can get lots of information about how it works, why you'd do this and specific examples. The one that I walked you through is a renewable example. There is an energy efficiency example that's on there as well. And then, you can download (at the bottom) the overview, the documentation.

And you can always contact me. There's my contact information. And I'm happy to answer any clarifying questions now or any other questions later. Thank you very much.

Catherine Morris: Thank you, Denise.

There are some folks that have already downloaded your presentation before the webinar and noticed that there were some changes in the slide that we did not get posted immediately before. So, we will post your final presentation afterwards.

Denise Mulholland: OK.

Catherine Morris: People keep asking. The website for that is [www.epatechforum.org](http://www.epatechforum.org) and you just need to click on to the next page which will take you to the 2012 materials because this has been ongoing for a number of years. You can look back at all the different topics we've covered at that page.

In any case, a question that came in, one was regarding the discount rate that you mentioned as an input. Are there plans for giving users a broader range of discount rates? There is not agreement that 3% should be the lower bound.

Denise Mulholland: That's a great question. For the COBRA model, no, again, because we have this hard-wired into how EPA does it. But, that would be a great question that I would ask David when he talks about BenMAP because he might have that option. I don't know. But, you might have that option in

BenMAP. I refer to COBRA as this sort of mini-BenMAP where it takes a lot of the BenMAP flexibilities and hard wires them into an inflexible tool for folks that maybe don't know what the difference is in terms of discount rates or what the real economic value is.

Catherine Morris: Another question was regarding the population census data that's in there. What is the population base and the census year? And then, what is the base year that you're using in general?

Denise Mulholland: For the emissions of 2017, I know we just ended up getting updated baseline data, so, I have to get back to you on that one. I know it's the latest greatest possible data that we could get.

Catherine Morris: OK.

Denise Mulholland: But, I don't exactly what year that is. But, that's the latest and greatest data. If you downloaded COBRA up to this point, it's outdated data, whereas the population data that's in the new version for today is as current as we can possibly get it.

Catherine Morris: Great.

There were a number of questions that came in for Julie and then similar ones for you, which is what methods are used to translate the emissions reductions into specific health benefits for heart attacks. Can you talk a little bit more about that part of the program? And then in Julie's case, she was also talking about calculating the actual cost. And yours, as well. The cost savings associated with that.

Denise Mulholland: In COBRA, there is – sure, I'd be happy to answer that. I'd be happy to follow up if I can't get into enough detail given the time that we have here today. So, COBRA starts out with emissions. But, it has a built-in air quality model, a reduced form air quality model in it that is called a source receptor matrix.

You can find out more about it in the user manual. But, essentially, it's based on air quality modeling runs that have been done in the past. And we figured

out the relationships between what's admitted in one state and what the air quality changes are and other places and how it goes around.

So, we have a reduced form air quality model in the tool. It's not a sophisticated air quality model which is why it's not appropriate for SIP. But, with this, we do it from a source receptor matrix, which is what EPA has done in the past for all this sort of quick and dirty analysis, to come up with air quality changes.

And then, we apply certain equations that are from the epidemiological community that are health functions. And these are equations that relate to these specific air quality changes and health incidences. So, it's mathematical equations. And then, come up with the health incidences. And we apply specific economic values that are all detailed in the user manual. And so, it's health incidences avoided times certain economic value equals the economic value.

Does that help?

Catherine Morris: Yes. Thank you. OK.

So, we're running a little bit late. So, first, we'll do a poll. And then, we'll move to David's presentation.

We're going to launch our poll question. As you can see, the next question is, "For what purpose would you primarily like to use these health estimation tools?" And you have four choices. So, if you'd quickly make your appropriate choice. Then, we'll see the results. OK. "Quantifying economic benefits of emissions reductions" and "Make the case to others about the benefits of these programs" are the two highest reasons for actually needing these tools.

Thank you for responding. That's our last polling question. But, just to remind you, you'll see some more when you leave the webinar.

And let's now turn it over to our final speaker, David Risley, who works in the Clean Air Markets Division at EPA's Office of Atmospheric Programs.

He uses the benefit assessment message to evaluate the benefits of EPA's current and prospective emission reduction programs and he's going to describe the Benefits and Mapping Analysis tool which, as we mentioned, is the most sophisticated tool. And, again, we don't expect everybody to walk away being able to use these out of the box. But, certainly, this should whet your appetite.

David?

David Risley: Yes. Thank you.

It's probably the most sophisticated. But I also would not be scared by it. It comes with a lot of information that you would need preloaded and, actually, isn't overly difficult to use.

I'm just going to walk through and talk about the Benefits Mapping and Analysis Program, which we all refer to as BenMAP. And I'm going to talk a little bit about what BenMAP is and how to use it. And then, I'll provide some links for additional information.

So, what is BenMAP? Essentially, it is a tool that we can use to estimate the health impacts and associated economic value of changes in air quality. And that's where this differs from some of the models – or the models that we've talked about to this point on this call.

When I say changes in air quality, generally, I'm referring to changes in criteria pollutants like PM 2.5 and ozone. And those changes could stem from emission reduction policies or efforts that are aimed at those pollutants or as co-benefits from reductions of programs starting with greenhouse gas emissions, for example.

I have to point out that BenMAP is really a flexible tool. There is a version of it that you can use that is very simple. All of the information that you need to run a simplified benefits assessment is existing in the tool. But, there is also the ability to manipulate all of the information in BenMAP. So, you can make it as simple as complex as you would like.

One function of BenMAP is that it can estimate health impacts on any scale. So, at the city level, census block level, even our national policies. And, similar to COBRA, BenMAP's results can be mapped for ease of presentation.

This is a list of a couple of the policies that BenMAP has been used to evaluate. And to me, one of the things that this demonstrates is flexibility. EPA has used BenMAP to look at national-scale air quality programs. But, it has also been used on local level analysis like the New York City Department of Health federal-level assessment. And EPA has also partnered with some international organizations to do evaluations in other countries. So, really, you can use BenMAP for almost anything.

So, the way that BenMAP estimates benefits is by combining population exposure with air pollutants baseline incidence rates for things like asthma, heart attacks, things like that, and concentration response functions. And, by combining those three things, it estimates health benefits. Denise referenced this as well. It's the concentration response functions. These are based on epidemiological studies that relate pollutant concentrations and incidences of health outcomes and you can use that function to estimate the benefits of your air quality improvement programs.

So, BenMAP could be used to estimate the benefits based on almost any concentration response function. But, these are the ones that EPA publicly reports and uses. So, similar to COBRA, we look at mortality, heart attacks, asthma attacks et cetera.

BenMAP relies on data from different sources to perform its calculations. And, essentially, what it does is it combines air quality and population data to come up with a population exposure. So, if you're thinking about an emission reduction program, that would be a reduction in exposure to a pollutant that a certain population would experience. And then, it combines that information with the concentration response functions and the baseline incidence and prevalence rates to estimate adverse health effects. And that has functions embedded in it that allow you to put an economic value on those adverse health effects that are avoided.

One way to visualize this a little bit is to go through an example. Let's say you're interested in pursuing a program that would improve air quality in a given region. So, you would have – on the top left graphic there – your baseline air quality. Coupled with that is the policy air quality. And BenMAP would take those two air quality grids and, basically, do a subtraction and calculate the improvement in ambient air quality.

Next, BenMAP would overlay that improvement in air quality with population data that's already in BenMAP. You don't need to provide that. And it would combine that with the background incidence rates which are, again, already in BenMAP, and then the concentration response functions to give you a health benefit.

So, if you were to use BenMAP, you would open the tool and this would be the first thing you would see. And you can see on the left side here a split screen. On the left side, there is a one-step analysis which allows you to basically use all of the defaults that are already in BenMAP. All you're doing is specifying the air quality data that you're going to use – we shall talk about it in a minute – and then, everything else would just flow from the default.

And then, on the right side is the different steps you would use to perform a custom analysis. Basically, there are four steps here, looking at your air quality data and then providing inputs to estimate the health benefits then telling BenMAP how you want to value and aggregate those benefits. And then, generating reports. So, it's just four pretty easy steps.

The first thing you would do, step one –you'll do this either as a one-step analysis or as step one of the custom analysis – is to specify your air quality data. The goal here is to estimate the change in population exposure to the pollutant of interest. And BenMAP even comes preloaded with a couple of things that you might find useful here.

It has monitored data that's preloaded. And you could generate (compare change in) air quality from pollution in one year to pollution in another year and perform an assessment based on that. Or, if you have your own monitoring data, you can import that into BenMAP. Or, if you have model

data which EPA uses, models like the CAMx and CMAQ which are pretty sophisticated air quality models – but, if you have any modeling data, you could import that into BenMAP to serve as your basis for your air quality data.

On slide 11, you can see how BenMAP is used to basically combine the air quality data that you specified with the built-in population data to estimate population exposure. So, essentially, it just overlays those two maps and tells you what your population exposure would be.

This slide covers steps two and three out of the four-step process that BenMAP uses. And it's pretty simple. Before I even get into it, I would just mention that, on the BenMAP website, you can download the standard data that EPA uses to perform these steps. If you didn't want to, you wouldn't even have to alter that at all.

Step two consists of the first two bullets. You would select your health impact functions and choose an analysis year. And that would be used to estimate the incidences (in the year you're avoiding). So, that number of asthma attacks that your air quality improvement would result in.

Steps three and four, basically, you're telling BenMAP how you would want to evaluate those results using, you know, different methods that are already included in BenMAP and then how you would want to aggregate your results.

These are some screenshots of what BenMAP looks like when you're actually using it. It's certainly not as visually pleasing as the DEQ. But, it is pretty easy to use. The windows on the right there basically show you what it looks like where you would tell BenMAP where your air quality files are and what population area you want to use.

On the last is a menu of the different health impact functions that are already included in BenMAP. You could select those. Or, again, you could download configuration files that are already set to go with EPA standard inputs.

The final step of BenMAP is reporting the results. I don't have as much detail here as I probably should. But, again, similar to the DEQ, you can output data

in tables, you can present data as maps. You can basically do anything you can imagine with the data.

Finally, I'll leave you with some links to more information about BenMAP. I almost wanted to lead with this because the BenMAP Web site has a lot of great information on it. It has training materials. It has presentations. It has the user's manual, which is really comprehensive and it answers a lot of questions. And then, in addition to that, there are BenMAP trainings that you can find. And there are two different providers of that training right now.

So, I'd be happy to answer any questions.

Catherine Morris: Great. You just answered one of our first ones, which is what are the training opportunities in using BenMAP? I wanted to let folks know that these links are not only in these presentations which you will find up on the EPA Tech Forum site. But, they are also in the *on* that page. You don't have to go into the presentation to get them. They are posted right there on the page.

So, a couple of other questions, David, on BenMAP : can it be used to calculate PM 2.5 emissions as well?

David Risley: PM 2.5. I'm sorry. PM 2.5 emissions or concentrations?

Catherine Morris: I'll leave that –

David Risley: I can answer – I can answer either way. So, BenMAP is not an emission tool. You would have to use another tool for whatever you're trying to estimate emissions from. And as far as air quality, BenMAP also is not an air quality tool. Remember, one of the differences between BenMAP and models like COBRA and the DEQ is that BenMAP starts with air quality.

That's really the key input that the user needs to provide. The only thing I would mention there is that there is monitoring data that is already included in BenMAP. It comes in the initial download. And if a user wanted to use some of that monitoring data – as their air quality input, then, they got it.

Catherine Morris: Well, that leads to another question. A couple of people have asked whether or not you can use this at a neighborhood scale or a specific road corridor scale. Could it be applied in those situations?

David Risley: Yes. That's a really good question. Essentially it would depend on the richness of the datasets. I would say yes, you probably could. But, you would need to provide a shapefile or something that BenMAP could read to figure out how or where those corridors are because something like that is more of a complicated assessment that BenMAP certainly has all of the tools and the functionality to do, but it requires a little bit more input from the user.

Catherine Morris: And maybe this is somewhat related. Can you also use it to estimate health impacts from different transportation scenarios? I'm not sure what or what scale they're considering here. But –

David Risley: Yes, that's absolutely what BenMAP is for. Again, the only thing that BenMAP needs as an input is change in air quality. So, if they are able to provide that to show the change in air quality for their project, then absolutely.

Catherine Morris: Can you talk a little bit about in what circumstances you should be using COBRA instead of BenMAP. And is one preferred based on the user type? Or, is it the type of available data?

Denise Mulholland: Well, Catherine, maybe David and I can both answer that one. This is Denise. They both start at different points and, essentially, get you to the same place. They start at different points.

As David was saying, the starting point that you bring to the BenMAP model is air quality changes – change in air quality. That's your starting point. And then, it offers you a lot of flexibility. It offers you the option to take those air quality changes and just run them through a very simply approach like COBRA and get similar types of results. Or, it enables you to make a lot of changes if you are more knowledgeable about specific functions that you care about or economic values that you feel strongly about.

You can change these here. But, if you do not have air quality modeling changes, if you don't have air quality changes, you can use COBRA if your

starting point is emission changes. And what it will do is do the air quality modeling for you and then apply the same equations that are in BenMAP – or it should be trying to get as updated as possible – the same equations in BenMAP to get you your results.

If you come to the table with air quality modeling or you come to the table with a desire to be able to change the functions and the assumptions within the model like the discount rate or something, I'm not sure if that's an option in BenMAP. If you start with emissions, it would be COBRA. And COBRA is a simpler tool. It's much more basic, in that way.

David Risley: Yes. I would only add to that that it's implicit in Denise's answer. But, BenMAP would let you elaborate more complicated air quality tools. So, if you're running an air quality modeling tool that's a little bit more sophisticated than the short or the reduced form source receptor matrix that's embedded in COBRA, then BenMAP would allow you to take advantage of that and run your air quality through BenMAP and, again, as simple or as complex a way that you'd like and see the benefits.

Catherine Morris: Thank you. I think there is – there is this other question that may also apply to all of our speakers. But, we came up while you were talking, David, about the how the economic values for health benefits are determined.

David Risley: Yes.

Catherine Morris: I think Denise touched on this a little bit when she was talking about it. Can you add anything here?

David Risley: I would mention that when EPA performs a rulemaking, we go through an exhaustive process and include a lot of information in our regulatory impact analyses. And all of that information is in there and much bigger than I'd be able to tell you. But essentially, EPA relies on the best economic information that's available.

And, in some cases, depending on the health outcome, we will use actual estimates of hospital cost and multiply an incidence of hospital admission avoided by the average hospital cost for that outcome and some of those. In

other cases like for our premature mortality, it's a little bit more complicated. Essentially, what we do is we review the peer review letter on this.

But, what people do is they talk about what their willingness to pay would be for a reduction in risk and then aggregate that risk up. There are different methods that are used depending on the health outcome that we're talking about. And there is more detail that's available in EPA's regulatory impact analyses.

Catherine Morris: Great. We'll, let's go ahead and open it up for all our speakers. And the next set of questions, really, are targeted at all the tools. One question that came in was how, if at all, these tools could be used with greenhouse gas emissions?

Who wants to take the first shot at that? Denise?

Denise Mulholland: Sure. I can take a crack at that. Greenhouse gas emissions, CO<sub>2</sub>, carbon dioxide are not in COBRA. We include criteria air pollutants because they are directly linked to health effect through our concentrations response functions.

Julie Wang Hawkins: For the DEQ, we have CO<sub>2</sub> emissions in both baseline as well as initial reductions for the on-highway, on-site idling, and other technologies that have fuel economy benefits. That's really the only place in the DEQ where you'll find it, if you're doing a run with technologies that give you fuel economy benefits.

David Risley: For BenMAP, it's certainly flexible enough to allow a user to use CO<sub>2</sub> or what-have-you if have a concentration response function that you're interested in. You could use it. But, currently, EPA does not use BenMAP to estimate any health impacts of CO<sub>2</sub> and as Denise said with COBRA – we use it for co-pollutants and criteria pollutants.

Catherine Morris: Great. This question is more directed at Denise. Are you aware of policies or programs that have been informed by COBRA results? Or, is it just for internal screening assessments?

Denise Mulholland: That's a great question. Actually, Catherine, I have folks who've used it for both purposes. We have seen, for example, there was just a study that Duke put out recently looking at the health advantages of their Clean Smokestacks law that they had passed a number of years ago. So, they used COBRA to figure out what the health benefits are of that.

There are a number of studies that we – the Department of Energy is another one that has looked at – what are some of the health impacts of different technologies – renewable technology programs that they have been investing in. And there are certainly a number of states out there that have done both screening level and analysis with COBRA. We link to several on our website and we have some within the presentations that are on our website. And we plan to expand the list that's out there so that you can see how it's been used by others. But, certainly, it's been used for both purposes.

Catherine Morris: Moving back to David, can BenMAP be integrated with GIS programs such as ArcGIS? I don't know if you're familiar with that. But –

David Risley: Yes. It definitely can. One way that EPA uses that is you can export all of the BenMAP results, anything you would want to export. And you can do that in a format that's pretty easily importable into ArcGIS.

Catherine Morris: Thanks.

Another question was regarding whether there are plans – well, let me stick with BenMAP. For BenMAP, have you actually gone back and compared actual health impacts based on some assessments that you did in the past to determine how close your model is to predicting the real results?

David Risley: As far as I know, EPA has not done that. But, I'm certainly not the only one that performs these types of assessments. So, I probably couldn't speak for the whole agency on that.

Catherine Morris: OK.

Are there plans to integrate steps to calculate atmospheric dispersion models in BenMAP? Is there a plan to integrate technology and fuel use related

changes so as to calculate emissions changes like DEQ into COBRA? These are two separate questions, one for you, David, and one for you, Denise.

David Risley: We're certainly looking at updating BenMAP. But, as far as I know right now, one of the things that we like about BenMAP is its ability to take in air quality modeling from anywhere. So, as far as I know, we're not looking at pairing it up specifically to an atmospheric dispersion model or any air quality model.

Catherine Morris: And, Denise, the question for you was, is there a plan to integrate technology and fuel use related changes so that you can calculate the emissions changes like DEQ into COBRA?

Denise Mulholland: Within COBRA, you can pick from your emission categories that come from the national emission inventory, the EPA hub. So certainly, you can pick specific types of vehicles.

For example, you could select highway vehicles, you could select off-highway transportation types. And there are different degrees of specificity that you can get into with COBRA. I just gave fossil fuel combustion electric utility. But, there certainly are options where you can look at fuel use. You can adapt it to your analysis to figure out what are the emission changes.

My guess is that you're coming in with the emission reduction. It's what you really need. So, if you come in with the emission reduction associated with a technology or a fuel use change and we just mapped it into the appropriate place. If you have the emission reductions from a specific technology or a fuel change, then you could put it into COBRA. You can add it into the right spot, that you'd bring that information to it.

Catherine Morris: OK. Thank you very much.

Thanks to all the speakers. We are out of time for questions and I do apologize we have to leave some of them unanswered. But, you do have access to the contact information for our speakers. And this presentation is up on the website that I mentioned, [www.epatechforum.org](http://www.epatechforum.org). And we definitely

encourage you to go to the links that are provided there to test out some of these tools. And then, you might actually ask more questions.

So, with that, we're going to go ahead and close the webinar. And, again, you will see some exit poll questions. There's about five or six of them. It shouldn't take you very long to answer them. But the results would be very helpful to us. So, please take a second after you close out.

And look for additional information about the future, our next webinar, which should be in the next month or two. And we'll get that to you by e-mail for all those of you who attended and those of you that are on LIST SERV.

Thanks very much.

Julia Miller: Thanks, Catherine. Thanks, everyone.

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