Tools for Building Energy Efficiency: Resources for Policy Development

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For more information, see the clean energy policy trainings offered by the Solutions Center.

Webinar Panelists

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Tim Reber	Hello everyone. I'm Tim Reber with the National Renewable Energy Laboratory and I'd like to welcome you to today's webinar which is hosted by the Clean Energy Solutions Center in partnership with the Copenhagen Centre on Energy Efficiency, the World Resources Institute, and ICLEI, all partners to the Sustainable Energy for All Building Efficiency Accelerator. Today's webinar is focused on the tools for building energy efficiency and resources for policy development.
	One important note of mention before we begin our presentations is that the Clean Energy Solutions Center does not endorse or recommend specific products or services. Information provided in this webinar is featured in the Solutions Center's resource library as one of many best practice resources reviewed and selected by technical experts.

Before we begin the webinar I'll quickly go over some of the webinar features. For audio you have two options. You may either listen through your computer or over your telephone. If you choose to listen through your computer please select the mic and speakers option on the audio pane on the right side of your screen. Doing so will eliminate the possibility of feedback and echo. If you choose to dial in by phone please select the telephone option and a box on the right side will display the telephone number and audio pin you should use to dial in.

If you're having technical difficulties with the webinar you may contact the GoToWebinar helpdesk at 888-259-3826 for assistance. If you'd like to ask a question during the webinar—and we certainly encourage everybody in attendance to please do so—you may use the questions pane on the right side of your screen where you can type in your direction directly.

If you're having difficulty viewing the materials through the webinar portal you'll find PDF copies of most of the presentations at http://cleanenergysolutions.org/training. And you may download them and follow along as our speakers present. Also an audio recording of the presentations will be posted to the Solutions Center training page within a few weeks and will be added to the Solutions Center YouTube channel where you'll also find other informative webinars as well as video interviews with thought leaders on clean energy policy topics.

Today's webinar agenda is centered around the presentations from our guest panelists: Maryke van Staden, Ksenia Petrichenko, Nate Aden, Peter Graham, Christian Mahler, and Jennifer Layke. These panelists have all been kind enough to join us today to discuss publically available analytical tools for local governments and other stakeholders to accelerate building efficiency improvements. Before our speakers begin their presentations I'll provide a short informative overview of the Clean Energy Solutions Center initiative.

And then following the presentations we'll have a question and answer session where the panelists will address questions submitted by the audience. We'll have some closing remarks and a brief survey.

So without any further ado this slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is one of 13 initiatives of the Clean Energy Ministerial. It was launched in April of 2011 and is primarily led by Australia, the United States, and other Clean Energy Ministerial partners. Outcomes of this unique initiative include support of developing countries and emerging economies through enhancement of resources on policies relating to energy access, no cost expert policy assistance, and peer-to-peer learning and training tools such as the webinar you're attending today.

The Solutions Center's four primary goals: it serves as a clearing house of Clean Energy Policy resources; it serves to share policy, best practices, data, and analysis tools specific to clean energy policies and programs; it delivers dynamic services that enable expert assistance, learning, and peer-to-peer

sharing of experiences; and finally the Center fosters dialog on emerging policy issues and innovation around the globe.

Our primary audience is energy policy makers and analysts from governments and technical organizations in all countries. But we also strive to engage with the private sector, NGOs, and members of civil society. The marquee feature that the Solutions Center provides is the no cost expert policy assistance known as Ask-an- Expert. The Ask-an-Expert program has established a broad team of over 30 experts from around the globe who are available to provide remote policy advice and analysis to all countries at no cost.

For example in the area of buildings we are very pleased to have Cesar Travino, leader of the Mexico Green Building Council serving as one of our experts. If you have a need for assistance in building efficiency or any other clean energy sector we encourage you to use this valuable service. Again the assistance is provided free of charge.

If you have a question for our experts please submit it through our simple online form at http://cleanenergysolutions.org/expert. Or to find out how the Ask-an-Expert service can benefit your work, please contact Sean Esterly directly at sean.esterly@nrel.gov or call him at 303-384-7436. We also invite you to spread the word about this service to those in your networks and organizations. And with that I'd like to provide a brief introduction for all of today's panelists.

First up today, we'll hear from Maryke van Staden, a Low Carbon Cities program manager and director of the Bonn Center for Local Climate Action and Reporting. Maryke coordinates ICLEI's Low Carbon strategy, working with local governments around the globe. With more than 25 years of professional experience and policy insecurity Maryke has spent the last decade focusing in sustainable energy and climate change at the community level.

After Maryke we'll hear from Dr. Ksenia Petrichenko, a researcher at the Copenhagen Center on Energy Efficiency. Ksenia provides analytical support to Sustainable Energy for All initiative through research on energy efficiency and renewable energy best practices.

Presenting along with Ksenia we'll hear from Nate Aden, a research fellow with the World Resources Institute. Nate's research at the World Resources Instituted focuses on industrial sector emissions productivity, methods to align company greenhouse gas targets with ambitious climate scenarios and the role of buildings in low emissions urbanization.

Following Nate and Ksenia we'll have our first case study from Dr. Peter Graham, the executive director of the Global Buildings Performance Network. Dr. Graham has been the technical advisor and past coordinator of the United Nations Environment Programme's Sustainable Buildings and Climate Initiative where he has developed and managed many of UNEP's key projects and publications in the building sector.

Our second case study will be from Christian Mahler, and energy specialist from the Energy Sector Management Assistance Program at the World Bank. Christian has previously worked as a climate change mitigation specialist for GIZ. He has been working with cities in Africa, Asia, and ECA to tap energy efficiency potentials across urban sectors.

And our final speaker today will be Jennifer Layke, director of the Building Efficiency Initiative at the WI Ross Center for Sustainable Cities. Jennifer leads he Building Efficiency Initiative's research in collaboration with WR Cities' teams and Global Buildings experts.

And finally with those introductions I would like to go ahead and welcome our first speaker, Maryke, to the webinar. So Maryke, whenever you're ready.

Maryke van Staden Great, thank you very much. Good day ladies and gentlemen. It's a great pleasure to speak with you and hopefully have great discussions on this topic of buildings and energy in buildings. As you know the UN Sustainable Energy for All initiative has been making quite a move globally. It's been launched with the support of Ban Ki-moon. The UN Focus on Climate is this year obviously in focus with the COP21. And the aim of Sustainable Energy for All is to ensure universal access to modern energy service to double the rate of improvement in energy efficiency and to double the share of renewable energy in the global energy mix.

All of these are key focus areas of every single activity in the SE4ALL initiative. We have a couple of accelerators that were launched last year in September. These focus on a variety of areas where energy is obviously key and sustainable energy transitions need to move forward. Our focus today is very much on buildings and promoting sustainable building policies and practices worldwide.

Introducing very briefly the Building Energy Efficiency Accelerator the main partners working on this are WRI, ICLEI, and World Business Council for Sustainable Development. But we have a huge variety of partners. If you see this slide you see businesses, you see NGOs, you see networks—really a booming business in itself to get these partners all together to work on an incredibly complex topic and sector focusing on sustainable energy in buildings.

Now why are we looking at efficiency in buildings? We know that buildings consume nearly 40 percent of energy demand and account for more than one-third of greenhouse gas emissions globally. This very many people who live in buildings, who use buildings, who work in buildings don't necessarily think of that energy use directly leading to greenhouse gas emissions. So that's part of the angle that we also need to look at is raising awareness on this large impact that we need to address.

Moving to large potential certainly if we can reduce energy demand in building globally by one-third by 2050 using known best practices on a huge scale across all regions we can certainly shape and support this switch to a sustainable future and reduce emissions drastically. The third element, and

clearly not the least, buildings do not typically stand for one or two years. We talk sometimes—most of the times—about decades.

The beautiful old centuries building in historic city centers—Again this is something we need to consider across all spectrums, all types of buildings—so avoiding poor choices that can lock in the high costs, carbon emissions, and for urban services. If we look at the economic, social, and environmental benefits these are clear. People who work in the field of sustainable energy understand this but we do also need to build a better understanding amongst building owners, building users, tenants, and so forth to really ensure that we all understand that scaling up in these areas would make significant change.

We do have a conundrum however. We know the technologies are there. They're available and cost effective. Clearly R&D will bring new technologies to the market but we know we can roll out now. The barriers seem to be more behavioral and institutional. Focusing on awareness raising is key. We need more technical expertise. The younger generation also needs to understand how to focus on energy in building in their studies, working across multi-disciplines.

We need to look at performance uncertainties, ROI requirements, split incentives, and funding. All of these require very different categories of actors who need to work together in a field that quite frankly has huge potential and huge interesting opportunities to switch. We need to diffuse good decisions, show that inaction is also leading to higher costs in the future, and certainly single technology approaches are not necessarily the best. We need to get a good match between good design, good technology mix, and good user behavior.

To overcome many of these barriers we need that deep efficiency. Looking at this beautiful picture it clearly shows you that policies can bridge the efficiency gap. We know what we need to do and new partnerships are need also working with us in this building efficiency accelerator to implement more ambitious products, implement policy packages, and address those barriers, bridge the efficiency gap and avoid lock in.

Now we are actively encouraging local governments to sign up to the BEA—the Building Efficiency Accelerator. Clearly the overarching commitment is there in their own jurisdiction to double the rate of energy efficient commit by 2030. This is their commitment that they would make when the sign up. And then they need to at least implement one policy, one demonstration product ideally to be announced at the COP21 though we know time is short. So we will also obviously invite those to continue in the first 2015 period.

Secondly they need to committee to creating a baseline of building energy efficiency performance, and thirdly to track, regularly report, and share those good practices with other governments. We have a call to action before the COP21 in Paris calling on ministries, governments, industry, universities, NGOs, and international organizations to work with us to work and connect to the BEA. And in particular, a call to local governments to make know their leadership; they can support the call to action by contacting us.

5

And there is a very brief contact list for you, both colleagues from WRI, World Resources Institute, and myself and my team. Thank you and over to you Nate.

Nate Aden   Great, thank you Maryke for the introduction. And thanks to all the participants for joining today as well as to the Clean Energy Solution Center for hosting the webinar. It's a great collaboration with several organizations as Maryke was showing. So I will be going through the mapping of the building efficiency tools portion of this webinar. So here's just a brief overview of the webinar overall. And again my name is Nate Aden. I'm from the World Resources Institute. And I'll be presenting this portion with Ksenia from C2E2.

So Maryke provided a nice introduction that provided some of the big picture here in terms of why we care about buildings. In terms of the specific opportunity that we're looking at with the tools that we're talking about today the large drivers here are at a global level the doubling of urban population between 2000 and 2015 is a major driver of urban construction and the buildings that we're talking building energy use. At the same time we've got a profusion of newly available data at the buildings level.

So for example in the U.S. Nest is a company that was acquired by Google that collects a lot of these building level data and links them with web-connected services to improve efficiency and create new capabilities in buildings that is emblematic of how the sector is changing quickly. So that would be sort of examples of the bottom up data that are becoming newly available here. At the same time, as all of you are aware we've got policy goals that are being discussed at the global, national, state, and local level.

And of course Paris is the one looming in the next couple of weeks. So the simulation tools that we're talking about today really helped bring those two together and contributed to the low carbon city outcomes that we're all working towards. I've just included a list of six preliminary summary tracking metrics here on the right in terms of how we actually measure what it is we're working toward.

One basic measure to start with is city-wide energy use or greenhouse gas emissions. This can also be put in terms of intensity—so energy or emissions per square meter: number of certified buildings or projects. There are various certification seams globally that many of you are familiar with. And we'll talk about more. Clean development mechanism methods and some areas are increasingly interested in talking about net zero buildings and different ways of defining those and tracking the number of those. And then just policy demonstration projects overall—we can talk about that as well.

In terms of the tools that are out there this is a very well-established space. There have been simulation tools that have been around for decades now. And this is just a screenshot of one directory of building energy software tools. And you can see it lists more than 450 tools that are available online. Meanwhile beyond the buildings level city level tools are also available. And

so this is a summary from NREL of some of the city level tools that are available among different sectors.

What we've done in this project what Ksenia and I have focused on, is grabbing some of the information sources and tools that are available particularly as was mentioned earlier—the freely available tools that are focused at the building and city level and starting to synthesize these and start to make them more accessible for the stakeholders that will be signing on to the Building Efficiency Accelerator that was described earlier.

The challenge here is to harmonize this vast range of tools with various capabilities and audience and assumptions and data requirements with the needs of these new stakeholders who are trying to move towards clean low carbon cities. And so this is sort of a busy slide here but in the upper portion you can see that we've mapped out portions of the building life cycle for new buildings and existing buildings. And these are sort of intervention points or opportunities where there can be efficiency improvements.

Going back to the large global drivers that I mentioned beyond Paris and the various accelerators that has already been a large movement. So here you can see a summary. You can see 40 of some of the 228 global cities that have already set GHG reduction goals and targets. More than 430 million people live in these cities. And here on the left you can see an estimate of the savings that would be achieved if these cities achieved the targets.

We have broken the overall policy cycle for city stakeholders regarding buildings in their cities into these five steps of scoping, identification of opportunities, design, implementation, and the evaluating and reporting— going back to more scoping. And we have broken the universe of available public tools into project tools and policy tools. And so now I will hand the webinar over the Ksenia to walk through a decision tree that we developed to help guide stakeholders in cities to help select tools and understand what tools are available.

Here you go Ksenia.

Ksenia Petrichenko   Thank you very much Nate. I'm going to present the main result of analysis which we conducted together with Nate, C2E2, and WRI. As Nate pointed out the main idea was to really map the tools which are publically available which focus on building energy efficiency and which can be used by city governments in order to develop and improve on their policy framework for improving energy efficiency in buildings. So this is not complete and comprehensive of all possible tools which are out there.

As Nate mentioned there are a great variety of them but we try to pick and map those tools which we thought can be helpful and can be used by policy makers in their efforts to develop various policy packages in their cities. So if participants will have any suggestions on how we can improve this _____ exercise please contact us after the webinar with your suggestions and we will be happy to consider them. This is a living document so we'll want to have it as a growing exercise and including more possible, useful tools.

So as Nate presented we have this framework of policy development cycle which you can see on the top of the screen as a process. But it's really a cycle. And for each state we try to identify what are the key aspects policy makers should look at in order to develop their policies. And for each of these steps we try to suggest certain tools which can be helpful. So starting with a scoping stage which is really the first state of policy development houses ran local situation and the city should be analyzed and energy efficiencies stakeholders of the jurisdiction should be taking into account.

The first thing which policies makers could think of is whether there is a baseline for energy efficiency already in place. And if there is no baseline then there are certain tools which can help to create this baseline. One of them is Common Carbon Metric which you are going to hear about in more detail from Peter Graham. So I will not focus on it now. Another suggestion for the tools that can be used at this stage is GREAT—Green Resource and Energy Analysis Tool—for cities which can help local governments to identify potential energy and emission reduction opportunities and create action plans.

So these tools can be used in the baseline preparation process. And if the baseline is established or can be established through these or other tools the next question policy makers can answer is whether there is a _____ to collect required data for this baseline whether the step exists or if certain data gaps can be filled somehow. And if the data is largely unavailable other tools which can contain some proxy data which can be used to fill these data gaps can be used. For example TRACE tool developed by World Bank which you're also going to hear about today in more detail.

Or some other city level databases can be used in order to send in data into the tools for development of the baseline. After this step the next question is whether the city can identify what are the key barriers to energy efficiency which already exists and which should be overcome in order to improve energy efficiency in the jurisdiction. If the barriers cannot be easily identified we suggest a number of sources which can be used and which can provide an overview of the potential barriers to energy efficiency.

For example dry land transformation group work by WRI or IPPC chapter buildings, IEA Governance Handbook and other information sources. Next after this is done we consider the scoping stage is finalized and we can move to the next stage which is identification of potential policy options which can be considered for policy development. The question that has to be answered here is whether it is possible to identify policy instruments to address existing barriers and prioritize them. If it is not a very easy process a number of tools can be helpful in this.

For example using policy assessment tools developed by WRI and Johnson Controls can provide with a simple framework to help policy makers and stakeholders to design their _____ strategies through assessment of a number of policy options for energy efficiency in buildings and assess their current status as well as difficulties and importance for their implementation.

The next stage of the cycle is policy design. And at this stage it is important to have certain design guidelines and information on existing policy practices to take into account when particular policy instruments are being designed. A number of sources which we all _____ contain this kind of information and with guidelines. We looked at a number of sources which are available, for example Handbooks for Sustaining Building Policy developed by UNEP, IPCC reports, as well as IA Governance Handbook and _____ information of course which I mentioned before.

For existing policy practices there are a number of sources and tools available online. IA Building Efficiency policy database as well as Global Building Performance Network tools. They have one tool: one on new buildings and another one on existing buildings for deep retrofit programs. They contain a number of case studies and best practice which can inform policy makers on potential success stories and solutions which can be implemented in their jurisdictions.

Another important question to consider is how to include and track energy efficiency benefits. The benefits are not always included in a policy development process. So it is important to have information on co-benefits and include them as part of the policy design. That work, developed by IAM could benefit a relation on co-benefits as well as guidebook on the co-benefits evaluation tool for urban energy systems and other tools such as COBRA which can estimate and map different co-benefits such as air quality, human health, and related benefits of energy efficiency policies can be helpful at this stage.

Moving to the next stage which is implementation of course is _____ to the question whether there are tools and information sources available at policy makers' disposal in order to effectively implement policy instruments. Here we identified a number of sources which can be helpful. We distinguished between our tools which aim at projects meaning at improving energy efficiency in particular buildings or _____ buildings. And there are tools which particularly help in new buildings or existing buildings that are energy efficiency retrofitted.

And they help to design and identify energy efficiency measures which can be implemented through certain input data and analytical algorithms and can help to estimate potential energy savings, greenhouse gas emission reductions, as well as cost savings for these programs. Also we looked up different tools which can help implement policies which can result in this project. _____ tools from which I haven't mentioned—this for example— solutions gateways.

This is an online platform and database which offers a vast amount of information, energy efficiency case studies, success stories in different cities and countries as well as how particular policy packages have been implemented in those jurisdictions. And the last stage of the cycle which we are looking at is evaluation and reporting which is very important because it helps to derive lessons learned and key ways to improve policy implementation and enforcement.

And here there are also a number of tools which can help in this process to evaluate the impact of policies and projects which have been developed here in the cycle. Here we also distinguish between different tools separately for policies and projects. And some of them I already mentioned. As you can see some of the tools which we took into account can be implemented at several stages of the cycle. So for example for policies such tools as LEEP-C can help to analyze the impact of a number of different policy types for existing public and residential buildings.

They can also help to alleviate the costs and energy efficiency savings based on the policy inputs. And for the projects I can mention for example ENERGYSTAR portfolio manager or EDGE tool which can give the opportunity to analyze potential energy savings from particular building projects based on the inputs provided by the user.

So this is a very brief overview of the so-called decision tree which we came up with which we hope can help policy makers to navigate through their policy making process and advise on the tools which they can along this process. As I said this is a living document and we are summarizing the findings of this analysis in the next addition of Driving Transformation Report which should be published during next year. So you can find more information and sources in these documents as well as if you have any questions and would like to find particular tools you are very welcome to contact us directly.

With this I would like to finish my part of the presentation. And we are going to look at two case studies for particular tools on—as I said—Common Carbon Metric will be presented by Peter Graham and the TRACE tool will be presented by Christian Mahler from World Banks. We're starting with the first presenter, Peter Graham, on Common Carbon Metric.

Peter Graham   Thanks Ksenia. That was a very good overview. Thank you very much for presenting that. I'm just going to switch my slides up here so you can see them properly. Thanks very much for the opportunity. I am the executive director of the Global Buildings Performance Network. We're an NGO which supports governments and industry to identify best practices in building energy polices and develop actions plans to get the mitigation potential of the building sector.

I want to talk about the Common Carbon Metric which I've been involved in for a number of years now—since early in September 2007. And I wanted to put it in the context of how it helps inform policy action plans which is a key service I suppose of the Building Efficiency Accelerator and one of the reasons why the GBPN is involved as a partner.

So in developing an action plan policy—action plan for building efficiency or for mitigation there are a number of different phases which I normally undertake. The first is stock taking which is identifying the current situation, level of energy consumption, building stock, the capabilities on the ground to institute change and levels of awareness and so forth. Once you understand that basic picture then you can go into scenario analysis and goal setting.

This is when the Common Carbon Metric starts to be useful as a tool when you want to establish an MRV baseline for building energy and associated emissions. For _____ building stock or a group of individual buildings or an active portfolio of buildings. And from that baseline we have new functionality in the Common Carbon Metric. We can start to generation mitigation scenarios based on different policy actions. And moving from scenario analysis and goal setting we then look at implementation roadmaps.

So this is really where the jurisdiction would start to set out modes of stakeholder engagement and education and capacity building and key dates and milestones for achieving emission reductions. And of course what's also very important in developing an action is making sure that the plan can be funded. And this is again where the Common Carbon Metric can be useful in establishing an MRV baseline using methodology which conforms with the standards required by the UNFCCC programs, the _____ programs, development bank programs, and the like.

What is the Common Carbon Metric? It began back in—We were starting to develop it and it really began in 2008. In 2010 it was developed as a pilot tool and there were two rounds of piloting of which covered around about nine square kilometers of four areas of individual buildings and around about 350 square kilometers of building stock globally for residential and also non-residential buildings. And essentially the _____ _____ building process there was a metric which is put forward which enabled consistent reporting on energy intensities, kilowatt hours per square meters per year of operational energy and also kilowatt hours per occupancy year.

And the being able to convert those energy consumption metrics into carbon emission equivalent metrics, kilograms of CO_2, equivalent meters squared per year and also a program CO_2 per occupant per year. The occupancy metric is often used for residential more than it is for commercial. So the Common Care Metric phase one exists as a spreadsheet tool. It's available from UNEP or from GBPN, and other partners who have been involved in its development.

It has two approaches to deriving energy intensities and energy baselines and also emissions baselines. One is a top down approach which provides a step-by-step approach for disaggregating regional and national level energy performance data and also fuel consumption data from buildings in a particular region. And then there's a bottom approach which enables you to build up a baseline using data from your _____ used in building.

Ideally you would use the tool in both the top down and bottom up modes so that you could check the accuracy of the data that's being used at top down and also from bottom up. If you were taking the top down approach the there are some basic data requirements. For area data what's called the hall. This is building stock level data. This would be for example for commercial buildings in the city or for residential—types of residential in a particular area. Or it could also be a floor area of a particular building portfolio.

And this if possible also for occupancy numbers for the buildings within that jurisdiction. So that could be based on average number of people in a household for example, et cetera. We also want to understand if possible the intensity of use of buildings. So this would be a percentage of occupants in building areas attributed to the different categories of building stocks, number of people in homes, number of people in offices, school, et cetera.

And then also as a minimum to have information on the total amount of electricity consumed in that particular area and also if possible different the consumption of different fuel costs beyond electricity. You can see there you can also break that down by percentage for different buildings types if you have that level of information. Most of the pilot projects focused on one particular building type—That would be residential and non-residential or a sub-category of those. That's multifamily housing or office buildings.

So finally we convert those energy baselines into emissions _____, emissions factors. There are default emission factors in the tool itself based on the electricity average emission factors for the countries. But of course different grids have got different emission factors. And so it is possible to find more specific emission factors in these _____.

From a bottom up perspective you can do it from a measured data point of view as well. So taking the bottom up approach you use a description of the building type, building name, and if possible the address and any other information you have about the building or a group of buildings which is under investigation. And then you basically collect the same sort of information but from the bottom up it's usually measured data, occupancy surveys, and also other utilities bills that would provide you with different levels of consumption of different fuels

You can also incorporate a calculation of the opposite of from the purchase of green power or renewable energy that's generated on the site. That's the bottom up and the top down. No in the Common Carbon Metrics spreadsheet tool you would hopefully be able to do an analysis of both the top down and bottom up and then come to an understanding of what is an average baseline that could be used for a particular type or a stock of building.

Here's just a quick example of how it's been used to date. This is from one of the pilot studies in Kuala Lumper. This is study of the baseline emissions and energy consumption in an affordable housing project in KL. This slide here just shows you how the jurisdiction used it in terms of policy context. From left to right you can see that there is a need for being able to address emissions in Malaysia. But there's no policy at present on residential building energy performance.

And that there is a very high level of emissions associated with electricity use in Malaysia and that this is an issue for affordable housing because if the government is trying to reduce emissions it also needs to consider how to do that in a way which suitable for that sector of the community. And so therefore the decision is not to use the Common Carbon Metric to establish

baselines that could inform the need for residential building energy performance regulations.

So in this process both top down and bottom up data as used. [inaudible] derived from national statistics in previous studies. And in this case it was the full area of an affordable housing project in KL which happened to be of a standard design. The results of this study could be then generalized for other parts of Malaysia as well. And then there was an effort made to collect bottom up electricity bills for 383 households. And then a door to door survey done looking at patterns of end use and behavior for 281 households.

The results came out—We haven't gone through the whole tool for you but the results are fairly straightforward when they do come out the other end. You can see here on the left hand side two of the projects that were looked at. And you see the bottom up approach and the results—energy consumption and GHG emissions. And then the top down approach. And what you can see is that there's a discrepancy between the bottom up measured baseline and the top down measured baseline.

You can see that energy consumption from the bottom up approach is estimate at about 43 kilowatt-hours _____ per year whereas the top down approach came in at about 85. Over all of the pilot use of the tool there has been a discrepancy between the top down and bottom approaches. This has to do with the system boundary which is used in national statistics and the specificity of emissions factors associated with supplying different _____ to buildings.

With that in mind the Common Carbon Metric is now being developed as a CCM 2.0. And this is an online tool. It basically tries to expand on the very basic calculation mechanisms of Common Carbon Metric spreadsheet and to add a scenario model which is being built up from this Central European University and has performed the IPCC and Global Energy Assessment and others various sophisticated and comprehensive policy model for buildings summarize on the GBPN website at the Building Energy Policy Scenario tool.

We're combining the scenario modeling and the Common Carbon Metric now to provide an online tool which is going to be more accurate than the spreadsheet tool and enables the users to set baseline and then also generate scenarios based on different policy options. The tool is not yet online but it's fully designed and will be online in the New Year. This is basically just a few slides to show you what it looks like. The Common Carbon Metric will have two modes.

One will be an online version which will enable users to calculate measured baselines and then also scenarios and also opt to share data with the global community. And there will also be an offline version so that you can actually download the tool and use it in house if you will as long as the users are certified. You can see here just a couple of screenshots from the new tool. This is where you would enter the basic information for in this case a bottom up analysis.

But you could choose a top down analysis or you could choose a hybrid analysis which is an analysis based on _____ buildings rather than it being from measured data or from national statistics. You can choose to set a baseline or you can choose to set a scenario which is called a future line. In all cases you have to set the baseline first. And then you can start to develop your future line. And there are a whole range of different levels that you can establish your baselines for: national, regional, city, districts or portfolio of individual buildings.

And this is just an example on the right hand side of some of the outputs. But you can also see the green line on the top showing the different types of data that then can be input at different stages. There is also an option if data doesn't exist in a region to use property data instead of measured data so that you have a first step to getting some insight into the kinds of policy options that can help mitigate emissions in your region.

Combining the Common Carbon Metric with the scenario modeling tool enabled us to provide a range of scenarios. It also allows customization at different scales, _____ _____ or municipalities. It provides for different baselines set for different base use. It also helps to identify emissions from different end usage. It also now has a much more comprehensive set of normalization, options to climate zones, and then also building ages can also be noted in the tool as well.

This is going to be an improvement on Common Carbon Metric 1.0. And this is basically what it'll do. It'll provide you with a baseline which gives you an intensity of energy use for example from any given year based on your data. It enables you to project scenarios for future lines here on the spot. Data inputs are pretty much the same as the Common Carbon Metric 1.0 but there are new data inputs required to set the scenarios. Retrofit and demolition rates for example, _____ protections, population projections and so on so that you can establish the basic information to generate scenarios.

You can see here also that we're taking advantage of existing datasets for certain end users so that they'll be a way of taking shortcuts. If you don't have all of the data in your region immediately you can use reliable data from other sources. And this again gives you the top down approach, again pretty much the same as Common Carbon Metric 1.0 also with data that enables you to project, so annual growth in energy for spacing, et cetera.

Just to show you where it's going this Common Carbon Metric has been in place now for a number of years to establish MRV baselines for energy consumption and remissions. It is also now being used to inform countries developing NAMA programs. It's also now informed and it's been incorporated into an ISO standard for carbon metrics in buildings which is available from the ISO now. Thanks very much.

Tim Reber   Great, thanks Peter. And at this point we will move on to the second case study which is Christian.

Christian Mahler   Thank you very much. I'm happy to talk to today about ESMAP's Tool for Rapid Assessment of City Energy. And thank you Ksenia for really providing

a good overview for the use of the tool. I should note that TRACE is not an exclusive building tool but it is a tool for multisector municipal energy assessment that can help a city to quickly identify energy efficiency, performance, and opportunities in seven sectors which are shown here. That's transport, buildings, public light and water, wastewater, power, and heating solid waste and industry.

We're currently updating the tool and will be hopefully ready by the end of the year. Let me know walk you through some of the new features. So while TRACE was initially focusing on sectors that would be under the control of the municipality actually TRACE deployment in more than 60 cities have shown that a _____ for the energy consumption is usually found in the residential and industrial sector. And we also learned from city officials that they want to address energy more holistically even though they might have emitted _____ on some of the other sectors such as public buildings or street lighting that are usually under the control of the municipality.

So we extended the TRACE scope to also include residential and commercial buildings as well as industry. And TRACE actually offers the process from analysis to recommending a course of action. And so the update also includes 100 building recommendations across those seven sectors which is basically a selection of the most suitable recommendations that can be applied to the city context and be proposed to the city in the course of the assessment along with case studies on delivery mechanisms such as PPPs or ESCO financing.

From feedback of city officials we also learned that it is very important to offer some hand holding beyond the diagnostics process. They want to get a sense of what is financially feasible. So 50 of the 100 building recommendations can also be tested for financial profitability. The new TRACE will be an Excel-based tool and this is basically the interface. On the left hand side you can see where the data is entered and where you run the sector savings estimates, confirm the potential savings, the degree of city or authority control.

Then after having selected the priority sectors you move on to the recommendations part where you can refine the recommendations and eventually in the middle these are the intervention models that help to assess the financial viability. This is how the new collection sheet looks like that helps the team when collecting the data. And as Ksenia already noted the tool is intended for use by those cities that do not have a good database and do not have a good knowledge of the energy efficiency potentials.

The deployment of TRACE starts usually with visiting the cities to inform about the process and data requirements. Information collected during those visits for the basis for the city background report which is basically a first report that informs the progress of the diagnostics. What we learned is that the setup of a municipal energy efficiency taskforce across the different stakeholders proved to be very successful in terms of fostering across departmental collaboration even beyond the World Bank's involvement.

After collecting the basic data and in order to start a discussion with the city we run a benchmarking to basically highlight what the areas are where the city is performing very well or very poorly to basically start the discussion of what could be the potential priority sectors for the city to engage in energy efficiency measures. But this is more a quick and dirty analysis to really start the discussion. And the more sophisticated analysis comes with the sector prioritization where we look at the relative energy intensity, the amount of energy spending, as well as the degree of city or authority control.

And the city can also select from the sectors according to their priorities and make a decision then on moving forward in determining what sectors they want to look at more closely. On this slide you can see that when you have selected the priority sectors you can then go on and fine tune the recommendations. To do this initial appraisal we asked the user to critically analyze the city's capacity to act, emphasizing five different _____ which are also outlined here on this slide.

It is finance, human resources, assets and infrastructure policy regulation and enforcement as well as data and information. So for instance if transport is one of the prioritized sectors the user must provide information on the competency of the city in terms of transport, project finance, and knowledge level of the transport team, the type of transport assets and infrastructure that is already in place. And so this will eventually allow really to fine tune and tailor the recommendations to the city's needs.

Eventually—and this is also a new feature of the TRACE update. As I mentioned earlier the city or the implementing team will then have the possibility to run profitability analysis and to look at the costs and other benefits arising from the potential measures.

In the next chapter I will talk a little bit about the entry points and our experiences in deploying TRACE in different countries to provide an understanding and I think for all of us working with the cities. So what are the entry points for us and the challenges in supporting cities to advance energy efficiency? We actually found that city energy diagnostics can help address a number of consideration needs for cities. But we also saw during the past first deployments that these entry points for urban energy efficiency diagnostics are typically not expressed by cities as a need for energy efficiency.

But rather evolve from local challenges such as power outages, air pollution, and high energy costs. And then eventually we can help the cities addressing those issues. And I've listed a couple of reasons below that cities found useful. For instance for the newcomers to energy efficiency contributing to an enhanced understanding of the city's energy use, challenges, and potentials to inform future policy and urban planning processes or support the development of an urban sustainability agenda.

For cities that already had some exposure to energy efficiency identify and prioritizing sectors and measures with high energy efficiency potentials and quick returns to showcase viability of urban energy efficiency and improve service delivery to city dwellers. This might be good for cities who had

limited _____ but who want to prioritize where they get the most bang for the buck. Third is to provide a set of implementable and tailored recommendations that can be used to develop an investment pipeline or inform on the overall municipal investment plan.

This is already more advance. Or forward to mainstream energy efficiency and sustainability into the institutional structure of the city by for instance a city wide procurement policy or by setting up an energy efficiency taskforce. Let me know continue with a couple of country and city cases. On this slide is experience from India and Ukraine. When we were deploying TRACE in the three cities of Bhubaneswar, Cuttack, and Puri in the state of Odisha which is in the east of India the major challenge actually was to find good data proxies for the energy efficiency analysis to identify the potentials.

And this due to the fact that the three cities are only beginning their urbanization process because 80 percent of Odisha's population still lives in rural areas but there is a rapid urbanization taking place. But that makes comparison with more mature and urbanized cities very difficult at least for the moment. So while the current analysis and the KPIs look pretty good they do not really say anything about the future challenges and how important it is for those cities to have a sound urban planning and to [inaudible] codes on the permits and enforcement as well as on the urban planning and to avoid future carbon _____ and high life cycle costs.

The bank is now working with those cities to enhance their building code enforcement because while the building code exists it is not really enforced. And the other example in Ukraine is there the cities already some exposure to energy efficiency. And there is also an ongoing decentralization reform which basically helped in working with the cities. They have a lot of autonomy in providing municipal services other than for instance in India where usually the state government is responsible for providing municipal services on cities.

The cities do not really have autonomy even in providing municipal services. In Ukraine we carried out TRACE in three cities with subsequently drafting of three visibility studies. Investment pipelines and rapidly increasing heat and gas tariffs this year basically sparked cities' strong interest to work on both public and residential buildings due to potential energy savings. And while in the past municipal energy efficiency measures—for instance in the public building sector—were almost impossible to finance through public budgets.

Due to budget code restrictions at the national level the energy modernization law which came into effect in May this year now allows energy service companies to invest into reconstruction of state finance assets—for instance schools and hospitals—in their energy service contracts. So this now allows us for instance to set up with one of the city's municipal energy service companies for performing those energy efficiency measures. This case also clearly shows that it's not about only the cities in implementing policies. But very often it also depends on national legislation that needs to be addressed along with what is decided in the cities in terms of uptake of energy efficiency measures.

On the next slide I have an example from Brazil and Kyrgyz Republic. Last year we started deploying TRACE in four smaller towns in Kyrgyzstan and here as well the government was leading the dialog with the bank because the cities don't really have the capacity and also the autonomy in providing services and in performing energy efficiency measures. Here the entry point for TRACE was decentralization reform and a requirement for the municipalities to develop municipal energy savings plans.

The rationale for the Kyrgyz government to look at energy efficiency was an over reliance on hydropower for heating in public buildings while hydropower capacities are diminishing during climate change. With the public building retrofits that are planned—a project with the World Bank—the government of Kyrgyzstan wants to showcase best practices and _____ renovation to reduce power consumption for heating.

What we realized throughout this project was another great benefit of the tool which is actually less apparent. It helps in engaging with the cities after you've started your process. And on-site inspections in those buildings actually revealed missing capacity in building retrofits. We could offer to local crafts people, design institutes, and engineers our capacity building seminars where we showcased international best practices in energy efficiency retrofits.

The other example for Belo Horizonte where TRACE was performed in 2012 was intended to investigate sector priorities for energy efficiency. There was already a sustainable energy agenda in the city. And city officials explained that the data collected in developing the TRACE analysis helped them to better understand the energy consumption patterns and provided them with recommendations for energy efficiency interventions—those that I mentioned earlier.

So following the TRACE analysis the city adopted a wide range of measures such as electricity consumption, monitoring for public buildings, LED retrofits of traffic lights and review of planned and ongoing projects associated with energy efficiency. And even a certification scheme for environmental sustainability of private enterprises and residential and commercial buildings. So you can see that engaging with the cities there is huge diversity in terms of what the entry points are for us and also how the cities are going to tackle the different challenges.

We've seen that even in the same country those can be very different from city to city. While TRACE provides good analysis and intervention guidance it offers us a great opportunity for the dialog with the city and for across departmental exchange. Thank you so much.

Tim Reber   Great, and thank you Christian. With that we will move on to our final presenter, Jennifer, who is going to provide some closing thoughts and remarks. And then after that we will move on to our question and answer session which will be moderated by Maryke. Please don't hesitate to go ahead and ask questions for after the Q&A which will be coming up shortly. Jennifer, whenever you're ready. Thanks.

Jennifer Layke	Great, thank you so much. And thank you to the presenters. This has been an excellent discussion. I wanted to circle back around and just conclude on the webinar today with a view to where and how these tools are critical for the Building Efficiency Accelerator and for the work that we would love to do to engage with cities and with technical experts and organizations around the world as we look at urban energy efficiency solutions.

Very briefly to begin that part of our conversation we're going to talk a little bit about the—I'm sorry somehow we have the last slide, not the beginning. Here we go. We're going to talk a little bit about where we're going from here. The Building Efficiency Accelerator will be announcing a new set of partners that have joined at the climate negotiations on Buildings Day or Energy Day at the climate talks in Paris in December.

Our goal is to work with 30 cities and jurisdictions over the course of the next two years. And as you heard in the introduction from Maryke we're focused on trying to ensure that cities that are working with us commit to a policy a project, and to tracking and communicating their progress on their building efficiency goals. The reason we thought it was critical to begin to explore and to map the tools available to cities as they look for opportunities in energy efficiency is because this mapping exercise is a critical part of our program overall.

But we also recognize there are many tools available and that finding and developing kind of a road map of how you begin and how some of these tools connect is a critical piece of the agenda for our Building Efficiency Accelerator and for many others in this space. So the cities that work with us participate in webinars and training. We provide technical support in terms of helping them identify and move forward with their agendas locally. We focus on local action prioritization.

As we heard cities may be thinking about their activities in two ways. First they may have a sense, working with some of the existing organizations such as the World Bank and the ESMAP program. They may have a sense of what some of the major opportunities are for their action in their public building stock. In contrast others may have a strong interest or concern around what's happening with the urbanization but not have a clear sense of what the picture or profile is for the building sector in their cities, whether that's public or private.

And our partnership is designed to help them track through this initial phase of identifying and prioritizing the action that they may seek to implement in their markets. We will be and continue to look for tools, expertise, and solutions through our network approach and very strong partnerships with many technical organizations including Clean Energy Solutions Center, the Global Building Performance Network, ICLEI, the World Green Building Council, World Business Council for Sustainable Developments, and the many others that Maryke showed you on the earlier slide.

We also recognize that the investment that is needed to transform buildings in cities is often illusive. It can be illusive from the perspective of getting your

own budgets aligned to delivery energy efficiency. And it can also be illusive in terms of trying to find external funding sources that could support a city's interest in energy efficiency. And finally our goal with the Building Efficiency Accelerator is to raise the profile and increase collaboration between cities and with other organizations globally in order to help facilitate peer-to-peer learning processes.

Our process for engagement starts, as we've discussed, with this commitment—this commitment to join the Building Efficiency Accelerator, to assess the priority areas using tools and data to develop a directed and focused exploration of the key areas of interest for that city and to begin to work through implementation planning, identify funding opportunities, and finally move into a process by which cities can track the improvement in their building efficiency using common tools and coordinated engagements.

The work we do focuses on many types of policies. We've heard examples from our presenters and our case studies and from Ksenia and Nate earlier on the types of opportunities that exist, whether that's in the implementation of codes and standards, taking a sector such as social housing or public housing and doing retrofits in a municipal owned or managed. Have a housing stock thinking through and engaging around targeted programs such as those which would say we'll take a ten percent reduction in our greenhouse gas emissions from the building sector by 2025.

There are a variety of different policies and actions available to cities and jurisdictions who are interested in pursuing building efficiency. And our effort in the Building Efficiency Accelerator is to support a variety of these. So I'm going to share with you very briefly one case study in Mexico. We have worked with Mexico City for the last eight months since March of 2015 when we launched a multi-stakeholder partnership for the Building Efficiency Accelerator there.

The first six months of our process took a view to exploring the issue of where the city is today and what it hopes to accomplish, identifying then in the summertime the barriers, whether those are technical and administrative or economic barriers in budgeting. And working through technical workgroups and workshops to help identify and make recommendations to the city. And those recommendations were in the form of looking at local building energy code implementation, retrofits, and financing programs and administrative changes that the city could make in their procurement guidelines.

That case study is a good example of how we work in an intensive manner with cities. Not all cities work with us in this intensive way. We also work with cities in a more hands off or just supportive way if those have already been engaged in a change process and are simply looking for additional resources. But in Mexico City we worked with over 100 stakeholders. We developed these four working groups which were engaged in an intensive six month process in order to provide support to the city around implementation that will begin in December of 2015 through November of 2016.

So we are now looking for opportunities to expand the Accelerator's reach. As we mentioned earlier we're going to be announcing new partners in COP and at the Global Green Growth Forum hosted in Denmark in April. And we're very excited to be presenting some of the accomplishments and actions as well as the new partners and the expansion of the program in the COP at a variety of events including those by our partner ICLEI.

I'm going to leave it at this and turn it back over to Maryke and to our colleagues to answer and take questions and move us onto the more interactive portion of the webinar. Thank you.

Maryke van Staden   Thank you very much Jennifer. Thank you all for very interesting presentations. The fist questions are trickling in so let's quickly run through those. The first question from Frank: what about ISA 50001? Is it not a driver to get clean air buildings? And is it mandatory in all countries? So that question in one, could you explain please the link between the ISO standard and the building owner how we could engage there? Maybe—I'm not sure—Nate would you like to take this one?

Nate Aden   Sure. And I'll let Ksenia jump in as well if she has anything to add. Certainly the ISO 50001 and energy management programs in general are very important to our subject here. The reason that we haven't included it so far is that it's not entirely free for everyone. It's a certification program that requires subscription. But it's definitely an important program. I think also the fact that it's broader than just buildings is one reason that we haven't focused on it.

So obviously it's used a lot in industry as well. But it's definitely an important point of reference and one that we can focus on more if there's sufficient interest. Do you have anything to add Ksenia?

Ksenia Petrichenko   I think that's about the answer I would give as well. Maybe just to add that a number of ISO standards which can be linked to buildings energy efficiency—We were considering to include other certification programs in the _____ of the tools. But because there are so many and we wouldn't want to feature only certain standards or certain certification asking particular organizations, we want to maintain this more neutral scope of the all.

We decided to leave it for now but thank you very much for the comment. We will look into this in the future. And of course the link between energy management and building efficiency is very important to know.

Maryke van Staden   Thank you Ksenia. And maybe just coming at that particular question from the local government perspective this is of course an ISO standard that addresses organizations. So the local government, as a legal entity or any level of government for that matter, that owns buildings should definitely also explore it to drive it in a broader context of energy management within their own government operations.

Maybe a question for Peter, your example of Kuala Lumpur was really very interesting. How are those results of the CCM used in Kuala Lumpur for policy development?

Peter Graham Good question. The first step there with Kuala Lumpur was they have a building code which covers basic construction quality of all buildings. And they had not yet extended that to the energy performance residential buildings. They're still in the process of investigating what the best way of regulating energy performance in residential building new. But to begin with the affordable housing sector was important for a number of reasons.

One is that there are a number of standard designs in affordable housing that are used throughout Malaysia that are representing in the entire building stock. And the way that the building developments are procured involves both the private sector developers and commercial operation. But there is also a government funded approach as well. So using that building platform to develop the baseline for multifamily residential is important because you had a way of being able to engage with stakeholders for both private and public sector and bring them into this process.

It was a political priority in terms of understanding whether or not the affordable housing model was actually affordable to _____ residents. And so again involving residents is part of this process. It's very important. Also for the first time, they were really engaging well with the utilities and energy providers from the point of view of providing data to support the baseline. All of those critical steps were almost facilitated by the use of the tool in Kuala Lumpur to develop the baselines and have given the city government there sort of an infrastructure for taking initiative which would be to start to launch _____ guidelines and demonstration projects.

Maryke van Staden Thanks Peter. Maybe before we go to Christian could you maybe explain if the data were unavailable how does the local government use the CCM?

Peter Graham Yes. Any data that—It would be difficult if you were trying to follow the MRV practice, especially from the bottom up point of view. You need to be able to take the commitment to start to collect data. At the end of the day there is no way around that in the long term. But there is also a possibility for using good proxy data throughout. There are some of the reasons the CCM 2.0 is connecting with the Central European University model and the model that's been used by _____ as well.

There is quite a lot of good proxy data that can be used for different building types, different building ages, different end users, and different climate zones. So in a situation where the data doesn't really _____ it's still possible to use in _____ until proxy data. But with the caveat that of course it might not give you an indicator of what the baseline is. But at the end of the day it's much better to be able to establish a process of directing data because that at the end of the day is what's going to be transformative in your _____ and there you can plug in proxy data.

Maryke van Staden Oh okay great. Maybe that's a nice link to Christian's presentation. Also you've been collection city data through the trades too? How have you done that? Where has the data been collected and do you really use all the data you collect?

Christian Mahler	Thanks. In fact I think this is a very good question. Yes we do collect data directly from the cities, from the different departments in the cities. So when we start the TRACE deployments we engage directly with the cities also through local experts who know best where the data is located, to whom to talk to. And then this data collection exercise usually takes from two to four weeks depending on how easily data can be collected and whether they're available or whether the local experts need to come up with some estimates.
	Right and then we basically run—As I've shown to you we run the benchmarking as well as the sector prioritization exercise to eventually come up with the tailored recommendations. And yes usually we do use most of the data. Although of course if the city doesn't want to look into specific sectors then either those sectors and parts of the data—this is excluded up front or in the process of the diagnostics.
Maryke van Staden	Great. Thank you Christian. And maybe the last question to Jennifer. You've seen now Ksenia's presentation. Also there's a host of tools and guidance available. How are we actually going to package that in the Building Efficiency Accelerator to make it easy for people to find the right tool for the right activity?
Jennifer Layke	I think it's an excellent question. For the Building Efficiency Accelerator partners we're going to be developing and using the mapping that you saw Ksenia and Nate present with regards to where is your entry point? Where are your goals? And how are the tools then applicable? But we would look forward to working with our partners. Specifically to help create more visual tools and the ability to click through, depending on where you are, what your questions are, with regard to data and planning.
	So that you can in a sequential way and a logical way explore these different tools without having to know that you're committing to one or the other at the outset. Our menus of policies, our menu of tools—these are going to be elements of what we develop and work with in the partnership in order to ensure that our partners have visibility and access to a variety of opportunities and options.
Maryke van Staden	Great. Thank you very much Jennifer. So connecting the dots we started off looking at why was Sustainable Energy for All launched, looking at access to modern, efficient energy services, reducing or optimizing energy efficiency, and accelerating the use of renewable energy. All of this comes very well together in the built environment. The range of tools and guidance available is being collected and pulled. And we will help to package it for different kinds of users.
	In particular to support the organizations and the governments that have large clusters of buildings that need to be renovated or where they're planning new buildings to really optimize and avoid locking in wrong decisions.
	With that I'd like to hand over back to our host, Clean Energy Solutions Center, and just wish to thank all the panelists from my side. This was very interesting and exciting times for us in the future. Tim, back to you.

Tim Reber   Great, thanks so much Maryke. And again I'd like to extend a big thank you to all six of our panelists. You did a great job of making sure we got through everybody and everybody provided some very interesting and useful insights. That was very much appreciated. I'd also like to thank everybody in our audience for attending the webinar today. We'd like to invite you to check out the Solutions Center website to view the slides as well as listen to a recording of today's webinar which should hopefully be posted within a week or so.

Additionally we'll be posting the webinar recording to the Solutions Center YouTube channel where you'll also find other previous webinars and some information on other upcoming events and whatnot. So with that we'd like to invite you to inform your colleagues about the Solutions Center and the services and information it offers. We certainly hope to see everybody again at a future Solutions Center event.

With that, I'd like to end the webinar and invite everybody to please have a very nice rest of your day or as the case may be, evening. Thank you very much everyone.