Building Momentum for Energy Efficiency through Voluntary Targets and Improvement Programs

—Transcript of a webinar offered by the Clean Energy Solutions Center on 23 July 2019—
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Webinar Panelists

Shannon Hilsey	World Resources Institute
Mao Qin	Urban Renaissance and Low Carbon Development Office of Changning
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Matt Keighley	Hello, everyone. I'm Matt Keighley and welcome to today's webinar, which is hosted by the Clean Energy Solutions Center in partnership with the Building Efficiency Accelerator, Lawrence Berkeley National Laboratory and the World Resources Institute. Today's webinar is focused on the Building Momentum for Energy Efficiency through Voluntary Targets and Improvement Programs.
	Before we begin I'll quickly go over some of the 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 in the audio pane. 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-hand side will display the telephone number and audio PIN you should use to dial in. if anyone is having technical difficulties with the webinar you may contact GoToWebinar's helpdesk.
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you will find other informative webinars as well as video interviews with thought leaders in clean energy policy topics.

Finally, one important note of mention before we begin our presentations is that the Clean Energy Solutions Center does not endorse or recommend products or services. Information provided in this webinar is staged in the Solutions Center resource library as one of many best practice resources reviewed and selected by technical experts.

So today's webinar is centered around the presentations from our guest panelists: Ms. Carolyn Szum, Dr. Jing Hou, Mr. Mao Qin, as well as an introduction of the Building Efficiency Accelerator by Shannon Hilsey. They have joined us to discuss the core elements of the Building Energy Efficiency targets playbook. Before we jump into today's presentations I will provide a quick overview of the Clean Energy Solutions Center. Then following the panelist's presentations we'll have a question and answer session where the panelists will address questions submitted by the audience. At the end of the webinar you will automatically be prompted to fill out a brief survey. We thank you in advance for taking a moment to respond to this.

So the Clean Energy Solutions Center was launched in 2011 under the under the Clean Energy Ministerial. The Clean Energy Ministerial is a high-level global forum to promote policies and programs and advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Twenty-four countries and the European Commission are members, contributing 90-percent of clean energy investment and responsible for 75-percent of global greenhouse gas emissions.

This webinar is provided by the Clean Energy Solutions Center, which is an initiative of the Clean Energy Ministerial. The Solutions Center focuses on helping government policymakers design and adopt policies and programs that support the deployment of clean energy technologies. This is accomplished through access to no-cost expert policy assistance and capacity-building activities such as this webinar. The Solutions Center is cosponsored by the governments of Australia and the United States.

The Solutions Center provides several clean energy policy programs and services, including a team of over 60 global experts that could provide remote and in-person technical assistance to governments and government-supported institutions, no-cost trainings on a variety of clean energy topics, partnership building with development agencies and regional and global organizations to deliver support, as well as an online library containing over 3,500 clean energy policy related publications, tools, videos, and other resources. Our primary audience is made up of energy policymakers and analysts from governments and technical organizations in all countries. We also strive to engage with private sector NGOs and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across its suite of different programs. Several of the partners are listed above and include research organizations like IRENA and

IEA and programs like the Sustainable Energy for All program, and regionally-focused entities such as the ECOWA Center for Renewable Energy and Energy Efficiency.

Our marquee feature of the Solutions Center is the no-cost expert policy assistance, known as the Ask-an-Expert. Ask-an-Expert service matches policymakers with one of more than 60 global experts selected as authority leaders on specific clean energy finance and policy topics. 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 cleanenergysolutions.org/expert. We also invite you to spread the word about the service to those in your networks and organizations.

So our first presenter today is Shannon Hilsey, who is a project associate at the World Resources Institute. I'll pass it over to Shannon to start off today's webinar.

Shannon

Thanks, Matt. Hello, everyone. Thanks so much for joining us today. We are so grateful to the Clean Energy Solutions Center for hosting our webinar series, and I am very excited to be doing this webinar today with our partners at the Lawrence Berkeley National Lab in Shanghai, Changning District.

We want to quickly get to the real content of today's webinar, which is on energy efficiency targets and improvement program. So I'm going to very briefly give an introduction to our program, the Building Efficiency Accelerator, for anyone on the line who may not have already known about us, who may not already be a partner. We're happy to be presenting today both to some existing partners in the BEA as well as partners who may be interested in working with us in the future, and we hope you will be after this webinar.

As Matt said, we will be starting with this introduction and then moving on to some content building momentum for energy efficiency through voluntary targets and improvement programs with Carolyn at the Lawrence Berkeley National Lab, and then we'll have a case study presented by Mr. Mao Qin at the Shanghai Changning District. At the end of the webinar we'll have a little bit of time for questions and answers, which you can submit in the questions box to the right, as Matt said.

Building Efficiency Accelerator Partnership, this is part of a webinar series, and we'll be happy to share these webinars as well as links to other webinars that we've had. But we do a lot more than webinars. We are a public-private partnership that was begun in association with the Sustainable Energy for All Initiative of the United Nations with the goal of aiming to double the global rate of improvement of energy efficiency worldwide by 2030. And there were several different energy efficiency accelerators initiated by the UN for that purpose. In a number of different sectors we are the buildings-related partnership of that sector and we work specifically with city leaders to try and support city leadership on building efficiency. So focusing on what sustainability experts in seven national governments worldwide can do to lead their local markets towards more efficient buildings.

I won't spend too much time on why building efficiency is important because I think everyone is on the line today because they are already interested in it. But I think one of the key pieces that we focus on a lot of times is the long-lasting implications of buildings. The life span of buildings being 40 to 100 years or more really means that as our cities worldwide develop this is an urgent time to think about energy efficiency before those inefficient buildings and high costs and high emissions get locked in.

Currently the Building Efficiency Accelerator is the partnership of over 50 global partners; they're not all pictured here. We have some updating to do, but we have many partners across the organizational and private sector space and we're proud as of now to be partnered with 50 sub-national jurisdictions worldwide, including the seven on the right that most recently joined from Latin America. When cities sign up with the Building Efficiency Accelerator they commit to three actions in support of our global vision of making all new buildings highly efficient and zero carbon by 2030 and all buildings by 2050. Cities commit to adopting, implementing, and enabling policy to implementing a pilot program and to tracking and communicating their work and sharing lessons with other cities.

Today we're going to focus specifically on city actions that relate to energy efficiency targets and improvement programs. And this is just a very small sampling of the types of actions that cities might choose which fall into that category. In Dubai they recently completed a benchmarking study of 100 buildings, issued scorecards and recommendations to the participants in that program. Mexico City is launching a private sector energy efficiency challenge program to lead the private sector in the city towards energy efficiency in a voluntary way. And in Nairobi they're aiming to commence baseline studies on water and energy usage in order to inform their future work on energy efficiency.

In support of city action the BEA provides a variety of support, including help with a local action, prioritization, and tracking process, a wide variety of tools and solutions offered by our many organizational partners, such as the Lawrence Berkeley National Lab, who you'll hear from in a little while, as well as guidance on finance and funding opportunities and opportunities for international recognition.

Our specific technical assistance offer has several different layers, which we're happy to talk through with you after the webinar, if you're interested. But today we're going to be focusing on a self-guided resource we call playbooks, as well as on our energy targets, which is one of our three core thematic offers within the BEA. And Carolyn will talk a little bit more about that in a minute.

Just as a note, this is a complicated slide and I'm not going to go through it all, but our BEA city action process is a series of five steps, and the playbooks that Caro is going to be discussing will be a self-guided resource that will focus primarily on the central three steps of action that lead to implementation of building efficiency actions and result in energy savings. So we'd love to speak with any organizations or cities that are interested in

getting more involved with the BEA or ramping up their work after the webinar.

But with that I am going to switch to Carolyn, who will get to the real content that you came here for.

Carolyn
Thanks, Shannon. So, Matt, I will ask if you could kindly put up my presentation and then I will help advance the slides.

So thanks, everyone, for joining this webinar. It's a pleasure to be here today. As Shannon indicated, we're going to present on the target playbook, which is one tool in BEA's toolkit which aims to help cities to develop voluntary existing building energy efficiency targets and improvement programs.

I'll very briefly introduce my team. Also on the line is Dr. Jing Hou, a joint postdoc fellow of Lawrence Berkeley National Lab and Tsinghua University; as well as Mr. Mao Qin, who is the Deputy Director of the Urban Renewal and Low Carbon Project Management Center of Changning District.

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So I think what I'll mention here, I think Shannon gave an excellent introduction to today's global energy and climate challenges, as well as the importance of building energy efficiency and achieving our overall 2015 Paris Agreement targets. What I'll add here is that in this webinar we intend to provide step-by-step case study-based information for cities and building portfolio managers to develop and implement voluntary building efficiency targets and improvement programs. In general, while defining energy efficient high-performance building through codes can be considered the foundation of a successful energy efficiency market transformation effort, voluntary energy efficiency targets and improvement programs provide critical direction and momentum. They not only encourage buildings to be operated at significantly reduced energy usage levels, but they also incentivize the buildings industry: the designers, the developers, the owners, the managers, et cetera, to introduce innovative strategies and technologies to deliver large volumes of energy-efficient high-performance buildings, which should help to increase the cost effectiveness of these technologies and solutions over time.

I'll also say that this particular webinar will draw on the case study of Changning District, Shanghai, which has used a pioneering targets-based building energy efficiency program to establish itself as a leading low carbon district in Asia and globally.

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So here's a little bit of background on the Changning District in Shanghai. It's one of 16 districts in the city. Shanghai is also China's largest economic center. It covers about 38 square kilometers and has a population of close to 700,000 residents. This district is established with mostly commercial buildings, also with a few industrial activities. It has really been at the

forefront of Shanghai's effort to transition to a low carbon city. It's sought to achieve this vision by leveraging international expertise, such as from the World Bank, and piloting innovative policies and programs yet to be implemented anywhere in the world—excuse me, anywhere in the country. In addition, in 2011 one of their business districts, Hongqiao, was selected as one of eight low carbon demonstration areas in Shanghai.

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Generally establishing a city-level voluntary efficiency targets and improvement program includes four phases: assessment, development, implementation, and improvement. Each of these phases contains several steps and we're going to talk about these more as we go forwards.

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So the first stage for establishing a voluntary existing building energy efficiency and targets improvement program is to assess the current situation as pertains to targets, policies, programs, and data, to understand the possibilities and potential barriers. So with regard to targets, questions cities will want to ask themselves are are there existing national, provincial, and local energy or greenhouse gas emissions reduction targets for the building sector. If so, what are those targets and how is progress towards the targets measured?

Secondly, cities will want to do an inventory of existing policies and programs. Mandatory programs such as codes and standards, regulations, as well as voluntary initiatives, such as training, information programs, et cetera. Cities will want to understand what achievements have been made in building energy conservation as a result of these policies. And also how would a voluntary existing building energy efficiency targets and improvement program fit into this existing ecosystem and framework.

Lastly, and most importantly, cities are going to want to assess their capacity as it pertains to data. Questions that will want to be asked are is there an inventory of existing buildings stocked for the city? Are data on the characteristics, such as size, location, [audio cuts out] collected, cleansed, organized, and stored and analyzed in the city? If so, what data are collected by whom, how often, and what format? Where is the data stored and what analyses are conducted? If not, where and how could one obtain the necessary data and information above and/or initiate a data collection effort?

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In the case of Changning District, they undertook a very thorough analysis of existing targets, both at the national level and the local level. They also did a thorough review of national, provincial, and municipal building energy efficiency programs and policies even prior to initiating their targets and improvement program. They looked at existing codes, they looked at retrofit business models which had been put into place. They also determined that their district itself had made steady progress in a number of areas, including

exploration of existing building retrofits, promotion of an integrated renewable energy application, supervision of building energy efficiency, training on building energy efficiency, et cetera.

They also had an important advantage as it pertains to data, and that was that in July 2011 they had put into operation a commercial building Energy Consumption Monitoring Platform, the ECMP. This was a real-time online building energy performance monitoring system that covered 100 commercial buildings in Changning District, and collected on an ongoing basis total energy consumption; energy consumption by end uses and system; and broken down by fuel type; as well as other important characteristics on buildings, such as type and function, size, construction year, occupancy, et cetera.

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So once a city has undertaken an initial assessment of data targets and policies and programs, they're going to want to look at the benefits and potential barriers to a targets and improvement program. Questions cities will want to ask at this stage include what information exists on the benefits of voluntary targets and improvement programs; are there case studies, reports analyses that can be assessed; what information is needed to understand the benefits for our city and how could we obtain this data; as well as what barriers might be faced while implementing this type of program and how we could overcome these barriers.

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In the case of Changning District, again, they undertook a very thorough assessment of benefits. They invited World Bank and international consulting firms to partner with their government and to develop a carbon dioxide abatement cost curve for one particular district—for the district. They focused on one particular zone, the Hongqiao economic and technology demonstration zone, to undertake this cost curve study. I won't go into a lot of detail about the CO2 abatement cost curve, but just indicate that it allowed them to systematically understand the abatement potential, the cost and ease of implementation of various CO2 mitigation options.

What they determined from this study was that existing building energy efficiency improvement was the single largest emission reduction opportunity in their district. And moreover, it was one of the least cost methods to reduce CO2 emissions. They determined that this particular approach to improve existing building energy efficiency could also help the district achieve its goals and vision for carbon emissions reductions, and another target they had set for 33,000 tons of coal equivalent goal for their district.

Once they had established that existing building energy efficiency was going to be a critical piece of their overall vision to become a low carbon district in China, they had to look at what barriers may be faced when improving existing building energy efficiency. Some of the barriers that they identified included split incentives, such as the fact that building owners are responsible

for financing improvements in building energy efficiency, but often the benefits flow to tenants and renters, who have lower costs for their energy utilities. They also determine barriers to just lack of financial incentives, lack of understanding of business models to drive energy efficiency in existing buildings.

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So once an assessment of benefits and barriers has been undertaken, cities then want to look at which stakeholders and what tools and resources will be needed to implement an existing building energy efficiency targets and improvement program. Questions to ask include what institutions in the city have been responsible or have expertise for existing building energy efficiency, either government, academic research, non-profit; What institutions should be assigned leadership roles or support roles; who should be involved in designing the program, implementing the program, or advising technically or strategically; and do these institutions have all the resources and tools they need: financial, equipment skills. If not, where and how could they procure these resources?

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In the case of Changning District you can see in the graphic on the upper-right that their first step was to identify all stakeholders relevant to designing and implementing a voluntary energy efficiency targets and improvement program for commercial buildings. They determined that they needed support from municipal government and sector government, building owners, operations management teams within buildings, property management companies, developers, ESCOs, financial institutions such as banks, renters, and government service occupants.

Their second step, and very critical, was to set up a new institution, the Shanghai Changning District Urban Renewal and Low Carbon Project Management Center, to coordinate and integrate the strengths of the different stakeholders and to take charge of the low carbon transition of the district. Changning District also identified a variety of tools and resources to support design and implementation of their program. They leveraged their real-time commercial building monitoring platform, World Bank's abatement cost curve tool, benchmarking tools, building simulation tools, implementation planning tools. They also identified international best practice case studies, procured government financial support, and access to external experts from World Bank, a global environment facility, and others.

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So that concludes the session on assessment. I'm now going to talk a little bit about developing existing building energy efficiency targets and improvement programs.

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So questions that cities will want to ask right upfront when they begin developing these policies is, "Okay, I need to define the scope and policy of this policy. So what type of existing building energy efficiency targets and improvement program do I want to establish? Do I want to put in place energy use intensity performance-based targets for my building stock, or a percentage better than a baseline target, or a percentage better than code target, or a type of information program?" I need to think about how existing building energy efficiency targets could be established, what science-based methods I would use, from the very simple to the more complex. What are the advantages and disadvantages of various approaches to establishing and implementing improvement targets? What are the estimated costs and impacts of these various methods? On which buildings will I implement this targets and improvement program? And what will the scope of the entire program be? Will I include training, technical assistance, use of online tools, financing, et cetera?

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So in the case of Changning District, they undertook really a four-phased approach to fulfill this component of the target-setting approach. First and foremost, they undertook a thorough analysis involving numerous outside experts to select the type of existing building energy efficiency targets and improvement program that they would implement. They assessed both national building codes as targets for buildings and also performance-based energy use intensity targets. They looked at standard methodologies of kWh per square meter, as well as normalized approaches to setting targets. In other words, factoring out all of the influences on building energy performance that can't be controlled by building owners and managers to create more equitable targets associated with the program.

And I'm not going to go into depth here in this webinar on the different methodologies that they explored. Those are contained in our targets playbook and we're happy to answer questions. But what I will say is that once they had looked at all these methods they undertook additional analysis to understand the pros and cons of each of these target-setting methodologies. The approach they took may not be right for every city, but there's some valuable information in the playbook as to what might be pros and cons of different methods. In the case of the performance-based targets, these energy-use intensity targets, some of the positives include linking directly to the energy savings goal for a particular district. Also, measurement and verification is very straightforward in terms of this type of target.

Important things to consider is the need to factor out or normalize for all of the various influences on building energy consumption which are outside the owner or manager's control, such as occupancy or operating hours or services and amenities in order to create an equitable target that building owners and operators are willing to buy into. This may require additional data collection and regression analyses, et cetera. Targets based on current building codes also should be considered. In the case of Changning District they had determined that not all buildings had actually met the current national code

level, which was a 50-percent improvement in energy performance against a 1980's baseline building. Simply asking buildings to meet code was one option that they considered for their targets and improvement program. The advantage of this is that it's more legitimate to enforce. Some of the disadvantages include not having a direct link to an overall energy savings goal, and in this case emissions reduction target identified in their CO2 abatement cost curve exercise. In addition, targets based on codes tend to be heavily technology focused, and there's less flexibility in terms of selecting the most effective energy efficiency options to achieve actual energy performance—operating energy performance in buildings.

In terms of a third aspect of defining the scope of the policy or measure, Changning District also looked at the estimated costs and impacts of the various methods for target-setting. That information is contained in the lower-left graphic; it's also in our targets playbook. But they determined that some of these methods would be more expensive to implement and may have lower or higher energy and GHG emission reductions outcomes.

Finally, they had to determine on which buildings they would implement their targets and improvement program. They took a very detailed stepwise analytical approach to identify both the buildings as well as the type of target-setting method that they would employ. Ultimately they chose a performance-based target-setting methodology using a normalized approach, i.e. factoring out variables such as occupancy and operating hours to set equitable targets that could be bought into by various stakeholders. You can see in the lower right-hand graphic the specific building types and the amount of energy savings that would be achieved by implementing these normalized targets, driving towards their overall goal of 33 tons of coal equivalent avoided in the district.

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Also in terms of development, cities are going to need to think about how to develop locally appropriate policies related to existing building energy efficiency targets and improvement. Questions cities want to ask at this phase is will there be any incentives or disincentives to motivate buildings to achieve their targets? If so, what types of incentives: certifications, awards, subsidies, or disincentives, such as higher utility rates? Will there be a technical assistance program for buildings to help them achieve these targets? And if so, what type of technical assistance: training, tools, experts?

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In the case of Changning District, they evaluated a range of implementable incentives and disincentives to promote stakeholder buy-in of their overall voluntary targets and improvement program. A mapping of these measures by stakeholder group is shown in the lower-left. This is not a comprehensive list, but illustrates the various options explored by the district.

In addition to this, Changning government implemented a new policy, the management method of special funds for low carbon development in

Changning District, which would be valid for five years. This particular management method's policies are shown in the right, and incorporated things such as subsidies for interruption associated with operation for retrofit existing building energy efficiency project support, subsidies for demonstration projects, et cetera.

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The third component of the development phase is policy adoption. Questions that may be asked by cities at this phase are what are the specific targets by building type, and what specific policy measures are necessary to facilitate the targets and improvement program adoption.

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So as I mentioned earlier, Changning District had an overall goal to reduce the district's total coal consumption by 33,000 tons of coal equivalent. They decomposed that target across various building types: hotels, shopping malls, office buildings, et cetera, and determined which specific buildings needed to save how much energy in order to meet these goals. In addition, as I mentioned earlier, they set up a new policy program, as well as leveraged some additional outside measures, such as financial support, implementation of reward measures, access to financing support, and incentive policies. All of these are detailed extensively in the targets playbook, so I won't go into them in depth here.

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So the fourth component of the development stage is to create an implementation plan. And questions cities will want to ask is what will the implementation plan for the targets and improvement program contain? Will there be a timeframe for buildings to achieve these targets? And what tools and resources will be necessary?

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In the case of Changning District they used a project implementation plan computer-aided tool, and you can see an output from that in the right side of the slide. They also developed a timeframe for implementation of their targets and improvement program aspects. Phase one would focus on improving energy efficiency in buildings where the actual energy use intensity was higher than the target value. And these buildings also represented the largest energy savings potential that could be achieved, such as through major retrofit or lighting retrofits.

Phase two would be to focus on improving energy efficiency where the actual energy use intensity is higher than the target value, but the energy savings that could be achieved would be at a higher cost. So envelope retrofits, for example. Phase three would be to focus on buildings where actual energy use intensity is higher than the target value, but the actual energy potential savings is small.

11

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So that concludes the development section and now I'm going to focus on implementation.

So the first component of implementation is implementing the energy savings actions. So questions municipalities will want to answer at this phase include what are the procedures needed to implement a voluntary energy efficiency targets and improvement program? How will stakeholders participate and interact with one another in this process?

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So in the case of Changning District, on the left here you can see that the district did an excellent job during the implementation phase to analyze potential problems and design both specialized models and traditional models to address these problems. Again, I'm not going to go into detail here because of time limitations, and also this information is contained in our playbook. But you can see in the diagram on the right that Changning District had a very complex model associated with implementation of energy savings actions involving ESCOS, building owners, the Changning District government, financial institutions, and other government stakeholders. And I think Mr. Mao and Jing Hou can answer any questions associated with this management process during their presentation.

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Also incorporated into the implementation phase is monitoring progress and making adjustments, taking immediate action to resolve problems that may arise. So questions municipalities will want to ask at this stage include how will the impact of the existing building energy efficiency targets and improvement program be measured and evaluated? So what key performance indicators will be assessed and how often? What outcome indicators will be used to evaluate whether this program is a success or not? Who will participate in the measurement and verification? What is the level of participation in a voluntary program? Is it sufficient to achieve overall goals? And to identify problems as they arise and take corrective actions.

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In the case of Changning District, they identified a number of key performance indicators, including the number of buildings implementing energy efficiency measures, total floor area, implementing EE measures, energy savings achieved, total carbon dioxide emissions reduced, total subsidies approved to implement energy efficiency measures, and the percentage of the overall target for the district achieved.

In the lower graph you can see that they also had built-in feedback mechanisms, such as when the government would issue a policy and it would be applied in the marketplace, there would be immediate feedback from

professional services organizations involved in the marketplace to government so that they could take corrective action.

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The third component of influence is implement is to showcase to stakeholders and the public what results are being achieve or have been achieved. So questions cities will want to ask is what is the level of energy and GHG emissions reductions that have been achieved? What other benefits from voluntary energy efficiency targets beyond just these targets have been realized? Have we increased the market for energy efficiency services? Have we improved building comfort? Have we created new jobs? To what extent have the targets helped to support energy and GHG emissions reduction in buildings and how can participants be recognized for their outstanding achievement?

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So again, Changning District, during its 60-month implementation period for this project, did an excellent job of tracking key performance indicators and was able to therefore communicate very effectively both with domestic and international audiences on their achievements, which are shown in the upper box on this slide. They also did an excellent job of participating in international and domestic summits, forums, technical seminars, establishing connections with multilateral banks, non-government organizations, consultancies, et cetera, to both learn and to share their experience. And you can see some of the examples of their outreach on the slide, on the lower part of the slide.

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So the final phase is improvement.

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And question that cities will want to ask at this point include what is the level of participation in our program? What are the energy and GHG impacts of the program? How effective have our tools and resources, incentives, and institutional setup been? What other benefits have been realized? What is the scale or the potential for scale-up and replication and how can benefits in particular be scaled?

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In the case of Changning District, they focused on continual improvement as it pertains in particular to their energy consumption-monitoring platform. They now have 187 commercial buildings connected to the ECMP, and have extended and upgraded that platform, adding new functions, and ensuring that our platform is supporting additional relevant stakeholders, government ESCOs, research institutions, and building owners. IN addition, they've continued to update the CO_2 abatement cost curve based on real data from

these 100 existing buildings in their district that have participated in the existing building energy efficiency targets and improvement program.

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This is also included Changning District developing additional useful tools, such as a case database, energy consumption status assessment and diagnostic tools. They've also continued to review and evaluate the long-term impacts of their existing building energy efficiency targets and improvement program, identifying aspects of their pilot that are most replicable and of course sharing with international stakeholders in forums such as the building efficiency accelerator.

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Also improvement existing building energy efficiency targets and improvement programs will require municipalities to continue to think about what has worked and what hasn't worked. Again, how do we continue to improve? Should we consider increasing the stringency of our targets or applying them to more buildings? How can we achieve this and in what timeframe? And again. Changning District has continued to evaluate the results of its programs and identify next steps.

They have sought to increase the number of commercial buildings in their district that will participate in these types of existing building energy efficiency targets and improvement programs. They're also continuing to assess technologies, policies, and institutional mechanisms that can be leveraged to further drive energy savings and renovations in their existing buildings.

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So I'll conclude with a few tips associated with existing building energy efficiency targets and improvement programs. I think very important is that not only energy can be considered in these types of targets and improvement programs, but also taking into account opportunities to improve comfort and service levels in buildings. Transferring energy savings into cost savings can help make the business case for building owners and management companies to get involved. Leveraging opportunities to optimize building functions through renovation processes.

In addition, policymakers should ensure that they have support from any relevant authorities. They should consider if subsidies and other incentives could be leveraged from government, either central or local. And strategies to persuade ESCOs and other stakeholders to get involved. On the data side we can't stress enough how important this is; data is really at the core of existing building energy efficiency targets and improvement program. And while Changning District had access to a very sophisticated energy consumption monitoring platform, that's not a requirement. And the building efficiency accelerator and Lawrence Berkeley National Lab have online free software tools that can support cities in collecting and analyzing data.

Training is also important to take into account. There are often gaps between the designed intent of a building and the actual operational energy performance. So training building engineering teams to maximize the efficiency of equipment and systems in a building is critical to achieving actual goals in a voluntary targets and improvement program. We've seen thousands of buildings that have the most advanced high-tech technology, but if that's not operated to high levels of efficiency, beneficial outcomes cannot be realized.

Also it's important to publicize and share findings. That not only connects you to a network, but it also allows you to share lessons, gain new insights, and really to benefit other cities that may be looking to do what you're doing.

So that's all for today and I look forward to hearing from Mr. Mao and Jing Hou with more information on Changning District's activities.

Matt

Thank you very much, Carolyn, for an excellent presentation. I'd just like to remind everyone that if you'd like to ask a question about any of today's presentations or speakers, please ask them in the questions pane. We'll hope to respond to those at the end of today's webinar.

I'll now introduce Dr. Jing Hou, who is a joint postdoc fellow of the Lawrence Berkeley National Lab in US and Tsinghua University in China. Dr. Jing will be translating for our next presentation today, Mr. Mao Qin, who will also be joining us for the question and answer session after Mr. Mao's presentation.

So our final speaker today is Mr. Mao Qin, who is Deputy Director of the Urban Renewal and Low Carbon Project Management Center of Changning District in Shanghai. So I'll now pass it over to Jing and Mr. Mao to present on Mao's slides.

I'll bring in here, Shannon, he'll see—you might lead the Q&A session. Shannon, do you have any questions for Carolyn, and Carolyn, do you have any questions or any other suggestions to bring into this conversation before Mr. Mao presents? Over to you?

Shannon

Sure. I would love to invite anyone on the line who has questions for what we've presented so far, please let us know with the question box that is to the right of your screen. I want to start just by asking Carolyn, this is—your slides were wonderful, so really great, straightforward set of steps for city leaders that are interested in making progress on energy efficiency existing building targets. I'm interested to know what you think—you spoke a little bit about national government incentives, like a building code, for instance, that might prompt a city to be pursuing specific targets for their existing building renovation and programs. But I'm wondering if there's anything else that you think a national government in particular can do to support this kind of work at the city level, or things cities can ask for, yeah, from their national governments?

Carolyn   Yeah, that's a great question. I think there's a lot that national government can do to support these city-level targets and improvement programs. I think off the top of my head would be subsidies or some sort of financial incentive, perhaps a tax rebate or subsidies for buildings that actually undertake retrofits or existing building energy efficiency improvements. That's a direct way that cities can help to incentivize movement in the marketplace for energy efficiency.

Another way that national governments can support beyond financing is through by other policies that kind of augment existing building energy efficiency improvement, such as perhaps data transparency requirements, making public a building's energy use intensity levels or energy performance. If national governments are also able to develop analytic tools like benchmarking tools, or gain access to those tools for use in their country or in their cities, that's quite powerful as well in terms of spurring and supporting targets and improvement programs.

You know, they're often responsible for codes and standards, and as I mentioned, a strong building code is often a foundation that's important for a targets and improvement program, where some cities may want to consider targets built around those codes and standards.

So there's quite a lot of action that national governments can take. And certainly I think Changning District did a very good job of leveraging all sorts of national level initiatives. They leveraged targets that existed, requirements for energy consumption display, preferential taxes and subsidies that existed. They also leveraged financial support for energy audits that was made available by the national government.

I think also, Shannon, that national governments can play a major role and reward. So offering some type of high-profile recognition for buildings and cities that achieve outcomes or take action, and that's quite low-cost, and I think also effective in providing motivation for existing building efficiency improvement.

Shannon   Thanks, Carolyn. That's great. And I think your last point on national government, particularly providing sort of the soft incentive of publicity and recognition of city-level work, although, you know, it's a soft benefit that can also have very tangible benefits for the municipal government, and that's something that those of you interested in the building efficiency accelerator, that's something that we're working increasingly on, is working with national governments to figure out what cities in the country need in particular to support, enable, and incentivize their building efficiency work at the sub-national level and bring together those levels of government that don't always talk to each other about what mutually supportive actions they can take in service of their national and global climate goals. So I think that's a really great point and something that we're working to improve and increase across our network.

Matt   Okay, great. Thanks, guys. We might just see if we can try Mr. Mao again. Mr. Mao, have you muted yourself, or you're good to go? Jing, go ahead.

Okay, thank you, Matt.

So Shanghai Changning District is located in the western part of Shanghai, in the downtown area, covering an area of 38-square-kilometers. Since 1990 a member of large commercial buildings, such as office buildings, hotels, and shopping malls, have been built in Changning District, especially in Hongqiao area. In recent years building energy efficiency has become a key area for sustainable development in Changning District, because there is no industry in Changning anymore. To promote building energy efficiency Changning District implemented the World Bank Shanghai Low Carbon City Project since 2013. _____ they were hoping to promote implement this World Bank major project for building energy efficiency improvement, to improve our city's soft power in Changning District.

What worked is soft power of the city, Changning District, they think it's about promoting a lot of new concepts to implement some new technologies and new energy applications through low carbon energy efficiency retrofit projects and to cultivate a lot of industries and technologies and promote economic. So at the same time, promoting international corporations and drawing of the—and applying the bank's concept technologies and _____ domestic and abroad, forming experiences and practices that can be popularized and then replicated with perfect system and imagine these complete policy systems and innovative operations mode.

So during the project process, in the implement process Changning District cooperated with World Bank and Energy Foundation and ISA. And the Changning District also accepted a lot of support from RRDC, WRI, and the state _____.

Okay, next page, please.

So this page indicates that through 2012 to 2018 and the Changning have completed 45 existing building energy efficiency retrofit projects in this district, with a total floor area of 2.4 million square meters, and have an annual energy savings of about 30,000 tons of standard coal.

Thank you. I _____.

So this page indicates that through the implementation process over the years the concept of building energy efficiency improvements is changing. So at the beginning of the _____ project, that's in 2012, the part is to improve existing building energy efficiency of large existing commercial buildings or reduce the energy consumption of large existing—as to improve the energy efficiency of equipment and facilities in the large existing buildings. To be specific, it's just to replace and retrofit equipment and the facilities in the building.

By doing the project implementation, after a few retrofit projects Changning District realized that the equipment and the facilities of many existing

buildings have now reached their service life, and now it's cost effective to simply replace them. And many building owners are reluctant to carry out retrofit; therefore, Changning District introduced the Continued Commissioning Concept into this project. So building commissioning actually is not a new concept or technology; it's a rise in United States for that years already. But based on Changning's experience, commissioning is really a very cost effective approach for existing building energy efficiency improvement.

So at the year 2016 Changning District, their existing building energy efficiency improvement retrofit project become—the parts become retrofit plus commissioning. In recent years, especially from 2018-2019 was the development of Internet of Things technology and the improvement of related technologies and economics, intelligence operation and maintenance management has emerged as the times requires. So compared to just commissioning, so through intelligent management we can get more savings through the intelligent management technology and the effective and more efficiency and the more effective.

So therefore, for now Changning District's main parts for existing building energy efficiency improvement consistent of intelligent management plus commissioning plus retrofit. Yeah.

Okay, next page we will introduce how Changning implement.

So on this slide you are seeing at now is about the sale abatement cost curve. This cost curve, Carolyn has mentioned it just now. This too is very effective. So this Changning District sales _____ abatement cost curve was drawn based on basic situation and market technology service in Changning District. The details of this cost curve could be found in World Bank's report on their _____. This curve is a 3-D national. The axis refers to the emission reduction. So we will use the difference value to—we will take the difference value as the emission rate action. The y-axis refers to the cost of emission reduction or annual savings. This cost takes into account the cost of the whole life cycle of the equipment since the purchase. The zero-axis above refers to the investment without ray10, and the zero access below refers to the investment with ray10.

Okay. So through this curve we can find that out of economic consideration we should give priority to recommending the technologies with the largest of ray10 on investment and consider the difficulty of implementation at the same time.

Next page, please.

So this slide indicates Changning's popular design for this project. For building sector Changning refers to area. The first one is existing building energy efficiency improvement area. The second one is not zero building _____ and demonstration projects. So to fulfill all these targets and works the supporting system is very important. So you could see from the supporting

system, under this we have the institutional mechanisms and the data platform to support system for the targets and as the project implementation.

And we also introduce financial institutes, their financial support. We also emphasize on the capacity building for the financial institutions, because building energy efficiency improvement projects is different from the traditional long projects and their process is totally different. Because _____ for existing building energy efficiency retrofit projects, lots of projects will adopt the ASCO model to implement the retrofit.

So we also implement some training to financial institutions for their capacity-building, help them to familiar with these models and to promote some new financial products to support building energy efficiency projects.

So the last one you will face is technical support system. So in our opinion the technology is developing, so it's very important to have a technical support system to introduce new technology in the system. So in our project—in our World Bank project we use all these five very advanced technologies in our projects. Like include whole process management, energy hosting, _____ and building commissioning, abatement cost curve, too, and a big data software analysis. So all of these three parts form a very effective supporting system and institutional _____.

So we mentioned earlier that the concepts are changing. They're in the project implementing process is based on this mechanism, this supporting system. So we understand that different cities, different areas have different contacts that's in their city. So we suggest that every city who want to implement a similar program, you should combine the context and the culture and all the relevant context and the develop the top _____ design for your city first.

Next page, please.

So now Mr. Mao will introduce the policy design and the implement.

So policy, we consider from two aspects. The one is constraint policy and the other one is incentive policy, which is often referred to carrot and a stick. For the _____ policy we draw on the experience of the New York City's Energy Efficiency Benchmarking policy. Based on their experience with then the Energy Efficiency Benchmarking policy, that complies with _____ reality.

So by implementing original energy efficiency benchmarking in Changning, on the one side, the building owners could understand their energy efficiency labels, and on the other side, the further away is the disclosure of the data are some constraints, like some forming the constraint of social reliability for these complaints.

So on this slide, the last feature you can see here is benchmarking results. This we will standards both to the building owner and then we will also disclosure this own website. And we call this benchmarking as a soft constraint policy. So relative to the constraints policy, the step city is easy to implement. So during the five years, through 2013 to 2018, Changning

District has subsidized 23.19 million RMB and they drive a total social investment of 141 million RMB, and with an elaborate ratio of 1:6.1.

So the subsidies will go to the technologies and the energy efficiency measures, which has no return without a return in the cost curve.

Next page, please.

So this slide you can see all the technologies we adopted during the five years implementation process of the World Bank project. And the technologies and the frequency—their frequencies.

Next page, please.

So this page Mr. Mao will mainly introduce five usage scenarios of during commissioning in Changning District. So the first one is the commissioning is the independent consult service. It's just exactly like the same as the business model of building commissioning in the US.

So the second one you can see here is the model based on EMC model. The EMC model is equal to the ASCO model. So under EMC model the building owner and the service provider, they will focus more on the investment to replace equipment. And also they will draw the energy savings as the basic for the payment. But it's hard to guarantee high reward, high retain project with replace the equipment only. So during the World Bank project we found that some building owners, after the replacement of the equipment they would hire some third-party independent consult service company to provide some commissioning service for them. But some other building owners want to do this, but as the results is the ones who have the third-party commissioning services, they get more energy savings.

So the third mode is some follow-up optimization service of building retrofit. So because first-time buildings, existing buildings, after retrofit their energy efficiency got improved. And along with the energy efficiency improvement their building type—I mean they're building space type in the building may change. So for guarantees of your energy savings they will also adopt a building commissioning in this case.

So these three models are the three regular models we are adopting in that project. So besides these three traditional modes we also have two new pilot mode for building commissioning. The one is normalize the building commissioning under energy hosting mode model. Because this model is based on the Internet of Things, so the energy consumption and the energy efficiency could be monitored by the third party and they can grasp the real energy efficiency of the building. What are some issues or some problems were found by the best third-party monitoring, as then the commissioning will in time to adopt.

So the second pilot new model for commissioning is the _____ station commissioning after equipment installation, aiming at act for energy efficiency target. So these two new pilot model, which you can see in the

most left and the most right in the green color, these two models are very new and they are not very much cases in reality. But we understand these two models are more suitable for the future and will be a trend. So we will—like Changning District, will promote this to models in the future.

Next page, please.

Shannon Hey, Jing, we're a lot over time already, so I'm just wondering if we can go real quickly through the last two to finish out the webinar.

Jing (translating for Mao)

So this slide is a real case of our project in Changning District. So the energy savings is 223-percentage. So it adopted the building commissioning model under ENC model. So the lower two figures indicates the PA system.

Next page, please.

This figure is super-important for us. So we based on our last five years of cumulated data, real data, and developed this abatement cost curve. We developed it into a database. The database could be continuously rolling update. Once a new project, retrofitted project, their data get into the database, so the cost curve will directly change. And it could be also further divided into five different cost curves, according to different commercial building types, like a hotel, shopping mall, and office building. Yeah. So it has a very strong practical guidance for the following retrofit projects.

So my last recommendation today is to do a good job of data statistics and use the analysis with lots of big data to continuously—and use the results of big data analysis to optimize the energy efficiency improvement parts in the cost curve.

Okay, thank you. Thank you all. Sorry for the delay.

Matt Thank you, Mr. Mao. Thank you, Jing Hou, for that helpful presentation. Apologies for the technical glitches. We'll hopefully smooth those out when the webinar goes live on YouTube and our website.

So thank you for each of the panelists. We don't have any time for questions today, unfortunately, but if you have any questions please feel free to direct those directly to all of our presenters or go onto their website and find resources there that might be able to help.

So great. Thank you, again. On behalf of the Clean Energy Solutions Center I'd just like to extent a thank you to all of our expert panelists and to our attendees for participating in today's webinar. We very much appreciate your time and hope in return that there were some valuable insights that you can take back to your ministries, departments, or organizations. We also invite you to inform your colleagues and those in your networks about Solutions Center resources and services, including our no-cost policy support through our Ask an Expert service. I invite you to check the Solutions Center website if you you'd like to view the slides and listen to a recording of today's

presentations, as well as previously held webinars. Additionally, you will find information on upcoming webinars and other training events. We'll also be posting webinar recordings to the [Clean Energy Solutions Center YouTube channel](#). Please allow at least one week for the audio recording to be posted.

Finally, I would like to kindly ask you to take a moment to complete the short survey that will appear when we conclude this webinar. Please enjoy the rest of your day, and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar for today. Thank you very much.