

REN21 Renewables 2015 Global Status Report: Energy Efficiency

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Webinar Panelists

Rana Adib Renewable Energy Policy Network for the 21st Century (REN21)

Ksenia Petrichenko Copenhagen Centre on Energy Efficiency (C2E2)

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Tim Reber

I'd like to welcome you to today's webinar, which is co-hosted by the Clean Energy Solutions Center in partnership with the REN21 Initiative. Today's webinar is focused on REN21's flagship report, Renewables 2015 Global Status Report and its findings as it relates to energy efficiency.

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, 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 side will display the telephone number and audio PIN you should use to dial in. Panelists, we ask that you please mute your audio device when you're not presenting.

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the questions pane where you may type in your question. If you have difficulty viewing the materials through the webinar portal, you will find PDF copies of the presentation at cleanenergysolutions.org/training and you may follow along as our speakers present.

Also, an audio video as well as the presentations will be posted to the Solutions Center training page within a few weeks of the webinar and will be added to the Solutions Center YouTube channel where you'll also find other informative webinars, video interviews with thought leaders and other clean energy products.

Today's webinar agenda is centered around the presentation from our guest panelists, Rana Adib and Ksenia Petrichenko. These panelists have been kind enough to join us today to discuss REN21's Renewables 2015 Global Status Report and what exactly made 2014 yet another record year for renewables as well as the findings as they relate to energy efficiency. Before the panelists begin their presentations, I will provide a short informative overview of the Clean Energy Solutions Center Initiative. Then following the presentation, we have a question and answer session to address questions submitted by the audience. We'll finish up with a few closing remarks and a brief survey.

This slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is one of the 13 initiatives of the Clean Energy Ministerial that was launched in April of 2011 and it's primarily led by Australia, United States and other clean energy ministerial partners. Outcomes of this unique initiative include support of developing countries and emerging economy 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 are attending today.

The Solutions Center has four primary goals: serves as a clearing house of energy policy resources, it's there to share policy best practices, data, and analysis tools specific to clean energy policies and programs. It delivers dynamic services that include expert assistance learning and peer-to-peer sharing of experiences. And finally, the Center fosters dialogue on emerging policy issues and innovation around the globe.

Our primary audience is energy policymakers and analysts from governments and technical organizations in all countries, but we also strive to engage with the private sector, NGOs and civic society. One of the marquee features 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 energy efficiency policy, we are very pleased to have Jeff Deason, senior analyst with the Climate Policy Initiative serving as one of our experts. If you have a need for policy assistance in this area or any other clean energy sector, we encourage you to use this valuable source. Again, the assistance is provided free of charge. If you have a question for our experts, please submit it through our simple online forum at

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. Now I'd like to go ahead and provide a brief introduction for today's panelists. Our first speaker is Ms. Rana Adib. Ms. Adib is the research coordinator at REN21. Among her responsibilities is the annual production of REN21's highly referenced Renewables Global Status Report.

Prior to REN21 Rana worked for over ten years in private industry and applied research in the area of renewable energy, energy access, and waste management. She was also responsible for coordinating the biogas-to-energy research programme of Veolia Environment.

Our second speaker today is Ksenia Petrichenko. Ms. Petrichenko is a researcher at the Copenhagen Centre on Energy Efficiency, which is part of the UNEP-DTU Partnership. Ms. Petrichenko provides analytical support to Sustainable Energy for All initiative through research on energy efficiency and renewable best practices, development of regional techno-economic pathways by 2030 towards the SE4ALL objectives, provision of technical support to developing countries and emerging economies in collaboration with various organizations on accelerating energy efficiency actions.

And with those introductions, I'd like to go ahead and welcome Rana to the webinar and hand over the controls to her.

Rana Adib

Thank you, Tim for this great introduction. Welcome everybody to this webinar. I'm very happy to do this presentation and as Tim mentioned, we are producing the Renewables Global Status Report every year at REN21. So very quickly, what is REN21, it's the Renewable Energy Policy Network for the 21st Century and its multi stakeholder network dedicated to the rapid uptake of renewable energy worldwide. The different stakeholder groups represented in this network are NGOs, industry associations, national governments, science and academia and international organizations.

It's very important to keep this in mind because this multi stakeholder approach also explains or it's very much reflected in the way the Renewables Global Status Report is produced. Sorry, my slide is not continuing. Actually, the Renewables Global Status Report is produced in a collaborative way, which means that we are drawing on a network of 500 contributors, researchers and reviewers worldwide. These are involved in different ways so there is a monitoring team, there are country and technology and topical contributors and we have very extensive peer review process.

This has certain complexities but lots of advantages because first we can really make sure that we have the best insights of the different stakeholders. We just know that for some areas, for instances, official statistics are not always reflecting the reality. It also allows us to have quite timely information available because in 2015, we are reporting on 2014 trends and the other

advantage is really a big transparency and lots of buy-in I'd say from the different stakeholder groups.

This report or this year's addition is the tenth edition and it was launched actually on 18th of June at the Vienna Energy Forum. The report features always a section on the global overview, on market and industry trends. Here, we are more looking to the different renewable energy technologies on investment flows, the policy landscape and there is one specific section under distributed renewable energy for energy access. We also have every year a specific feature or a feature addressing different topics.

This year it was on using renewables for climate change adaptation and the Global Status Report 2015 features for the first time a full section on energy efficiency. The background for this is really that it's important to have the message out there that renewable energy and energy efficiency need to be thought as a unit. When it comes to renewable energy technologies, the report covers all renewable energy technologies, looks into power heating and cooling and the transfer sector and as mentioned for the first time energy efficacy too.

Ksenia, who will follow my presentation, will explain you more about the status of energy efficiency. It's to mention that REN21 collaborated for this section with C2E2, which is a center for energy efficiency based in Copenhagen. Now let me—sorry, I'm trying to hide some—one aspect also to mention for you is in the Renewables Global Status Report we are consolidating information at the global level, however, we are collecting a quite significant amount of country information. This information is presented and shared at the REN21 Renewables Interactive Map, which you can access by following the link.

Here you will really have the possibility to dig more at the country level and use the information we're collecting but which is not always reflected in the GSR. Let me quickly show you some main outcomes. So basically, when we're looking—what is important to keep in mind is the status of renewable energy in 2014 is very different of what it was ten years ago. And renewable energy has really surpassed all expectations. The global installed capacity and production from all renewables have increased substantially and this is to large extent linked to significant cost reductions of most technologies but in particular of PV and wind.

This is something to really keep in mind. Also, when we're looking forward that renewables might really surpass all expectations also in the future. What is really key in in this development is the policy and regulated framework throughout the world.

And this is something to also keep in mind even if the developments are very positive, it still needs policy support. So when we're looking the investment was \$370,000 billion USD when we're looking for instance in the power sector you will see that power capacity was of 657 gigawatts installed compared to 85 in 2004. And even higher, when we're also including hydro of 1,712 gigawatt installed.

You will also find more details for the different renewable energy technologies. When we're looking at the heat technologies, you can see that there is less information available. We will discover why later. When we are looking into renewable energy in the world, what is necessary to keep in mind is that the global final energy consumption increased by about 1.5 percent in 2013. And despite this - actually and this is really a big, big success message of this year I'd say. Despite this, 2014 showed for the first time a decoupling actually of the CO2 emissions linked to energy consumption despite actually the continuous economic growth.

And this is something which is very much explained by the stronger development of renewable energy but also of energy efficiency. The renewable energy provided an estimated 19.1 percent of global final energy consumption in 2013, which is a slight increase. The share of modern renewables increased to 10.1 percent. What is important to keep in mind here is that the target of sustainable energy for all is 36 percent renewable energies shared of final energy consumption by 2030.

It shows we're improving but there is still a ways to go. People always like to know where they stand. They love football and we're doing something similar actually on the renewable energy champions. When we're looking into the top five countries actually for investment, you'll see that China, the U.S., Japan, U.K. and Germany are really high top.

What is interesting to see is that when we are looking at the investment relative to annual GDP we really have a list of very different countries with Burundi, Kenya, Honduras, Jordan and Uruguay. This is something which it's an indicator, which is really interesting because we—and where we also had the feedback that we should not only focus on the biggest countries but also on smaller countries which at their country level can do quite a lot of significant things.

Now when we're looking - and I think that's something which is interesting—when we're looking into the renewable energy power capacity, you will see similar countries with, including hydro China, U.S. Brazil, Germany and Canada, however when we are looking to this at the per capita level, we will mainly see European—or only European countries was Denmark, Germany, Sweden, Spain and Portugal on the top.

This is really linked to the continuous policy support existing in these countries even though the last years were more challenging but—which allowed to release — renewable energy power technologies, in particular wind and solar quite widely. Looking into the power sector, it's just clear that the power sector is a sector which evolved in a more substantive way.

Renewables accounted for 27.7 percent of global power generation capacity and 22.8 percent of global electricity demand, which is quite significant. What is interesting to note is renewables made up for 59 percent of net additions to global power capacity and surpassed actually for the first time the net additions or the investment and net additions from gas and fossil fuel.

The total renewable energy power capacity was 1712 gigawatt and increased of more than 8.5 percent over 2013. With regard to the big discussion which is ongoing as is it possible to have significant renewable energy shares, it is important to know that many countries have a share of even 30, 40, partly 50 percent of renewable energy power capacities was reaching some peaks and that there is a lot of countries which have more than one megawatt install capacities. Sorry, one gigawatt on install capacities.

The heating and cooling sector is much more challenging. The energy used for heat accounted for about half of total world final energy consumption in 2014. So it is a very important sector, however, renewable energy only represent something like 8 percent of the share.

The positive trends out there, there is a growing interesting. There is also a growing interest at the local level, at industry level, but advanced systems represents still a small fraction of the global market. What is really important to keep in mind is there is slow growth but there is a huge potential. And it is important to really address renewable energy and heating and cooling much more to reach the energy transition.

The transport sector is quite similar actually to the heating and cooling sector. Has less attention from policymakers in the industry. Renewable energy accounted for an estimated 3.5 percent of global energy demand for road transport in 2013, up from 2 percent in 2007. So we see there is still an increase, a slight—but the potential's higher.

The primary focus of policies, markets and industry, it's very clearly on liquid biofuels. However, there is suddenly also a trend in development of gaseous fuels and electricity and especially the electricity part also creates pathways for integrating renewable energy into transportation but also integrating renewables into the energy system in more systemic way.

That's also a trend we can see in the heating and cooling and the transport sector. They're very low cost in particular of PV and wind, put quite some pressure on other renewable energy technologies, non-power renewable energy technologies and also pressure off non-electricity markets. So the electrification of heating and cooling and transfer is certainly one of the upcoming trends.

Let me now show you some developments on the different renewable energy technologies. Wind power had 51 gigawatt of capacities added in 2014 reaching a 370 gigawatt of wind power install capacities. What you can see is there, over the last year, of really impressive increase and continuous increase. The offshore wind represented 1.7 gigawatt of grid-connected capacities added in 2014 and reaching a world total of 8.5 gigawatt.

Again, what is important here is that there are countries which have a large share of renewable energy—oh, sorry, wind power integrated into the grid. Looking at solar PV—oh, sorry. Maybe on wind again, wind was really the renewable energy technology which added most actually of renewable energy of install capacities.

The second is solar photovoltaics, which added 40 gigawatt in 2014 and reached a capacity of 177 gigawatt. What is really interesting to see is that more than 60 percent of all PV capacities in operation worldwide was added over the past three years. And this is something which is really a result of huge cost reductions in the sector.

As a consequence, we clearly see that there is a diversification of the markets into other regions with Asia coming up as a first runner and accounting for almost 60 percent of global additions. What is also interesting as a result of in particular for the PV part is that it also allows to push renewable energy into markets which were considered to be non-commercial markets like for example renewables for energy access in developing countries.

Hydropower is the third renewable energy technology with a total hydropower capacity in 2014 of 1,055 gigawatt, 37 gigawatt new capacity was added in 2014 and this presented a 3.6 increase. There is a steady industry growth, which is driven by two main trends. One is clearly the expansion of China and also the modernization of aging hydropower facilities. This is something which is quite specific to hydropower, which is more conventional, and older renewable energy technology I'd say that the market maturity differs quite a lot from wind and PV.

Bioenergy is a very important renewable energy technology. It's also a very challenging renewable energy technology. The total primary energy demand from biomass was approximately 16,250 terawatt hours and biomass was used to produce 12,500 terawatt hours of heat but also a lot of power. The power capacity was estimated to be five gigawatt in 2014. That's the other capacity and reached approximately 93 gigawatt.

You will see here there is a lot of approximation I would say. This is really linked to the fact that bioenergy has a very complex pathways. There is many sources, lots of conversion pathways, lots of energy uses. It's a very disburbed renewable energy technology and having good and reliable precise information and especially quantitative is quite challenging.

However—or this also, as a result, there is probably much better information available on every bioenergy, which is traded bioenergy. So when we're, for instance, looking to wood pellets production, we see an increased over the last years and there was an increase reaching 24.1 billion tonnes of wood pellets used in 2014. There is clearly an increase international trade and also shift of the regions knowing that the wood pellet producing regions continue to be Europe and North America, but we see that now the imports are really focusing more—are not only focusing on Europe anymore because the policy framework changed. For the global production of wood pellets, it rose by 9 percent.

For the liquid biofuels, the top country for total production of biofuels were the U.S., Brazil, Germany, China and Argentina. The production increased by 8 percent in 2014, total of 127.7 billion liters. The global investment biofuels production capacity continued, however, to fall in 2014, down 8 percent from 2013 and reaching a near 10-year low of \$5.1 billion USD. This is certainly a

result of two aspect, it's more complex policy and regulator frameworks but also the very low oil prices in the second half of 2014.

Another heating and cooling technology is the solar thermal heating and cooling. Their cumulative capacities of all collector types in operation was of 374.7 gigawatt thermal with an additional 44 for gigawatt thermal. China account for more than 80 percent of the global market. And this is something which is a trend which took place over the last year so it's not new. But there is still a concentration in this country and the trends in 2014 is really the focus on glazed water collectors, also the development of a more industrial scale application, so larger scale applications, the implication of solar power, the integration of solar thermal technologies into district heating and to commercial applications.

However, for solar thermal, there is clearly a slowdown in the market which is partly a result again also of the price pressure from renewable energy power technologies. I mean there are many reasons to invest in renewable energy. On the policy side, clearly jobs in renewables and job creation is something which is extremely important. And that's why it's a great news that global employment continue to increase with an estimated number of jobs, 7.7 million direct or indirect jobs in renewable energy industry.

The key areas of sectors are still wind power and also PV but wind power increasing, which crossed the 1 million jobs threshold. Sorry, it is bioenergy and solar energy are the key areas and wind power now reach the 1 million jobs threshold.

On the global investment side, the new investment estimated was of 270.2 billion in 2014 and when we're including hydropower, which is not tracked historically by Bloomberg New Energy Finance. The investment is even reaching 301 billion. The reasons for the increase are the increase in solar power installations in China and Japan. The investment in solar power was up 25 percent so this really explains it. The record investment in offshore and wind projects was also reached in Europe.

It is something which is quite encouraging to see that after down actually over the last couple of years 2014 really showed a positive sign by increased investment again. What is also interesting is to see that the repetition of investment, new investment and renewable power and fuels differs quite significantly from region to another. When you're looking here on the slide you will see that it's really reflecting the uptake of Asian markets including—so we have here on the right side in green is China. Underneath it's Asia and Oceania. There's really an uptake of these markets.

What you can also see is that in Europe actually the investment are going down significantly which is linked very much to the changing policy frameworks here. In developed countries the annual investment in 2014 was \$138.9 billion dollars with an increase of 3 percent. In the developing countries it was \$131.3 billion, an increase of 36 percent compared to 2013. This is really something which is very important to keep in mind. We have a regional __ which is reflected by the investment too.

Now I mentioned this in the introduction. This huge development would not be possible without the right policy and regulator framework. We see today when we're looking at the policy map I'd say of 2015 this is with early 2015 data, we see that luckily the map is really quite intensively red which is a good sign in this case because it means that there is lots of countries with policies and targets.

The countries in darker orange are the ones which have policies but no targets or no data. The light orange is with targets with no policies and the gray countries are the ones where either there is no target and policies or no data available. This is quite an important indicator; however, it's also important to keep in mind that the fact that a country has a target and/or a policy does not always mean that this can really attract investment.

So when we are looking at the policy landscape we see that in 2014 there were 164 countries with policy targets and we clearly see a big concentration when we're looking at the different policies to feed-in policies and RPS but also tendering coming up. A real trend which is there is that countries do not choose anymore to only have one type of policies but to merge different components of the different policy mechanism. What we can, however, also see is that there is a real refocus on power policies and that heating and cooling and transport have less attention.

That's something you can see here in this slide when you're looking into the blue-ish policies. All these have power policies, heat obligations and mandates are in orange and the biofuels obligation and mandate are in yellow. We see a certain stagnation of the heating and cooling and the transfer policy. There's only a very slight increase compared to the power mechanism. And this is really, yes, something to lobby for because there is no way to reach the renewable energy or the sustainable energy for all renewable energy target by 2030 without addressing actually renewables in heating and cooling and transfer.

I mentioned that we have one specific section on distributed renewable energy in developing countries. So basically this is the addressing the role of renewables for energy access in rural and some urban areas. It's to keep in mind that there's still 15 percent of the global population which lacks access to the electricity grids. No, actually it's to electricity shortly. It's not the grid only.

Distributed renewable energy systems which presents really a very important solution for these countries, not only for political reasons but also for economic reasons. It is a solution which is much more cost efficient in many cases than extending the grid and also renewables offer the possibility to not only address electricity access but also clean cooking solutions.

It's quite challenging to have good data here. There's many case study, there is many trends on programs, et cetera. There is very little information on the investment in this area or the information about install capacities, energy output, et cetera. However, from what we could collect in the GSR this year,

we really see that we are talking about significant markets. For instance, the off-grid solar PV attracted approximately 64 billion of investment in 2014.

So what are the conclusions of this year's GSR? Very clearly there is continued growth in 2014 especially against—and that's important to keep in mind because it's against the backdrop of increasing global energy consumption and a dramatic decline in oil prices, in particular in the second half of 2014. As I mentioned before, the great message that for the first time in 40 years economic growth and CO2 growth has decoupled and that's really a very important message and record for renewables, not only renewables but also energy efficacy.

The past decade has set the wheels in motion for the global energy transition of a transition towards renewables. However, it is needed to sustain basically this effort to create long-term and stable policy frameworks which can also adapt to changing environments. And this is something which is important because we see that through renewable energy technologies develop a lot and nobody, for instance, expected the huge cost reductions and the policy framework, regulated framework really need to take this into account but also offer the stability to attract basically investors and industries interest.

There is the real need to have a greater attention to heating and cooling and the transport sector and have more crosscutting energy system thinking. And considering the importance of renewable energy for energy access and also the big market shares distribute renewable energy present in some developing countries, there is a real need to have more embedded information on this distributed renewable energy markets and really the installed capacities and all this to improve the access to upfront finance too.

I'm closing this presentation. You will find more—you can download the GSR on the REN21 website. You have the addresses here. I also invite you to visit the Renewables Interactive Map and I would like to mention that we are producing regional reports with basically similar approach but which allows to dig more into the region and more into the country level and that there will be one report upcoming for the static region which will be presented in October at SIREC which is the South Africa International Renewable Energy Conference.

Another one on the ECE region which will be presented at the COP, another one on the East African Community which will be published early 2016. I'm obviously available for any questions which might follow. Thank you very much for your attention.

Tim Reber

Thank you very much, Rana, that was wonderful and quite informative and we actually do have a couple questions from the audience. But we're going to hold off and get to all the questions together at the end. So with that, we'll just go ahead and hand it over to Ksenia to jump into her presentation. Ksenia, whenever you're ready.

Ksenia Petrichenko

Yes. Thank you very much. Thank you, Rana, for such a great overview of the report. As Rana mentioned, Copenhagen Centre on Energy Efficiency has

contributed to one of the chapters of the report and that's the first time the report has a chapter focused on energy efficiency. And we were very happy to provide a concise overview of key transfer energy efficiency and development and as well briefly discussing synergies between energy efficiency and renewable energy. You know, we're mainly focused on energy efficiency but very much support the view that energy efficiency and renewable energy should be considered together and the synergies between them should be exploited to full extent.

I'm trying to switch the slide, yup, sorry. A few words about Copenhagen Centre on Energy Efficiency. It's a research and advisory institution dedicated to accelerating the uptake of energy efficiency policies, programs and actions. It also serves the role of Energy Efficiency Hub for the Sustainable Energy for All initiative, which means that they're working on supporting the achievement of the objectives of this initiative by 2030, particularly in the field of energy efficiency.

C2E2 was established in 2013 by UNEP and Denmark Technical University and has been fully operational from 2014 where the research team based in the UN City in Copenhagen. A few words about sustainability for all, it's a modest stakeholder partnership between governments, private sector and civil society which was launched in 2011 by UN Secretary General Ban Ki-moon with a main goal to achieve sustainable energy for all by 2030.

This goal is based on three inter-linked objectives, to achieve universal access to modern energy services, double the global rate of improvement and energy efficiency and double the share of renewable energy in the global energy mix by 2030. At C2E2 we're mainly focused on the energy efficiency objectives, however, we're also exploring the synergies between these three areas which can foster the progress.

I like the definition of the synergy given by Mark Twain because I think it reflects the idea of behind the interaction of energy efficiency and renewable energy in a very simple way. So the main idea is that as efficiency of energy service increases and therefore the use of fossil fuels decreases, a contribution of renewables to the primary energy supply grows. On the other hand, the highest share of renewables in the energy mix, a vast primary energy is needed to provide the same level of energy services.

So having this in mind and as well as objective for sustainable energy for all, conducted an analysis and quantification of energy efficiency and renewable energy synergies in collaboration with IRENA which serves as renewable energy hub for sustainable energy for all. The results of this analysis are presented in the working paper, which should be launched by the end of this month, by IRENA. And the idea of the analysis was to look at different examples to achieve sustainable energy for goals related to energy efficiency and renewable energy, if energy efficiency and renewable energy options are implemented separately from each other or if they're implemented together.

The analysis was focused on eight countries and with some extrapolations to the EU level at the global level. For quantification of renewable energy

potential, we use the results of three maps modeling done by IRENA and summarized in their 2014 report and for energy efficiency potential we use data from IA New policy and efficiency growth ___.

IRENA mapped in a nice way different models which are targeting energy efficiency and renewable energy. As you can see from the figure, the results show that the high energy - renewable energy shared in total final energy consumption is the high energy efficiency results of this in ISR. And the results which—where is the—our analysis very much support the same idea.

So now results will show that with the department of renewable energy options only by 2030, the reduction in total final energy consumption is approximately 8 percent and if we can—in relation to reference case. But if we combine renewable energy options with energy efficiency measures, then this potential increase is by 22 percent. Now this is a very important outcome in terms of achieving sustainable numbers for all goals.

So we can see that energy efficiency is very much supporting the progress on renewable energy objectives. We also looked at the breakdown of energy savings between renewable energy options and energy efficiency measures. And the results show that approximately two-thirds of primary energy savings can be achieved through energy efficiency improvements.

This analysis which I very briefly presented here just through the trait of the quantification of potential synergies between energy efficiency and renewable energy is only the first step. At the moment we had C2E2 also in cooperation with IRENA are working with the modeling of global and regional technology pathways towards sustainable energy for all objectives and further quantifying the synergies between renewable energy and energy efficiency in a more detailed way.

And we aim to release the summary of these findings by December. So while we were preparing the contribution to GSR, we looked at potential synergies between energy efficiency and renewable energy. And there are a lot of examples which can be used as the guiding principles to understand the synergies. One of the examples are of course efficient building on the roads and equipment, ___ that ___ renewable energy generation which can on one hand reduce building energy demands but also electrical grid congestions and losses which is energy costs and expenditures as associated with fuel transportation.

Another example is that proving end-use efficiency and increasing user on-site renewables can also reduce primary energy demand as I show from the results of our analysis for example. With global energy use and energy requirement, the opportunity to increase is—that the change increase for renewables to meet most or all energy needs. Another example is that improvement in energy efficiency reduces the costs of delivering energy services by renewable energy and the saved amount of money can be reinvested for financing additional energy efficiency improvements for deployment of renewable energy technologies.

On advising energy efficiency status __ trends is turned out to be probably different from the one on renewable energy, the results of which you heard from Rana. Energy efficiency is comprised of much more diverse range of technologies, matter as indicators and in general is much less tangible than renewable energy. There is still no internationally agreed indicator for tracking energy efficiency progress at the higher level. So when we're conducting this analysis, this analysis is not meant to be exhaustive or comprehensive but we're trying to highlight just the key trends on the global level and on the sector level that was different countries.

The rate of energy intensity reduction is often considered as a proxy for energy efficiency improvement due to the lack of compatible alternatives and required data. So at the global level we look at energy intensity and the results show that it has been decreasing between 1990 and 2013 at the average compounded annual rate of 1.25. Most world regions also demonstrate the decline in this parameter with most significant reductions coming from CIS region, North America and Europe. However, it is very important to understand that energy intensity reduction is driven by more structural changes as well. That's the energy efficiency improvements. And then these regions, it's very likely that structural changes contribute to a large extent to this decline.

Analysis of the trends for key sectors shows that energy efficiency is improving for different regions and countries or different sectors. So buildings, we looked at the data on energy efficiency on buildings and natural energy buildings and nearly zero-energy buildings and the data which we've got shows that the number of these buildings is increasing on the global level with U.S. and EU leading this process.

The scope of such projects is also extending with many projects targeting existing buildings and providing the results for nearly-energy reservation as well as __ focus on public buildings to be showcased for high building energy performance. More large buildings with large floor area can also achieve nearly zero-energy building level.

Also, another trend which we noticed is that near zero-energy projects are extending the scale, moving from single buildings towards ____. Building systems and appliances are also demonstrating improved efficiency and wider proliferation of efficient options. For example, the global market for heat pumps grew upwards of 25 percent between the 2011 and 2013. Energy performance of refrigerators has increased by approximately 50 percent during the last 20 years while televisions can achieve up to 70 percent at the moment when compared to conventional models.

Global lighting market is also in the process from transitioning from energy intensive incandescent bulbs to LEDs which can offer up to 90 percent of energy savings for the same light output and provide up to six times longer illumination. EU, China and U.S. at the moment have the largest share of LEDs in their lighting markets.

In transport sector, key trends which we outlined include fuel economy improvements in private vehicles, increased penetration of electric and hybrid vehicles and shifts to more sustainable modes of passenger travel. We also looked at global transport energy intensity and the results show that at the global level it has been decreasing between 2000 and 2013 with a rate of 1.6 percent and also has been decreasing at the comparable rates across most of the regions.

Another trend is global proliferation of electric vehicles. Between 2008 and 2013, global sales has had it increased from approximately 10,000 to more than 400,000 vehicles with the lower rates averaging more than 100 percent annually. However, the share of this vehicles in the regional and country and a global vehicle __ is still quite small.

On the trend, we make it to increase the efficiency of mobility, the improvement of and growth of public transportation infrastructure is crucial. As of 2013, more than 150 cities around the world have implemented some kind of mass rapid transit system transporting up to 28 million passengers every weekday.

As for industrial sector, energy intensity of this sector has also been declining between 2000 and 2013 also at the global level and across most of the world regions. One of the interesting productive trends related to energy efficiency improvement is the expanded implementation of energy management systems at industrial facilities, particular under ISO standard 50001. Between 2011 and 2013 energy management systems were implemented at more than 7,300 sites worldwide.

We also looked at key policy developments in energy efficiency and tried to collect best practices and key developments during 2013 and 2014 across different countries and across different __ instruments. The key observations which can be concluded in several __ first of all there is an increasing number of economy-wide targets for energy efficiency improvement in different countries. Many countries introduced more stringent regulations, for example, building codes and improved energy efficiency requirements into already existing declarations.

There is also expansion with the coverage of standards and labeling skills to a large number of energy consumer products why the proliferation of standards related to energy efficiency and transport and investment sectors. Many countries also provide various forms of incentives for energy efficiency improvements, mainly in the building sector but also, for example, in transport. Now these may include different kinds of instruments, including revolving funds, green investment schemes, grant programs, taxes, tax credits, rebates and subsidies.

In terms of exploiting the synergies between energy efficiency and renewable energy so far there has been relatively ___ systemic thinking of the two in the policy agendas. But our three main approaches, which can be identified in terms of developing policies on energy pieces and renewable energy. Some

countries encourage renewables and energy efficiency in parallel, for example, or through economy-wide targets separately for each of the areas.

The second approach, integrating renewables and energy efficiency under the same economy-wide bases. And the third one is requiring joint implementation of renewables and energy efficiency. And here for example in the energy efficiency upgrades which require also renewable implementations. We tried to identify several examples in the report. Maybe one of them can be recently established rules for building efficient energy ___ and ___ light which includes nearly zero-energy building target from 2020 onwards as well as 10 percent renewable requirement for keeping system retrofits.

At the local level, the example can be the city of Sydney which is in the process of finalizing the ___ energy efficiency master plan which intends to reduce energy use in buildings as well as greenhouse gas emissions and will be implemented together with city's renewable energy master plan and its three-generation master plan. So I think these are the key highlights I wanted to talk about from the chapter on energy efficiency from Global Status Report. As I said, this was just the first attempt to outline the key trends for energy efficiency side.

We at C2E2 have committed to make contributions for 2016 version of the report with a more detailed analysis with energy efficiency trends and developments and we'll be looking for collaboration on the data and information sharing so if you have best practices or data to share on energy efficiency programs in any parts of the world, feel free to contact me. Thank you.

Tim Reber

Great. Thank you so much, Ksenia and thank you again, Rana for your earlier presentation. We certainly have gotten a good questions from the audience and to the audience we ask that you go ahead and any questions you may have now's the time. You can use the Questions pane over there on the right side of your screen to ask some questions and I'll relay them. So with any—out any further ado I guess we'll just jump in.

So the first couple questions are for Rana. The first question is: what main advantages do the countries who have bigger shares of a certain renewable energy technology have? For example, CF PRPV, are those countries. Are those countries more experienced in technology maintenance? Do they have good experience with policies? What's your view on this? And Ksenia, you could certainly jump in as well if you have some input on that one.

Rana Adib

I mean there is no real—I think it depends very much off the objective of the country and it depends on the technology. So for some technologies indeed key challenges are, for instance, in the operation maintenance it's really the local experience I'd say which is important. And in this case, it is the real advantage to know about this and also to be able to export this experience I'd say into the markets.

However, when we're taking—I mean I'm taking the example of PV, for instance, in Germany. This is certainly something which was fought in a broader way of establishing a policy framework but also developing a PV industry which can then export—I mean for internal markets but also for export markets. So it's very difficult to just give one answer because it depends on the different mechanism which work together and the objective for a country to really develop the specific renewable energy technology.

When it comes to policy design, obviously having this in the market itself, having the possibility and the experience of adapting it—I mean adapting the policy to the renewable energy technology development is something which is important to realize. However, when we see that there are some countries which have a lot of experience, in some technologies in particular the more mature technology like wind and PV.

Today it is just possible to learn from the experiences at the international level and to rather move forward and build on the—it's like, for instance, not only having the ___ for instance but mixing it with tendering options so I think it's very difficult to just give one answer on this question.

Tim Reber

Right, everybody's going to have a slightly different experience for sure.

Rana Adib

Yeah.

Tim Reber

All right, thank you. Moving on, Ksenia, we had a couple questions specifically targeted at small island developing states or SIDS. One person acknowledged that energy efficiency renewable energy synergies will need specific consideration in SIDS and they're curious if you have any best practice advice or examples. The synergy is for EERE in small island developing states.

Ksenia Petrichenko

I thank you for the question. I think it is very important. For this chapter on energy efficiency we're looking at the ___ bigger countries because also due to space and time limitations. I think as far as I remember we haven't included the examples from small island best practices, but if anyone would like to share this information with us, that would be great. I mean it's a bit challenge to find information on the best practices. So if we can have some kind of information sharing best practice exercise, that would be really good.

We're looking at collecting best practices for several countries at the moment but it's bigger countries mainly like India, China and some other bigger countries. So the simple answer is that this kind of examples have not been included in the 2015 version of the report yet.

Tim Reber

Great, thank you.

Rana Adib

Maybe to—

Tim Reber

Yeah?

Rana Adib

Just from my side, a comment actually on this. On the small islands as well as on this ___ renewable energy in developing countries, what we clearly see is that basically the energy systems need to be so optimized because you have little production capacities to meet significant demand that the energy efficiency logic is already very much built into the project we encounter. So I think it's probably cases where renewable energy and energy efficiency are thought very much in the process—in the projects together already.

Tim Reber

Great. All right. Good, thank you. The next one here I guess is really for either of you. They acknowledge that long-term stable policy frameworks are a big challenge and are wondering how to make it happen in the absence of global consensus or even concerted regional efforts.

Rana Adib

So I think that, yeah, on the global level obviously I mean to some extent it's important to look into the climate discussion because at the global level it's for the moment still probably the framework which is the one which can provide some ___ which could foster renewable energy development and also energy efficiency development.

What we clearly see is that the development—the fact that the renewable energy or sorry, that energy will be part of the sustainable development goals for the first time, I mean that's still under discussion but it looks like it will be the case is a very positive signal. So we also hope that it will trigger basically more global mechanism at this level. When it comes to regional and yeah, I certainly agree, I could not agree more actually.

When we're looking into the introduction or integration of renewable energy, there is a need to really not only think it locally but in particular when we are thinking about grid integration, having it at the regional level. What we see here is that there is, even if it takes a lot of time, because it's ___ head of political frameworks, regulator frameworks which need to adapt one to the other.

There is, however, an increasing awareness about the importance of regional frameworks and that's also something we can, for instance, identify with the different power pools we see in Africa with the development of regional and renewable energy and energy efficiency centers in many regions. So there is a growing awareness of this but it takes time. However, the positive thing to keep in mind is that more and more countries are working into that direction.

Tim Reber

All right.

Ksenia Petrichenko

Let me just [Cuts Out]. Yeah. Oh, sorry. Yeah, I just wanted to add that of course the global framework and agreement from the global goals and responsibility is extremely important and I'm sure everybody's looking for the next hook but I think a lot of actions can be done on the national and local level and it is up to each country to decide on their policy framework and on their own goals and targets and how to achieve and how to implement them.

There are certain initiatives which can support this process and which can help countries and cities to implement energy efficiency actions as well as

increase their renewable energy department. I can give just one example which we are working with. It's [Cuts Out] efficiency accelerator platform which is multi stakeholder platform of different organizations which come together across different sectors and try to help different jurisdictions to implement energy efficiency actions. We have several accelerators working in different sectors on buildings lacking appliances, transport and industry.

So if there is an interest from the country to improve their energy efficiency, increase renewables, there is a global support for that and sustainability for all initiative, also provide this kind of support. So I think of course global agreement will facilitate and to ease the process, but I think the urgency of the actions in these two fields is so important that the motivation and the actions should come from the countries already.

Tim Reber

All right, thank you both. That was quite helpful I think. Just going to keep moving on here and sorry for my slowness in sifting all the questions we have here. So the next question here is for Rana and again, Ksenia I guess that either of you can jump in. But they're wondering for countries with targets but no policies for renewable energy, what are the steps and how can the policies be implemented? Do have any examples of how those policies follow the targets?

Rana Adib

I mean very often the target is really the—just the target is not really enough, I think the question depends on what the country aims with the target. It is also a fact that in the past—well, more in the past, in the beginning of renewable energy development we have seen targets upcoming which were more political targets, I think, yeah, communication targets but where action was not following.

What we see now is that with a better understanding of the different policy mechanism, the development of country and regional action plans, whether it is __ for all, whether it is under _ for all, whether it is under the country actions of IRENA, there is really more opportunities for the countries to have a step-by-step development of action plans not only at the country level but also at the regional level. And again, it is very—I mean there is not only one answer to this because it depends very much on the country's starting point, what the target is, what renewable energy technology we're talking about, what the industry situation is in the country.

But I think when it really comes to policy design and regulated frameworks, probably what is helpful here is IRENA has developed quite interesting guidelines on how to design a target. I think this was published three weeks or four weeks ago, something like that but also on the different policy mechanism and that's more analytical and yeah, more in-depth studies produced by them which can be helpful in basically designing the step-by-step approach which is necessary. Obviously just having a target is not enough, it needs to be translated into policy and regulated framework.

Tim Reber

All right, great. Thank you. This next one here is believe is for Ksenia. Again, of course Rana, if you have input, feel free to jump in. They're wondering in achieving the 2030 global target of doubling the rate of improvement in

energy efficiency, is it safe to say that all countries should at least have the equal burden of cutting down their own energy essentially or should larger and high impact countries carry a larger burden?

Ksenia Petrichenko Well, this global target ___ does not imply how it should be spread out across different countries and regions, but obviously the more a country will do in regard of this target the closer we will get by 2030. But it's actually a very good question and we are trying to answer this in our work.

We are, at the moment of developing pathways—technological and policy pathways to achieve sustainability for all objectives both on energy efficiency and renewable energy. And then we're going to look at potential for energy efficiency and renewable energy in different countries and in different sectors and try to identify which country and which sector how much realistically can contribute to this target.

So there is no commitment by joining Sustainability for All that you're going to reduce your energy consumption or energy capacity by 2030 by this much or there is no distinction between different countries. But in general if you commit to this global objective that ___ finds that you're trying to implement the subjective on your country level. So if there is an objective to double energy efficiency improvement by 2030, then probably the country should try to aim at least to that.

Tim Reber All right, great. Thank you again. So we have a question here regarding solar investments. Rana, wondering about the size of solar investment in 2014 and also follow on regarding investment in off-grid PV. They're suggesting that off-grid PV representing 23 percent of total global RE investment and wondering if that's correct or if you can speak at all to that.

Rana Adib Okay, let me quickly have a look at the slide certain there because—yeah, because 23—now listening to 23 this seems quite significant that it would be off-grid. So I'm checking whether it is correct or not.

Tim Reber Okay, well, maybe we can—

Rana Adib Okay, sorry. My computer just froze so, yeah, I need to check this and get back. Can you maybe send me the email of the person so I will get back with more details on that?

Tim Reber Absolutely.

Rana Adib So 23 percent of renewable energy investment seems high to me. I don't think this is realistic but it might be—oh, now I have it, 64 billion of investment in 2014. And the question was 23 percent of? Sorry.

Tim Reber Right, 23 percent of total global RE investment, whether or not that's accurate or if you could speak at all to that. We can always come back to it or if you'd like, you can [Crosstalk]

Rana Adib Yes, this would be perfect because I need to check this. Great. Thank you very much.

Tim Reber We'll put you in touch with—sure, absolutely. While we're on the subject of sort of off-grid solutions and things of this nature, this is for either of you, if either of you have looked at investment in new technologies for energy efficiency and renewable energy, specifically looking at source of investing like Venture Capital and Angel Funding. If so, what trends have you seen in both the amounts of such funding from places like Venture Capital and Angel Funding and also the types of niches and technologies that are starting to be funded in greater quantity.

Rana Adib I can say that from our side—

Ksenia Petrichenko Well—please go ahead.

Rana Adib Okay. So basically, just from our side, so that's from the REN21 side, basically the investment section is really building very much on the—or yeah, not __ is building on the work which is done by UNEP, the Frankfurt School UNEP Centre and Bloomberg New Energy Finance. They are looking into venture capital trends. I don't think that they are looking into Angel funding and they do not specifically look into off-grid solutions.

They are not tracking investment into everything which is small scale and very decentralized and accordingly quite difficult to capture. This is clearly something we're trying to—I know that this year we didn't have this, last year we had, for instance, a text box on Crowdfunding. We tried to capture this in a more qualitative manner but we don't have specific data on that topic.

The objective clearly is to strengthen the data situation on distributive renewals, also on innovation. So if there are any persons participating in this webinar who could help us improving the data situation here, we're really happy to welcome you in the community. It's quite challenging, but yeah.

Tim Reber Thank you. Ksenia, it sounded like you also might have something you wanted to mention on that topic?

Ksenia Petrichenko Yes, just a very brief comment on energy efficiency side of investments. I joined about this comment about challenges for finding data and I think energy efficiency might be even more complex because that as I said, it's a very diverse subject and it's also hard to determine what you consider as energy efficiency improvement and what you don't. So within this report, within this chapter we're going to look specifically on investments in energy efficiency, but we acknowledge that it's a very important subject.

And in 2016 version we will definitely try to tackle at least somehow and I joined throughout this call for those releasing now if you have any ideas for finding the data on investments on energy efficiency technologies and measures, we are very welcome to share them. So I think in the current chapter of the report there might be some indication of investments for very

few technologies or matters but we did make systematic ___ that within all there is a quite significant interest in that and we had the discussion with the map on maybe preparing a report specifically focusing on energy efficiency investments but that's going to be in the future plan of work.

Tim Reber

Wonderful, thank you both. Moving on to a new topic here. Wondering if either of you can comment on worldwide interest and the potential market for DC Microgrids, if they allow for potential battery charging and things of this nature.

Rana Adib

I mean that's certainly something we see very much in the distributive renewable energy sector. There is, I'd say, basically sign of religion fights between DC and AC fans and the technologies existing. We're seeing more and more project upcoming in this area. What we also see that it's a topic which comes up even in industrialized countries when we are really linked to basically the whole storage discussion.

However, now I'm really talking about the European markets here more but here, I think that DC, AC discussion is not that strongly existing just because even the storage solutions are still bridge connected. I'm aware of I think and I just forgot the name but I'm aware of the two companies quite active in using DC system for mini grids for energy access. And I think that battery developments really allow for this technological solution.

So it's certainly a trend which might be upcoming more and more. It will also or it's also something which needs to be discussed very much back to back with the appliances which are being used in the system because the appliances we are using all today are more and more DC based. So there is suddenly an interesting trend to follow. I don't have more data on the investment, on the market shares for the moment but it's certainly something which will be—allow me to track when we're looking into technology trends.

Tim Reber

Great, all right, thank you. I think we have time for about one more question and then we'll move on and give you each a moment to provide some closing thoughts if you have them. This last question I guess it's for you again, Rana. Just wondering how the report aligns IEA reports, like a world energy outlook thing that's of this nature?

Rana Adib

So basically we have a few strong collaboration with IA. I mean with IA and IRENA and that's a good thing in this because obviously these agencies really try not to duplicate efforts. So on the world energy outlook, we have a—so at IA there is a world energy outlook but there is also the Medium-Term Report on renewable energies and we are very closely working together with this team specifically because in our approach so there is—we're using similar data sets.

So there is a very strong exchange of data. We're much more focusing here on the status. REN21 is not doing any modeling, no projections. Where at the Medium-Term Report really focuses on the projections. And then through this collaboration on the renewable energy part, that's clearly something which also is integrated into the world energy outlook. So yes, there is a

coordination upfront of the data and normally we're not covering it up with numbers which are significantly different. It's more that REN21 is quite—makes the information available quite early on the status. It's also using informal data and IA is more looking into the outlook here.

But for instance, the share information we have, the renewable energy shares we are publishing in the GSR based to a large extent and then revalidated on IA data. And the assessment of the statistics received—the information received from the industry association from the country contributors REN21 and IA are collaborating very much to come up with the similar shares here. I hope this answers the question.

Tim Reber

All right. Yeah, I think so and that's good to know. So we're running out of time here. I'm sorry we didn't manage to get to all the questions, but those of you whose questions didn't get answered, we will try and share them with our panelists and hopefully get a chance to get your questions answered. We're going to wrap up with a brief survey, but before we do, I just want to give each of our panelists about a minute here to provide any closing remarks if you have any. Otherwise, if not, we can just move right on to the survey.

Rana Adib

So from my side maybe just, yeah, thank you very much for the opportunity to present this and also for the participants who participate and really I'd say the Renewables Global Status Report is an annual report. It's well established and well referenced but it can only survive because of so many experts worldwide participating and I hear from the question that there is a lot of interest in areas where unfortunately today there is still big data gaps.

Please use the opportunity of having this platform and getting engaged and whether you can provide country information, technology information or participate in the peer review. We're really very happy to welcome any interest of expert in the process. So don't hesitate to contact me on that.

Ksenia Petrichenko

Yes, I also wanted to join them and thank all the participants for their attention and it was a really great opportunity for us to contribute GSR and I think it was a very important development that a whole chapter is devoted to energy efficiency because as we talked about today, these areas should be ___ and synergies should be explored to much more extent than now if you want to achieve global goals and progress with climate change mitigation.

I would also like to encourage all participants to express their interest in sharing the data, best practices on energy efficiency. We are continuously trying to collect this data but of course all pieces of information are very scattered. And C2E2 is actually at the moment is developing a large management platform which is going to be an online portal exactly for collecting and systemizing and making the information on energy efficiency publicly available.

So if you have any contributions or any ideas or if you would like to link me to ___, please feel free to drop me an email or connect me on LinkedIn or somehow else and we'll be very happy to collaborate and exchange the ideas and data on energy efficiency. Thank you.

Tim Reber

Great. Thank you again, both. So with that, we'll just move onto—we have three short questions to try and get some feedback from the audience on how we're doing. So I'd like to go ahead and ask everyone to please answer the question on your screen now. All right. And then second question. Okay, great. And then the last one. All right. Thank you very much to everyone. Thank you again to both Rana and Ksenia as well as a big thanks to everyone for attending.

As we mentioned earlier, a recording of the webinar will be posted to the Clean Energy Solutions website at cleanenergysolutions.org/training hopefully within a week as well as copies of the presentation. We'd like to invite you all to visit the Clean Energy Solutions website to take a look at the other training materials we have and possibly share the Clean Energy Solutions material with others in your networks and organizations.

So with that, I'd like to wish everyone a very happy rest of the day or evening as the case may be for some of you and we look forward to seeing all of you at our next Clean Energy Solutions event. Thank you very much.

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