

Bruno Lapillone Enerdata

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Sean Esterly

Hello, I'm Sean Esterly from the National Renewable Energy Laboratory and welcome to today's webinar hosted by the Clean Energy Solutions Center. We are fortunate today to have Bruno Lapillonne and Carine Sebi from Enerdata covering the topic of benchmarking countries' energy efficiency.

One important note I'll mention before we begin our presentation 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 Centers Resource Library as one of many best practices resources reviewed and selected by technical experts.

Before we begin, I'll quickly go over some of the webinar features that we have. For audio, you have two options. You may either listen through your computer or over your telephone. If you chose to listen through your computer, please select the "mic and speakers" option in the audio pane. If you select the telephone option, 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 and this will eliminate the possibility of background noise and any feedback and if you have any technical difficulties during the webinar, you may contact the GoToWebinars helpdesk at (888) 259-3826 for assistance.

If you'd like to ask a question during the webinar which we welcome, we ask that you use the "questions" box where you may type in your question; that's on the right side, and if you are having difficulty viewing the materials through the webinar portal, you will find PDF copies of the presentation at <https://cleanenergysolutions.org/training> and you may follow along as our speakers presents. Also, an audio recording and the presentations will be posted to the Solutions Center training page within a few weeks.

So we have a terrific agenda prepared for you today that's focused on the topic of benchmarking of countries' energy efficiency. Bruno and Carine will tell us about overall benchmarking of energy efficiency performances and policy, and then discuss how country's comparison in terms of effort and achieve results can be carried out and compared. Before our speakers begin with their presentations, I will provide a short informative overview of the Clean Energy Solutions Center Initiative and then following the presentations, we will have a question and answer session and wrap up a short survey and closing remark.

So, this slide provides a bit of background on the Solutions Center. The Solutions Center is an initiative of the Clean Energy Ministerial and it's supported through a partnership with UN-Energy. It was launched in April of 2011 and is primarily led by Australia, the United States, and other CEM partners. The outcomes of this unique partnership include support -- sorry about that -- outcomes of this unique partnership includes support of developing countries through enhancement of resources on policies relating to energy access. We provide no-cost expert policy assistance and provide peer-to-peer learning and training. I think someone needs to put their speaker on mute, if you could do that please.

So, outcomes of this unique partnership includes supportive developing countries through enhancement of resources on policies relating to energy access, the no-cost expert policy assistance and also peer-to-peer learning and training opportunities and example of that is the webinar that everyone's attending today.

So, the four primary goals of the Solutions Center is; it serves as a clearinghouse of energy policy resources. Also serve to share of policy best practices, data, and analysis tools specific to Clean Energy policies and programs. The Solutions Center delivers dynamic services that enable expert assistance, learning, and peer-to-peer sharing of experiences, and lastly, the center fosters dialogue on emerging policy issues and innovation around the globe. So, our primary audience is energy policy makers and analysts from government and technical organizations in all countries and then we also strive to engage with the private sector investors, NGOs, and civil society. Next slide.

A hallmark feature that the Solutions Center provides is our expert policy assistance. So, "Ask an Expert" is the valuable service offered through the Solutions Center. We have established a broad team of over 30 experts from around the globe who are available to provide remote policy advice and analysis on a broad range of clean energy sectors. So, it's also a nice thing this service is provided to all countries at no cost and I'm please to inform you that Bruno, Vice President and Co-Founder of Enerdata is one of our experts in the area of demand and energy efficiency policy evaluation. If you have a need for policy assistance on energy efficiency or any other clean energy sector, we encourage you to use this valuable service. Again, this assistance is free of charge and to request for assistance, you may submit your request by registering through our "Ask an Expert" feature at <http://cleanenergysolutions.org/expert>. We also invite you to spread the word about this service to those you may know in your networks and organizations.

We encourage you to explore and take advantage of the Solutions Center's offerings including the expert policy assistance, subscribe to our newsletters, participate in the webinars, and provide recommendations on resources that we can include in our library.

Now, I'd like to provide brief introductions of our distinguished panelists. First, we have Bruno Lapillone, Vice-President and Co-Founder of Enerdata, and then we also have Carine Sebi, an Energy Analyst at Enerdata, which she specializes in energy efficiency, and now, I'd like to turn on the presentation to Bruno. Bruno, welcome.

Bruno Lapillone

Okay, good morning. Good afternoon, everybody. So, we start by introducing briefly Enerdata that is the company that is engaged in study that the worldwide ever kept. Can you go to the next slide please?

That's an independent consulting company that we're working as a world labor [Indiscernible][0:06:55] any issues and with climate change issue, with the long experience and then you can then linked with immersing climate change and we are relying on the sets of the required details forecasting models covering the latest demand and the level of country or world into supply and demand, and we have also developed a local database and methodologies and possibilities that we'll present in this presentation. So, this presentation on the energy efficiency benchmarking, which is quite ambitious for which I'll be wealthy.

We rely on civil studies that we carried out at Enerdata; one of which is linked to ODYSSEE MURE project that is supported by the Intelligence Energy Europe Programme of the European Commission that is coordinated by ADEME and that brings together all the energy advances over the year so there's about 35 partners of 27 countries, and we also rely on the experience with the ADEME and WEC project whether it is on field or the local energy efficiency policy evaluation of one million.

Next slide, gives you the overview of the presentation. So, there will be an introduction on the concepts of benchmarking. Then, we look at the benchmarking of trends, the benchmarking of performance level, and then if we're done, Carine Sebi will talk about the benchmarking policy and then conclude everything now. Next slide.

The energy efficiency and benchmarking rely on the fact that there are a lot of targets on energy efficiency in EU countries but also at a rural level. We'll start with EU because there is a very strong commitment on energy efficiency for the EU countries. EU policy relies on three main targets for the year 2020 that are known as the "20-20-20": 20% share of renewables, 20% reduction in greenhouse gas emission and 20% energy savings. So, I will be talking more on the 20% savings. A new law has been adopted recently in October 2012, known as the Energy Efficiency Directive that list a set of requirements for EU member states to reach this 20% target.

It replaces the previous directive, known that the Energy Service Directive that fixed a target of 9% of energy savings in 2016 for each member state. This 9% will be calculated as the share of reference consumption for five years, usually the five years consumption for 2001 to 2005, and the savings have to be made in domestic transport, buildings and small industry. Large industries are excluded because they are covered by

another directive on the Emission Trading where the large companies have to reduce the fuel emission and of course, it means that they have to do some savings as well.

Next slide shows that half the countries in the world are also efficiency target, which is based on the survey, we do regularly with the World Energy Council that covers 80 countries, and a lot more than 80 countries in the world now, and that shows that there is an increasing number of countries with energy efficiency targets. 84% of the countries surveyed in 2012 are the target compared to the 45% six years before, and there is a progression that could be seen from the graph in all regions especially for Latin America that is now engaged very previously with energy efficiency policies taking advantage with comprehensive program. Next slide.

So, in the new directives imposed to EU countries to report to European Commission every three years about their energy savings so they have to send the detailed report calculating how much they have saved and to check with the target of 9% I mentioned before and also they have to leave the policy measures they have implemented or they plan to implement. It's making the savings that could be obtain from these measures. So, this document called the National Energy Efficiency Action Plan, it is available on the website of the European Commission in English so you can follow the policy measures implemented in all the countries. In other regions, there is also an increasing need of reporting.

By law, they have to report about to justify the percent that they spent on the energy efficiency policy, all because there are requirement at the international level especially in the framework of NAMAS. In this context, benchmarking becomes a key priority for the following reasons; benchmarking countries' performance and to understand and to identify which countries performs the best, and then try to understand why they perform best, and benchmarking policy measures can show which measures are the most effective, and this is very interesting because countries experiment measures and this is also was known from other countries so, it's been interesting to compare and benchmark the measures implemented. Next slide.

So, benchmarking could be done. I'm talking now of benchmarking of energy efficiency performance, energy saving, the energy percentage program. These can be done at two different levels. At the detailed level, such as the level of industrial branch like cement, [Indiscernible][0:13:03] for refrigerator, air conditioner, and we're not be talking of that unfortunately but the other [Indiscernible][0:13:11] we'll be plan on a more specific topic and there are a lot of initiative at the level that the world with initiative in doing some benchmarking for finance and within for [Indiscernible][0:13:29] or for the outcome initiative for buildings.

What are we be rather talking is what can be said at the aggregate level either on the sector, all of the level of the all economy. So, what are the

countries that perform the best at the overall level, and of course, we have to use the indicators that quite aggregate, so, this is the topic of the presentation. This benchmarking can be done in two ways, either by looking at the level of the performance achieved by the countries or in terms of progress. We can have a country with good performance now, but we're not really improving energy efficiency probably because they have already done all what was potentially – possibly evil and on the other hand, we have countries that are improving very rapidly with their performance, when you look at benchmark but they do it because they have poor performance at the beginning.

Roughly speaking, but speaking [Indiscernible][0:14:36] reality but we can see that the new EU member countries in Europe, mainly from Central and Eastern Europe, they fall into that second category that says that they less efficient, all member of the EU but they are making the rapid progress that you will see in the next slide. China is another example where the greatest performance, and not good compared to the rest of the world or EU countries but well, and now has very rapid improvement. In the next slide, we will see what efficiency about the trend.

So, the trends can be first of all look at the very simple indicator which is the energy intensity that creates the energy consumption of a country to EED and here, we can have two indicators; the primary energy intensity that looks as the total consumption of the country we will include and the final energy intensity that's been only considered with final consumer such as the buildings, industry, transport, and the difference with the previous one in that in the previous one, the primary energy intensity, the energy sector will be included and the energy sector or the power sector is the most important in terms of energy. So, depending on what is the purpose of the evaluation, we may prefer the primary intensity or the final energy intensity. Usually, energy efficiency agencies, they focus their program on energy consumer like industry, buildings and transport. I'm not so much interested in making savings in the power sector because [Indiscernible][0:16:22]. So, for them with benchmarking, it would be rather done at the final consumption level where it might use a final energy intensity but each one was rather an [Indiscernible][0:16:35] and for instance, the objective I mentioned earlier of the 20% for the Commission, for European country in 2020. The primary level is included observing the power sector and the other energy activity that we find. So, energy efficiency improvement is then measured by a decrease in the primary or final energy intensity that we are using less energy per unit of GDP. The 1% reduction in the energy intensity will be considered as 1% improvement but I will call it overall energy efficiency. This is something very broad, energy use more efficiency but that doesn't necessarily mean that we are doing technical training from a more engineering point of view. Next slide.

Example, you have here a map of the station from the [Indiscernible][0:17:38] for the world in its counting that show the

settlement of the different countries in terms of changing the primary energy intensity. The lighter countries are countries where the reduction is the fastest like the China for instance and the darker countries are countries we use less reduction in the primary energy intensity. So, what can we conclude on that? I will go to the next slide now.

We have to be careful because what we are showing here is the results of a lot of factors and energy efficiency is only one of the factors that needs a decrease in the energy intensity. First of all, what can be the changes in the structure of the GDP, is there is more service. If service is going very fast in the economy, our service is much less intensity than industry, the consumer [Indiscernible][0:18:43] generate one minute of GDP energy services.

Of course, if energy efficiency was incoherent, the intensity will decrease. In the same way, depending on the type of industry that is being developed, if there is a strong development of industry like electric components which have low energy intensity that require [Indiscernible][0:19:06] during and this will generate \$1 of GDP, then it will reduce also the energy intensity, and then, that can be changed in the power mix, without the more renewable and it will be decrease on its quantity of energy used because renewable [Indiscernible][0:19:23] provided first some deficiency in the [Indiscernible][0:19:22] whereas nuclear has been developed.

Nuclear has only 30% efficiency, which means more energy being consumed. So, all of these factors will have to be taken into account. So in other words, the energy intensity trend only gives a rough proxy of energy efficiency gain as well when you decrease goods, but we cannot say they're just energy savings. To better access and benchmark energy efficiency trends, EU countries are now using the more sophisticated indicators that were developed in the framework of the ODYSSEE MURE project, I mentioned at the beginning and that we have called the energy efficiency ODEX project, ODYSSEE energy efficiency index that I will explain in the next slide.

This index measure energy efficiency progress. It is calculated for each end-use sectors, households, industry, transport, and service as follows. For each sector, we identify indicators that's capturing energy efficiency improvement at a detailed level. For instance, further, we look at which is greater air conditioning, space heating, water using, and for each of this end-use, we select one indicator. For instance, for space heating, we can take the kilowatt-hour plus when we do leave the premises, for refrigerator per kilowatt-hour. So, we don't need to take the same unit. We always take what is best for [Indiscernible][0:20:58] energy efficiency.

Then we combine, we calculate for each of for each of these end-use an index for space heating, or refrigeration as an example and we'll make the weighting of this index, taking into account the share of each end-use

that's composed of sector -- in the total of the sector. For instance, space heating is 80% of the consumption, the index for space heating will have the weight of 80% percent and so on. So that, we are able to calculate the index for the total of the sectors, doing this weighting feedback. As I explained here, space heating represent 80% like I said and if we of service then first have the energy efficiency program for waiting which means, the contribution of anything to energy efficiency progress in the outer system would be 80%. Next slide.

So, we do that to all the sectors and we are able to build the difference index, one for each of the sectors. We have industry in dark, blue, and black; household in orange, transport in blue and after that, we calculate again the weighted average of the different sectors taking into account the share of each sector in the system, final consumption. Completely for the EU, calculating the ODEX from 2000 to 2010, we get the value of 88, which means that we can save that in the EU that being the 12% energy efficiency improvement between 2000 and 2010.

All in [Indiscernible][0:22:57] 1.2% per year which when you get the target, I referred earlier, this 9% savings in 2016 from the directive and what equivalent to 1% per year because of 9% of a 9-year period. This should mean that we are about to target over this period but difficult if may change in the future and because it should be monitored every year. So, this is a very interesting indicator that is cleaned from a lot of factors that have nothing to do with energy efficiency. Change in the structure of the GDP, change in the structure of the industry, if not included here, and we have a better proxy on energy efficiency program. Next slide.

We can then rank the countries in Europe in terms of performance. So now, we have developed the index to show energy efficiency improvements, and on the left, we have countries and as I mentioned earlier, there are countries that started with lower performance and the other European countries and they experience rapid energy efficiency improvement like Poland, Bulgaria, Romania and Slovenia, about 2% per year, the right, we have [Indiscernible][0:24:18]. Which has almost no improvement, so, if you have more provisions, we could use that you send. UK is around 1.11% close to France. So, we are able to benchmark the countries because indicators and the most energy efficiency program.

If we now include the Eastern European countries that had low performance at the beginning, we can say that the Netherlands stand out as the benchmark country in terms of energy efficiency progress, followed by France and UK. Now, the next slide.

We look at another issue on how to benchmark the level of performance. I've been referring to this level of performance, things that you see in European countries that low in performance and other human countries. Well, how can we do it? Well, if we want to do it at the aggregate level, there are not many indicators we can use. The only thing that is available

can be looked at the regular level, the energy intensity consumption relating to GDP. However, we can't just compare the energy intensity as calculated but we can try to make some corrections, to take into account some of the specific national characteristics and there are few that we are able to take into account and produce an indicator that is corrected for some of the cycles.

The climate of course in Europe and we have countries that are cold, countries that are warm and we can adjust the intensity to the same climate and usually, we take the EU reference because we need a reference too. We calculate the fixed saving intensity in all the countries as if they are all the same clients. The second form is to address through the general price level, and third one is to address to the GDP structure and of course, one is to address to the industrial specialization. These adjustments are explained this morning. Next slide.

The adjustment for price is done by using purchasing power parities instead of exchange rate, and even in European countries where many countries are using the same currency in euro, we need to make these adjustments and these adjustments take into account that the general price level is not the same in the different countries. If I look at the euro zone, you will have big difference between Southern countries where price level is usually quite low and the northern countries with very high price. So, this is reflective in the GDP, the GDP also being equal. We look higher in countries with high-price level and in countries with low-price level but it doesn't mean that the level of the [Indiscernible][0:27:48] those people are very different.

So usually, when making comparison of the GDP on the countries that's using the GDP, international organizations are using purchasing power parity instead of exchange rate, and it is what we do to do the [Indiscernible][0:28:07] and by the way, when we do comparison at world level, we do exactly the same adjustment as this can be seen in the World Energy Council that there where we make comparison of the energy intensity of all countries. The second adjustment about temperature I mentioned to you because this is done on the space heating requirements and cooling requirements by -- on the basis of heating degree days and cooling degree days, but to measure also, there are countries in general participating from there.

The adjustments to the same GDP structure is to take into account that a country like UK for instance, in generating a lot of GDP services whereas a country like Finland, will have a lot of industry. So, this will make the comparison more accurate by taking into account the different energy structure and we can even go into more detailed -- the fourth adjustments to take into account the different within industry. Again, if I take Finland, half of the consumption of Finland is just a part of [Indiscernible][0:29:19] industry which is a very intensive industry whereas if I look at Hungary and Slovakia, lots of the consumption will be in electronic industry or

production of the equipment which are low intensity. So, this will make the comparison more relevant and this is what it shows in the next slide.

Well, we have read the countries according to their final energy intensity but that has been adjusted because of parameters I have mentioned, and there, Germany turnout as the country with the best performance. We only have to be careful the best to be good the brackets because we cannot correct all differences but this is already an interesting time to tell the difference between countries, and Germany is followed by UK and Spain. Next slide.

Just a little bit more on the need to be cautious and not draw a drastic conclusion. Adjusted final energy intensities compared to the overall performance in energy productivity and not energy efficiency from a technical viewpoint. At this level, we cannot say that German buildings are more efficient than buildings in Finland for instance, and this is not the purpose, and several additional factors that are not even linked to technology are still embedded in the relative values of these adjusted intensities, the fact that there are more cars in some countries that will increase the intensity.

Behavioral maybe important also, initially, they have more cars and Germans love their cars so according to the impact is the consumption. The building structure, the fact that in some countries, they do share of houses and there are more energy intensity than apartments. So, maybe before we ever would take into account, more and more factors that this requires additional work, and then she brought the website of the ODYSSEE project. You can find there more refined analysis, trying even to correct for some of these factors. So, just the conclusion, the adjusted final energy intensity is better than not doing the adjustment but it is not the perfect entity. Now, I will return to my colleague Carine Sebi that we'll talk about the benchmarking of policies.

Carine Sebi

Okay, thank you Bruno. So now, we will see the recent link between this energy and energy efficiency performance that Bruno presented at and the quality intensity or effectiveness, and more precisely are the good results observed in terms of energy efficiency observed for the Netherlands, UK and France in terms of chance or in terms of level for Germany and UK. Are they correlated to energy efficiency policies implemented in these countries or to other factors, not quantified above? Then comes to the question, "How can we observe these policies and benchmark them?" and to benchmark these countries in terms of policies and measures on energy efficiency, we first have to define how to assess the policy intensity and effectiveness in this field of energy efficiency.

So, we will try to give you a glimpse of three different indicators that are commonly used in the energy efficiency community to assess the policy intensity. So, the first indicator, I would try to present to you the number of policy targets, and second one computed as the number of measures

according to their impacts that are presented in the MURE database that can be done in two ways. First, we can take into account the number of the highest impact measures up to benchmark countries according to weighted impacts that we will present to you in the next slide and the third indicator that we will briefly show, contains energy efficiency scoreboards. Thank you. We will give results and inference from the European case and how many times okay. Next slide please.

So, our first indicator could be the number of policy targets that may reflect more ambitious policies. For instance, a country with a wide range of hundreds of targets may have a stronger impact or commitment than the country with few or no target at all and the graph on this slide presents the distributions of the European countries according to the number of policy targets implemented. So here, you can see the targets are expressed in different ways and first of all, they may refer to a rate of energy savings. This is the case of the EU country with the energy targeted. The part in pink corresponds with the part on the graph, and just remind what Bruno said, [Indiscernible][0:34:50] directives impose all membered countries a rate of energy saving of 9% in 2016 as the recent contribution.

But you can find also all the type of end-use sector like in the residential sector where some countries who impose or implement targets and impose a minimum number of ratings to be reinterpreted by us until some survey. So on this graph, Germany appears well as the country with a large number of targets, as well as France. However, the Netherlands, who experienced good results as some of you, know, before in terms of energy efficiency trends and energy intensities do not have many targets. So, what can we conclude from this first indicator is that it may not be sufficient to capture the policy intensity besides the natural target if not taken to come back here and find them a target of energy consumption resistance with new approach in Europe, in EU and there is more constraining target over type of targets. Next slide please.

So, another approach or another indicator of the policy intensity could be the number of energy efficiency measures implemented in the countries in the different sectors. We could add up the number of measures but it may not be a relevant enough indicator as some measures may have a higher impact compare to others. So, we could request the methods used in the ODYSSEE MURE project where they consider the impact of the measures implemented as an indicator. So, for each measure such as in the MURE database, there is a high important which is attached to the impact evaluation of a measure. If the quantitative evaluation is available for a measure, the measures used for evaluation of related results are provided, as well as the energy savings and the series of rejection achieved over at given timeframe.

However, if no quantitative evaluation is available, the qualitative expert judgment is recorded. It is namely an assessment of the measure's impact in terms of energy efficiency savings. So, each measure in the MURE

policy database is classified according to its impact in terms of energy savings, which is evaluated according to three levels, high, medium and low impact. These three categories are linked to the aggregate electricity or final energy consumption of the respective sectors, that is to say household, transport, industry or service sector and they put the following limits that will define for each of these levels.

So quickly, for the low impact, the savings are; for instance, to a level below 0.1% of the sector's consumption and medium level is compared between 0.1% and 0.5% and then high impact measures have 0.5% indicators of the sector's consumption. So, if the quantitative evaluation is available, the impact can be easily calculated by applying this definition. However, for measures with no quantitative evaluation, the qualitative -- if you're given by a [Indiscernible][0:38:48] expert judgment. So, to summarize the second approach, to identify the most active countries and rank them according to the potential impact of their energy efficiency, so this can be done by taking into account the member of the highest impact measures. Next slide please.

So, from the MURE database, we -- this is graph that represents the ranking of European countries according to the adjusted number of high impact energy efficiency measure and we can see now that Spain turns out to have the most aggressive policy although this is not much reflected so far in the results observed. It is followed by Germany and I will just remind you, Bruno presented further that these two countries belong to the three most efficient countries according to the ranking made above with adjusted final energy intensity and the third one, the UK, it says on that graph it arrives only on the ninth position, and here, the Netherlands are only in an intermediate position. So, for the moment, there still no clear correlation between the policy ranking and the [Indiscernible][0:40:15] ranking preventive [Indiscernible][0:40:16] by Bruno. Next slide please.

So, the second approach, from this indicator is to analyse this -- still the measures from the position of this project by taking into account the raising number of measures and calculate the new indicator of impact as follows and find some we can pick up for the highest impact measures they come for five, medium impact measure come for three and the low impact come for one and then then we calculate the weighted average. The results as shown on this graph where France now joins the two other countries that were already identified with the high impact measures, Germany and Spain. UK and Netherlands are still in their most intermediate position. So, the analysis of these two indicators, so that there is not always a correlation between the last type of high impact measure and the results of that. Next slide please.

So, and third methodology which is proposed to find the energy efficiency program, continue on training the National Energy Efficiency Action Plan. So, Bruno presented previously the objective for the NEEAP that it was said to describe the energy efficiency measures that could target the 9%

indicative of the energy saving target by 2016. One of the top energy efficiency projects was to screen the NEEAP and to assess -- and they assess the NEEAP of two levels. First, they check whether and in what way the plan contain the information required by the Energy Saving Directive. Second, the screening comprise another view of additional information in the plan which exceeds the requirement of their energy [Indiscernible][0:42:30] directive.

So, the screening highlights, the strengths, and the weaknesses of the national policy implementation and identifies the policy gap in these policy recommendation. The main talk of part of the screening is the NEEAP but they -- these are broader range among experts and this in-depth interview with selected national experts and they focus the analysis onto two following effects. First, the effective sectorial policy package that is to say all the measures are comprehensive, adequate and well-balanced, and they took into account a second factor, which is the government framework. It's the institution and mechanism to facilitate and smooth implementation of sectorial policy efficiency and so on.

So, the graph on this side represents the results from the branch selected member state of the NEEAP screening from the building sector and the list of the 10 criteria are described from zero to two points to get the cross-country analysis and I can just give you a list of the criteria that has been taken into account of the building sector, that means to say the building code. The economy incentive that are implemented in the countries, either energy performance function contracting ODYSSE and so on. The results from the disbursement screening show that in the building sector, France has the highest rate followed by Germany and Austria. Next slide please.

So, what about outside Europe? The USA, these are State Energy -- proposed the State Energy Efficiency scoreboard to get the comprehensive ranking of the U.S. based on the array of metric structure best practices and recognize leadership in energy efficiency policy. So scores are given on some policy area, type of policy mixed for some of the targets, financial instrument. It is given to the State then the results are [Indiscernible][0:45:00] to obtain a maximum score over 50. Then of on the right, it gives system of data where you can see that California was the benchmark before because they lost one point in the score and they come in the second position after Massachusetts. So, this indicator is powerful because it gives the top 10 and it shows evaluation of the ranking. Next slide please.

So, as a conclusion, the analysis of the two indicators of policy impact shows that there is not always a correlation between a large set of high impact measures and the results observed. Can we conclude that countries may register good results although they don't seem to have a comprehensive set of measures? No, we cannot come to such a decisive conclusion as the indicators used to measure the policy intensity are not perfect. First, measuring the intensity of policy from the number of

measures, even taking into account their impact, may hide the fact that a single regulation may have a strong impact on demand, if its requirements are very ambitious for instance, while several regulations that are badly enforced, or where compliance [Indiscernible][0:46:38] or a large number of fiscal or financial incentives, that are much use or well-known by consumers. We have a limited impact on demand. In other words, quantity does not always mean quality. Next slide.

Secondly, the assessment of the impact of measures is based on ex ante evaluations or expert judgment as I've told you and may not be enough harmonized across countries, although some kind of harmonization is done in the MURE database and the indicators used for benchmarking the results achieved by the different countries in terms of energy efficiency progress and level are already quite advanced, they do not reflect 100% energy efficiency as a rough estimate, as explained above for the adjusted energy intensity. The ODEX indicator may provide a more accurate vision of the real energy efficiency trends but will still embed the effect of non-efficiency related factors that are difficult to correct, such are fine incentive effects linked to the economic crisis in Europe since 2009. Finally, measures in policy implemented recently do not have immediate impact on energy efficiency performance and may have also an impact only in the coming year. They cannot [Indiscernible][0:48:07] delay between implementation and real impact that could explain the non-correlation we observed. The benchmarking of countries' energy efficiency performance should therefore be considered with care as it depends on the quality of the indicators used in the comparison. Thank you.

- Sean Esterly All right, Bruno and Carine, thank you so much for your outstanding presentations. We do have some great questions from the audience that we use the remaining time to answer and discuss and the first question is, when counting intensity of EE policies in a single country, does you also count implicit targets such as greenhouse gas reduction targets or focused only on implicit goals?
- Carine Sebi On the targets, we present the classification of country. We presented the - it's the only taken into account the energy efficiency target and not the one related to greenhouse gas emission.
- Bruno Lapillonne What is the question?
- Sean Esterly I'll repeat the question, yes. It is, when counting intensity of energy efficiency policies in a single country, do you also count implicit target such as greenhouse gas reduction targets or focused only on implicit goals?
- Bruno Lapillonne Okay, we understood the question right and the answer that Carine gave is that we do not take into account the added policies on the greenhouse gas because the topic was really on energy efficiency. But we could also have

a more comprehensive benchmarking of policies and you know, in your -- there are a lot of policies that are renewable but this is not included here.

Sean Esterly All right, and next question is, could you please explain a little more concretely what the difference between primary and final energy intensity is?

Bruno Lapillonne Well, the main difference is that in the primary intensity, you include what is going on in the power sector to make it simple. So, if a country is moving from thermal power generation to renewable as it is being done in a lot of European countries, it means we are saving energy. So this will mean that the primary intensity will decrease more rapidly than the finally energy intensity. So, the difference is really what's going on in the power sector. I can give you another example from the year 2012. In 2012, because of the massive use of shell gas [Indiscernible][0:51:08] in the U.S., a lot of coal had been exported to Europe and many power plants that used to run on gas, they're not the same but one with power generator was done by using coal instead of gas, and the reason was a significant decrease of the efficiency of power generation and coal is less efficient and this mean it increase especially the primary intensity, all things being equal.

Sean Esterly All right, and next question from the audience is, what are the sources for the impact assessments that were used to define the impact factors for the energy efficiency measures?

Bruno Lapillonne You're referring to the MURE database?

Sean Esterly From the policy presentation.

Bruno Lapillonne Yes. So, this is based on as explained by Carine on real assessment of measures. I would say that about 1/3 of the measures that are being implemented in Europe, that are in the MURE database as an evaluation and there are different types of evaluation. We have -- even there are a lot in another project, the European Commission Classification of Measures. We have top-down method, we have bottom-up method, and bottom-end means there are some kind of measurements that is being done or kind of a direct assessment with consumer and within this area of methods, you have different possibility. Only the three are between the quality of the assessment and the cost.

So there is not one method, there are a lot of methods that are being used depending on the country and the sector. To be strong, the best evaluation would be to make a survey with the sample of consumers that benefited from the measure compared with the sample that did not benefit of the measure and compare their performance but as soon as we're talking about survey, it's very expensive. So, doing some metering and there will be some light approach that can be based on the council that's counting [Indiscernible][0:53:44] that has been done and make some proxy about the savings as a link to ODYSSEE.

- Sean Esterly Okay, and next question from audience is rebound effect is an important issue when we deal with energy efficiency. Did you take into account the analysis? How and to what extent ODEX indicators can incorporate rebound effect?
- Bruno Lapillonne You're right. It's a very important factor. It's very difficult to tackle where there's no good study for the moment. We are monitoring all studies at one level on the rebound effect and there is no conclusion. It can go from 10% to 100% savings being lost by their behavior, by rebound effect. In ODYSSEE, we -- in the ODEX we try to -- I did not explain because lack of time and this could be technical but for heating, because it's made for heating, we have this phenomenon with rebound effect. We are actually [Indiscernible][0:54:51] ODEX.
- One that took the actual evaluation in the space heating consumption per square meter and another one that use some -- that we call technical ODEX where the assumption is that savings cannot weaver. So, if we achieve a level of saving in one year, it cannot go backward, so if we use saving, we allocate it to a rebound effect. So, it is a proxy statistical analysis of rebound effect. So, we do not measure rebound effect but we try to correct some more of the rebound effect in the ODEX indicator.
- Carine Sebi Concerning the qualitative MURE measure assessment that you can find in the MURE database policy measure, take into account this rebound effect and it can as well be taken into account in the impact assessment that only a few number of measures take care this time or take into account, which is really difficult to assess.
- Bruno Lapillonne Yeah. Maybe to compliment if we have time about the issue of rebound effect and the issue of measuring the saving evaluation quality; there's an interesting approach that was developed in the UK in the framework of the green deed program that is a new program that is being implemented. Well, they do for a particular reason, ex ante analysis that is to see that we have some default sector to estimate the saving that would be linked to different type of actions like mutilation of the wall, mutilation the roof and so on. They make a correction to consider that the real saving with the only one share of the ex-ante calculated saving.
- Their share is almost 50%, it depend on the type of action that is being done and then taking into account three factors to explain why the actual performance will be lower than the theoretical model calculated performance. One will be the rebound effect, one will be that one -- the quality of the work, of the mutilation, the way that's being put and the third one, they consider -- when they've done investment for retrofitting for instance, there is always certain part of the bidding that you cannot reach. [Indiscernible][0:57:32] they remove 50% and maybe 20%, 15%, they allocate it to rebound effect.
- Carine Sebi Just to conclude these three last parameter that Bruno just explained are commonly used for the energy performance contractees to assess the

energy saving because now, the [Indiscernible][0:57:55] financing policies, they finance reprocessing and the loan is paid by calculating the energy savings and more often, they base on the three [Indiscernible][0:58:11].

- Sean Esterly All right, and just to clarify in the last question, they were wondering who provide the data and policies for all the countries you assess. What are the specific references? Do you pay the people who provide it or are they consultants or national agencies?
- Bruno Lapillonne No, I explained that in the beginning this ODYSSE MURE project rely on a network of national partners and more as a partner of the National Energy Efficiency Agency. So, they have a direct access to the policy and to the studies of evaluation of the policies that open in the public. As I said, this project is sponsored by the European Commission so they received some funding but not 100% funding; some funding from the European Commission to support the collection and the organization of the measure in the database.
- Sean Esterly Okay, next question is, how can you increase the correlation between the large set of high-impact measures and the results observed, and also, can you clarify the slide 4.4 concerning the Portuguese results.
- Carine Sebi The question on 4.4 is how we can increase the last set between this indicator as the previous one?
- Bruno Lapillonne Okay, I see that the Portugal has a bad rate for buildings. So, this is based on the assessment that was done within the project that is called the Energy Efficiency Watch. We are not working within or in that project. This one is sponsored by the European Parliaments and the other methodology to quantify as what's explained by Carine and I think there is one or next -- one additional slide we did not show but it's included at the end of the presentation, no? Okay, good work, where it explains -- but we could plan the more information about the way it is done. The first part of the question was, about what?
- Sean Esterly The first part was about, how can you increase the correlation between the large set of high-impact measures and the results observed?
- Bruno Lapillonne Well, as I said, as what said in conclusion, the difficulty for this presentation that we did and also the best analogy that could be done because which we really think into account the time when the measure that being implemented, this was explained in conclusion. For the event you experience that there is a lot providing tax measure, just implement them recently, you can't see from the statistics for the year 2010. You will see it maybe in 2015. So, we have to add another dimension which is the time dimension, but then it becomes quite complex especially if we deal with so many countries.

- Carine Sebi Just for instance on the MURE database I check over 1500 on-going measures. 27% were implemented from 2008 so, this is quite huge number of recent measures implemented that where the impact on the results or on the energy efficiency performance levels are not always observed and one can add that the crisis effect may reduce the impacts of energy efficiency measure.
- Sean Esterly All right, next question is, is there any experience or method for accounting, for behaviour or lifestyle changes in the success of energy efficiency policies?
- Carine Sebi I have in mind the example of Japan after the Fukushima accident where they asked during winter and summer times to -- the regulation in the private sector to put down several appliances such as air conditioning and [Indiscernible][1:03:33] anytime are varied significant impact on demand. So, one can say that policy can have a changing behaviour and about lifetime, it was observed last two years ago when they say these trends are okay this year.
- Bruno Lapillonne More generally, what is observed that behavior can change when there is the risk for the power supply for instance. There is the example of South Africa or many other countries where they managed to save a lot of electric energies through behavioural change on the short-term basis but it may not have a long-term impact.
- Sean Esterly Next question is, do you think a new study linking the high-impact policies versus the practicality of enforcing them might throw more light?
- Carine Sebi Could you repeat, please? Yes, the high impact and the practicability of --
- Sean Esterly I'll just repeat the whole question. Do you think a new study linking the high-impact policies versus the practically of enforcing them might throw more light? Could it be that the Netherlands is enforcing all its policies effectively?
- Bruno Lapillonne Yes. This is a good point and actually this is a point that we will look at carefully. We know exactly if we count measure, if we want to do it at one level for the [Indiscernible][1:05:15] we are preparing a report that will be issued in the next October where we reviewed the existing policies in different sector area of countries and we know exactly countries. A lot of countries that are getting regulations but they are not yet told enforced so they have no impact. In Europe, this is not the case but there can be some modulation in the way they are implemented. So the European Commission is very interested in checking a group they are implemented. So, this is a point that we will take into account and soon, we'll be able to add this new components and new factor.
- Sean Esterly All right and then next question, is could you please make a judgment on the case of Spain? Is it to be concluded that the measures are not well-

designed or not accomplished and have you studied the percentage of policy fulfilment of the studied countries?

Bruno Lapillonne Well, about the case of Spain, we -- Carine already answered. We look at it carefully because we were surprised by the result. It is true that a lot measures are being implemented recently as effect, and also, Spain is experiencing the deep economic crisis that was felt. Consumer can't invest and no new construction is being done and so, this will of course impact their performance for sometimes. Once the measures were in place, maybe that we won't see the impact before many years and the second part of the question was on what?

Sean Esterly Yeah, the second part, is it to be concluded that the measures are not well-designed or not accomplished and then have you studied the percentage of policy fulfilment of the studied countries?

Bruno Lapillonne Did you say policy procurement you say the?

Sean Esterly Yes, policy procurement.

Bruno Lapillonne Performance [Indiscernible][01:07:31].

Bruno Lapillonne I don't quite understand what really is meant by policy procurement.

Sean Esterly Oh fulfilment. So, [Indiscernible][01:07:48], yes.

Bruno Lapillonne Yes. We're the same stories. It's really something that needs to be assessed. Another example, we have Latin in Europe, like in many other countries. [Indiscernible][1:08:03] Latin Europe has a plan and the commission is very cautious to be sure that the clients are correctly levelled. So, they have launched several programs to check randomly the actual levelling compared to the actual performance compared that to the level and there were some gaps and now, because this dimension is important, each time in the European regulation, it is mandatory to do random check of building code, of any level, of energy efficiency certificate which before, did not take this. The process of any control is costly and we are in the period where public [Indiscernible][1:09:04] have to reduce the efficiency not the issue to insist on having more control of the implementation of measured; these are the costs.

Sean Esterly Another question from the audience, is do you intend to write some white paper about these subjects so that citizens of Europe could achieve the best practices individually?

Bruno Lapillonne I think if you go on the ODYSSEE MURE website, there are a lot of publication benchmarking policy that's already delivered and this white report also we are preparing is looking at that. So, from our side, the European Commission is publishing official white paper is a different thing.

- Sean Esterly Okay. Just a couple of more question is, we can observe regularly some breaks in energy consumption data, in particular for detailed data by sector or industrial branches. These breaks can then induce some breaks in estimation of energy intensities or unit energy consumption and we can easily underestimate or overestimate energy efficiency improvements. How do you manage with that?
- Bruno Lapillonne That's a difficult question. First of all, we have to identify that there is a break early at first step. Then once we know there is a break, it may be possible to correct it but if you think due to a change of classification, sometimes we cannot do it, so, we have to separate the period in which we do the assessment. So, for instance, in the ODYSSEE database, the ODYSSEE MURE project, we have a lot of data and indicator over long-term period but in some case, it is only possible to analyse by some period so over the whole period, we do a lot of consistent definition of the data due to data break, and it is a tricky issue because the statistician, they like to change certification, they never think of the people who are using the statistics who needs consistent definition.
- Sean Esterly Next question is, some countries might have a long history of pursuing energy efficiency policies while others might have just started pursuing energy efficiency policies, imperatively recently, did you spot such a difference in timing and if so, did you manage to adjust it in your study?
- Carine Sebi This is what Bruno explained that, this is the next step and we should take into account the history of policy implementation and for instance, if we took it again the example of Netherland and Spain that they don't have the same past energy efficiency policies experience.
- Bruno Lapillonne In the MURE database, all measures are received from when they were implemented so it's very easy to draw a chart showing for each country the dynamics of the implementation of measures and this is typically since we're analysing reports that you can find on the ODYSSEE MURE website. So, probably, we find that the Netherlands, has a lot of measures in the past but Spain is something recent. So, it's very easy to track. The only difficulty is with the measure that it's being implemented in 2008 to decide when it has an impact. If it is building relation, it may take a few years. If it is an economic incentive, then the impact would be shorter. So, what we did not do yet is to try to define when the measure will have an impact in time, in our experience.
- Sean Esterly Statistical definition can defer from one country to another and can induce a bias to make cross country comparisons? For example, for a given country, industrial energy consumption can include non-energy uses and they can be excluded for another country? They think it's dangerous to compare industrial energy intensities of these two countries. How can we manage with this discrepancy?
- Bruno Lapillonne Well, it became a problem if you take National Statistics and you compare directly. That issue worked with the international statistics that they

already harmonized the definition and which is what we've done by your [Indiscernible][1:14:25] by IEA, that we do also at Enerdata or in the ODYSSEE project, there is already this kind of harmonization of definition. So, the comparison is about the bias that you mentioned, but if you should take one data of a country, you compare with another country, and you are 100% sure that they are not comparable, because everybody has his own definition.

Sean Esterly You told that -- you said that in the MURE database that the impact of the policy is estimated based on the impact assessments studies. Can you explain to us briefly what is the methodology used in these studies to estimate savings which can be allocated to a policy?

Carine Sebi Bruno explained previously that the measures are for instance, the MURE, there is not really -- for a given sector or a given end-use sector a methodology that is implemented all over the world so typically the -- and as explained Bruno again, if you have quantitative data that could take into account the energy savings from expert or ex-ante analysis, the measures tried to provide the impact, otherwise it's given to a wealth assessment from the -- is given by the person in charge or the member of the energy efficiency and for instance, are regulation may have a stronger impact compared to financial instrument.

Sean Esterly The MURE database as I said 1/3 of the measures are quantitative evaluation and these evaluations are just a summary of the studies that have been done at the national level, so, it's not the database or it's not the coordinator of the database that puts value definition. We just put the result of the studies inside of the database. If you document how much savings over which period and the methodologies document it. So, it's possible to track which methodology was used. But to give you an idea and review what industry of the different methodologies in which you can find it again in the report that I don't have it in mine now, probably a mix of different methods.

Sean Esterly All right and that were last of our questions. I do just want to remind the audience because we have a few people to ask that PDF copies of the presentations can be found at www.cleanenergysolutions.org/training and within a couple of weeks, we will be posting the recorded audio versions of the presentation in the training section of Clean Energy Solution, so that same website.

Now, I'd like to just ask our audience to take a couple of minutes to take a quick survey on the webinar that they viewed today. We have three short questions for you to answer. Your feedback is very important to us as it allows us to know what we are doing well and where we can [Indiscernible][01:17:57]. So, Heather can you display the first question please, and the first question is, "The webinar content providing me with useful information and insight?"

Next question.

The webinar's presenters were effective?

Next question.

Overall, the webinar met my expectations.

Okay, thank you for answering our survey and with that I'd like to just offer an opportunity to our speakers to provide any final closing remarks and thoughts before we close the webinar.

Bruno Lapillonne

Well, you have seen there is a lot of work. We try to relay the policy report because we link the policy report to the results obtained but we are [Indiscernible][1:19:47]

We thank you for your attention.

Sean Esterly

On behalf of the Clean Energy Solutions Center, we also like to extend a heartfelt thank you to both of you, to our panelists, and to our attendees for participating today's webinar. You guys have been our terrific audience and we very much appreciate your time. I invite our attendees to check out the Solutions Center website over the next few weeks if you'd like to view the slides and listen to the recording of today's presentation as well as previously held webinars.

Additionally, you'll find information on upcoming webinars and other training events. We'd also invite you to inform your colleagues and those in your networks about Solutions Center resources and services including the no-cost policy support. Have a great rest of your day and we hope to see you again next future Clean Energy Solution events and this concludes our webinar.