

Energy Efficiency Policies and Trends in the EU

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Webinar Panelists

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This Transcript

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Eric Lockhart

Everyone, I'm Eric Lockhart with the National Renewable Energy Laboratory, and welcome to today's webinar, which is hosted by the Clean Energy Solutions Center and Partnership with Enerdata. Today's webinar is focused on energy efficiency policy and trends in the European Union. One important note of 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 Center's 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. 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. If anyone is having technical difficulties with the webinar, you may contact the go-to webinar's help desk at 888-259-3826 for assistance.

If you'd like to ask a question, we ask that you use the question pane where you may type your question. If you're having difficulty viewing the materials to the webinar portal, you'll find PDF copies of the presentation at cleanenergysolutions.org/training, and you may follow along as our speakers present. Also, an audio recording and the presentations will be posted to the Solutions Center training page within a few weeks and will be added to the [Solutions Center YouTube channel](#) where you'll find other

informative webinars as well as video interviews with thought leaders on clean energy policy topics.

Today's webinar agenda is centered around the presentations from our guest panelists, Dr. Carine Sébi and Dr. Wolfgang Eichhammer. These panelists have been kind enough to join us to discuss energy efficiency policies and trends in the EU. Before speakers begin their presentations, I'll provide a short informative overview of the Clean Energy Solutions Center Initiative. Then following the presentations, we'll have a question and answer session where the panelists will answer questions submitted by the audience, then 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 13 initiatives of the Clean Energy ministerial that was launched in April of 2011 and is primarily led by Australia, United States, and other CEM partners. Outcomes of this unique initiative include support of developing countries and emerging economies through enhancement of resources on policies relating to energy access, no-cost expert policy assistance, peer-to-peer learning and training tools such as the webinar you're attending today.

The Solutions Center has four primary goals. It serves as a clearinghouse of clean energy policy resources. It also serves to share 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 experience. And lastly, the center fosters dialogue on emerging policy issues and innovation around the globe. Our primary audience is energy policy makers and analysts from governments and technical organizations in all countries, but we also strive to engage with the private sector, NGOs, and civil society.

A marquee feature that the Solutions Center provides is a 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 demand and policy evaluation, we're very pleased to have Bruno Lapillonne, vice president and co-founder of Enerdata, is also actually an expert on the Odyssey Muir Project that we'll be talking about today, serving as one of our experts.

If you have a need for policy assistance and energy efficiency or any other clean energy sector, we encourage you to use this valuable service. Again, the assistance is provided free of charge. If you have a question for our experts, please submit it through our simple online form at cleanenergysolutions.org/expert. We also invite you to spread the word about this service to those in your networks and organizations. Now I'd like to provide a brief introduction for today's panelists.

First up today is Dr. Carine Sébi. She's a project manager at Enerdata where she participates in the coordination of the Odyssey Project as well as working on numerous European and international projects on energy efficiency,

particularly on buildings. She also works on public policy assessment and demand analysis. Following Dr. Sébi, we'll hear from Dr. Wolfgang Eichhammer who is the head of the competence center on energy policy and energy markets on the Franhauser Institute for Systems and Innovation Research in Germany, as well as the professor for energy efficiency and energy systems and modeling at _____ University, Netherlands. And with those introductions, I'd like to welcome Dr. Sébi to the webinar. If you could just go full screen with your presentation, that would be fantastic.

Carine Sébi Yeah. Can you hear me?

Eric Lockhart Yes, we can.

Carine Sébi Okay.

Eric Lockhart Your slides are still showing in presentation mode, though. If you could full screen them, that would be great.

Carine Sébi Yeah. Does it work? I'm sorry.

Eric Lockhart It might be because your screen is up. Maybe –

Male Carine, are you using two monitors? That might be the reason why.

Carine Sébi Now? I'm sorry.

Male That's okay.

Carine Sébi And now?

Male Yeah, it's showing two slides. It's showing the first and what looks to be the second slide.

Carine Sébi Yeah, I'm sorry. I don't know how to—

Male That's usually what happens with two screens. That's okay, I can go ahead and show them from my end if that would be all right with you, and you can just tell me when to advance to the next slide.

Carine Sébi Okay.

Male Give me one second.

Carine Sébi The program is—okay, now I can see. Very sorry for that. Thanks a lot, Eric, for your introduction. I'll speak first on energy efficiency trend in European Union from results from the Odyssey Project as you presented. Next slide please. But before, let me briefly introduce my company. So _____, an independent information and consulting firm specializing in the global energy and problem markets. We have over 25 experience years of experience in economic issues related to mainstream and downstream energy. Our products cover energy databases, statistics, report key energy news analysis. Forecasts,

we have our in-house modeling like the pulse model of the metro, focusing on demand forecasting.

And last but not least, we have our experts in energy efficiency as you presented in introduction. Our headquarter is located in Granam in France where I'm located right now. But we have as well offices in Paris and in Singapore. Next slide, please. So as I explained, today, Wolfgang and I will present the results stemming from the Odyssey Muir Project, which is financed and _____ 2020 a special program of the European commission. Odyssey is coordinated by Adem, the French Energy Environment and Efficiency Agency, while _____ technically coordinating the Odyssey part on quantitative indicators while my colleagues are from final _____ are coordinating the Muir database on energy efficiency policies and measures implemented in the EU.

And that's why we are sharing that presentation today in two parts, and Wolfgang, my colleague, will present in the second session, the seminar, some results on policy implementation. There are basically two main objectives in that project. The first one is to evaluate and compare energy efficiency progress by energy sector for the EU countries and for the average at the EU level. And the objective is also to relate the progress to the _____ of trends in an age of consumption.

And the second objective is to monitor energy efficiency policy measures in the EU countries, and we have two main tools to evaluate that trend, thanks to two databases. The first one is the Odyssey database on indicators, and the Muir database on the policy measures implemented by sector. I put the link on the slide where you can have access to all the information related to that project. Next slide, please.

Odyssey Muir was created more than 20 years ago, and it is renewed every three years, and the latest census brochure was published last September. And today, we will be _____ on the detriments, even if we have updated all data up to year 2014. I guess that the publication will be available on our website, and you will see I put direct link if you click on the image. Will have direct access on the website on the direct features of the website. And on the right, I put a screenshot of the data tool webpage where we propose several features to really understand and decompose the trends in terms of energy efficiency all over European countries. Next slide please.

So my presentation, the outline is very simple. I will present for each energy sector the main trends while in the sentences, a sentence, I will present the aggregate results at the EU level. Next slide please. So let's start first with the industry sector. Next slide. So before 2007, the industrial energy consumption was roughly steady. As it is shown for the EU level on the graphic on the left with the histogram, and we can see that however, since 2007, most EU countries have been hit by the industrial recession with a strong reduction for some countries. The most struck by the crisis, like for instance, Italy or Spain.

And on the long run, that is to say from 20 to 2014, we observed that the industrial consumption was in 2014 18 percent below its level of year 2000,

our reference year. Then the graphic pie on the right shows the decomposition of the EU total energy consumption by sector, and one can easily see that the share of industry has decreased from 29 percent in 2000 to 25 percent in 2014. So since 2007, the message here is that we observe strong decline of the industry energy consumption. Next slide. But what are the main drivers that can explain such a decrease in the industry sector? This is what we try to understand on that slide where we decompose a variation of industry consumption by several effects. So basically, between two years, the variation can be decomposed to the two years here.

For instance, 2002, 2014. It can be decomposed first by the activity effect that you can see on arrange doc histogram. Activity expressed here in the case of industry can be illustrated by an increase in the economic activity measured by divided of that sector. And there is as well structural effects that can be seen on the blue due to a change in the structure of that value addition in the industry sector among the various branches shifted from cement industry to, I don't know, to copper industry or for instance. Then we have the energy savings links to energy efficiency improvement that are shown in orange where we take here only the technical improvements. Then we have in green a residual effect that captures the change in the variation of product and industry.

This is what we call the non-technical improvement. This is mainly negative effect due to less efficient operation in industry because the manufacturers do not operate at full capacity. So these are the four main effects that try to—that can explain the movement of the conception in the long run, and what we can see is that since 2007, this is the bunch of histograms on the right of the graphic. So since 2007, the reduction of activity was the main driver of the observed decrease of consumption, and energy saving had a much lower impact.

And between 2000 to 2007, so now we are on the left bunch—the left histograms, the stability of conception was the result of balance between the activity effect and energy savings. So we can see that the structural effect of low impact on the variation of consumption, meaning that the industrial activity and branches are steady over time. To conclude the energy consumption reduction in industry, that is mainly explained by a decrease in the activity of the industry sector.

Next slide please. So now, let's focus on savings at two level. The first level is the additional annual savings. Again, we take only technical savings that are represented in orange histograms. And on the other side, we have the cumulated savings, that is to say the sum up of the orange histograms, that is to say the sum up of annual savings across systems since 2000 that are represented in the trend in blue. And we can see that the cumulated energy savings reached in 2014 62 MTOE. So it means that without this improvement, energy consumption would have been 62 megaton of oil equivalent higher that year.

And if you look now at annual savings, that is to say the orange histograms, we see again the negative impact of the crisis during the period of 2008 to

2010. And since 2007, yeah, we see that the trends have been reduced by half. So I'll explain. It can be explained by the crisis, and maybe as well due to the fact that most of the progress have been achieved so far combined with the fact that there is less investment in renewable of infrastructure because of a decrease in the industrial activity. Next slide, please.

So here, we look at the energy efficiency trends by the main branches of the industrial sector. And we tried to understand what are the main branches that explain that, yeah, decrease in energy savings. And we slow—we see that there is lower energy efficiency progress since 2007 because of the low progress in some branches, and even no more in energy efficiency improvements for some branches because of the recession. One can quote the cement machinery of paper branches. However, on the opposite, we see greater progress in some branches like the chemicals or the transport of branches. Next slide, please.

So I hope I gave you a glimpse of the progress in the industrial _____. Let's see what's happening in the transport where we see improvements that have been driven by two main modes that I'll present now. So first, let me just remind you that the transport sector represents a steady share of 30 percent of the total EU consumption. And it's steady. And what can we see in that slide is that during the first period before the crisis, that is to say before 2007, the energy consumption of transport are steadily increased by 1.5 percentile at EU level. You can be seeing that on the trends with the orange trend with dots. Be careful, the graduation for the EU average has to be red on the Y-axis on the right.

And for most EU countries, we observe that trend except for Germany where we saw a decrease for that first period. Then from the year 2007, we observe a decrease at a pace of 1.6 percent per year, and finally, in the end, the level of conception of year 2014 was slightly higher than year 2000 level. So again, let's try to understand on the next slide. What are the main drivers? So as for industry decomposition, we look here on that slide at the main drivers. The first one is the activity again that can be translated by an increase of the distance traveled of passengers, or an increase of the goods in transport sector. This has been—it's shown on orange on the graph. Then you have the energy savings due to the diffusion of more efficient _____, for instance.

There is another effect, the effect variation of conception in transport, which is the model shift. That is to say that policy incentive, some modes like for instance metro rail, rather than private cars or, yeah, something like that. And to other effects, negative effects, again, such as the low load factors, or the increase of empty running of truck during—yeah, lower activity. So what can we see is that on the long run, that is to say from 2000 to 2014, so please refer to the bunch of histogram on the left, the slight increase in energy consumption of transport is due to the fact that energy savings around 60 MTOE balance the effect of the growth in traffic of passengers and goods.

And since 2007, so now we're on the right of the histograms, the decreasing energy consumption in the transpose sector mainly due to energy savings, like around 30 MTOE, with no more activity effect due to the traffic slowdown as

I explain to you previously. Why during the first period? So we're now in the middle from 2000, 2007, the energy savings have been upset by the activity effect. Next slide please. So let's now have a look at what's something at the model—at the mode like what's happening about the improvements in forecast for trucks and light vehicles and for air transport. On average, we have seen previously that there is an improvement at the base of 1.1 percent per year at EU level since 2000.

And there is a greater progress that has been achieved for both cars and especially for airplanes. But energy efficiency progress has slowed down for trucks and light vehicles since 2007. Again, because of this fall down in the traffic, in the freight traffic by road that led to a less efficient operation of truck. Next slide, please. As for the industry graph here, we have the same kind of presentation of the annual savings and the accumulated savings. We see that in 2014, the energy savings in the transport reached around 60 MTOE, meaning again that without this energy efficiency improvement, the energy consumption would have been higher by 60 megaton of oil equivalent. We can see that there is a slowdown in energy savings in 2009, mainly due to no more process of goods transport as a consequence of the economic recession.

Next slide, please. So here, we see that as I explain, one of the factor is the improvement of the, for instance, the specific consumption of new cars. The diffusion of new efficient cars will of course improve the progress in terms of energy efficiency, and on that slide, we see the specific consumption of new cars and the stock average. So let's start first with the stock average. That is to say what is the average performance of all the stock of cars. We can see that it has decreased from 8.1 liter per hundred kilometers in 1995 to 6.8 liter per 100 kilometers in 2013 thanks to the diffusion of new cars that have improved the whole governance of the stock. If we look now more carefully at the specific consumption of new cars, it has been decreasing faster since 2007 as a result of the EU regulations thanks to our labeling and manager minimum energy _____ standard.

Or national incentives and of course higher fuel prices. So if we explain more precisely what happened before and after 2007, it is because in 1995, a voluntary agreement was set between the European commission and car manufacturers that was finally—that had the allure effect, and it was not really effective. Hence from 2007, the directive enforced manufacturer to make efforts in terms of new car performance, but I'm sure that first thing in the second part will take some time to present you the most representative policy implemented forecast. So as a result, new cars consume around 40 percent less in 2014 compared to around 1995.

Next slide, please. So as I briefly explained before, model shift is as well a reason or a factor, a driver that affect energy efficiency. And it can come from more efficient vehicle, but as well from the shift of part of the traffic from road that's to say cars from passengers or _____ for freight, to more efficient modes like public transport of passengers. So I say before rail was metro, or rail and water for goods.

Indeed, all countries are implementing measures to change the present model split that is dominated by cars and truck in EU. So on the left graphics, we observe a steady share of the public transport in passenger traffic at EU level. However, there is a high progression in some countries, like for instance, in Belgium, Italy, France, or UK. And on the graphic on the right, we see that at EU level, 25 percent of good traffic is carried by rail and boats with Sweden and the Netherlands having the highest share of over 40 percent.

In terms of progression, Belgium and the UK are the widest thanks to the diffusion of goods traffic due to water transport. So let's now have a look on the last but not least sector, the residential sector. Next slide, please. Next slide. Thank you. The house of energy consumption in European Union represents on average 27 percent of the total consumption. The main end users that compose the consumption of residential sector are space and water heating, cooking and consumption from larger electrical appliances like refrigerator, freezers, washing machine and so on, and we can see that on average, the energy efficiency of residential sector has improved significantly since 2000.

It was 25 percent better in 2014 compared to the reference year of 2000, and it's explained thanks to the energy efficiency improvement, mainly from space heating we will see, and thanks to the diffusion of more efficient new electrical appliances thanks to the implementation of labeling programs. Next slide, please. So on that slide, we look at space heating, which is the most important in use in the residential sector. Indeed, there is a range from 60 to 80 percent of the household consumption that come from that and use except for Mediterranean countries of course where winter is less severe.

Hence, it's improvement has a significant impact on the world _____ of energy efficiency in the residential sector. So if we look now at the graphic, we see that the efficiency of space heating has improved steadily since 2000 by 2.2 percent per year at the EU level. This can be explained thanks to the deployment of more efficient new buildings, heating appliances, and the renovation of deeper renovation of existing dwellings that could as well be part of that _____. And as a result, I've seen that the share of the space heating in total in the total of the share of space heating has declined by four points since 2000.

The lower volume of construction since 2009 because of the crisis has however limited the impact of new dwelling standards and thus had a direct effect on the energy efficiency global performance. Next slide, please. As I said, space heating is has a great share in residential sector, but electrical appliances represent on average an important share like ten percent of the residential sector, and having a greater importance as average consumption is increasing over time, as you can see, on the total histograms. More precisely, the consumption of electrical appliances per dwelling has increased by 0.5 percent buyer since 2000 with a decrease in trend since 2007. However, the consumption of small electrical appliances has been growing rapidly, and now represents a higher share of the total consumption of appliances compared to the large appliances.

This can be explained by two effects. So the first one is the steady equipment rate for larger appliances, meaning there is a saturation in household about the rating of equipment, and the fact that there is more targeted policy implemented for these larger electrical appliances. And on the one hand, the diffusion of electrical appliances and the small electrical appliances is greater, and there is less policy targeting that kind of appliances. Next slide, please. So again, as for the other sectors, let's try to decompose the variation of consumption into several effects. So now the activity effect can be translated here in terms of increase of dwelling, construction, more construction due to the fact that the average size of dwelling is decreasing, and demolition rate is lower and so on. We have as well a lifestyle effect due to an increase in appliances per dwelling, as I just showed you the multiple equipment in house.

Like for instance, TV and so on. Another effect that is larger ____ due to increased average size of dwellings, an increasing comfort to people from higher—bigger houses. And energy efficiency linked to improvement. So this is the technical energy efficiency gains that we can observe thanks to the diffusion of more efficient appliances, thanks to standards in construction or to a regulation and renovation and so on. So what can we conclude from that graphic is increased number of dwelling—the increasing number of dwellings, sorry, and appliances, contribute to raised household energy consumption. But their effect is counterbalanced by the energy efficiency improvement as we have seen, for instance, for space heating, meaning that in the end, without this savings in 2000, the energy consumption of household would have been around 80 MTOE higher in 2014 at EU level. Next slide please.

So let's see what's happening if we aggregate all the sectors I have a presence in. Unfortunately, I don't have time today to present you the preference of the service sector, but it's all included in the link and the brochure and the website I mentioned in introduction. Next slide please. So here, we show the global energy efficiency improvement. This is what we call in the frame of our project the Odex, which is a construction of Odyssey and index, which is calculated as a weighted average of the energy efficiency gains offset by sector.

So I will not repeat again the performance by sector as I just presented, but on average, which is shown here in green, you can see—in orange, sorry, that 17 percent—no, in red, we observe that 17 percent of energy efficiency improvement between 2000 and 2014 are like two percent per year. Next slide, please. So this graphic represents the same results as I just presented in previous slide, but differently. Indeed, it shows the accumulated energy savings for each sector that are summed up to present the global volume of improvement.

So since 2000, around 220 MTOE energy savings was gained in 2014. Or an equivalent of 17 percent of the final energy consumption. In other words, without energy savings, the final energy consumption would have been 17 percent higher in 2014. And again, we observe a lower progression of these

savings since 2008 as a result of the economic crisis. And one can easily see that most savings have been gained in the household sector. They represented 36 percent of savings followed by industry or _____ that represent roughly 30 percent of the savings. And while the services and agricultures are of a minor effect.

Like _____, so this is the last but not the least slide that show you, again, the main explanatory factor of that final energy consumption variation in the EU. And we can see that economic activity increased consumption by around 80 percent over to 2014, 2000 to 2014, sorry, while demography and lifestyles like I explained before, increasing appliance and _____ in larger dwellings also contributed to increase the consumption by around 40 MTOE each—and energy savings of 220 meter MTOE offset the effect of these four drivers of consumption growth leading to a decrease in final consumption of 66 MTOE. So before I give the floor to my colleague, Wolfgang, I just want to remind you that everything is available on the website. I mentioned at the very first slide of my presentation. Thank you very much, and Wolfgang, yeah, I'll let you present the energy efficiency policy _____ in European Union.

Wolfgang Eichhammer Can you hear me, and is everything fine with the screen?

Eric Lockhart Yes, we can hear you well, and the screen looks good.

Wolfgang Eichhammer Okay, so we'll come altogether, and thank you very much for listening to the second part of the presentation, focusing on energy efficiency policies in the European Union and also on the evaluation practices. But let me first very briefly also introduce my company. _____ is Europe's largest organization for applied research, and you see here a map of Germany. There are 67 locations. My own location is to the southern—southwestern part close to the French border, and in total, we are about 24,000 employees, and when people ask are you a public or private company, the answer is 70 percent we're a private company with income generated from contracts, and 30 percent is provided by the federal government as basic financing.

We have also some affiliations offices and some _____ also in the US, but also in other regions of the world. Now this part is focused on the energy efficiency policy part, and you also find the website link here. But let me first add one thing to what Carine has said about the Odyssey Muir project. I think a very important aspect of this project is that it gathers national teams from the different European countries. In total, more than 30 teams, 28, and Norway for example in Switzerland, and I think the contributions and the insight of these national teams is extremely precious. So in a way, the work that you present here is a lot based on the work that these teams have provided.

Now I will focus on the energy efficiency policy, but you will also get some insight into the analysis tools that we have developed or are developing because our experience is when you talk with your analysis to the policy sphere, you need to talk in a transparent and easily understandable way. On one hand, we have many policies here. The Muir database comprises about 2,400 energy efficiency policies in those 30 countries, so there's a lot of

complexity on one hand, and on the other hand, it's not so easy for an unskilled user to make directly efficient use of the database.

So we merely tried to provide access to that information that even if you are not a database expert, you are able to extract the information that you want for your analysis. The contents of this presentation is structured as follows. At first, I will give you some insights into EU energy efficiency policies, but it can only be to a limited degree because on one hand, while energy efficiency policies are set at European Union level, on the other hand, they are also largely dominated by the national level.

As you can imagine, there's a lot of heterogeneity in what the different countries are doing in the European Union. The next point is focused on how to identify successful energy efficiency policies. And then we focus on how to look at policy interactions, and I'll present for that two tools. We developed the policy _____ and the policy interaction tools which provide support in analyzing such interaction. And finally, this is an interesting new development, at least for Europe while in the US. There is already quite some work going on with the ACEEE work. This is work focusing on energy efficiency policy score about—and I will try to present you the present state and present results for that.

Now focusing first on EU energy efficiency policies and also showing you a bit the way how things are accessible in the database. This is in fact that entrance screen when you analyze energy efficiency measures in the Muir database. By the way, Muir stands for—it's a French abbreviation because the origin of the project is French, and it stands for—measures for Rational Use of Energy, _____. That's the origin of deprivation _____. And you can inquire the database according to different approaches.

You can actually look at countries, you can look at different types of measures, and there are some types of measures as you can see by the plusses. You can analyze targeted end uses, but you can also, for example, analyze actors, target audiences, or evaluation methods that have been used. And in fact, important features that we try together in the database is information on the impacts, the quantitative impacts that the measures may have in terms of energy savings or CO2 savings. And also we try to—even if we cannot gather quantified information, we try to categorize measures according to a certain scheme of criteria by no impact to medium impact and high impact measures.

When you look at the measures, here is an example of household measures aimed at energy efficiency, and you see on the left hand side, the European measures is an aggregate across all new member states, and you see that if you look from 1995, there was really a strong focus on the one hand on legislative measures. For example, like building regulation and others, and second focus are financial measures. And it's interesting to look at the dynamics that these measures have the writing graph presents measures that have been presented under the so called National Energy Efficiency Action Plan's suite that have been published two years ago by the different EU member states.

And you can see that the financial focus of the measure has been strengthened across all the member states. The main reason for that is that building regulation—sorry, that the main reason for that is the _____ rehabilitation of existing buildings has become a very important issue in Europe. Buildings live for a very long time, and Europe has the target to have zero energy stock of buildings by the middle of the century, but on the other hand, when you look around, more than half of buildings that stand today, will still be standing by 2050. And so really, a lot of emphasis have to be put on these existing buildings, and the main road through that is through financial measures. This is why this type of measure is really increasing.

On the other hand, this is just a snapshot from a few countries on the same sector on the residential sector. They are really very different cultures among the countries, and it raises indeed important question, but some harmonization could enhance let's say the uptake of energy efficiency measure or whether these differences in culture are really something that have to be taken care, and also continue to be expressed inside of measures that are chosen. You see here for example on the upper left hand side, Germany and—well Germany has a strong focus on legislative measures, on financial measures as let's say the general view on the sector in EU while if you take on the other hand a country like Finland, they have an extremely strong focus on informational measures. Because maybe this is more linked to the culture of the country.

But maybe also—and this is for example the case of Romania, you see that financial measures are relatively a less implemented, which is largely explained also by the economic context for a country. This is a view—a cost-cutting view on the main EU energy efficiency policy measures and their impacts. And so I don't have the time to discuss them in all the details, and also Carine has already mentioned some of them. Let me briefly discuss the most important one. In fact, the most important one is a cost cutting one, the energy efficiency directive, the so-called ED, which has been introduced in 2012 and which in fact continues the older—or replaces the older energy service directive, and this is energy efficiency directive has—should lead to a 20 percent reduction of primary energy consumption compared to a given baseline scenario, which is equivalent to reduction by 368 million tons at EU level by 2020.

And last year, there has been a big debate about how to—or two years ago, has been a big debate how to extend this to the 2030 frame, and it was decided to have a reduction target of 27 percent by 2030 compared to the same baseline. And at present, there is more discussion because the evidence is growing that this target is too low, and it could be that in the course of this year, the target will be increased to 30 percent, and the energy—or perhaps even more, and the energy efficiency directive will be revised in that sense. Other important cross-cutting technologies are in the taxation field and in the field of renewables, so remember that we talk about primary energy, and primary energy is influenced also by renewables policies given the I would say artificial efficiency of some types of renewables like wind and solar with 100 percent nominal efficiency.

And that has an impact also on the change of primary energy consumption. Looking at the different sectors, starting with industry, the first sector which Carine presented, while at the cost-cutting level, they are limited number of policies, and in particular, there is the EU mission rating scheme, and we just carried out an evaluation of this scheme. Indeed, the impact of this system is rather limited at present due to over allocation, and Carine has not shown any indicators that the driving forces for energy efficiency improvement are limited there.

On the other hand, the buildings and appliances Carine has shown that some changes in the energy consumption of this sector, there is on one hand of the building part, the energy performance directive of buildings supported by many national building regulation, and so the impact of this building regulation framework could be enhanced and will be enhanced. It has an impact, especially when translated to let's say a member states who want to be ambitious on building regulation.

On the other hand, the eco design directive as you could see had a very tremendous impact on the large appliances. There is improvement to be made on the smaller appliances on the IT appliances, but in total, the eco design directive has already put in place about 15 regulations and labeling schemes and is intended to be enhanced and be evolved in a dynamic manner. So it can be expected that the impact of the eco design directive on the second block, which Carine has shown that the small appliances can be enhanced in the future.

And finally, the transport sector will—Carine already mentioned the emission performance standards, which in fact is the largest single saving measures, and you saw the stone change in specific consumption of the cars, which Carine has shown. This will be further enhanced in the future, especially with the introduction of electric cars. In particular, support at the national level by a variety of countries who give subsidy schemes who have set up subsidy schemes for this type of energy uses. Now after this brief view at success—at EU energy policies, I wanted to have a bit more cross-cutting view, including how to identify successful policy measures.

And for that, we have a set of specific facility in the Muir database. We observe that many countries would like to compare their policies with other countries, and so frequently, they ask the question how can we compare our policies with other countries. For that, we develop as set of criteria or 12 criteria, what is a successful measure. We group them into two categories. First, we call it high priority criteria. We gave a higher rate to them, and the second one, which you will see on the following slide, we called them low priority criteria. While we divided the first group into six on one hand, we have high impact measures or measures with high number of applicants. I will say a bit more about how to measure the impact a bit later on.

We have measures which are most cost efficient for the implementer. The third criteria is the potential for market transformation, and for the promotion of energy service market. The fourth criteria is the suitability to overcome barriers for energy efficiency. Criteria five is the ease and stability of

refinancing. This is for financial measures because some—some measures fail due to the problems of refinancing, especially when the country has economic problems. Then typically these type of measures are canceled, and this is very harmful for the long-term implementation of measures.

The final criteria in the group is the persistency of the savings in use by the measure. Because some measures only imply savings for certain period of time. This is especially the case of behavioral measures, partly, so persistence is also important criteria. Here you see the second bunch of criteria reaching from transferability between countries, so learning effects, linking to other measures, so policy packages, experience with the measure, avoidance of negative side effects and support of positive side effects. So multiple benefits is the issue, which a lot of discuss the present at the international level.

Finally, the ease of acceptance by relevant stakeholders. And, these criteria, we evaluated for the different policies with a score between 1 and 5. There was a certain approach given some are quantified, some of these criteria are quantified, and then grouped into the 1 to 5 categories. Others are more based on expert estimates. Let me briefly—something—say something about one of the criteria which is the quantitative impacts that are available and in fact when you look at the information available at the national level, you find there was quite the learning process following these framework directives from energy efficiency. The energy service directive, and the energy efficiency directive, and you see here in this slide, more or less from left to right, a kind of learning.

It gives the percentage of measures that have a quantitative impact evaluation. And on the very left hand side when you look at all the measures which you have in the Muir database, you see it depends a bit on the sector. The colors are on the different sectors. But let's say on average, we have maybe something like 35 percent of all the measures have a quantitative impact evaluation. And the more you go to the right hand side, you see here for example one in the middle is the National Energy Efficiency Action Plan 1, and then Plan 2, Plan 3. They date from 2007, 2010, and 2013, and Article 7 is one part of the energy efficiency directive. It's the most recent one.

And you see that there was a continuous learning and effort to quantify the measures which are part of the reports of the country. So this is really a very good effect of this directive that the countries now are really transparent in what they think is the impact of the measures and there's a regular reporting. So from the methodological side, there was really a big improvement. Now coming to the question of how to look at interaction of energy efficiency policies—because you can imagine if you have so many policies in the database, there are interactions, and we have developed tools to make these interactions more visible, and also try to quantify. Also, I must admit this is a rather difficult area, and it's often something which you have to do in a very focused manner on very few measures.

But we try to develop this more broadly in the database. Here you see one example of such a policy might be in fact of the heart of the mapping is the targeted end use. In this case, you see the right there in the middle, it's a space

heating in existing dwellings. You focus on insulation and boilers. On the left hand side, the green part is different types of measures. I've chosen here the example of Finland, and you see European measures and national level measures, and those are the ones that are acting on this specific end use. You have some designation of the measures here.

I can't discuss them here in detail. On the other hand, on the right hand side, we tried to link that to the indicators, which Carine has presented, and for example, we look at the evolution of our given Odyssey impact indicator, which represents in a way the impact of the policies. This you can see on the next hand slide, you see a list of policies, and you see an evolution of the indicator. But as you can see from this example, it's the link is not straightforward. In fact, you see here policies that are in fact reducing energy consumption, but this example of Finland, unit consumption of heating per household per square meter, the indicator is increasing, and in fact, so there's an overlap with other factors, like for example, comfort factors, higher temperatures, or longer heating periods and these kind of things which are overlapping the savings effects here.

So it's not easy to establish the causal link between the indicate on one hand and the measures, but in some cases, it's possible to establish this link more closely. You have to take into account other factors than energy efficiency points. This is an example how energy—how interactions between measures, energy efficiency measures, can be considered, and we have developed a kind of tool which based on this policy mapper is looking at the different measures here, a variety of measures aimed at a given target in these space heating in Finland.

And with this tool, it's possible to evaluate what could be the overlap between those measures and the combined impact. This in fact without entering into too much detail is based on the measure interaction matrix, which defines in a way how strongly the different measures that you have been seeing on the previous slide are interacting. You see here that some of them are not interacting, some are to some degree interacting, while others are more strongly reinforcing or overlapping to each other.

So this is a detailed analysis of the interaction that has occurred. This is just one example of successful measures we identified, and where we also looked at this type of interaction between policies to some degree, and I cannot now—this is the example of Germany, and I cannot discuss now these measures here in detail, and they are also many other examples of this type in different countries. But just the point about a very successful measure is the KfW program in the building sector. This is one of our most important measures in Germany is aimed at deeper innovation, so it's a very, very important measure.

On the other hand, you see also a variety of new measures here, very successful ones in Germany, and in particular for example, the already mentioned echo design directive for example. Now coming to the final part of this presentation, which is the policy scoreboard, and I think this is quite interesting also from a methodological point of view. We are to some degree

a bit learning from what is happening in the US in that field, but also trying to develop new features. In fact, we have developed four main scoring approaches, which fall into two large categories. In fact, we developed so-called output base scoring, which in fact is based on the quantitative impacts, which the measures have, and on one hand, we have input base scoring, which is based on financing volume.

And while the first is really an original development—the first three are really an original development in this project, the last one is something that has been developed already by ACEEE for the US to a large degree. The first group, the output base scoring we divided into three different parts of scoring. One is based on energy savings. One is related to energy efficiency potential, so how much of the potential you already have realized with the savings. And the third one is related to 2020 or 2030 energy efficiency targets.

So how close with the measures you can come to the targets that they have _____. And just to show you this slide here from the US, which is the input base scoring, this was from 2014, but I heard that the 2016 energy efficiency scoreboard is coming up or has been published right now. And so we have been a lot inspired by this, and we think there is a lot of need for this type of scoring because many countries and many politicians would like to compare their policies with the ones from other countries. I haven't too much time to describe here much of the methodology behind the scoreboard, but you can find information on that on the database about the methodology. But only point I wanted to make on this slide is I mentioned that on average about 35 to 40 percent of the measures have been quantitative impact evaluations while the other have similar quantitative capitalization of the impacts based on estimates that are precise as the quantitative impacts, but is a specified procedure how to estimate that.

And the scoreboard in fact combines both approaches in one, and this is described in the methodology to paper we have developed. Finally, just to show you how big the need for that is, this was a presentation we made in Germany. I apologize if some of the comments here are in German. And in fact, it's a combined score board combining on the left hand side the status, the absolute—oh. Was it thrown out now? Sorry. So on left hand side, it's the status what shows the absolute level of energy intensity, but corrected to some degrees. The middle is the trend by how much has been saved. This is based on the Odex, and the right hand side is the policy scoreboard I just discussed, and yeah, you see in blue the German position and while in the ACEEE scoreboard Germany appeared as number one.

Here in the European context. It depends a bit on which type of scoreboard you look at. Germany is rather good in the absolute level, but the improvement over the past years, that's the middle table, is not so strong. But on the other hand, the ranking of the policy is pretty good. And so there is hope that in the future, this can continue to improve the German energy consumption. Okay, I think we are close to the end here, and yeah, I thank you very much for your attention, and here you have also indication of more information you can find, and it's on the website. Thank you very much.

Eric Lockhart

Thank you both for those fantastic presentations. We'll turn now to the question and answer session. We have some questions coming in from the audience, and we'll use the remaining time to answer and discuss them. The first one goes to I think both of you. Our attendee asks if lifestyle effects in terms of more appliances in larger dwellings are a consequence of energy savings or a rebound effect, or if the two are relatively independent.

Carine Sébi

Do you want to answer first?

Wolfgang Eichhammer

Maybe first, you comment on the indicators, and maybe then I can comment on the policies and how they impact on the lifestyles possibly. Okay?

Carine Sébi

Yeah, okay, so thanks for that question. So yeah, indeed, the lifestyle, as we presented previously where we try to decompose the effect—yeah, the main drivers of the energy consumption, and one of the driver in the residential sector is a lifestyle translated by the increasing of equipment rates, and on one hand will affect the energy consumption towards an increase. While at the same time, the policy targets thanks to level or maps, that is to say minimum energy performance standard.

They try to lower or to improve the efficiency of that appliances. All these effects are taken into account in our databases, and it gives me as well the opportunity as I did not do the same. It releases the same exact size as Wolfgang. We have developed on the Odyssey part of the Odyssey Muir website several data tools, and one of that feature is a decomposition feature where you can play with things by sector with the different drivers. And in the original _____ sector, the live data effect is included, and you can see all over time or during different pile of time the impact of the increasing number of appliances and the performance of these appliances.

That is to say the specific exception by dwelling. I hope this _____.

Wolfgang Eichhammer

Okay, maybe I'll just get a few words from a policy side, first commenting on lifestyle. In fact, yeah, we did a bit the comparison by looking the impacts of the policies compared to other changes that impacted on energy consumption. And in fact, it's a bit, yeah, said in a way that policies so far only account for maybe like 20 percent of the changes that you observe. So a large set of still very strongly impacting on energy consumption, and particularly strongly for example so far in the building sector where for many years, the specific consumption was more or less constant per building while there was a lot of building regulation, and this was due to many large studied effects, like large surfaces, like high heating temperatures, and so on. So I think this is really strong, and the question is really which policies are well addressing a lifestyle on one end while not, yeah, too much intervening in the personal life of the people.

And second point, the rebound effect, yes, this is also a concern. Also, it's perhaps less dramatic than sometimes described. But clearly, for some of these applications, you can see that the policies are followed by rebound

effects in the lighting, in the heating and so on, and you have to think about specific measures how at least counteract these effects. Thank you.

Carine Sébi

Just to compliment, sorry, about the rebound effect as a transition to what Wolfgang said. For the indicator, the composition, this kind of effect can be seen in the residual effect. That is to say the non-technical energy efficiency improvement that you can translate in the residential for the rebound effect, or for instance, in the transport sector, take you to a low load factor affected because of the decrease of efficiency. Of activity, sorry. So this kind of effect as the rebound effect is covered as well.

Even if we have difficulties to say the exact share of rebound effect that affect the energy consumption trend.

Eric Lockhart

Great, thank you for that. The next question is a little bit more general on your opinion if the overall energy savings to date are satisfactory, or put differently, how far we've come—how far have we come relative to what's possible in terms of energy efficiency.

Carine Sébi

Go ahead.

Wolfgang Eichhammer

Should I take that, Carine, or you want to –

Carine Sébi

Go ahead.

Wolfgang Eichhammer

In fact, when I talked about the different directives that European level—and when I talked about the targets, we did an analysis, for example of the 2020 targets, and the 20 percent energy efficiency improvement. And indeed, at that timeframe, Europe is pretty well positioned, and we are very close to achieving that target. But to a large degree, this was impacted by what Karen has shown in the indicators the activity changes, which have impacted a lot.

And on the other hand, also, when you analyze carefully the reference development that was the basis for the 20 percent target, this reference development was pretty optimistic before the crisis with respect to let's say economic growth, and not considering detail, separation effects that are occurring in the economy. So I would say 2020 level is fine, but when you look at the lower perspective at 2050 level and intermediate path, 2030, you see that we need to dramatically increase the path that we want to really reach the targets that are necessary under 80 percent reduction or even 95 percent reduction of CO2 emissions. Thank you.

Eric Lockhart

Okay, thank you. The next question is about a specific policy if you're aware of it. The attendee asks if energy performance certification, 31 directive, has been a successful energy efficiency policy. More for Wolfgang.

Wolfgang Eichhammer

Yeah, indeed. So this is aimed at the building certification, any performance certification of buildings. Yes, the picture is mixed here. I would say first of all, the approaches among the member states rather different, and this is a major drawback I would say compared to the labels for appliances.

Because the labels for appliances, they're all uniform, and all easily recognizable in the building for building certificates. There have been quite some differences in realization and different member states. That was one point. And the second point is people observe that there are major differences with what the label states and what is really consumed, and there has been a lot of debate about, yeah, consumption and demand labels. So depending on the building characteristics mainly or depending or including some of the use based on previous consumption.

But this can really change from one use to the other, or between the rate of consumption and use itself, and this has made a bit people are not very trustful in the labels so far. The experience is that the certificates are not yet used to the degree they could be in the transactions between the different owners of the buildings or the renter and the owner. I think we have to more carefully revise those policies and improve in order to make this a very efficient tool in practice. Thank you.

Eric Lockhart

Great, thank you. There's a pair of slightly more technical questions for Carine about some of the indicators. I'll ask them together and you can take them whichever order you like. One is an attendee asks for a little bit more background on the decomposition between different categories. The activity energy savings structure and industry that you showed. The other one is a question about the choice of leader per 100 kilometer versus mega jewel versus kilometer for efficiency of new cars.

Carine Sébi

I'm not sure I got the second question, but I'll ask you to repeat it at that time. So the attendee is asking for more details about the composition effects in the industrial sector. So this is the slide eight from my presentation where we tried to—the activity effect is at the global level is the GDP. And if we look at the industrial branches, it can be translated by the value addition of each branches, which are some—thank you—which are summed up as the global value addition of that sector. So when we look at what if the structure of—if the value addition would be the same, we see that the impact of the activity, sorry, and while the structure effect is the weight of each branch in industrial energy consumption, and we look at what would happen if we stay—if we consider that the structure of the industrial sector would have remained the same in 2000 and see what is the consumption.

And then we can see the impact of the structure. That is to say that if the decomposition of the industrial branches would have remained the same, the second—the conception would have been more higher in the long run, for instance, and then the energy savings are up sells thanks to specific conception in industry by branch. For instance, the cement sector, that is to say the amount of energy you need to produce one ton of cement. And we tried to see how it—the speed of each of these factor within total consumption variation. Can you repeat please the second question about transport on the specific consumption of new cars?

Eric Lockhart

Yeah, that question was just about the metrics chosen to look into that one. You used liter per 100 kilometer I believe, and the question was about using mega jewels per kilometer I guess to capture fuel mix and things like that.

Carine Sébi

Okay, this is a good remark. Indeed, it's the case for new cars. This is because we are in Europe, and we are used to look at a liter per 100 kilometers, but of course you can play with the metrics with the coefficient. You just multiply, and then you get the jewel, or it's the same for aggregate or total consumption that I show in the MTOE or in the building sector where I used to look at the kilowatt hour per meter square, for instance, or the _____ of space heating. So yeah, it's the—I mean you just have to make a conversation, but the dynamics, the trends are the same. Of course, when you look at liter per 100 kilometers or per _____, for instance.

Wolfgang Eichhammer

If I may comment briefly on that, I think it's a good suggestion that the longer term, I mean certainly have the structural shift maybe between a gasoline and diesel, but when you will include, for example, electric cars or maybe gas driven cars, I think that the structural effects will become more pronounced, and then this conversion is much more important. So I think it's an interesting observation.

Carine Sébi

Yes, indeed, I agree, Wolfgang. We take it as an option of innovation in our communication and dissemination of indicators. Thank you.

Eric Lockhart

Thank you very much. Our next question is if you could mention some of the best performing, in your opinion, regional or national energy efficiency schemes for existing homes that offer no cost or low cost in home energy assessments with integrated incentives for energy efficiency improvements.

Wolfgang Eichhammer

Yeah, I think this is directed to me. I'm a bit, how do you say, passive or I don't feel so much comfortable with the word low cost. We had some debate in Europe about the cost effectiveness of policies, and I now take a bit the German perspective. In the energy efficiency directive, there was suggestion to set up in different European countries so-called energy saving obligations. These are obligations on energy suppliers to carry out a certain number of measures with the clients, and also in the building sector. Indeed, this is a tool or instrument that shall promote the least cost solutions, which at first sounds good and reasonable, but in Germany, the debate was focused on the observation that, for example, in the UK, with such type of instrument, a very low cost installation measures were promoted, relatively shallow insulation measures, which bring at first quite some savings.

But when you have the longer-term perspective to 2050, you need to take a different look, and you need to bring forward, for example, people innovation schemes, and this right from now. So I don't think there is really a free lunch here in the building sector. We have to put some money there when we go for the existing buildings. Maybe the best improvement we can take is to develop packages, to develop scale effects on buildings despite their individuality to improve on the cost side. But I don't think it will be a free and low cost lunch for buildings.

Eric Lockhart

Great, thank you. We have one quick last question. We're running short on time. Any questions we didn't get to, we'll reach out to the question askers offline. This last question is one of the attendees noticed on the website that on the—for the Muir projects that Bulgaria seems to score best in most

scenarios, better than Germany, Austria, Scandinavia, and that was surprising. I'm wondering if you have a brief explanation.

Wolfgang Eichhammer Yeah, I can do so. First of all, you should observe that the scoreboard is composed by different parts, and countries like Bulgaria were starting from an extremely bad level. For example, on the building side in industries very high consumption, and over the past, I would say 15 years, and especially the exception of those countries to the EU, tremendous efforts have been carried out by those countries, certainly supported by a specific support, for example, through a structure funds and other types of incentives for these regions with more or with weaker economies. So there has been a lot of measures undertaking in those countries, and this reflects both in the progress of the indicators, the trend, and also in the policies undertaking. This is why when you look to an overall scope or why quite some of these countries have been—are high in the rank indeed. Thank you.

Eric Lockhart Great, thank you very much for that and for answering all those questions. At this point, we'd like to turn to the survey. So we'd like to ask our audience to take a minute to answer a quick survey on the webinar that you viewed today. We have five short questions for you to answer. Your feedback is very important to us as it allows us to know what we're doing well and where we can improve. So the first question is displayed. The webinar content provided me with useful information and insight. Next, the webinar's presenters were effective. Overall, the webinar met my expectations. Do you anticipate using the information presented in this webinar directly in your work and/or your organization?

And finally, do you anticipate applying the information presented to develop or revise policies or programs in your country of focus? Great, thank you very much for answering the survey. The Clean Energy Solutions Center, I'd like to extend a thank you to all of our expert panelists and for our attendees for participating in today's webinar. We had a terrific audience, and we very much appreciate your time. I invite our attendees to check the Solutions Center website if you'd like to view the slides and listen to a recording of today's presentations as well as previously held webinars. Additionally, you'll find information on upcoming webinars and other training events. Additionally, we're now posting webinar recordings to the Clean Energy [Solutions Center YouTube channel](#). Please allow for about one week for the audio recording to be posted.

We also invite you to inform your colleagues and those in your networks about Solutions Center resources and services, including no-cost policies support. Have a great rest of your day, and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar.