Monitoring Energy Transition

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Webinar Panelists

Patrick Criqui Enerdata

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Webinar Host Today's webinar is focused on monitoring energy transition. 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 the 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 the box on the right side will display the telephone number and audio PIN you should use to dial in. If anyone is having any technical difficulties with the webinar, you may contact the GoToWebinar's help desk at 888-259-3826 for assistance.

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Finally, one important note to 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 the many best practice resources reviewed and selected by technical experts.

Today's webinar agenda is centered around the presentation from our guest panelist, Patrick Criqui, who has joined us to discuss Enerdata transition monitoring tool and methodology, as well as analysis and case studies. Before we jump into the presentation, I will provide a quick overview of the Clean Energy Solutions Center. Then following Patrick's presentation we'll have a question and answer question, where Patrick will address questions submitted by the audience. At the end of the webinar, you will be automatically prompted to fill out the brief survey as well. Thank you in advance for taking a moment to respond.

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

This webinar is provided by the Clean Energy Solutions Center, which focuses on helping government policymakers design and adopt policies and programs that support the deployment of clean energy technologies. This is accomplished through the support and crafting and implementing policies relating to energy access, no cost expert policy assistance, and peer to peer learning and training tools, such as this webinar. The Clean Energy Solutions Center is co-sponsored by the governments of Australia, Sweden, and the United States, with in kind support of the governments of Chile.

The Solutions Center providers several clean energy policy programs and services, including a team of over 60 global experts that can provide remote and in person technical assistance to governments and government supported institutions, no cost virtual webinar trainings on a variety of clean energy topics, partnership building with the development agencies and regional and global organizations to deliver support, and an online library containing over 5,500 clean energy policy related publications, tools, videos, and other resources.

Our primary audience is made up of energy policy makers and analysts from government and technical organizations in all countries, but we also strive to engage with private sectors, NGOs, and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across a suite of different programs. Several of the partners are listed above, and include resource organizations like IRENA and IEA, and programs like SEforALL, and regional focus entities such as ECOWAS Center for Renewable Energy and Energy Efficiency.

A marquis feature the Solutions Center provides is a no-cost expert policy assistance known as Ask an Expert. The Ask an Expert service matches policy makers with more than 60 global experts selected as authoritative leaders on specific clean energy, finance, and policy topics. For example, in the area of national climate change, we are very pleased to have William Becker, executive director at President Climate Action Project, serving as one of our experts. If you have a need for policy assistance in national climate change or any other clean energy sector, we encourage you to use this valuable service. Again, this assistance is provided free of charge.

If you have a question for our experts, please submit it through our simple online forum at cleanenergysolutions.org/expert. We also invite you to spread the word about the service to those in your networks and organizations.

And now I'd like to provide a brief introduction for our panelist today. Patrick Criqui, who is an emeritus researcher at the National Center for Scientific Research, works on economics of energy transition and climate policies at the University of Grenoble-Alpes. His research has initially explored the economics of solar energy and the modeling of international energy markets. And with that brief introduction, I'd like to welcome Patrick to the webinar. Patrick?

Webinar Host Hello?

Patrick Criqui Hello, Patrick. Welcome to the webinar. Your screen looks wonderful.

Webinar Host Okay. Thank you very much, Katie. So today, I'm glad to introduce to you the—an Enerdata project which has been developed in the wake of the Paris Agreement. When most all countries of the world decided to commit implementing climate policies, we entered in a new age of climate policies, and this is the age of defining and implementing de-carbonization strategies for these different countries.

And so, in Enerdata, we decided to develop a data system in order to try to monitor the transformations that are starting and that will be hopefully ongoing in the energy systems of the different countries of the world.

So, my presentation will be structured along four main stages. In the first one, we will examine rapidly the observed trends in emissions, the national contributions, which correspond to the commitments of the different countries in the Paris Agreement, and furthermore, we will also examine rapidly what could be—what are considered that two degree compatible trajectories, both at global level and at country level.

Second stage will be rapid examination of some systems of national energy transition dashboards. And then I will present the tool, the data system of Enerdata, the Energy Transition Monitoring, EnerTraM, and try to illustrate the work that we are developing currently in order to fully develop this tool.

And then in the fourth stage, we will examine three countries with some detail, three countries that are Vietnam, Mexico, and Senegal, and use the EnerTraM tool in order to analyze the process of energy transformation in those countries.

So, I start with the observed trends, the national contributions, and the two degree C compatible trajectories. First of all, at global level, you know that in the Paris Agreement, COP 21, the different countries of the world agreed to submit national _____ contributions, and there has been a lot of discussion around these NDCs, whether—in particular, whether to know if these NDCs were globally compatible with the two degree targets for the world. There are different estimates. In France, there has been a multidisciplinary group created, the so-called Interdisciplinary Group on National Contributions, and we tried in this group to perform an assessment of the global NDCs. And as illustrated on this diagram, the red arrow shows that very probably, the sum of the different NDCs doesn't fit exactly with the two degree trajectories, as identified by _____.

This means one thing. This means that in the future, there will probably be the necessity to revise and to strengthen the targets that corresponds to the different NDCs. Now, when considering the same type of problem at the national level or at the country level, we can illustrate what I call the double gap, the double gap in initials. First of all, the gap between the ongoing trends in the different countries, and the NDCs—that is, the difference between what is actual—what is currently ongoing in the different countries, and what should happen _____ to the NDCs.

And the second gap is the difference between the nationally determined contributions and what could be a two degree compatible trajectory. Here, I show an example with China taken from work by Climate Transparency, and we can see that indeed there is a double gap, a gap between the trends and the NDCs, and gap between the NDCs and two degree compatible trajectories _____. So, this is exactly the type of gap and range we try to explore and to analyze in order to improve the capabilities of the different countries of the world in improving and implementing their climate policies.

The following slides is—was—comes from a study to which I participated between 2013 and 2016, which is a deep de-carbonization _____ project. This project was initiated by Jeffrey Sachs, an advisor to UN Secretary General, and by _____ _____, who has _____ later on, who has been the special envoy of President Francois Hollande for the COP 21.

This study aimed at identifying what could for 16 large emitting countries deep de-carbonization scenarios. And one can represent this study with this diagram, that we—you have on the—on the Y axis, you have the per capita emissions of the different countries, and on the X axis, you have the GDP per capita. You can see the huge range between the different countries of the world, both in terms of per capita emissions, and in terms of GDP per capita. And the focal point that has been used in this DDPP study was to say sometime shortly after 2050, every country should reach a level of about 1.7 tons of CO2 per capita. This is only CO2 for energy. This was only the emissions that were considered in these studies.

And this can be illustrated by the following arrows that show the way that has to be—that has to be followed by, for example, United States, France, and a country like Vietnam, where you see that in the future, there should be some convergence in per capita emissions towards this focal point of 1.7. It means huge transformations in each of these countries, but of course, particularly in those countries with the highest per capita emissions today, that are the most industrialized countries.

And finally, for this introduction, in this product, we also identify what could be identified as the three pillars of decarbonization. The first pillar is of course energy efficiency. This is certainly the first step to be performed in the decarbonization of the energy systems. The second stage is the decarbonization of power generation, but also not only power, decarbonization, for instance, of gas _____ is a very important issue. And finally, there should be some transfer from high carbon energy carriers towards low carbon energy carriers, that are decarbonized electricity, decarbonized gas, and other biomass or biofuels. So, these are the stages for the approach.

Second stage, some examples of national energy transition dashboards and indicators. We do consider at Enerdata that indeed this is a very important issue of being capable of identifying some key indicators to follow the implementation, the successes, or the difficulties of the energy transition policies. There are already in many countries this type of sets of indicators. In France, in the framework of the so-called national low carbon strategy that has been published in 2016, there is a series of monitoring indicators for the transport sectors, with targets and means of policies to be implemented. Also in the building sector, in agriculture and forestry, in industry, in energy, and in waste management.

Similar approach in Germany, where a set of monitoring indicators for ten domains have been identified. This is in the framework of the so-called Expertnkommission zum Monitoring Energie der Zukunft. This is the Expert Commission for the Monitoring of Energy of the Future. So, a similar approach.

And also, this exists in the UK with the Climate Change Committee that also identified a set of targets and a set of policies and measures to be implemented in order to progress in the decarbonization of the UK energy system.

And finally, a last example is one provided by work by Climate Transparency, which is I would say the federation of NGOs, climate NGOs, and Climate Transparency also proposes a dashboard for an energy transition or a dashboard for decarbonization with 15 key indicators that allow to follow progress in decarbonization. So, this is ongoing experiences already.

So, we decided to use—at Enerdata, we decided to develop a specific system, an energy transition monitoring tool, which goes—is to develop an information system with different dashboards on—precisely on ongoing trends, what are the different sectors in the different parts of the energy systems, what are the ongoing trends, what are the sectoral targets that are in the different national energy policies, and finally, what are the transformation trajectories that will allow to go first towards the nationally determined contributions, and probably in the near future, towards revised nationally determined contributions, and in the longer term, towards long term targets which are typically dividing the emissions by a factor of four or a factor five, particularly in the industrialized countries.

This concept of dashboard is consistent indeed with the one of nationally determined contributions as identified in the Paris Agreement, and we are convinced that it will be of the highest importance in the future, when the different countries will enter in the phase of climate policy implementation. This monitoring should allow to follow the different dimensions of the energy transition and allow to adjust the policies to—both to the context, to a changing context, because the context will be changing, but also to adjust the policies according to the difficulties that may be encountered in the process.

And through the combination of its unique system of international databases, and modeling and scenario development abilities, we consider that Enerdata is well equipped to ensure the international monitoring of energy transitions, or at least an international monitoring of energy transitions.

The structure of the information can be described with some kind of pyramid. On the top, we have the synthetic indicators, with an overview and a dashboard, a compact dashboard, with the key strategic indicators. At a lower level, we have a series of sectoral Kaya indicators. Kaya means—refers to the Kaya equation that defines and identifies the carbon content of energy, and the energy intensity or energy content of GDP, as key drivers of emissions. So, at the first level of—or at the second level, sorry, of analysis, we consider the main sectors, power sector, building, transport, industry, and try to develop these indicators that are mostly the CO2 content of energy niche sector and the energy intensity of—in each sector.

Then at the lower level, we have common strategic variables, those variables that are not described in the so-called Kaya equations, but, for instance, these are the number of passenger kilometers in the transport sector, or square meters in the building sector, in terms of steel produced in the steel industry, and so on, and so on. And we consider that these strategic variables might be common variables, or national or country specific variables. And all this is based, all this system of information is based on the set of Enerdata databases that has been developed now since more than 20 years, with data on energy supply, energy demand, prices, investments, at a country level, and with a fairly detailed level.

And to end this stage of the presentation, we propose that—this is still preliminary. We might modify and improve this dashboard shortly. We propose a compact dashboard for sectoral strategies, while identifying synthetic headline indicators, such as GHG emissions per capita or CO2 intensity of GDP, the carbon factor that is—which means tons of CO2 per ton of _____, and so on, and so on.

And then we have a group called power sector, with similar indicators, transport, industry, building, agriculture, and land use and land use change and forestry. So, with a set of 22 indicators, we hope to have a _____ view at the process of energy transformation in the different countries.

Just a last element for the methodology. In order to identify and compare ongoing trends and NDCs, nationally determined contributions, with longer term trajectories, we use scenarios, scenarios that are produced with the POLES model. The POLES model is a world energy model initially developed for the EU Commission and currently used at CNRS, my research team, the JRC, Joint Research Center, _____ Joint Research Center _____, and used also at Enerdata. And the model represents 66 countries or regions with energy models connected together through international energy market modules.

And the model is used to produce Enerdata's annual outlook, EnerFuture, and currently, EnerFuture simulates and describes three scenarios: EnerBrown, which is a fossil intensive world energy scenario, EnerBlue, which is introducing some degree of climate policies, and it is considered broadly as NDC compatible, so that is I would say a low intensity carbon—decarbonization policy, and finally, we have EnerGreen, which is—which represents two degree C compatible, that is a more ambitious emission reduction scenario.

And this is with this data system, and the scenarios produced with the POLES model, that we can try to analyze the situation, current situation and future situation of the different countries. We start with Vietnam. Vietnam is, as you know, an emerging nation, with quite a high economic growth rate, more than 6 percent per year in the past 15 years. For the moment, a low urbanization rate, but 98 percent electrification rate. This means that most of the Vietnamese people have electricity. And this explains a high level of per capital consumption of electricity, with a growth rate that is very, very high in the past years, 12 percent in the 2000-2015 period.

Per capita emissions in Vietnam amount to about 2.2 tons of CO2. That is about one third of the world average for CO2 emissions from energy and industrial processes. So, this is a starting point for Vietnam.

The evolution of the CO2 emissions today represents just more than half the total emissions for Vietnam, and CH4, from agriculture, in particular rice crops, represent 36 percent of total emissions.

The EnerBlue and EnerGreen scenarios are very well fit to the Vietnam lower and upper ambition NDCs for 2030, but indeed, in the farther future, they result in extremely contrasted emissions in 2050. The range for the emissions—the emissions today are of about 200 million tons of CO2, and they could be between—the range is between 550 and 290 million tons of CO2 respectively in the EnerBlue and the EnerGreen scenario. So, you see that the trends that would go beyond the NDCs in 2030 will result in very, very different emissions in the long range, 2025, in 2050, I'm sorry, with _____ emissions range between 5 in EnerBlue and 1.7 in EnerGreen. So, this shows the very wide range that different policies will introduce in this situation.

If we now have a look at primary energy in Vietnam and primary energy by source, we can see that today, total primary energy supply is about 75 million tons of oil equivalent in 2015, and it could triple in—in 2015, I'm sorry, and it could triple in 2050, in EnerBlue, with coal representing about half of the total, which means that it will have a very strong impact on the CO2 emissions, particularly _____ use of coal.

In EnerGreen, the total primary energy supply is only multiplied by a factor of two by 2050. The carbon content of energy has been increasing in Vietnam since the 1990s, while the energy content of GDP remained about constant since 2000. The carbon content decreases in EnerBlue, and still more in EnerGreen, and this is what allows to drastically reduce the total emissions in the EnerGreen scenario.

The final energy by sector can also be analyzed with EnerTraM in the two scenarios. In EnerBlue, the consumption in industry is expected to go very fast, much faster than the other sectors, reaching almost two times its current consumption level by 2015. In EnerGreen, industry consumption growth is limited by strong efficiency improvements, and it represents only 50 percent of final energy consumption, about—between 2020 and 2050. Building and transport represent each about 20 percent of total consumption.

And finally, the power sector. Compared to official Vietnamese forecasts, and particularly the Vietnam Energy Outlook published in 2017, a lower economic growth and a lower electricity demand elasticities in the Enerdata scenario result in much lower electricity demand in 2050, about 700 and 550 terawatt hours, respectively, compared with 1,200 terawatt hours in the Vietnam Energy Outlook, which seems to be quite a high figure.

In EnerGreen, CO_2 emissions of the power sector are almost stabilized after 2020, while they continue to grow sharply in EnerBlue at five percent per year, and this is due principally to an increased use of coal. Indeed, one can identify the fact that there is a very strong dilemma for the power sector in Vietnam. Vietnam can choose a coal-based strategy, and this strategy has some risks. The fact that coal power plants that are currently decided will come online by 2025, and they will be only at two-thirds of their technical lifetime in 2050. This means that heavily relying on coal for the 2030 horizon may induce significant capacity and infrastructure investments, with a high risk of stranded assets if coal production were to abandoned due to climate constraints or CO_2 emission constraints.

And one can identify an alternative to this scenario, which is a flexible renewable and gas strategy, which relies more on renewables and natural gas, and which may allow a phase-in of diversified carbon options, low carbon options. In the short term, gas may contribute to electricity production, with twice less emissions per kilowatt hour than coal power plants. In the medium term, gas turbines might be the perfect backup to variable renewables, which certainly will have a development in Vietnam. And in the long term, gas from renewable resources may represent a significant share of supply. So, these are very different strategies, and the government in Vietnam will have to decide on which to choose.

What can be the priorities for defining a long term decarbonized energy strategy _____, first of all, it might be relevant to identify the right balance between supply and demand action. As already mentioned, the electricity demand projections are quite high currently, so it might be interesting to review the electricity efficiency options that would allow to limit the growth in electricity consumption. And second, unless it is considered that Vietnam can ignore emission constraints in the long run, then surely, this country should avoid carbon intensive supply options that may respond to short term needs, but induce over-investment in dirty assets, and excessive cost when CO_2 price or physical constraints will be introduced. This is the risk of having important stranded assets in the medium and long term.

And finally, the country could prioritize flexible options that will allow for future adjustments in the strategy and contribute to the design and deployment of an energy system that is both clean and efficient. I think this is an interesting case. We find these types of conclusions for other countries, but this gives an idea of the conclusion of insights that can be drawn from the EnerTraM tool.

So, let's have a look to Mexico quickly. The population and economic growth in Mexico is lower than in Vietnam, two percent per year, compared to more than six percent per year in Vietnam. Energy consumption has been stable, and CO_2 emissions even slightly decreased since 2000. This reflects a relatively low growth compared to other emerging countries. With four tons of CO_2 per capita, emissions are below the world average, and relatively stable since 2000.

The EnerBlue scenario for Mexico extends this situation and is compatible with Mexico's nationally determined contribution. But the EnerGreen scenario displays a significantly different profile, with a reduction of per capita emissions down to 1.5 tons of CO_2 per capita.

Totally primary energy supply is bound to almost double in 2050, in the EnerBlue scenario, while in EnerGreen, the total primary energy supply incurs a much lower increase, at 225 million tons of oil equivalent. The fuel mix is also very different in EnerGreen, with more than 50 percent of supply provide by biomass, solar, and wind, and also some nuclear in the primary energy supply. So, different absolute level and different fuel mix.

Final energy consumption is bound to increase in both scenarios, but much less rapidly in EnerGreen, and from EnerBlue to EnerGreen, the consumption of energy is almost unchanged, while further efficiency improvements are observed in buildings and in the transport sector. This can be explained by the fact that there are already quite a lot of energy efficiencies gained in industry, even in the EnerBlue scenario.

And finally, the electricity sector of Mexico, total electricity consumption is about the same in the EnerBlue and EnerGreen scenario, and this is due to the fact that basically, increased energy efficiency in EnerGreen is counterbalanced, compensated, by further electrification of final energy consumption, which is in line with, if you remember, the three pillars of decarbonization that I presented a moment ago.

The electricity mix is very different, with natural gas representing two-thirds of total production in the EnerBlue scenario, but only one-fourth in EnerGreen. So, you see that in the case of Mexico, if you compare with Vietnam, in the case of Mexico, the situation is quite different, and the strategic issue is how to reduce natural gas and replace natural gas by renewable in the electricity sector, while in the case of Vietnam, and particularly due to the fact that electricity consumption increases very rapidly, and renewable cannot for the moment keep pace with the electricity consumption increase, in the case of Vietnam, natural gas was a solution to replace coal with much less emissions associated.

In any case, in the case of Mexico, going back to Mexico, the CO2 content of electricity decreases from 450 to 250 grams of CO2 per kilowatt hour in EnerBlue, but it is down to 80 grams of CO2 per kilowatt hour in EnerGreen.

The insights for Mexico, they are the fact that the comparison of EnerBlue and EnerGreen, and EnerGreen showed that current NDCs of Mexico are not compatible with the decarbonization scenario or trajectories. In the transition, critical will be the capacity to limit energy demand growth through enhanced energy efficiency, particularly in building industry, and also through the electrification of transports. Critical also will be the choices in the development of the electricity scenario. While no scenario incorporates a strong hypothesis of coal-based electricity, but the relative weight of renewable and gas will be decisive in that case, with very different emissions of the power sector in the different scenarios.

And last country to be examined today, energy transition in Senegal. This is a type of country which is different in the sense that Senegal is—we do not—there are no detailed energy forecasts for Senegal available. The country is not for the moment identified in the POLES model. So, it is more difficult to compare the trends with the long term trajectories. However, it is possible to compare the ongoing trends with existing targets and the NDCs, and try to understand what are the key dynamics in the evolution of Senegal's energy system today.

CO2 emissions in this country have risen significantly since the early nineties. However, they remain low in absolute terms, because they represent only ten million tons of CO2. Per capita emissions, also, they are rising. They are extraordinarily low at 0.6 tons of CO2 per capita. This means only one-tenth of the world average, so increasing, but still very low level.

One look at total primary energy supply and final energy consumption of Senegal. One can observe a doubling of total primary energy supply in the past 20 years, but the structure of supply has remained quite stable, with 50 percent of total energy being provided by oil, and the rest by biomass energy. Small quantities of coal are however introduced in the energy system in recent years. And the sectoral split of final energy consumption is also relatively stable, with building, transport, and industry incurring similar growth in the past 20 years.

As far as electricity is concerned, electricity consumption has incurred a much higher growth than other energy sources or energy carriers, and production has been multiplied by a factor of 4 in the last 20 years, compared to a doubling of the total primary energy supply. And this indeed corresponds to a rapid, also not fully achieved, electrification of the country. Today in

Senegal about 55 percent of the population is electrified, but the rate goes down to about 20 percent in the rural parts of the country.

Oil provides most of the total power production today. But since 2000, hydro and gas-based production provide one-fourth of the total, which is quite significant _____.

The sectoral consumption by source, so the growth, as I have said, has been similar in the different sectors, but they have very specific fuel mix in the different sectors. In the building sectors, the most noticeable feature is a recent surge of electricity consumption, together with a still very significant consumption of biomass, traditional biomass fuels. In transport, oil of course dominates, fully dominates. And in industry, one can note indeed a massive progression of natural gas in recent years, while electricity and biomass, modern biomass in that case, also progressed.

What are the insights for Senegal? So, we have the case of an emerging country with I would say moderate economic growth, so _____ six percent per year for Vietnam, two percent per year for Mexico, four percent per year for Senegal. However, in the latter case, energy demand is expected to grow rapidly in the near future, due to the low level of energy consumption today, and to the take-off of transport and industry, also due to the replacement of traditional biomass in households' consumption.

Electricity will be a key sector, again, for energy transition, as its share will grow in energy for buildings, while the electrification of transport still raises particular challenges in a low income country. It is very difficult for the moment to imagine the electrification of transport in a country like Senegal, but maybe in the near future, this might turn to be an option.

Natural gas, both as a final carrier in industry and as a primary source for electricity production, will be a major issue, and finally, renewables and gas should be considered as complementary alternatives to coal in the power sector.

And there I come to the conclusions, which are the following. They are rather methodological, I would say. The fact that energy transition monitoring will certainly be a key element in enhancing the ability of the different governments of the world to develop effective and efficient climate and energy policies in the line of the Paris Agreement and in the line of the expected developments of the international negotiation _____.

The diversity in national circumstances, which I think the three cases I presented illustrate fully, and also, the diversity in the priorities, constraints of the different countries, the diversity in the data and modeling, all these diversities I would say doesn't prevent to analyze energy transition in a common framework and with common insights, common and complementary insights. This is at least what hopefully comes out of the case studies I presented today.

And the last word I want to say, that we consider this work as highly interesting to develop, and we hope that in the future, this work will go on, and will contribute to the deployment of effective climate and energy purposes. And I thank you very much for your attention.

Webinar Host Wonderful. Thank you, Patrick, for that outstanding presentation. As we shift to the question and answer session, I would like to remind our attendees to please submit any questions you have using the question pane at any time while we discuss some of these questions that are already submitted. We have some great questions that we'll use the remaining time to answer and discuss. Patrick, the first question is, are you aware of comparable studies or information systems on energy transitions?

Patrick Criqui Yes, thank you. Yes. We—indeed, before to start our project of developing this data system on energy transition, we had a look of—to what is existing in—at what level, and there are indeed quite a lot of studies or information systems that has been developed. I'll try maybe to go to the—I skipped the—I had the French case also, but I didn't have time to present. But on this slide here, you can see the benchmarking that we have performed before to launch our project. And this is only a small number of examples, but we listed about 30 studies with the target of trying to analyze and to quantify different indicators for the transition.

And all these studies are of course very interesting. We consider that in _____, this organism that developed since many years now, a detailed system of energy databases, and the modeling systems. We have the capability of covering a very broad range of countries and a very broad range of indicators. And what is more important maybe is the fact that we can combine data on the past evolutions of the energy systems, and forecasts of the main elements of these energy systems in the future. So, we do not ignore what exists in the rest of the world, which is very interesting. And we are in contact with many of these organizations, and particularly with Climate Transparency, and—but we continue to develop our own system.

Webinar Host Wonderful. Thank you, Patrick. Our next question is what is the information that is available at Enerdata, and on which countries?

Patrick Criqui On this issue, yes, I've got—this is a description of the different components of the Enerdata energy system. All these information systems are _____ in what is called the global energy data, with historical data on economy, energy, and emissions for about 60 or 70 countries. Enerfuture is a forecast that covers about 60 countries, with demand and supply projections of these countries, while Odyssee and Enerdemand are detailed energy database. Odyssee has been developed for the European Commission and the European countries, with detailed energy consumption data for these countries, while Enerdemand is a similar data system, but for countries outside of Europe.

Global energy data indeed is available for all countries of the world, indeed. Only Enerfuture and Odyssee and Enerdemand are available for a limited number of countries, but limited number that is quite significant already.

Webinar Host Wonderful. And a follow-up question to that is when will 2017 data be available, and for which countries?

Patrick Criqui Enerdata tries to be as quick as possible in the development of the data systems for the different countries, and we expect to have fully detailed data for the G20 countries by summer, by June 2017—'18, by June 2018. Yes. And then the rest of the countries by the end of the year.

Webinar Host Great. Thank you so much. Our next question is you mentioned an analysis of the gaps between trends, NDCs, and targets, but it doesn't appear clearly in the presentation. Can you discuss that?

Patrick Criqui Yes. This is clearly work in progress. We have the idea of trying to define a very simple indicator of the gap between I would say the reality and the intentions, and we are exploring different system of indicators to have these indicators as general as possible, in order to have a comparability of the efforts across the different sectors in one country, and across the different countries. And for the moment, we are still looking for the ideal measure of the gap between reality and the intentions, but we—hopefully, we will produce results quite soon on that issue.

And in that case, we will be able, if I—we will be able to have a measure of what I showed at the very beginning of the presentation here, that data point. The question is how to define a robust indicator of the magnitude of the gap and try to figure on the angle between trends and contributions, and contributions and two degrees _____. This will come soon. We are still working on it.

Webinar Host Thank you, Patrick. Our next question is you mentioned the three pillars of decarbonization, energy efficiency, decarbonization of energy carriers, and the transfer to low carbon carriers. Which do you consider as the most important, and why?

Patrick Criqui Well, this is a very difficult question, a very difficult question because I would say it depends. But to be more specific, I would say that indeed, it very much depends on the structure, existing structure of the energy system of the different countries. It also depends on the strategical priorities that are identified. One can say that each pillar will be important in all countries, and this I suspect has been shown by the presentation of the three different countries.

But to some extent, there might be some degree of substitutability between the different pillars, and maybe this is an opportunity to speak of the French case, where in the French case, we have a policy which is currently based heavily on energy efficiency and a reduction of energy demand. There is France an Energy Transition Act that proposes as a target—indeed, this is not a proposition. This is in the act, in the law, proposes to reduce total energy demand by 50 percent in 2050, which is a very significant reduction, especially if you take into account the fact that for an industrialized country, France has already a quite low energy consumption.

So, this is a very ambitious target. And in the different scenarios that are available for France, one can consider that either it will be possible to meet this very ambitious target on energy demand, or if it is not possible, if it's—if in the end it turns out to be too difficult to reduce as much demand, then in that case, it will be necessary to develop more decarbonized energy supply.

So, this illustrates the fact that—and this also shows the interest of having a monitoring system, because it can allow to adjust the policy according to the difficulties that may be encountered on this long travel towards zero—low or zero carbon energy systems. So, each pillar is important, that's sure, but depending on the country, of its priorities, constraints, of the existing energy systems, and according to the difficulties that will appear in the future, then the relative importance of each of the pillars may change, and may—yes, may change.

Webinar Host Thank you, Patrick. Our final question for this webinar is how do you choose which countries to do case studies on or highlight? And do those countries, those individual countries, have their governments contact you, or what's the process of that?

Patrick Criqui Well, up to now, we have been working with the so-called Agence Française de Développement, which is the development bank of the French government, and this agency had an interest in the different countries we have covered. But in the future, the tool intends to be a very generic tool that can be applied to different countries.

Of course, the quality of the analysis will be proportional to additional knowledge and additional work that will be performed on the different countries. So, this is an open question. For the moment, we choose the countries that interested much the Agence Française de Développement, but in the future, it is open to any country or organization that might be interested in analysis for a given country.

Webinar Host Wonderful. Thank you, Patrick, for answering today's questions. I'd like to provide you with an opportunity for any additional or closing remarks before we close the webinar today.

Patrick Criqui Okay. No, I hope that this webinar helped to see the—how the management of detailed data can contribute to the definition and implementation of sustainable energy policy. That's all.

Webinar Host Great. Thank you again, Patrick, for the wonderful presentation today. And on behalf of the Clean Energy Solutions Center, I'd like to extent a thank you to all of our—to Patrick and all of our attendees for participating in today's webinar. We very much appreciate your time, and hope in return that you—there were some valuable insights that you can take back to your ministries, department, or organization. We'd also like to invite you to inform your colleagues and those in your networks about the Solutions Center resources and services, including no cost policy support through our Ask and Expert service. I invite you to check the Solutions Center website 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 are now posting webinar recordings to the Clean Energy Solutions Center YouTube channel. Please allow about a week for the audio recording to be posted. Finally, I'd like to kindly ask you to take a moment to complete the short survey that will appear when we conclude the webinar. Please enjoy the rest of your day, and we hope, again, to see you in future Clean Energy Solutions Center events. This concludes our webinar.