

## **Eurostat podcast: Stats in a Wrap**

### **How much energy does Europe get from renewables?**

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#### **SPEAKERS**

Julian Prime (International Energy Agency), Madeleine Mahovsky (Eurostat), Jonathan Elliott, Person on street

#### **Jonathan Elliott**

Stats in a wrap, the new podcast series from Eurostat.

#### **Jonathan Elliott**

Welcome to another episode of Stats in a wrap, the podcast series from Eurostat, the statistical office of the European Union. With this podcast series, we like to immerse ourselves in the world of statistical data by wrapping them up into small packages, intriguing stories, and fascinating conversations about the everyday and not so every day that we experience in our lives. No topic is too obscure or too obvious because we, the data scientists at the frontiers of knowledge, know that the numbers never lie. And they nearly always have something new to say. We hope to bring you interesting delicious bites served piping hot from our wrap cafe. I'm Jonathan Elliot, your host for this episode. And today we're going to be talking about Europe's renewable energy, particularly its ambition to become the world's first carbon neutral continent. Eurostat has tracked with meticulous care, the emerging success story of the EU's renewables. And it's a story rooted in the extraordinarily diverse geographies and histories of the 27 member states, as well as one of the world's most exciting fields of technology. The race to save the planet from climate catastrophe can really only be observed in the numbers and data science has never been so important. So to guide us through the vast and fascinating world of renewable energy and statistics, I'd like to introduce our two guests: Julian Prime is the head of electricity, renewables and coal statistics at the International Energy Agency.

#### **Jonathan Elliott**

Welcome, Julian.

#### **Julian Prime**

Hi, Jonathan. Thanks for having me here.

#### **Jonathan Elliott**

And with him is Eurostat's Madeleine Mahovsky, who heads the energy statistics unit. Welcome, Madeleine.

#### **Madeleine Mahovsky**

Thank you, Jonathan. I'm glad to be invited.

**Jonathan Elliott**

Thank you both. First of all, let's just, I have to ask you a kind of informal icebreaker question. Julian, I'm going to start with you. Do you have solar panels or a wood burning stove, perhaps to keep you warm in the winter?

**Julian Prime**

Well, actually Jonathan. Yes, I do have solar panels on my home. When I when I bought a new home about 10 years ago, they were installed. And it's been generating electricity for me ever since.

**Jonathan Elliott**

Lovely. And Madeleine, what about you? Are you are you a green energy user as well as an expert?

**Madeleine Mahovsky**

I'm a green energy user in the sense that I often commute by bicycle to work.

**Jonathan Elliott**

Well, this is a podcast about statistics and regular listeners will be used to hearing about big and complex data. But the numbers that describe energy in the EU are unusually big, so big that total energy production is measured in something called petajoules. A term I've never heard of until I looked it up, but I suspect our experts do know it. So I'm going to play perhaps a mean trick on them and ask them - Julian, can you tell me what a petajoule is?

**Julian Prime**

Well, it's a way of combining different types of energy into a single unit. For instance, most people will use kilowatt hours for measuring their electricity. But when you're wanting to compare kilowatt hours and use of coal and use of gas, use of renewables, you need to use a common metric. And either the petajoule or the tonne of oil equivalent are useful metrics.

**Jonathan Elliott**

Madeleine, would you like to give your definition of a petajoule?

**Madeleine Mahovsky**

So it's basically a unit of energy. And the peta means it has many, many, many zeros. I think it's 15 zeros or something like that.

**Jonathan Elliott**

Well done, absolutely correct. It is actually 15 zeros, 10 to the power of 15, which is a 1000 trillion. And one joule is lifting one small apple the height of a meter.

Anyway, back to the main topic - and here's a stat to get us thinking...

Eurostat tells us that in 2020, 22.1 % of gross final energy consumption came from renewables which as a proportion has risen in the last decade. But there are many different kinds of renewables. Julian, can you just sort of set out for us, perhaps the different types and how they've grown?

**Julian Prime**

Well, certainly renewable energy has increased both within the EU and worldwide. There are a number of technologies that have increased more than others. So for instance, solar PV and wind have increased enormously over the last few years. But there are some stable technologies as well, such as hydro for generating electricity and solid biomass and their changes have been less obvious over the past few years.

**Person on street**

My place is like I my house is a little bit bigger, but we're also with two persons and we don't use a lot of energy, but we have like double windows. The walls are isolated, because we have three or four seasons in the Netherlands, so like in summer, it's very hot, but you don't want to have it too hot. And in the winter, it's cold, so but you have to ventilate. So it's like, yeah, and like all the houses have an energy label.

**Jonathan Elliott**

Madeleine, the adoption of renewable energy in the EU has been encouraging, but at the same time, the reliance on energy imports has also increased. Can you explain why?

**Madeleine Mahovsky**

Well, I mean, the EU relies actually still a lot on fossil energies, domestic energy production has actually gone down quite a lot. And that has to do with some policy decisions like to abandon coal, or to close nuclear power plants, meaning that overall, the EU is increasingly depending on imports from other suppliers and mainly outside the EU.

**Jonathan Elliott**

Yes, the energy figures in the EU have also been affected by the COVID-19 crisis. Julian, could you explain why fossil fuel consumption came down as much as it did during the pandemic?

**Julian Prime**

Because people were working more from home and less from the office, there was a switch from service sector demand for electricity to home use of electricity, mainly because of the lockdowns that were taking place. And it was noticeable. Worldwide, that around 10% less electricity was used in most countries during 2020/2021.

**Jonathan Elliott**

Yes, as you might expect, I guess. Who is consuming the energy, who are the biggest consumers: road users, aircraft, households? I wonder if you could tell us a bit about how it all breaks down?

**Madeleine Mahovsky**

Well, it actually depends on the fuel, as you can imagine. Industry is of course, a very, very important consumer of energy, and in particular, let's say, gas and electricity. Industrial production relies on those two fuels, mainly. If you look at the transport sector, obviously, oil and petroleum products are the most important driver. And so they're, the transport sector, including both the professional sector and also private households, consumes a lot of gasoline and diesel of course.

**Person on street**

We heat with gas.

**Person on street**

Yeah.

**Person on street**

So that's, also the stove is with gas. That's actually, that's a bigger cost than electricity. So whenever we change, we've had to change lately, a few times, whenever we change, we change all the light bulbs to LED. And it reduces the cost very much.

**Person on street**

More than 50%.

**Person on street**

See, yeah, we don't light them so much. We just use lights when we need them.

**Jonathan Elliott**

Renewables are sometimes thought of as something of a novelty, but of course, we've been using them since the dawn of time. Wood fuel, for example, is renewable energy. Julian, there are old renewables and new renewables, aren't there?

**Julian Prime**

Biomass has been used for heating purposes for many years. And hydro has been used to generate electricity, again, many years. But more recently, there has been changes, and solar PV has been introduced to generate electricity, and wind. And if you look at renewable energy supply in the world, over the past 30 years, you'll see that solar PV has increased by around about a third every year, year on year since 1990. And wind electricity has increased by around about 22% year-on-year, every year. Other more mature technologies such as hydro have increased less rapidly, but the amount of renewable electricity that is coming from hydro sources still dominates and is at around about three times higher than the wind.

**Jonathan Elliott**

Okay, that sounds interesting. Madeleine, do come in.

**Madeleine Mahovsky**

Yeah, sure, because you asked since the dawn of time, and I think it's an interesting question. And I just wanted to add, I mean, think of windmills, for example, that have existed forever just to grind to corn for example, or solar energy for salt production, where you have basically the power of the tides and you have the solar energy just to have salt.

**Julian Prime**

I mean, for instance, if you look at Africa, around 47-48% of total energy supply in Africa, is coming from renewable sources. But that is mainly traditional energy. So using wood for heating and cooking, and very little of that is what you would call the modern renewables.

**Person on street**

For example, we try to charge our phone at the day because we have the energy from our own photovoltaic. And so we try to use the energy on the day and not in the night, for example.

**Jonathan Elliott**

Yes, it's a fascinating area, anyone who's travelled in the global south will see how energy is used, and often perhaps in kind of more careful ways than sometimes we do here. Madeleine, I just wanted to ask you, first of all, as you have a kind of ringside seat in the Commission to see how the different policies have driven renewable development in Europe. Europe has an ambition to be the first carbon neutral continent. Can you tell us why it is that the EU has progressed as it has in renewables, and where that stimulus has come from?

**Madeleine Mahovsky**

The new agenda of the EU is called the European Green Deal. And it sets the target that you just mentioned that Europe becomes the first climate neutral continent in 2050. And the first milestone is already in 2030. So that is just seven and a half years away. It's pretty soon for such policies. And the idea is to make all the EU law fit for 55. So the idea is to have 55% reduction of greenhouse gas emissions. And right now, and this is actually an interesting moment to discuss, the targets are being renegotiated because of the so called Repower EU plan, which was triggered by the unjustified invasion of Russia in Ukraine. And the idea, the target is to raise the share of renewable energy to 45% in 2030.

**Jonathan Elliott**

It's important here to point out that the EU imports most of its energy. Madeleine, can you just talk us through that statistic? Are we actually as the 27 member states collectively, are we still mostly dependent on external sources of energy? Is that true?

**Madeleine Mahovsky**

Yes, indeed, as I said earlier, we are depending still, to a very, very large extent on fossil fuels in the EU. And at the same time, we have reduced our domestic production. And as I said earlier, this is because we want to get rid of coal and shutdown nuclear power plants.

**Jonathan Elliott**

Really startling when you look at renewable energy in Europe is how dramatically different the picture is from country to country. The differences in the league tables are both quite big, and often hard to understand at first glance, Julian, could you just tell us, for example, why Iceland, for example, is such a star performer when it comes to renewable energy?

**Julian Prime**

Well, Iceland has an awful lot of geothermal energy. That's a technology that's been around for many years, where you are getting energy from the core of the Earth. That doesn't rely on wind blowing. It doesn't rely on rain falling, or anything like that. So that's, as you say, it's a stable performer for producing energy for renewable sources.

**Jonathan Elliott**

And if you look at the bottom of the league, we find Cyprus and Malta both in southern Europe, which is abundant in sunlight. Madeleine, can you explain why Cyprus and Malta are so low in the rankings when it comes to renewables?

**Madeleine Mahovsky**

Well, I mean, you're referring now to two island economies and island economies are always very, very different from the mainstream, so to speak. Basically, both Malta and Cyprus rely to a very, very large extent on fossil fuels. And it's mainly oil and petroleum products. Just to give you the size, both countries in their energy mix have 87% of oil and petroleum products. And the situation for Malta is even worse, because you add to that share, you add 10% gas, so you're 97% of fossil fuels. But let's not forget, in terms of renewables, they're still at the end of the scale. They have both increased quite a lot. Cyprus is now at close to 17% versus Malta is at 11%.

**Jonathan Elliott**

Julian, you're in Paris and France has not performed as perhaps one might expect from such a leading economy and a major power in Europe. In fact, it's one of the few countries that did not meet its target. Can you explain why?

**Julian Prime**

Well, in France, a lot of the electricity has been generated through nuclear sources, which is another low carbon technology. As time went on, more investment was made in supporting nuclear than other forms of electricity generation. And it is nuclear is a, is a long-term investment. As is most electricity generating technologies. A country has invested in a certain technology, it isn't cost effective to just keep chopping and changing to new ways of generation.

**Jonathan Elliott**

So back at the top of the league, along with Iceland sit Sweden and Norway, again, hard to immediately see why they should be such big producers of renewable energy. Madeleine, what's their secret?

**Madeleine Mahovsky**

Well, actually, Sweden is outstanding in many respects. So it's a high share of renewable energy production, but also high share of renewables use in transport. For example, I just wanted to add that. Well, Sweden, Sweden already started from a pretty good solid level of hydro in the year 2004. Simply because they're having those natural resources. And Sweden is, I would say traditionally, is also environmentally aware. So they did invest a lot in the past in hydro plants. But let's not forget, they really increased their share by a very, very large margin. So the increase in the last 15 years was really impressive. The starting point in 2004, was 38%. And they are now above 60%. And for Norway, the

natural resources are similar to Sweden side, I would argue, and they rely mainly on hydro, but also have reached a stellar share of renewables in overall, above 77%. So this is fantastic. But they already started from 58% in 2004.

### **Julian Prime**

Certainly Madeleine, outside the EU as well, you can look at certain countries like Paraguay, where they have 100% of their total energy supply coming from renewable sources. And that is hydro, based on the Itaipu dam, which is shared with Brazil. So you know there are stellar performances worldwide, as well as within Europe.

### **Person on street**

The Netherlands, you have a lot of winds, I think like wind, like natural energy is I think the most. Yeah, like we have a lot of water, we have wind, we have sun, I think that is much cheaper. But we also have a big source of gas in the north. And I know that is very cheap.

### **Jonathan Elliott**

Julian, there are clearly some countries that are blessed with the geography to produce renewable energy, abundant sunlight, maritime coasts and the opportunity to put wind farms out at sea. So why aren't we seeing performance in renewables linked to geography in these rankings?

### **Julian Prime**

Well, certainly, yes, the geography is very important. But also it's the political motive of the country's government as well to decide which technologies to invest in, you know. Certainly, if you are looking at renewables worldwide, around 60% of renewable electricity generation worldwide, comes from just six countries: People's Republic of China, the US, Brazil, Canada, India, and Germany. Those six countries account for over 60% of renewable electricity generation.

### **Jonathan Elliott**

Madeleine, you wanted to come in there, do please.

### **Madeleine Mahovsky**

Let's not forget that hydro is already or has been for a long time a mature technologies. So the technological development for different types of renewable energy productions differs. So hydro is an old, in apostrophes, technology and well-established technology. So, it has a long tradition. On the one hand, on the other hand, what you see is that in recent decades resistance and here I'm talking about our democracies, resistance against more hydro plants has increased because people felt we don't have any natural rivers left and let's protect our rivers.

### **Person on street**

I think the biggest problem we're heading to is like all the resources are going empty, are declining. And I know like, we already have a water issue, but nobody, nobody is aware of it.

**Jonathan Elliott**

I'm just thinking about commercial and private companies, the private sector here is there a growing hunger in or an interest in the private sector to invest in large scale, solar and wind as a long-term commercial commitment? Obviously, it's very expensive initially, to set these up. But the potential is very, very lucrative because well, it's a renewable energy source. It's free.

**Julian Prime**

Certainly, yes, there is an awful lot of investments by private sector energy companies in renewables. And I think the latest stats show that total investment by ... total power sector investments, 80% of that last year was in renewables, grids and energy storage.

**Jonathan Elliott**

Yeah, absolutely.

**Julian Prime**

And most of the traditional energy companies are now trying to get a cleaner, greener face on their business.

**Madeleine Mahovsky**

This is why having a stable policy framework is so important. And so, if you look at the EU setting, these ambitious targets, provide some certainty for such companies to plan ahead, provided of course, the policies are credible, but this is what we're working for. But these investments, they are all very, very long term. And that is why the EU has set this long-term goal for the year 2050.

**Jonathan Elliott**

Yes, absolutely. Quite. Well, Julian, you just touched on China back there a little bit. And as we are talking about an ambition for the EU to become a climate neutral continent, I guess global comparisons are useful. China's fascinating, because it seems to be very, very progressive and investing huge amounts in solar. And yet, it's also very, very dependent on fossil, can you just sort of unpack the China story a little bit for us.

**Julian Prime**

China, as you say, is the world's biggest energy market. So, for instance, 30% of the world's hydroelectricity is produced in China. 33% of the world's solar PV electricity is produced in China. If you look at China as a whole, coal still accounts for over 60% of their power generation, and new coal power plants are still being built. But the sector as a whole, solar PV capacity addition have outpaced those of any other country in the world. In China, energy consumption has doubled since 2005. But if you look at the energy intensity of their gross domestic product, so the amount of energy that is needed to create one euro, or 1 million euros of GDP, that's decreased significantly over that same period. China has a very diverse industrial use. So for instance, in China, more than half the world's steel and cement is produced. And so you know, that that is going to have a big impact on emissions. And if you look at just the steel and cement sectors in China alone, CO2 emissions from that sector are higher than the entirety of the EU's CO2 emissions. But they are still growing in the amount of renewables and



still invest in renewables and developing technologies and building batteries that can be used for electric vehicles and so on.

**Jonathan Elliott**

Yes, battery technology has a huge role to play in renewables and there's another energy storage technology that's getting a lot of attention at the moment. And that's, that's hydrogen. Julian, can you explain a bit about hydrogen?

**Julian Prime**

Hydrogen is a very light, storable and energy dense element, and its use as a fuel produces no direct emissions or pollutions or greenhouse gases. The main obstacle to get low carbon hydrogen is the cost of producing it. And that requires large amounts of electricity to produce it from water through electrolysis, or using carbon capture technologies to produce it from fossil fuels. Countries are though, considering more the future of hydrogen. And for instance, in 2019, there were just three countries in the world that had a developed strategy for the production and use of hydrogen and that was France, Japan and Korea. But today, over 20 countries have released hydrogen strategies, and another 20 or so have publically announced that they are working to develop a strategy on hydrogen.

**Jonathan Elliott**

Madeleine, you're more cautious about the wonders of hydrogen. Just talk us through your reservations about the excitement over this technology.

**Madeleine Mahovsky**

Well, reservations, I mean, first of all, the EU does have an EU hydrogen strategy, and it plans to invest quite a lot of money into producing clean hydrogen. And I think Julian already said it, you need an awful lot of electricity in order to produce hydrogen. And now we need to look at how electricity is, is produced. This is the starting point. If electricity comes from clean sources, then we would generate clean hydrogen. If electricity is produced, for example, from nuclear power plant, you still have nuclear as the source of electricity. And if we would need to revert to coal plants at the current geopolitical juncture, then again, the electricity would come from that source. It's like for electric cars, I mean, you don't just plug in the car, and then your transport is clean, you need to look into what is behind the electric plug. And I would say that applies to hydrogen.

**Julian Prime**

There are a few statistics on hydrogen worldwide, and roughly 90 million tonnes of hydrogen was used in 2020. Well, that's mainly in the refining and industrial sector, and produced sadly, from fossil fuels rather than renewable sources. But that is, you know, hopefully going to change over the coming years.

**Jonathan Elliott**

Another technology that like hydrogen has been promoted as a potential game changer in renewables, but also attracted criticism is biofuel. Julian, could you just unpack a little bit for us that biofuels are sometimes not quite as green as people think, are they?

**Julian Prime**

A large number of biofuels do compete, when they are grown, with food crops. So that's why it's important to look at sustainable biofuels, which don't interfere with food.

**Madeleine Mahovsky**

We are using the new term for that, and we call them advanced biofuels, and advanced biofuels don't compete with food. And there is a second step of those advanced biofuels and that are those that do not compete with feed, either. So for example, if you have corn, instead of using the corn to produce biofuels, you would use the leaves. And the corn can be left for human food or animal feed, just to illustrate the case. So we start distinguishing those biofuels.

**Person on street**

Solar energy panels that you put on the roof, but that is also a little bit tricky, because the panels are very expensive. And you get your return of investment, actually, after seven years.

**Jonathan Elliott**

A lot of people now put solar panels on the roofs of their houses. And it's a common sight of course, Julian, I was just wondering if that's growing? Or is it more like the big solar farms we sometimes see in the countryside? Are they set to dominate?

**Julian Prime**

I mean, there is still a market for decentralized solar power generation. So people putting solar panels on their roofs, but it is more the commercial scale, the large solar farms that are now dominating the changes to how solar energy is produced.

**Jonathan Elliott**

That does surprise me. I mean, why? Why is it that we have to concentrate our solar energy production into one, into big farms like that?

**Julian Prime**

If you are talking about a big energy company, it's a lot easier to use it in one area then to pay 100,000 people to have a solar panel on their roof.

**Jonathan Elliott**

There are different models now emerging in renewable energy production, and part of the picture is people doing it locally and generating it locally, which is exciting.

**Madeleine Mahovsky**

What we're observing right now is a structural shift in how energy is produced. The energy system was based on a centralized production, the large companies produced energy and distributed it while households were consuming energy. But now this has changed with these smaller scale installations. Households are now also producing energy and feeding it into the grid. And it's not only households but it's also certain industrial sectors like agricultural sector, or even the services industry, we have actually

created a new term and we speak about "prosumers". So prosumers are consumers that produce their own energy and contribute to the grid. And they play a more important role now, and that is on the rise.

### **Julian Prime**

The amount that is being added each year in terms of renewable capacity is growing year on year. If we look worldwide in 2021, something like 295 gigawatts of renewable power capacity was added to the world's electricity supply, and global capacity additions are, in 2022, expected to be around 320 gigawatts. Now, that is the equivalent that would come to meeting virtually the entire electricity demand of Germany, or matching the total of the European Union's electricity generation from natural gas. So we are talking large amounts of renewable capacity that are being installed.

### **Madeleine Mahovsky**

Of course, this sector is growing enormously. But nevertheless, we will still need the typical and classical electricity producers, so there is nothing that would replace them. And the risk or the difficulty, the obstacle with renewable energies is of course, that they're available when the wind is blowing or when the sun is shining. But, talking about the "prosumers", there's a pretty interesting concept of so called virtual batteries. And that means "prosumers" that produce excess electricity, feed it into the grid, and they can consume it at a later stage when they need it at no extra cost. Typically, they would feed it into the grid in summer, and then they need it in winter. That is quite interesting and called "virtual batteries".

### **Jonathan Elliott**

"Virtual batteries"! It's almost the stuff of science fiction, but well, that's energy technology, I guess. It's full of innovation, and astounding facts and figures, which is what we're all about here at Stats in a wrap. But we're out of time and must wrap the wrap. It only remains for me to say thank you very much to our amazing contributors for a very wide ranging discussion to Julian Prime, the head of electricity and renewables and coal statistics at the International Energy Agency. Thank you very much, Julian.

### **Julian Prime**

Thanks, Jonathan. It was a great chat.

### **Jonathan Elliott**

And lovely to have you on the show Madeleine as well from Eurostat who heads the energy and statistics unit. Thank you very much, Madeleine.

### **Madeleine Mahovsky**

Thank you, Julian. And thanks, Jonathan. It was a very interesting talk.

### **Jonathan Elliott**

If you've enjoyed the show, don't forget to share with friends and colleagues where stats in a wrap can be found on Spotify, Apple, Google and all the usual places. And of course, join us for the next episode, when we'll be dishing up more flavoursome insights from Eurostat and this time celebrating European statistics day. Join us then, and for now. Goodbye!