

## Transcript: Balancing Green Energy, Energy Security, and Geopolitical Security | Dr. Sarah Lohmann (8.17.2021)

*[Majestic orchestral music featuring string instruments, trumpets and timpani plays, with a voiceover]*

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*[Music continues to play briefly before ending]*

**Ryan Hauck:** Sarah, thank you for joining us this morning, I'll go ahead and give you a brief introduction. So Dr. Sarah Lohmann is an Acting Professor, an Assistant Professor in the Henry M. Jackson School of International Studies at the University of Washington, and Visiting Professor at the U.S. Army War College. Your current teaching and research focuses on cyber and energy security, and NATO policy, and I know my students are really interested in cyber security right now as well, it seems to be really a hot topic for them.

And you're currently a co-lead for a NATO project called Energy Security in an Era of Hybrid Warfare, so that sounds really interesting. And you've joined the Jackson School from the University of Washington's Communications Leadership Faculty, where you've also taught on emerging technology, big data and disinformation, so it's really a pleasure to have you as part of our educator forum today. I'll turn it over to you!

**Sarah Lohmann:** Thank you so much Ryan, and greetings to everyone from Munich, Germany where I'm currently residing. I will be back in Seattle before the start of term, but I'm over here doing some research, and thanks so much to the World Affairs Council and the Center for Western European Studies for having me.

So I just wanted to let you guys know up front that while I'm currently a professor at UW and a visiting professor at the Army War College, up until earlier this year I was actually a middle school and high school teacher like yourselves and splitting my time between teaching seventh to twelfth grade and lecturing. This is my first full time professorship, starting in March and I'm loving it, but I, it was hard to leave my students, I loved teaching grade school as well.

So while this talk right here is particularly for your enjoyment, I also wanted to provide you guys with a few slides that you can use with your classes, specifically to talk about why the energy transition is actually relevant to the team sitting in your classroom, or perhaps via

Zoom or Teams on the other side of your screen. So you could use this for science class, for social studies, for geography, or even in the higher grades, economics, or German class. So what I'd like to do is give you as the teacher the big picture of what is going on in Europe and then to dive into a case study on Germany that you can use as a learning unit with your students. So I'm going to address first what the green energy transition is looking like and its cost to the average household, and then what that transition has meant for energy security, and finally the impact energy decisions are having on geopolitics in Europe.

Alright, so let's talk about the big picture of what's going on in Europe right now. In response to the Paris climate accords, which you've heard much about probably, they were signed by 196 parties in 2015; at that point the European Commission proposed a series of laws so that Europe could be in compliance with the commitments they made in Paris. In December 2019 then, the European Commission then presented a roadmap for a climate neutral Europe which they called the Green Deal. And then in March 2020 the Commission then created that legal framework for climate neutrality by 2050, and on June 24th of this year, so just over a month ago, the European Parliament passed the EU Climate Law.

So this made the 2030 emissions reduction target of 55% legally binding. What does that have to do with energy? In order to have climate neutrality and emissions reductions, it has to switch out the sources of energy it uses, from the dirty sources – so we're talking coal and oil – to renewable sources like wind and solar. Okay, so that's the big picture, that's the background.

*[Sarah Lohmann begins referencing a visual slideshow. These slides are available to view by url copy-and-paste: <https://jsis.washington.edu/euwesteurope/educator-resources/annual-teachers-workshop/2021-eu-policy-forum-for-educators-2/> They can also be located by navigating to the 2021 EU Policy Forum webpage on the UW CWES website.]*

This picture of downtown Munich here, Fridays for Future; so when I was living in Seattle it looked a lot like this downtown Seattle on Fridays as well. So I will just let you know that the high school teaching environment that I was in was actually here in Germany, and so there were a lot of students that were headed down, on Friday downtown to take part in these demonstrations. Just a picture prompting you, so you can bring it this up at the beginning of the class, to start to talk with the students about 'what does green energy mean to me,' okay, they may have been involved in this kind of activity, they may not have been, but you can just bring up the picture as a prompt, substitute in your own, but this is just an idea. Even if your students have not been involved in a kind of youth event around this topic, guide your students to the question of what green energy means to them, what does green energy look like? If they've been involved in advocating for it, why? Why not?

If you're instructing online, this is a moment where you can use like an interactive blackboard feature on Teams, or whatever platform you're using, for them to write down

their ideas, draw pictures of wind farms or solar panels or any other ideas they might have. So it's an interactive moment for you to start class. If you're meeting in the classroom, you can use a blackboard, a flip chart; you can get together in groups, let one student present in each group. And after you have the students' attention on the topic, you can get into the details of the case study.

So I'm bringing to you Germany today, not just because I live here, but because it's leading Europe in renewables, and it's also on the cutting edge of what's happening in Europe during this energy transition, it is a major energy producer. And so I'd like to get into some of its goals as we think about Europe as a whole and the goals that were made in Paris, and then by the Commission. Germany is actually aiming to cut gas emissions by 65% by 2030. So remember that the Europe-wide goals are cutting by 55%, so Germany is very forward thinking here. Currently emissions are down by 40.8% to where they had been in 1990; the pandemic helped that, right, I think the pandemic helped the whole world, it helped the U.S. as well in terms of what we're talking about with emissions, so they were looking really good at the end of last year.

They were wanting to get rid of coal by 2038 and phase out the last nuclear plant by the end of next year. What does Germany's landscape look like in terms of renewables? Right now we've got about 48.3% of Germany's electricity provided by renewables. So we're looking at 27% of electricity coming from wind, and what does that look like? So let's break this down for the students, right. They're trying to picture, what does that mean, right, you've got 29,844 wind turbines sitting there – that's a lot of wind turbines, and in fact, if you're driving across Germany as I have this this year, didn't do much flying, did a lot of driving, going up north passing by a whole lot of wind farms, going traveling across the south, a lot of wind farms. Not a whole lot of wind, unfortunately. But in 2020 it was looking very good for wind, and then the offshore wind farm; a lot of building on that front going on. 181 offshore wind farms right now with 28 of those operating, more coming online all the time. When we're looking at wind as a source for renewable energy, Germany leading Europe, just behind China and the U.S.; China placed number one, U.S. placed number two, Germany placed number three.

Okay, then when we're looking at solar, 20.6% of electricity generation just in June of this year alone was photovoltaics, so solar. So lots of progress. With all this progress, where's the rub, why is this even an issue? Okay, let's get into some of the conversations that are happening right now, and why? Because we've got an election coming up, energy is on everybody's minds. And the middle-class family is having to pay quite a bit. The problem is that when coal and nuclear are phased out, there's a huge energy shortfall. So when the last nuclear reactor will be turned off next year there's going to be a gap of 4.5 megawatts. That's basically the equivalent of 10 large coal to power generation plants, how much that they would provide. It's quite a bit of an energy shortfall.

So the German government had an audit done earlier this year, and they came back and they said, bad news, there's this huge gap, you guys are in danger of having big blackouts going forward, like immediately starting this winter and on through 2025. So, you know how is this happening, we've got all these renewables, but just because there's a lot of solar panels doesn't mean there's a lot of sun. Just because there's a lot of wind farms doesn't mean there's always enough wind. Wind can also be unpredictable here in Germany, you know, so you have sudden surges that drive down electricity prices or it doesn't blow it all leaving you with an energy shortage. Plus, as we phase out coal and nuclear, you're not having that same production.

Okay, so why do I have this picture here? This picture was drawn by one of my students, in the Jackson School; I taught a class this spring on NATO and cyber and energy. And so after we had gone around and each student got a country to think about in terms of the energy landscape and also, and then later, the second part of it was looking at where that connects with cyber, but let's just think about the energy part of it right now. Each student then mapped out what that energy landscape looks like. Okay so you can do this in your classroom if you're doing—if you're middle school or high school, you're just providing them with a country map. Okay, whatever country it is that you're wanting to look at.

He kind of cheated a little bit, he actually took a map that was from Gazprom, so it already had the blue lines, the gas pipelines in there. Ideally, if you're doing this in middle school or high school, you're just taking a blank map of Germany, a blank map of Belgium, whatever country it is you're wanting to look at, you can even do it in the United States. You're taking open sources, you know, we've been teaching students about how to use internet safely in the classroom, whether that be online or in the physical building. And how to use good open sources, not questionable sources, but good educational sources, for, you know, where are these things located.

So we did that, as a class we said, okay here's—these are where the wind farms are. This is where we've got lignite, hard coal, gas pipelines, the high voltage transmission lines and solar. We just did this by simply doing—I broke the students off into groups, and they had half an hour to 45 minutes and this what they came up with. Each person for their own country. They basically took PowerPoint, they drew lines; if you're physically in a classroom, if you give them that printout of the country, they can draw it with their hands; middle school, high school, right. If you're teaching for community college, you can just do this with PowerPoint, right. Okay so we've got this mapped out because we want this in our heads: what does it look like? What does this energy transition look like? We had lignite, we had coal in the past; that's being taken out of the picture now and we've got these new sources of energy going forward, alright. So we've got an application. Now what does it mean to them? If this kind of thing were to happen in the US, what does it actually mean, this kind of transition?

So you see some of the challenges that I put on the screen here. The [German government] audit said you're going to need 600 billion to maintain a stable grid, we've got a very unstable grid. And what's happened in 2021, the first half of the year, wind energy down by 25%, electricity emissions up by 25%, and coal, which we're supposed to be phasing out here in Germany, the usage up by 36%. We had a lot of bad weather here in Germany, it was a very cold winter and so you know renewables weren't providing what they needed to be providing, and so the usage went up. What happens then? The green energy bill that's needed for this whole transition, there's obviously a price to building all these renewables. That is being passed on to each and every household, alright, so to the price of 43% more than what the average person is paying in the rest of the European Union. Okay, that is basically going into our power bills every month, 50% more in taxes, okay, so bills up by 50% this year, and so that's being passed on to the average middle-class household in terms of paying for that transition.

In addition, what they're finding out is that because they have mostly phased out nuclear, and finally to phase out next year, they are having to import the energy from nuclear plants in France, Belgium and the Netherlands to make up for the closing of their own. So it's not that they're not using that energy anymore, they're just importing it from other countries, so they're basically shifting the problem just beyond the border, okay, shifting the environmental challenges just a little bit *[laughs]* up north, right. So the cost for the energy transition is passed on to either the public or other countries; the 38 billion for the green electricity last year paid by German households with that 50% our tab. Basically, Germany has the most expensive electricity prices in all of the European Union. Okay, so Germany is paying a price for being the most forward leaning.

Alright, so this is something you can talk about in your classroom, you know, what does what does that mean, so on the one hand, you want to do this, you want to do something that's good for the environment, on the other hand, what does that mean for the average household?

Okay, so, while Germany really wants to do the right thing, it has this serious dilemma, first of all, the renewables dilemma. Should it just keep producing renewables in the hope that there will be more sunshine and more stable wind next season? There's actually another option, because as many of you might know it's not just those two that make up renewables. While it only supplies 5% of Germany's power right now, hydro-electric power actually, you know, does not depend on the weather. That's the power of falling water to produce electricity. So Germany is leading Europe in this technology, and upping the focus on this non-weather-dependent renewable could help fill part of that energy gap. Secondly, as the federal audit found earlier this year, Germany is actually at a heightened risk of blackouts due to the energy shortfall and is quite unstable. That's the second problem that they're having to deal with.

And I will just dive into this very briefly, I know I was not really asked to talk about this, but because cyber is actually my main thing I will mention that Germany's grid is at risk for blackouts for the next four years, and the way that it is digitalizing energy to make power use more efficient actually in some cases also creates vulnerabilities. So, in addition to the fact that you have a high price tag that's 99.77 billion dollars through 2030 and grid fees that are needed for network investment, you've also got these vulnerabilities coming in through emerging technology.

So one thing that they're doing is the same thing that's also happening in the U.S., smart grids, which do allow for an electricity network to send data and energy in two directions, so you're connecting the power supply to the consumer and allowing electricity flows to alter according to demand, which is actually a really smart policy. But, as it makes that transition to smart grids to optimize that renewable energy infrastructure, it needs to keep in mind that the Internet of Things – that's those sensors and software and other connecting technology that allow homes and cities in our neighborhoods to control those energy outputs – that adds a layer of vulnerabilities to the critical infrastructure. So you've got this plug and play going on; that concept of the smart grid allows diverse actors, not just nice ones, also malicious hackers, to become more interactive with the energy supply.

If it doesn't have the proper cyber security protections built in from day one – and I know we got into this a little bit in the previous discussion with the previous speaker, but it is very important – any error here could make an already unstable grid even more prone to blackouts. Okay, so we've got a grid that's incredibly unstable right now, then you've got the emerging tech layer over on top of that, with the smart grid, and you've got a proliferation of malicious actors.

Then the third challenge, even as Germany aims to become more energy independent by producing renewables, it's still too dependent on other nations in its other energy sources. So what are we talking here? Its overall energy import dependency is 68%. 94% of Germany's gas needs are met through imports and 98% of its oil needs. So that's really a lot of dependencies that impact actually the geopolitics of Europe, okay. And this is a great opportunity to get ideas from the students, not to like dictate our own opinions, but to let them kind of hash it out and talk about what does this mean for Europe. Okay so let's just take these two areas, the grid and gas, okay. In terms of the grid, the energy sector is the most vulnerable to cyber attacks on industrial control systems (ICS). What are those? Those are the embedded cyber devices that control physical processes like generating and distributing renewable power. The energy, ICS, it's the most attacked of any sector.

So cyber attacks on ICS can actually cause physical damage and compromise the ICS itself – and Germany should know – it's been a testing ground for malicious cyber activities. You may have read back in 2017, Berserk Bear, attributed to Russia attacking a number of energy companies and attempting to intrude onto Germany's grid. And so long-term efforts launched actually to compromise the supply chain of critical infrastructure, such as energy,

water and power sectors, which are all intertwined when you're looking at how emerging technology is connecting them. And that's—those efforts have been ongoing up to the present time.

So it's going to be crucial that both the government and private companies servicing critical infrastructure are integrating cyber security into the innovation that they're using to transform the energy sector. One thing that, *[laughs]* you know, a lot of times in our enthusiasm to create something new, we forget one of the most powerful things: which is to make sure that that new innovation is hardened against those malicious actors, making sure that we do have the cyber security standards in there that we need. So as Germany launches into this digitized energy future there's just an urgent need for investment and education in upholding those cyber security standards across the supply chain.

The second issue is gas. And you know, take the time to look at this map with the students, where's that pipeline going, there's been a lot about this in the news in the US as well. Built in the sea right there above Estonia, Latvia, Lithuania and Poland, directly connecting Russia to Germany, yes, that decision's been made to finish the Nord Stream 2 pipeline for its urgently needed gas. And let's face it, Germany does have this urgent need. On the other hand, EU law is preventing Gazprom, the Russian company, from both owning the pipeline and supplying the gas, okay. It's called competition, there are laws about it. But there's a lot of considerations here. So Nord Stream 2 running off the coast of Estonia, Latvia, Lithuania and Poland, and those countries are still concerned not only about competition and supply, but also that Russia will use its presence there to gain military and geopolitical power.

What you had in the last few weeks [was] a recent European Court of Justice ruling about another pipeline and that reminded Germany that the EU's energy solidarity rules actually apply both politically and legally. So Germany's being asked to be a good neighbor, and what does that look like? On the other hand, it could face gas shortages if it hesitates. So Germany has a real conundrum here, you know, what is the right thing to do, it's got its own needs and on the other hand, there are these geopolitical ramifications. And all of these big decisions are happening at a time when we're just five weeks out from an election.

So this is what it looks like in my backyard, on the left, not the wind farms, I don't live right by wind farms. None right here in Munich, but here on the left-hand side, posters from my neighborhood. On the bottom "For a clean environment and honest politics," on the top is a play on words talking about 'let's take a walk through good climate policy, what that would look like.' There's posters everywhere, but the main theme of this election is climate change, energy, it's all about environment. Okay, so this is very different than what elections have looked like in the past, okay. This is the top of the agenda. Part of that is because of what's happening to Germans pocketbooks, part of that is because this is a very intense time in energy policy for Germany and for Europe.

Right now, the Greens are tied in the polls for second place at 19% with the Social Democrats; they're just six points behind the CDU/CSU. And I know you'll hear a lot about that in the next talk so I'm not going to get too much into it, but it is important when you're thinking about what is energy policy going to look like in Europe's biggest economy? Because the Greens have this at the top of their platform and they are going to continue driving it, they're not going to be backing down. And they have a historically high level of support. So green energy and renewables are definitely going to continue to be a priority in the years to come here in Germany, but they are going to bring that to the international stage across the EU because Germany is such a driver for the EU.

So how can Germany solve the dilemma, with its energy shortfall, its important problem and its high costs? Really take the time to brainstorm with your students and have them create a poster or do a talk on all the options that're open to them. So first of all let's talk about renewables; look at what hydro-electric power could mean for energy shortfalls, or, should nuclear plants stay online a little bit longer; what's the math on that, let's take it down and do the math.

Secondly, what about the grids? We've got to secure the grid; we've got to make sure that smart grids have ample cybersecurity and look at solutions for tampering energy influx from sudden wind flows. Okay, another place where we have to do our due diligence on math. And then third, imports. Look at how Germany can be a good neighbor even as it seeks to satisfy its gas requirements. Are the geopolitical risks worth it? How can it make sure that there are no negative impacts as a result to the East? You can create debate teams and they can be kind of formed pro and contra. Let's not dictate the answers to them; you can have them assigned roles, basically, on the major players in the debate. You can have one person be Russia or Gazprom, one person the Ukraine, one Poland, Latvia, Germany, one be a lawmaker and one be, you know, a German middle-class citizen who's having to pay the bill. You know, let's sit down and allow them to hash this out amongst themselves, and come up with solutions.

So I hope this walk through of current events has been helpful. Europe is transitioning its energy sources, even as the political landscape is shifting, and decisions made by each European nation are going to affect the outcome on the continent. You have the opportunity to tell your students about what is going on here, and you can explore with them what that transition means for them personally for where they're living or for Europe as a whole.

*[The music played at the beginning of the podcast plays again briefly before ending]*