

[SQUEAKING]

[RUSTLING]

[CLICKING]

ZEYNEB All right. It is the last session. You have survived the first day almost. And I'm really excited about this session
MAGAVI: because we started the day looking at the planetary scale.

And honestly, from a little bit of a slightly grim perspective, I don't think anyone left that session feeling really light and excited about the state of the world. So now we proceeded to talk about people, because no change happens without people, and then about what people can do in set rules, policy.

And now we are going to go ahead and go back to the scale question, but from the perspective of with people, with technology, with ideas, with rules. What can we accomplish? So I hope we're going to end the day with a lot of excitement.

And we also have two relatively new friends of mine who I deeply admire and am excited to have joining us, both not present. So we have two videos sandwiching our session today. And I am going to start with one, The Growth of GENs in Europe.

Sanjeev Kumar is joining us. I believe, are you in Brussels, Sanjeev?

SANJEEV
KUMAR: Yes, I am.

ZEYNEB
MAGAVI: All right.

SANJEEV
KUMAR: Lovely evening in Brussels.

ZEYNEB
MAGAVI: Lovely to see you up there. And I am going to ask you to introduce yourself to everyone. And then go ahead and proceed with your presentation.

SANJEEV
KUMAR: Brilliant. Thank you. Thank you so much, Zeyneb, firstly for the kind introduction and for the opportunity to come and talk to everybody in the room. My name is Sanjeev Kumar.

I'm the Head of Policy at the European Geothermal Energy Council, which means that my role is to really grow markets for geothermal across Europe. That's the European Union, but also countries outside, such as Iceland, Norway, down to Turkey, the Western Balkans, and Ukraine. So I look at, what are the regulatory frameworks? What are the financial structures that we need to grow geothermal?

And what I'm going to do is share some of the experiences that we've had in Europe. Let me start off with some pretty basic things about the contents of Europe. And then I'm going to give you some ideas about how you can perhaps build upon the session that you've had before, the discussions you've had this morning, and then the discussions we're going to have tomorrow.

So let's start off with some basics. Europe, generally, our heat gradient is quite low. We have lower temperatures, so we don't have a lot of power generation. What we do have is a lot of heating.

Our market is geared towards heating, and that heat market is transitioning. As it stands at the moment, there are about 10 million people across Europe who benefit from different types of geothermal heat pumps. These are small, closed-loop systems to large, open-loop systems.

We have district heating, direct use, and that's really for cities. We also, in a few countries, have a lot of district heating systems just for the agriculture community. So when it comes to thinking about your new customer base, I know a lot of the conversation is going to be around residential consumers.

There is a whole world outside the residential space. And people, like farmers, we found, in Europe are very, very vocal and generally tend to get their own way. And they have a desire to have a permanent supply of heating and cooling.

So it's a fantastic customer base. Factories. There's some of the big car makers in Europe who just installed geothermal heating and cooling systems for their factories, for their head offices. It's really big.

And, of course, we've got 11 million consumers tapped into geothermal power. But what I want to do is just to deep dive a little bit into what the situation in Europe is, why it's perhaps different to the US. But the challenges that we face are the same challenges that you're going to face as you start to scale up geothermal in particular, especially network geothermal.

So let's start off with some basics. Like everywhere else in the world, the bulk of our heating and cooling supply is fossil based. Where we have non-fossil-based heating and cooling, it's largely coming from combustible biomass.

And over the last five or six years, there's been quite an ugly discussion around toning down the amount of biomass to just focusing on that which can be sustainably sourced. And what that's effectively done is put a ceiling on the amount of biomass we're going to use in heating. So the growth market that they've had in the past is going to start to diminish.

And what that's really doing is it's paving the way for heat pumps and for direct-use geothermal. And when we talk about heat pumps in a European context, almost everybody thinks of air-source heat pumps. So the language that we use to describe electric heating with ground-source heat pumps, geothermal heat pumps is something we're going to come back to later on.

We also have a legacy system of district heating. So a lot of these are in former Soviet countries, but you also have them in Baltic places-- sorry, in the Scandinavian countries such as Denmark and Finland, where you have, effectively, heat networks that were built on the back of a coal plant, a gas plant, or a waste incineration plant. And you take the excess heat, and you pump it at high temperatures, at vast quantities through a network.

These are extremely inefficient. They're very, very polluting. And what's been happening over the last 20 years is that people have just been jumping, using things like air-source heat pumps, geothermal heat pumps to get themselves off of these district heating systems.

So this industry has a tarnished reputation. But if we're serious about decarbonization, we're going to have to rethink our district heating and cooling systems. And this becomes really important to you. So it's within that context of a multitude of supplies, renewable energies, incumbent fossils that network geothermal has to operate in.

So that's our competition base. The other thing which is quite important to us and will become an issue for you later on is the fact that we have largely densely populated geographical spaces. So we don't have vast lands in which we can do drilling and very big networks.

We have to operate in tightly confined spaces. And environmental protection is absolutely key. And what we found is that as the geothermal sector grows, the regulators, particularly those that are looking at protecting water-- drinking water, surface water-- those that are very, very nervous about geothermal activities around them, but also are very concerned and are driven by the perception of negative impacts, this has, in some cases, slowed down a lot of growth that we've seen in some of the really advancing countries, such as the Netherlands, where now it's much harder for us to get a permit.

So permitting becomes an issue once you start to see a reasonable size of growth within your geothermal systems. The other two things from this one is that when we often talk about geothermal in a European context, you can see from the three different types of geothermal heat pumps that we tend to focus on the first two, so vertical boreholes or two vertical boreholes linked to a hydrothermal source.

The example that you have at the end with a loop that's quite shallow, there's just not enough space for that to really operate in a European context. So that means that we are looking at deeper types of drilling, much more sophisticated. And access to land that becomes more important, as well as being able to get drilling rigs into people's gardens or down streets.

One of the other things that's happened is, in a few countries where the market has started to grow and it hasn't been regulated, we've had the issue of thermal interference, where people have been installing geothermal heat pumps in their back gardens, but they're too close to somebody else's back garden. And what you do then is they install a heat pump, a geothermal heat pump, and you're effectively diminishing the overall thermal efficiency of that one.

That's led to lawsuits in Ireland, for example. It kind of, again, dampened down the growth in that market. So these are the kind of things that you're going to have to start to think through. And for us, the most important issue becomes permitting.

You can see from the map at the bottom that's a map of France at a 100-meter depth. If you're going to install a geothermal heat pump, the zones in green, you just have to do a simple email to your local government just to say, hey, this is where I'm installing my borehole. This is the kind of depth it's going to be, and this is the geolocation as close as you can possibly get it.

And then that can be noted somewhere in a registry so that later on, in maybe 10, 15 years' time, if somebody else wants to plot something, they can very quickly check and see if there's going to be any kind of negative impact on any additional systems coming on. Then you have orange areas.

Orange areas are sensitive subsurface activity. And you need to get some form of external recognition. Again, this is for a 100-meters, 200-meters depth. There needs to be some form of third-party assessment.

And then the red areas are really where you need to have a full environmental impact assessment. They're very sensitive areas. And you can see that the congregation of red dots on the eastern part of France is the Alsace region, and the Alsace region is a volcanic region.

There have been examples where people have drilled geothermal heat pumps and in one case, actually, damaged eight or nine properties within a village. And that led to a variety of lawsuits and really did give a negative impression to geothermal, even if France is one of those countries that's really gung ho. In Alsace, the mayor of Alsace, all of them don't like geothermal.

And they lump all geothermal into this basket. So we need to be very, very sensitive around the environmental impacts as your market starts to grow. I noticed you might not be able to see this graphic clearly, but you can blow up the screen when you get the slides.

Sweden is the largest country in terms of installed capacity. Germany's second. France is third. But really, the countries to look at, if you're going to look at them, are Belgium, the Netherlands, and Poland. These really have grown, roughly, over the last decade.

These are new entrance, and that's where all the innovation is happening. And part of the innovation story in a country like Belgium is around network geothermal. I'm going to come onto that later on as to why that's the case.

And then what you can see here, on the figure 14, is the density of heat pumps per 1,000 households. So again, Sweden is the most populous country. In Sweden, home buyers generally tend to look at five criteria when they're purchasing a new property.

And a geothermal heat pump is normally the fourth or fifth thing that they look at. Before the construction industry collapsed in around 2020, houses with geothermal heat pumps sold for 12,000 to 15,000 euros more than houses that didn't. So there was a clear recognition in a mature market that this really does add value to your property.

We haven't quite seen that in other countries. But as they start to grow and they become much more populous, we expect this to still need to be the next big country where you've got a lot of geothermal heat pumps in there. Now, what's happened is that you've had the kind of conventional story around district heating and geothermal heat pumps.

And then out of nowhere, network geothermal came onto the scene. And they were young and sexy and fresh. And everyone's like, oh, my god, I need to have this. But this has come, really, from three angles. So the first angle is that district heating, you had a lot of people leaving district heating systems.

And what you started to find is that they were in communities. And once you start to take a community off a district heating system, the overall cost profile and the efficiency of that district heating system become a problem. So it's caused some negative tension with the district heating community.

On the other hand, you've had lots of people who were looking at doing their own individual installation. And then they suddenly realized, well, actually, we can band together and create a community energy scheme. And in a country like Belgium, community energy is really the thing that's driving this push towards network geothermal.

It's not just communities. It's property developers. It's rural communities. It's a variety of people who are just saying, look, it makes sense for us to work together to build a common infrastructure because then it's so much cheaper.

And just for full disclosure, I've tried to set one up in my street. I live opposite a school. I want the school to have all the boreholes and for us to pay a small fee to connect to their system. Of the 72 houses in my two blocks, we've got 30, so far, who are keen.

We need to get everyone else on board, and then we need to lobby the school to agree to do this one and get some way in which we can finance it. But individual installations are not the default option anymore. People want to be part of a collective system.

It's part of the normalization of the technology as well. And then the third element-- and I'm going to spend a bit of time on this later on-- is the planning aspect. Because Europe has been heavily dependent upon imported gas, and the crisis that happened after Ukraine was invaded, the response was saying, OK, well, we need to make someone responsible for planning a transition.

And whilst you have all the campaigners saying, look, the revolution is going to be exciting, we're going to be manning the barricades, it's not true. The energy revolution is all about logistics and planning and finance. That's all it is.

I can see Helen smiling here on this point. But it really is that pedantic. You need to get out maps of streets and start working out, well, actually, what parts can we convert quickly? Who goes first? Who goes second? Who goes third?

But more importantly, who makes those decisions? So let me give you some examples to illustrate this transition.

**ZEYNEB
MAGAVI:**

And, Sanjeev, I'm going to briefly say-- because you're on the screen-- that a couple of minutes for the examples would be wonderful. Thank you.

**SANJEEV
KUMAR:**

Yeah, yeah. No, no. I'm going to race through these ones. In fact, I'll just give you one example here, Enfield Council. This is a local authority. They converted to geothermal not because they love their network geothermal, but because the people who were living in the four tower blocks-- you can see two of them behind you-- they were massively, massively indebted in terms of their energy costs.

They had a social-political crisis. They looked at all sorts of options and opted for network geothermal. Instead of refurbishing one building and one building block by block, what they decided to do was all four of them in one go. And then you got the real system efficiencies kicking through.

And you can see the savings, between 450 to 700 pounds per year, depending on the residents, so the energy consumption within those buildings. This is my favorite project, simply because this is in the heart of Brussels. And it proves that where you have listed buildings, you can actually do geothermal projects.

And that's part of the sexy thing about it. And that's really where network geothermal has kicked off in Brussels. Sant Pau Hospital is a 16th-century site. You cannot touch this building place at all. There's a huge complex of schools.

It's a UNESCO Heritage Site. Geothermal was the only option. And rather than doing individual ground-source heat pumps, creating the heat network was really where you got the system efficiencies coming through. The biggest project in Spain.

This is really what I want to talk to you about. A couple of things. Policy matters. Now, what's absolutely essential is that, even if geothermal isn't mentioned in the first round of policy, once you start to get people thinking about what zero looks like, what a fully renewable system could be, they'll almost always come and discover geothermal.

And then they'll start complaining by saying, why didn't you tell us this existed before? And what happened in Wallonia, which is a small part of Belgium, is they invested, just put 35 million euros up front for some very basic grants. They did a lot of iconic projects.

But more importantly, you had Karno, the energy company, all of a sudden become a national champion in network geothermal. And Resolia, who were the engineering design company, are now winning contracts all across Europe. So there's an industrial policy story more than just the energy savings.

But what I said earlier, the planning bit is absolutely essential. And the two key things in the planning bit is to make sure that whenever you're conducting a plan, it has to be based on local, renewable energy supplies. If you take those two words out of it, you will end up with biomass.

You'll end up with a variety of Frankenstein solutions. If you want to keep it towards geothermal, you've got to focus on the locality and the renewable aspect around it. But really, what's super pertinent around this is the fact that words matter.

So when we describe network geothermal, the reason why we'd say network geothermal and not fifth-generation district heating or-- sorry-- heat pump networks is that they don't have the word geothermal in. And if you don't have the word geothermal, you're going to miss all of the things that you need to go through to get to the network geothermal system.

Always focus on who makes the investment. And some of the examples I showed you, it's the local government. It's a community. It's a property developer. Their needs are completely different. But the way in which they access finance is also completely different.

So it changes the gambit. Business models are the most important thing. It's not about, can you do the project? It's about, how do you make it profitable for everybody? And that's where the innovation around whether you have an on-balance or off-balance sheet.

What's the size and the length of the project? How do you build in the modules? How do you disaggregate the different prices that people pay? This is the most important thing when it comes to designing a system at scale.

Super important-- drilling is sexy. So whilst everyone talks about the energy savings, the greenhouse gas emission reductions, that's great. But in the geothermal world, once you've done the installation, you will not see geothermal ever again apart from two black pipes coming out into your heat pump.

So the drilling bit is where you get people attracted. Two more things. Super important-- you've got to have more and more people providing the service of designing and installation. The more you do that, the more competitive the price becomes, the more you start to get suppliers chasing markets.

And this is really the space we want to get to. And then the final thing is that whilst we talk about the energy service delivery, the real political win is in industrial policy. Can you set up manufacturing, any part of the component features?

Can you create companies with design experts or training experts or drilling experts? That's where you get the real value for money, and that's where the politicians really start to wake up. So on that note-- sorry-- act local, think global, go geothermal.

**ZEYNEB
MAGAVI:**

[LAUGHS]

[APPLAUSE]

Thank you. Thank you, Sanjeev. And I see that your previous slide, you apparently agree with our administration's drill baby, drill.

[LAUGHTER]

So thank you for covering so much.