Mark Winskel: “The UK has done well in decarbonising its electricity sector. Now it’s time to think about heat and transport”.

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The energy sector in the United Kingdom is responsible for 14% of all greenhouse gas emissions and accounts for over 6 % of the average person's salary spending. The UK government has ambitious goals, doubling the country's energy generation capacity by the late 30s of this century while fully decarbonising the energy sector by 2035. It wants to develop up to 50 gigawatts of offshore wind energy and increase the supply from solar power five times by 2035.

I am speaking with Mark Winskel, the author of numerous systematic evidence reviews informing energy and climate policy in the UK and an expert on the social scientific perspectives on energy. Mark, thank you for letting me interview you on behalf of Energy at Edinburgh.

I'm very happy to be here, Honza, and pleased to be contributing to this.

Mark, we are currently undergoing what people call “an energy transition”. How is the UK performing so far in transforming the energy sector?

Overall, the UK has done well since it started seriously looking at energy transition. That would be around 15, 18 years ago, in the late 2000s. We haven't been doing this for very long, but the basic statistics show the UK is one of the leading countries globally for decarbonisation over that period. If we define energy transition in terms of the pace of decarbonisation, the UK has a lot to offer and a lot to be proud of. I think we're now at a point where things become more challenging. We see that in a number of ways. We see the political narrative around net zero starting to splinter a bit; we have different parties saying different things about net zero. I think it also suggests that we're going into a more difficult period for the energy transition. Many of the things that we've done so far in the energy transition have been relatively straightforward. The progress that we've made has been great and surprising in many ways for someone who studied energy for a long time, but we're now at a point where we have to retrench and think about how we address the next phase of the transition in a rather different way.

In what way is it different from what the UK has been doing until now?

Until now, the energy transition has largely been about the electricity sector. We've made very impressive progress in electricity supply through switching away from fossil fuels to renewables and through demand reduction in different parts of the system, particularly around housing and buildings. What we also need to see now is the decarbonisation of other parts of that system. This requires thinking particularly about how we heat our homes in the UK, how industry sources its heating, but also transport. Heat and transport are much

less about the invisible changes that happen on “the upstream” and much more about how people interact with technology and how they move and heat their homes.

Is this something that researchers at Edinburgh are also working on?

Absolutely. This has been a really big change in the period that I've been doing energy research here at Edinburgh. We’ve seen a big growth in the interest in heating. It wasn't that long ago when heating was very much a neglected topic within the overall energy research and energy policy portfolio. We now have many different parts of the University looking at the heat problem from the perspectives of social and behavioural sciences, engineering and economics. Bringing those different aspects of the problem together is where we can make good progress.

That links onto your background in multidisciplinarity… Apart from the University of Edinburgh, you have also worked at the UK Energy Research Centre – can you tell me something about this centre?

The UK Energy Research Centre is something I have been involved with for a very long time. When it was first created, the expectation from the funders was that it would be a “whole system” research centre. One only has to think about the challenges of decarbonising an economy and the energy system within it to realise that no single discipline is likely to provide all the answers to this problem. The answers lie in the way different disciplines contribute to an overall problem solution. That’s what we try to do at the UK Energy Research Centre. We've done it for 20 years now. And we also try to do it here at Edinburgh through the Energy@Edinburgh Network. I have found it fascinating to work with different disciplines.

Do you have a multidisciplinary project like that in mind that you worked on personally?

I was heavily involved in one project looking at scenarios for the UK's energy system transition. We deliberately designed it to incorporate different disciplinary contributions. So how do we do that? How do we work on such a project over months and sometimes years? We have to create the right environment, composed of working groups within the larger project, so people can get to know each other and understand each other's contributions. We can then usefully integrate those contributions and the different perspectives.

I believe that within the project that you are mentioning, you worked on the decarbonisation of the UK’s transport. What does such decarbonisation entail?

There are multiple possibilities. You can think about very technical ways like substituting existing cars and other vehicles for low-carbon alternatives, particularly electric vehicles these days. But you can also think about behavioural changes: how individuals move around cities and countries, what modes of public transport are available to them, how much demand there is and how to factor in the possibility of changing transport demand. To answer those questions, you need to go to a discipline different from solely supply-side engineering and look across the transport system. So that's what we did. We provided some scenarios of low transport demand futures in the UK. We found that there are great advantages to demand reduction. These include reduced infrastructure spending and other

benefits to welfare in society. It was only by bringing together the social and the technical that we could understand that pattern of demand reduction benefits.

Having mentioned the progress that we've seen in the UK, is there a particularly promising, up-and-coming energy resource that could lead to further improvements on the supply side?

We can be quite proud of the fact that the UK is now the biggest market globally for offshore wind. And that's remarkable, really, because the UK was always considered to be a laggard in renewables' development in Europe.

How did that change come about?

Well, it happened because there were some pretty ambitious targets set for renewables. So that all happened quite quickly. Because of that market, we've seen rapid cost reductions. One of the important things about that story is that without market growth, we don't know quite how to get the cost of these technologies down. By setting ambitious targets, mobilising supply chains, and increasing competition, we can make really rapid progress in cost reduction. Now that can go further. We've got ambitious targets for offshore wind deployment. I think we can go further in onshore wind as well. That's been left largely out of the picture recently because of policy choices, particularly outside Scotland.

On the topic of wind energy… The issue with wind is that it doesn't always blow with the same intensity. Part of the energy transition will likely lie in transforming the energy grid. How can we compensate for the differences in the electrical current coming from these intermittent renewables?

At the moment, we still do that largely through the use of fossil fuels. We still have gas in the system to provide that flexible response. But that isn't something we can do if we're going to meet our net zero targets. We have to think of much smarter ways of balancing the electricity system. And there are all kinds of interesting technologies that are enabling that to happen. But we're still in an early period of that transition.

What are these technologies? Is it the use of machine learning to coordinate the differences in power supply? Is it trying to find alternatives to fossil fuels that would substitute them?

Yeah, well, we're in a learning period around the answer to that question. Some of it will be about alternative storage technologies. Electric battery technology is, again, coming down rapidly in cost now. We're thinking possibly about hydrogen as a conversion carrier to provide that stored backup capacity. But we're also thinking about how demand can be shifted and made more responsive so that we're not having periods of intense peak demand, so there's less strain on the system. And that will become increasingly important as we electrify heating and transport. Shifting towards a smarter grid will be very important in the future, but I think we're still working out how important that can be, alongside more conventional storage technologies.

The social sciences often use the term "Energy Trilemma." Can you tell me what it is and illustrate, using the UK as an example, why finding good solutions to the energy trilemma is a challenge for policymakers and energy systems?

The trilemma is quite a simple concept really, and it's been around for quite a long time now. It's the tension or the importance of three factors in the energy transition. And that's the environment the cost and affordability of energy, and the security of energy and the resilience of the energy system. The real value of the energy trilemma is to make sure one's not forgetting about any of those three things.

I think we've been through different periods in energy history where one of those things has been more important than the other two. For a period in 20th-century, it was very much about energy security and about where we could get our energy from. There was just not enough capacity in the UK, particularly in the post-war period in the 1950s. We really just needed to build and expand the system. Cost was less of a factor. In those days, the industry was nationalised, and it wasn't very clear where the cost was, who was responsible for it, and the cost was passed through to consumers.

And I think we definitely went through a period that was very much about cost reduction. The UK was one of the first to privatise its energy sector. We did that in the late 80s and the early 90s. That was very much thinking about the short term, about market competition. That lasted about 10 or 15 years. And then we've seen the rise of concern about climate change and the need for the energy system to respond to the need to mitigate climate change. Climate change became really important, and that was really helpful because it allowed the UK to set out its policy landscape for net zero, which became a long-term transition. So, we did a lot of good things during the 2000s and the early 2010s.

So, how is the trilemma playing out today?

Today, there is much more competition between those three factors—there's no getting away from concerns about energy security. We've seen that with the Ukraine war and the threat over gas supply to Western Europe. Energy security is very much back on policymakers' minds. There are concerns about energy affordability, given the war's impact on energy costs. Over the last three or four years, energy prices have tripled for most energy consumers in the UK. And at the same time, we're still trying to progress the energy transition to decarbonise the system. So those three factors of the energy trilemma are really playing against each other now.

Let's turn to another topic. Energy transition requires cooperation not just among disciplines but also between scientists and the private sector. You co-wrote a paper on a Dutch oil and gas company that transformed its activities. It may be quite hard to imagine that a company whose activities mostly revolve around oil can transform itself in a fundamental way… What are the key lessons that we learnt from that study?

That paper examined a particular case study, an offshoot of Shell in the Netherlands, and its activities around developing low-carbon energy businesses within its overall business. It has some encouraging and some less encouraging lessons. Some of the oil and gas majors have reinvented themselves in response to the climate crisis or are in the process of doing that. Others are making much less progress. That varies according to which part of the world they are based in.

We need to work with the private sector as much as possible, and we need to draw on the best practices, mobilising all that experience and capital availability to reinvest in the energy transition. There are no straightforward messages coming from a lot of that work – companies have to reinvent themselves, which is quite difficult. In some cases, other companies may be better at doing business in the low-carbon energy sector. But in other cases, where companies' activities involve heavy engineering and offshore skills, for example, there are possibilities to redeploy their capital, skills, and labour to be an important part of the energy transition.

So what about the cooperation with the public and the public sector? Are Edinburgh researchers also in contact with local authorities?

There's certainly been a lot of work at Edinburgh, working in partnership with local authorities and supporting local authorities, particularly in Scotland, in their planning around low carbon. People in Social and Political Science at the University - Jan Webb, Faye Wade, and Jess Britton – have been looking at how local authorities can make well-informed plans for the decarbonisation of their heating and energy efficiency. Each local authority in Scotland is currently developing its own local heat and energy efficiency strategies. This isn't an area that local councils have been traditionally expected to work on, so they lack the necessary skills and capacities.

The question is where they can go for that expertise. I think academia can play an important role in helping fill that gap. Many other organisations are mobilising to do so, but quite often, they are private sector consultancy firms. The great thing that academia can do that other expert bodies perhaps cannot is to mobilise public knowledge and to bring that into a shared environment. There's also work going on in the ECCI Centre at Edinburgh, providing information and data for local authorities in Scotland so that they understand where opportunities for decarbonisation within their boundary lie, where the supply is, where the demand is, and how to bring these aspects together.

Mark, along with Markus Mueller, you connected people from different disciplines at the University of Edinburgh… What led you to setting up Energy@Edinburgh?

We set up Energy at Edinburgh to bring together the expertise around the university on energy and the energy transition. What's happened at the University of Edinburgh and other universities is that the energy research community has grown a lot over the last period. Because of the way the university operates, there are particular centres of expertise around this institution in social and political science, engineering, physics and chemistry, economics, informatics, art and behavioural sciences, all looking at the energy transition.

That's great, and it means there's a lot of interesting work being done. But if you go back to what I was saying at the beginning, that no single discipline is likely to have the entire answer to the complex problem of energy transition, then that invites thinking about how these different bodies of expertise are scattered around the institution, and how they can be brought together to create a whole which is providing added value. We allow that to happen. We don't know quite where that leads us. We provide spaces and opportunities for

people to interact together, and we try to bring in outsiders from policy and business as well. And we see where that takes us.