

# Leeds University Business School – Research and Innovation Podcast

Episode: How can the Foundation Industries reach Net Zero?

Speakers: Professor Vera Trappmann and Dr Ursula Balderson

[00:00:00] **Vera:** Hello and welcome to the Research and Innovation podcast. I'm Vera Trappmann. I'm a professor of Comparative Employment Relations at Leeds University Business School.

[00:00:15] **Ursula:** I'm Ursula Balderson, a research associate at the Centre for Employment Relations, Innovation and Change at the Business School.

[00:00:21] **Vera:** Today in this episode, we are going to talk about the foundation industries and their way to become net zero. So what do they do in order to reduce their carbon emissions? And that's a really important question if we want to understand how we can decarbonize as a country. Ursula, can you maybe tell our audience what the foundation industries actually are?

[00:00:50] **Ursula:** So the foundation industries are a group of industries that include metals, bulk chemical production, glass production, ceramics, pulp and paper, and cement.

And what this group of industries has in common is that they tend to use large quantities of energy. So they involve a lot of high temperature processes. They often produce process emissions, which means that they don't just produce emissions through the use of fossil fuels, but their industrial processes also produce emissions as a kind of byproduct and these industries sort of underpinned the broader economy more generally.

So they often produce outputs which are used in other sectors. So for example, construction or food, you know, steel is used in construction as is cement. Glass is used in the food industry as a form of packaging. So yeah, these factors together mean that they're both essential and really difficult to decarbonize because it's not just a case of changing the energy system. You have this associated problem, which is process emissions that you need to deal with as well.

[00:01:56] **Vera:** So this is why they are called foundation industries because they are basically everywhere, in almost in every product that we use. Okay. That's interesting. And how are they intending to reduce their emissions?

[00:02:10] **Ursula:** Well. It's different for each sector. The research that I've been doing with my colleagues at Leeds - Vera, who's speaking with me today and our colleague Jo Cutter - we've looked mainly at sort of steel and cement and glass, but broadly speaking, there's a really strong drive to improve the efficiency of these industries and to change the fuels that they use in their energy intensive processes.

And also to change the raw material inputs that go into the production, because if you change what you use to make some of these products, you can, in some instances, although the technologies aren't entirely there yet, reduce some of the process emissions, but that is still, I think, to a degree, a work in process, depending on what industry you're talking about.

So to just give you a little bit of an example of what we mean by that, if you produce the products from raw materials, you get the process emissions. But in some instances, you can produce the products using recycled materials. If you remelt glass in the furnaces, it doesn't produce process emissions. Whereas if you produce glass from the raw materials needed to produce glass then you do get your process emissions.

With respect to cement, they're talking about completely changing the way in which cement is made. So, no longer is it going to be made using limestone to produce clinker, but sort of, using different types of clays and those have got different chemical properties and so don't tend to produce the emissions in quite the same way.

[00:03:55] **Vera:** Great. Thank you. So, just to make this very easy - what would you, can you give us an example for fuel switching for one of the industries for how it would switch from what to what?

[00:04:10] **Ursula:** So yeah, the glass industry, for example, the furnaces run on natural gas, currently, and there's new furnace designs evolving that would use electricity.

So obviously that's only as green as to the extent that our grid is decarbonized. It's easier to electrify smaller furnaces than larger furnaces and as it stands at the moment, there haven't quite developed technologies that allow furnaces to run entirely on electricity.

They're also using other different types of fuels. There's attempts to use biofuels, there is attempts to use hydrogen but quite a lot of the emphasis is on electricity.

[00:05:05] **Vera:** Okay, great, thanks. And that sounds like a major restructuring of the industries. What is the government doing to support this transition?

[00:05:18] **Ursula:** Yeah, these industries do need quite a bit of government support. There is a lot of, you know, technological change involved in reducing their emissions. There are a number of initiatives to support these industries but probably nowhere near enough. I think we would argue, you know, that there's additional costs with electrifying the furnaces and that you need new types of connections to the grid and issues with a kind of, grid capacity. B ut yeah, I mean, I think steel in particular is the industry that really stands out for needing a large amount of, if we're to maintain a domestic steel industry, it needs a large amount of investment, which isn't really getting from the government at the moment.

So Tata Steel, which is one of the UK's two blast furnace sites - blast furnace sites are where steel is produced from raw materials rather than recycled materials - they have estimated that the cost of decarbonisation would be around three billion for their site and they've requested a 1.5 billion subsidy from the government.

As you might have heard, last month, the government offered a support package to Tata of 500 million, so nowhere near the amount they were actually asking for, and this 500 million was aimed at aiding the transition to electric arc furnaces. However, in pursuing electric arc furnaces, rather than, say, for example, hydrogen steelmaking, this puts large numbers of jobs at risk, as electric arc furnaces are much less labour intensive than blast furnaces. It also affects the type of steel which can be produced and steel is generally lower quality as there is less control over the inputs as

electric arc furnaces are using recycled materials, and so there's the possibility that Tata could lose some of their key customers.

And at the moment, the estimation is that at the Tata owned Port Talbot site, in Wales, there'll be around 3,000 job losses as a result of this particular decarbonisation policy. This is obviously not a just transition, and very sad for all, for the workers and the communities who are going to be affected.

So the government isn't supporting the foundation industries the way that it needs to. Another important aspect of the government's industrial strategy or lack of industrial strategy is the way in which it's allocating money geographically. So, the government's industrial decarbonization plan is very much focused on decarbonizing sets of industry that are geographically concentrated.

So this is called taking a cluster approach. So it's focusing on, it's big industrial clusters. The places that are likely to receive investment first are kind of the East coast cluster, which is a combination of the Humber, Estuary and Teesside. And the high net project, which is over in the Northwest.

So these cluster projects intend to decarbonize heavy industry by building out blue hydrogen production capacity and carbon capture and storage networks. Blue hydrogen production involves taking natural gas (methane) and splitting that down into hydrogen and carbon dioxide and then capturing the carbon dioxide emissions and storing it underground, generally out at sea. As opposed to green hydrogen which is produced using renewable electricity to break water into hydrogen and oxygen. Green hydrogen doesn't need carbon capture and storage because it doesn't produce carbon dioxide.

These hydrogen and carbon capture storage projects will allow the businesses that are located nearby to decarbonize. The businesses that will be able to access this mode of decarbonisation is going to include chemical production, petrol refineries, new and preexisting gas fired power stations, for example.

So although these projects are potentially an important step forward, there's very little funding for sites that fall outside these clusters, which is quite a lot of your other foundation industries. So a lot of the glass industry, ceramics industry, and your pulp, paper industry, and cement industry. They won't necessarily benefit so much from these industrial cluster developments.

These industries are not really receiving support due to their geographical locations and the way in which the government is approaching decarbonization, which is very much focused on these existing clusters.

I mean, there is a logic to that. That is the way you can get the biggest gains for the lowest cost, but it does put a lot of other businesses across the country at risk.

[00:08:40] **Vera:** This sounds like a really difficult context for companies. And I guess the recent energy crisis has made things worse. How did that affect them additionally?

[00:08:52] **Ursula:** Yeah, I mean, the energy crisis is really bad news for the foundation industries, as I was saying at the beginning. They use a lot, they use a lot of energy, they have a lot of high temperature processes, so their energy costs are really high, and this is making decarbonisation

more difficult, there's less money floating around in the sector because it's kind of being eaten up by the high energy costs. Certainly the energy intensive users group is really stressing really hard that this needs to be, there needs to be a reduction in energy costs.

Yeah, I mean, so just to sort of contextualize what we're saying here, in the UK, energy costs are about 50 to 60% higher than some of our competitors. So that is a significant additional cost.

[00:09:34] **Vera:** And what do all these challenges mean for workers? You said some of the companies are at risk. That doesn't sound really promising and reassuring. How are the workers reacting? Are government putting in place any kind of rescue measures?

[00:09:52] **Ursula:** Well, we don't know that much about how workers themselves feel about this. But certainly not specifically within the foundation industries. But, yeah, this, as I'm sure you can imagine, this does have implications for people's jobs.

You know, if these industries aren't given the support they need, we could be looking at job loss. Hopefully that won't be the case. Regardless, some of the skills needed by people working in these industries are going to change. So, there's going to be a shift to much more need for data analytics, because one thing that we haven't really talked about is how in order to drive energy efficiencies where they are still possible, these companies are digitalizing.

So, what that means is, for example, if you take a glass furnace previously the amount of gas that it used would be controlled by the worker and they would decide how much gas to put on and how much gas to put off, depending on what they could see and their observations of what the furnace looked like primarily.

I mean, I'm sure there's more to it than that. But now what we have is there's furnaces being designed to have lots of different temperature measuring electrodes in, inside them. So these are producing huge amounts of data and that data is being used to optimize the amount of gas that the furnace needs to use.

So that's sort of changing jobs, for example, that's changing jobs like the furnace operator role and where previously that was, you know, that was done by a kind of experiential learning. Now that somebody doing that role would probably need an understanding in data analytics, in machine instrumentation, to kind of understand the machine that's operating the furnace, and that's changing the type of skills that workers need.

So, you know, there are questions around how easy it will be for people who have worked on these furnaces to transition into roles that require high level data analytics. It seems like the industries are quite supportive of enabling them to do that, but how it plays out in the real world is, you know, a big question.

These companies are struggling, partly because there's a real deficit of STEM skilled workers in the UK, you know, especially at the technical level. Just about, you know, a report by IDRIC was saying we can just about get by on the amount of graduate STEM skilled workers that we have.

But kind of technical workers - there is a real shortage of supply and that means that not all the businesses are able to get hold of the workers they need and that's going to become an increasing

problem as some of these projects start to get underway and there's complicated project management jobs that need to be done.

You know, there's a need for specialist welders, especially if we go down the hydrogen route, because the hydrogen molecules are much smaller. So that means you need very high-level welding skills if you're going to start piping hydrogen around.

You know, digitalization, as I was saying before, means that there's going to be high levels of machine instrumentation needed in these industries, as well as obviously a lot of electrical engineers, given the push for electrification of the furnaces. There's also probably going to be a need for jobs, more jobs in environmental auditing compliance and monitoring as we really, you know, put an emphasis on meeting the environmental standards and looking at what emissions are being produced by these businesses.

So, yeah there's quite a lot happening in terms of the skills demand and how it's changing in these industries. And that is going to have implications for workers and the hope is that a combination of government and company support will allow people who are already in these industries to develop the skills that they need to continue working and continue thriving in the foundation industries rather than there'd be a kind of sort of, like a shift change and in a different set of workers in because that wouldn't, I don't think that would be a very fair transition for people who were involved.

[00:13:35] **Vera:** Yeah, there's a lot that we need to expect from government as well to support those businesses.

And as you say, there is still a lack of research about what workers really think in those industries and how they are involved in the company policies. But I think what we know from the surveys that we have done with workers ourselves, and if you're interested, you can read a report that we have done for a trade union - Community - which is organizing workers in the steel industry.

We know that they're extremely concerned about their futures. We know that they are very anxious and concerned about climate change. And that they have a much better understanding of the causes and consequences and what needs doing to mitigate climate change. So, they are really a kind of part of the workforce that you could take on the journey.

But we also know that they are very anxious about losing their jobs and that they call for a lot of government support and particular for regional labour market policy, so to ensure that regions don't get deprived and that we don't witness what we have seen some decades before that some communities have just lost thousands and thousands of jobs.

So there's definitely more for us to learn in order to speak to workers. But there are clear messages coming from our research. And we hope that this will help inform some of the debates in the area of the foundation industries.

Yeah, thank you very much Ursula.

[00:15:15] **Ursula:** Yeah, thanks a lot for the opportunity to speak Vera. It's really, it's something I feel strongly about. I really hope the government pulls its finger out in terms of industrial policy. So yeah, thanks for the opportunity to discuss these issues.

[00:15:26] **Vera:** and if you're interested in more around decarbonisation and just transition, please listen to other series in our podcast series. Thank you.