HOUSE OF COMMONS

Business, Energy and Industrial Strategy Committee

Oral evidence: Industrial Decarbonisation – response to the Government Strategy, HC 164

Tuesday 18 May 2021

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Watch the meeting

Members present: Darren Jones (Chair); Alan Brown; Paul Howell; Mark Jenkinson; Charlotte Nichols; Mark Pawsey; Alexander Stafford.

Questions 1 - 20

Witnesses

I: Aaron Goater, Industry Lead, Committee on Climate Change; Mercedes Maroto-Valer, Director, Research Centre for Carbon Solutions, Heriot-Watt University; Nick Molho, Executive Director, Aldersgate Group.

Examination of Witnesses

Witnesses: Dr Aaron Goater, Professor Mercedes Maroto-Valer and Nick Molho.

Q1 **Chair:** We are now going to move on to our second panel, which is on a different topic, taking an initial view on the Government's industrial decarbonisation strategy. I am delighted now to welcome Dr Aaron Goater, who is the industry lead at the Committee on Climate Change; Professor Mercedes Maroto-Valer, who is from Heriot-Watt University and is the UK champion for the Industrial Decarbonisation Research and Innovation Centre; and Nick Molho, who is the executive director at the Aldersgate Group. Welcome to all three of you this morning and apologies that we are overrunning.

To get the conversation going this morning, my initial question is to you, Dr Goater. Could you help us understand where we are at the moment in terms of industrial decarbonisation? Which are the key sectors or processes that we need to really get hold of in this strategy?

Dr Goater: Thanks very much for having me this morning. I am very happy to answer that one. The industrial decarbonisation strategy covers the manufacturing and refining sectors in the UK. The biggest sectors there are refining, steel, chemicals, cement, food and drink, glass, paper, and vehicle manufacturing. Those sectors make up about 80% of the industrial emissions that are covered by the industrial decarbonisation strategy.

Q2 **Chair:** Are there any gaps? If there are, what are the key gaps from your perspective?

Dr Goater: The decarbonisation strategy covers all of those sectors. It is very much a first step in looking at how to decarbonise those sectors. It is really positive; it is saying something on most areas; it has been published to the promised timeline, but it is very much a first step. There will be an awful lot more steps until we have a fuller set of policies that can start delivering on a pathway to decarbonising to what we think is required, which is a 73% reduction in emissions in these sectors by 2035.

Q3 **Chair:** Are there any key gaps that you wanted to raise today that we should be aware of? Is it quite detailed and better to get in a written answer?

Dr Goater: Some of the key gaps that would be good to highlight in the strategy are probably around the use of electrification. There are a number of key technologies for decarbonising industry: use of hydrogen, CCS, and improving our energy and resource efficiency. One of the areas that is covered less in the strategy is electrification. It will likely play an important part in decarbonising industry and it is addressed less in the strategy. There is certainly more to be done on that than some of the other areas covered by the strategy.

Q4 **Alan Brown:** Mr Molho, is the scale of the industrial decarbonisation

strategy's ambition sufficient to meet the headline emission reduction targets of the two-thirds reduction by 2035 and, ultimately, a 90% reduction by 2050?

Nick Molho: It is too soon to tell. At the moment, the industrial decarbonisation strategy touches on all the right areas where innovation is required. It touches on the right kind of policy measures we are going to need to attract business investment in the long run.

The next steps in terms of innovation are not yet clear. The Government are committed to a range of investment funds, such as the £1 billion CCS infrastructure fund and the £240 million net zero hydrogen fund. All of these are really important. They are about supporting feasibility studies and small-scale pilot projects, but we are going to have to move up a gear in the near future in terms of trying out some of the key business models and technologies involving CCUS and hydrogen at scale. For example, France and Germany both have their own green hydrogen strategies, and are committing between €7 billion and €9 billion to those. We are going to have to make some further commitments in terms of public funding to really prove those concepts at scale.

The other really important point to note is that a lot of the long-term investment we are going to need is going to have to come from the private sector. In order to attract that investment from the private sector, we need very clear policy signals that will create markets for low-carbon industrial goods, and support viable and profitable business models for a wide range of industries. That is where we are currently lacking clarity. The strategy talks, for example, about the potential role of product standards, carbon pricing and public procurement. All of these are really important policy tools, but we need to develop our policy suggestions as to what we will introduce in the near term, so that businesses understand what the policies and the market will be for low-carbon industrial goods, and can start investing in some of the major capital-intensive investments that need to be made.

Q5 **Alan Brown:** On what timescale does industry need to see the joined-up policy ask and Government funding commitments to lever in the private investment funding?

Nick Molho: By background, we are a very cross-economy organisation, so our business members really come from across the economy. We are doing a major project with Frontier Economics at the moment involving a wide range of heavy industrial players and looking specifically at the next range of policy decisions that need to be taken. The next five years are really critical. This parliamentary term is critical in terms of announcing the next-step innovation funding. We need to see this over the next 18 months or so, to get a really good sense of how we are going to build on the innovation commitments that have already been made. On the policy signals, we need to provide a lot more clarity over the next two to three years.

In September, we have the net zero delivery strategy; that is a really important document. We hope that it will contain a clear overview of the key policy commitments that we can expect on a sector-by-sector basis for the next three to five years, so that industry really understands the measures that will be introduced to allow it to invest on the back of them. We would like to see more detail around carbon pricing and having a carbon price escalator, but also consideration for a carbon border adjustment mechanism.

Looking at the role of product standards can be a very effective tool in driving down embedded carbon, as well as improving resource efficiency in a production process. We would like to see some concrete measures on public procurement to grow the market demand for low-carbon steel, low-carbon cement and other industrial goods. The next two to three years are critical in this transition.

Q6 **Alan Brown:** On funding, you mentioned the massive sums committed by France and Germany towards their hydrogen strategy. Is that the sort of scale of economic ambition that the UK Government are going to have to commit? Is there a headline figure that industry would like to see?

Nick Molho: I have not come across a headline figure. Those different sums are not always very easily comparable in terms of like for like. Industry often mentions the importance of having some quite iconic projects or scalable trials, such as demonstrating green steel production at a particular site, as a way of showing the feasibility of particular technologies to get the market going.

I would see it more as ensuring that we put sufficient investment on the table in order to prove some of those technological concepts at a particular site and at sufficient scale, so that we can prove the concept and learn the ins and outs of how those technologies and business models are working. This really helps to inform the policy process in terms of understanding the kind of policy incentives you need to introduce, to ensure that businesses can respond and make their own long-term investments on the back of them.

Q7 **Alan Brown:** You have highlighted some key asks going forward in terms of policy development and demonstrating projects. Is there a general reaction from industry to this strategy that can be summed up?

Nick Molho: In terms of overall reaction from industries, businesses are pleased to see that the strategy has identified not just the key challenges that need to be overcome but also the opportunities. It builds on the previous session you have just had on levelling up. There are some really important long-term economic growth opportunities and opportunities to revive industrial heartlands if we do this right.

The key message from industry is that we need clear next steps on innovation to support the competitiveness of industry, attract investment in industrial decarbonisation, and deliver economic benefits in terms of

growing supply chains and potential export opportunities. We need clear policy decisions to be made in the near future to grow that demand for low-carbon industrial products, incentivise long-term investment and support viable business models.

Q8 **Paul Howell:** Professor Maroto-Valer, I want to talk about the four clusters and whether that is an appropriate strategy or policy that is in place. In answering it, could you just leave the bit about cement and these high-carbon industries that are more disparate? There is going to be a subsequent follow-up question from one of my colleagues on that. I am really talking about the appropriateness of the strategy of the clusters, whether that is delivering on enough of the industrial emissions that we need to do and whether that is the right sort of policy space that we should be going into.

Professor Maroto-Valer: Thanks very much for the question and the invitation to be here today. With regard to whether the focus of the clusters is right, there are dispersed sites where we also have very important industries such as cement and steel, but particularly cement. The short answer is yes; the focus on the clusters is right. The reason for this is that industrial clusters provide us with a unique opportunity for early deployment of infrastructure for decarbonisation. In some cases, we need to consider that that infrastructure is already there to some level, so we can build on that. The first projects that we are going to see coming into the clusters are also going to allow us to reduce cost. Going back to the earlier question around innovation, we can take the innovation to do cross-levelling that will be applicable within and outside the clusters to dispersed sites.

There are a couple points to reflect as well, in this question. The sectors and the industries we are dealing with in these industrial clusters are very much the same ones as we are going to find outside the clusters. When you look at all the clusters, first of all, there is not just one. They are quite diverse in their size, their emissions and the types of industries they have. When you put them all together, you realise that we can learn from the challenges that they face as we decarbonise them and apply them to dispersed sites.

It is important that we look at the clusters as an opportunity for green jobs, and to establish and re-establish the supply chain, ensuring that we can demonstrate the benefits of industrial decarbonisation in areas that are deprived to a big extent. They are suffering from an economic environment that is not very good. Ultimately, if we do this right, these clusters will become areas where we attract inward investment. We can then take those business models that Nick was referring to before and the policy models. These can be extrapolated to dispersed sites as well. The role of innovation here is going to be key because no two are the same, whether they are within or outside the clusters. How we get these cross-learnings, skills policy, business models and technology together will be key for us to decarbonise the whole of the UK industry.

Q9 **Paul Howell:** I just have a couple of small points to pick up there. You talked about the opportunity within the clusters to learn about things outside of the clusters as well, in terms of innovation and things like that. Would you therefore recognise that it is important for the people who are managing the things in the clusters to be very cognisant of the things that are outside? A particular innovation might not be as relevant in the cluster, but it might be something they have come across and want to make sure that they capture to use outside of the cluster. Is that sort of experience possible or am I just talking rubbish?

Professor Maroto-Valer: It absolutely is. A key function of the plans that we have set out now and proposed for the Industrial Decarbonisation Research and Innovation Centre is precisely what you have just said there: to take all these cross-learnings and make sure that we have knowledge exchange and information sharing. In some cases, specific technology may be applicable or may need to be tweaked. We may do something different, but there are learnings that we can take across and various functions for which that can happen.

Q10 **Paul Howell:** Dr Goater, pick up anything that you want to build on from what has been said already. A couple of specific points to pick up on are whether you believe the aim of the clusters fits with the Committee on Climate Change's recommendations and whether the Government should prioritise high-carbon industrial processes compared to low-carbon new industries and processes. Are we missing a gap somewhere in that space as well?

Dr Goater: The Government have stated that they aim to have four clusters by 2030. Depending upon whether your glass is half full or half empty, it is broadly in line with where we are, or slightly behind. We have said that you should establish at least two CCS clusters in the mid-2020s, at least four by the late 2020s, and further around 2030. The core principle here is that we need to have cluster infrastructure set up in all of the key places where it will be required. We will need that so that we can deploy technologies at substantial scale in the 2030s to get us to a 73% reduction in emissions by 2035. This is a decade of action in the 2020s to make sure that we really reduce emissions to very low levels. That infrastructure in clusters will need to be set up in the 2020s in all of the locations that it is required.

Coming on to your question about prioritising existing versus new industries, I might be repeating a bit of the same emphasis here. There is not that much scope to prioritise time-wise, but I recognise that there will be some value in considering the different industries. Ultimately, to get to 73% reduction in emissions by 2035, we are going to need action across all sectors to get started soon.

In terms of the ordering and prioritisation, there are a number of other important factors that will affect timing. These include the availability of infrastructure, the location of different plants, some of the costs, and whether individual plants and factories are ready to change their plants

because of the different maintenance cycles they have. The supply chain capacity in different areas will also affect timing.

The key message here is that we need to move across sectors. When decarbonising, all of these sectors will produce a new low-carbon product. In some ways, they will all become new industries producing new low-carbon products and selling those into a new market.

Q11 **Paul Howell:** It seems almost like it is reflecting something we have done in previous inquiries, in which we have been talking about heat and the decarbonisation of that. A lot of effort is required in the immediate time to get infrastructure in place to try to then facilitate things going forward. Is there a simple non-science story of where you are talking at the moment?

Dr Goater: Yes, in these areas of hydrogen and CCS, that is absolutely the case. There are other measures that we require where infrastructure is not as much the key, but for these areas of CCS and hydrogen it is a critical starting point.

Q12 **Mark Jenkinson:** I have some questions on technology to Professor Maroto-Valer initially. The strategy's technology focus is very broad: carbon capture, hydrogen, electrification and bioenergy. Which are the most challenging to deliver at scale? Is it too reliant on some of those emergent technologies like CCUS and hydrogen? What happens if they fail to become commercially viable?

Professor Maroto-Valer: You are right that the strategy presents a wide range of options. If I may reflect back my earlier answer, it is because we have a wide range of industries. Within those industries, there are multiple challenges, whether it is because they produce greenhouse gases as part of their energy demand or they produce them as part of the process. That is really difficult to tackle. We need multiple options.

There is clarity in terms of the proposals to build infrastructure around the clusters in the 2020s. There are two CCUS plans coming for the 2020s and another two in the 2030s. We have a bit less certainty on what is going to happen post-2030s, once we have built these very first plants and learned from them. The role of innovation could be quite critical in helping us to chart the new technological pathways that we are going to need in order to reach net zero, bring costs down, increase efficiency and avoid the risk of locking ourselves into any particular technology.

How proven or unproven the technologies are was also part of the question. We know that we can do CCUS. We know that we can do hydrogen; that has been demonstrated in other countries. The challenge that we have here is the scale and pace at which we need to deploy these technologies for the UK to decarbonise. There have already been

mentions of those intermediate targets that we have before we reach 2050.

This is really when we need to work together, work alongside these big projects, and make sure that we have the innovation and research alongside, in a whole-systems approach. This is about not just the technology but also the business model. We need to have the right policy, the skills and a whole-systems model, with the risk and the technology, so we can deploy them at scale and pace. The challenge is not the technology as such; it is the scale and pace at which we need to do this.

Q13 **Mark Jenkinson:** I will come on to business models with Nick. What are the Government's preferred business models for CCUS, low carbon and hydrogen? Can we deliver the required level of private investment in the necessary timescales?

Nick Molho: The Government highlighted a range of possible options that we understand are going to be consulted on. They are looking at a range of different ways of incentivising it beyond the innovation stage such as revenue guarantee mechanisms, product standards, public procurements and carbon pricing. Whether we will deliver it within the timescales needed and pick up the pace challenge that Professor Maroto-Valer was alluding to depends on how quickly we put those policy solutions together. That is really the key next step. The number 1 area of feedback that we get when we talk to different industries is about not being entirely clear where policy is going next. They want a clear carbon price trajectory and a clear set of drivers for product standards, and some of the others that I have mentioned, agreed as soon as possible.

It is worth pointing out, to your first question about the importance of CCUS and hydrogen, and the importance of the business models to support their rollout, that those are going to be important not only for clusters but also for dispersed sites. When we spoke with representatives of the glass, cement and ceramics industries, they were all clear that they needed access to CCUS to fundamentally reduce their emissions. They might need access to hydrogen as well. It is going to be absolutely fundamental that, in addition to having clear policy signals that drive business investment, we also ensure that the infrastructure that is put in place in clusters to support hydrogen and CCUS is developed in such a way that dispersed industries in dispersed sites can bolt on to that infrastructure. We need a degree of co-ordination here.

Q14 **Mark Jenkinson:** Just to move on a bit to energy-intensive industries, Dr Goater, the strategy states that the Government will consider the implications of setting the Climate Change Committee's recommended target for net zero steelmaking by 2035. I am a bit concerned about some of the rhetoric around net zero steelmaking, which seems to concentrate more on absolute zero steelmaking than net zero. The strategy does not rule out the use of coking coal, for example, in an integrated steelmaking process while using CCUS to mitigate the impact.

In the sixth carbon budget, there was a very tiny proportion of expected steelmaking emissions reductions from hydrogen, but significantly more from fuel switching, moving from blast oxygen furnaces to electric arc furnaces. A significant amount, over a third, was from carbon capture, which obviously expects ongoing use of things such as coke as a very important chemical element in steelmaking. We cannot make high-carbon steel without the addition of carbon. We use coke in the electric arc furnaces to encourage slag forming, which reduces the energy costs of the electric arc furnace and protects it.

How do we square this circle? In not ruling out the use of coking coal, for example, are the Government going far enough in their approach to decarbonising steel? What other options do we have in that regard, with coke being such an important part of the process?

Dr Goater: Yes, you are absolutely right to outline here that there are different options with different implications. At the moment, we are trying to set out a more technology-neutral approach and say that we need to reduce emissions from steel. We have said that the Government should set a target for steelmaking to reach near zero emissions by 2035. We say "near zero" because we are allowing the potential for CCS to be used as one of the options. The use of hydrogen with a technology known as direct iron reduction, the use of more electric arc furnaces and the use of CCS are all options.

We are talking about, in particular, two large plants in the UK. We do not want to set out the pathway specifically for those two plants. We are saying that there are three clear routes to decarbonising and the Government should set the ambition for industry to go down some of those pathways. If they use the CCS pathway, it will be really important that a particularly high amount, over 90%, of the carbon dioxide is captured. This is really pushing the technology, but it is possible. Otherwise, that will leave large amounts of emissions that need to be offset elsewhere. Across the economy, that is really pushing the boundaries of what we can do. If carbon capture and storage is used, we need to capture very high amounts of the carbon.

It will be interesting to see which technologies ultimately win. There has been an awful lot of activity on the hydrogen front internationally, particularly over the last six months to a year. At the moment, we need policy that can encourage industry to take forward these options, and to choose and recognise some of the benefits of different technologies.

Q15 **Mark Jenkinson:** The hydrogen technology in steel-making, for example, is very much concentrated on its use as a reductant in sponge iron, which still leaves the addition of carbon later in the process as an issue. We have to be clear with people that we either use coal, burn tyres or burn trees.

How should the Government approach the decarbonisation of these sectors and others, such as cement, in dispersed industrial sites outside

the clusters? Paul touched on some of this before.

Dr Goater: Cement is an interesting sector because so many of those sites sit outside of the clusters. For the cement sector, it is worth saying first that there are important circular economy and resource efficiency-type measures that can be used. For example, when building buildings and infrastructure, we cannot over-specify designs. We can have just as good-quality designs, but not over-spec, and that can be achieved with standards to reduce the amount of materials used there. There is also a role for the use of timber in construction. Ultimately, once we have used those, CCS is the core to reducing emissions from the cement sector.

The Government are currently proposing using a contract for difference mechanism. It is somewhat similar to the one that has been used in the power sector in the past, but it pays for carbon reductions. That seems like a sensible approach. The real challenge is establishing the infrastructure—that is not necessarily pipelines; it might be rail, shipping, canals or road—to move that carbon dioxide from dispersed sites to the places where it is stored offshore.

We have said that working on how that is achieved needs to be thought about now. It is probably going to take quite a long time to agree, especially given that some of those sites sit in really difficult places to decarbonise like the Peak District. The Government should start working with the minerals industries and the cement sector to develop a joint plan for carbon dioxide transport from those dispersed sites and establish a clear roadmap for what those sites are doing. At the moment, when we speak to those sites, we hear that they do not really know how they would transport their carbon dioxide away from their sites. They will not necessarily move forward with looking at the business models to fit CCS in their plants.

Professor Maroto-Valer: It is important that we realise that, in the clusters themselves, we also have cement in the Humber, in Merseyside and in south Wales. Obviously, 95% of all the CO2 emissions coming from the iron and steel sector are within the clusters, particularly south Wales, and a little less in the Humberside cluster. We can take lessons from here and take them to the dispersed sites.

A very important point has been made about infrastructure. We have been talking about infrastructure within the clusters and the opportunities for taking the costs down that that will bring us, because they already share quite a lot of infrastructure. For the dispersed sites to decarbonise, we are also going to need to build infrastructure. That might be pipelines or shipping. But it is going to be key in terms of the options that these dispersed sites have to decarbonise, whether we need to build pipelines for CO2, have more electrification or have better networks. If it is going to be hydrogen through the direct route that you explained before, that may also require that we have infrastructure for hydrogen or how that hydrogen is going to be generated.

It is clear that the 2020s are going to be crucial for us to start building that infrastructure and getting together those business models, with the right policy, and sufficient insurance of that policy, going forward so we can attract investment. The 2030s are going to give us a bit more of an opportunity for second or third-generation technologies that we have improved over the previous ones. We need to get things going in the relatively short term; that was my earlier message around the pace and scale. It is really the challenge that we need to look at here and focus on.

Nick Molho: I just wanted to stress the point that Dr Goater made about the circular economy. For many industries, there is scope for reducing emissions significantly by moving towards more resource-efficient business models. That is true in terms of input fuel. In Mr Pawsey's constituency, for instance, two of our members, Suez and Cemex, are working together to develop a fuel called Climafuel. It is a waste-based fuel that is essentially being used in substitution for coal. That is massively reducing the emissions of the Cemex site in Rugby.

We also need to think about the circular economy in terms of material reprocessing. That is the approach taken by the likes of Liberty Steel with its production of steel using recycled scrap. That is an area where we could do with growing our domestic supply chains, which have big job creation attached to them as well. Look at scrap steel, for instance. A lot of our scrap steel goes to Turkey to get reprocessed and then comes back to the UK. There is really scope for us to grow that circular economy capability within our supply chains a lot more.

On the points about dispersed sites, Professor Maroto-Valer made the important point about connecting those dispersed sites to the cluster infrastructure on CCS and hydrogen. That is important not just in terms of emissions, but also in avoiding market distortions. People do not always realise that a lot of different industries compete not just within the same sector but between material streams. For example, in construction it will be quite common for steel, glass and cement to compete to an extent against one another. You do not want those materials that come from dispersed sites to be at a disadvantage in terms of their access to low-carbon infrastructure relative to materials produced in sites that are within clusters. That is an important consideration going forward.

Mark Jenkinson: I agree that we can do much more with recycled steel. Obviously, that brings huge infrastructure problems when it comes to the infrastructure required for big electric arc furnaces, for example. I also read in a submission from the Materials Processing Institute to the company coal mine planning panel that something like 15% of our steel requirements cannot be produced from recycled steel in the UK. I think a lot of that is auto body. I am prepared to be corrected there.

Q16 **Charlotte Nichols:** My question is to Mr Goater. How much of a risk is there of carbon leakage now and in the future? What are the most effective ways that Government can address carbon leakage?

Dr Goater: Our assessment is that current policies have helped to protect companies from carbon leakage, along with what have been relatively low carbon prices. In the future, we expect carbon prices to increase. If there was not appropriate protection, there would essentially be a very substantial risk of carbon leakage. There absolutely is a need to have mechanisms designed to protect from carbon leakage.

One of the main mechanisms we have to protect against carbon leakage is the allocation of free allowances as part of the new UK emissions trading scheme, which has followed on from what was previously the EU emissions trading scheme. In the immediate term, that can continue to provide protection from carbon leakage. Over time, there will need to be a transition away from that approach. In the nearest term, there is a role for using taxpayer funding to allow us to both decarbonise and protect from carbon leakage. In the past, we have seen that companies have not fitted the more expensive technologies. When that is needed in the future—and they will come at a cost—taxpayer funding initially seems like the most appropriate way forward to allow companies to fit these technologies at a cost, without risking them being uncompetitive.

Over time, we do not expect the taxpayer to continue to pay for that decarbonisation, especially as more companies decarbonise. Over time, there will be a need to shift costs on to industry, and ultimately on consumers. That will require—this is a challenging area—policy on imported goods so that they are not able to undercut UK companies. That will involve either applying standards to imported products to ensure that they are of a low-carbon standard or using a border carbon adjustment mechanism to ensure that they also pay the carbon price on any carbon that has been produced when those goods were produced, so that there is a level playing field between UK and international goods.

Q17 **Charlotte Nichols:** You mentioned a carbon border adjustment mechanism there. What might the implications of an EU carbon border adjustment mechanism be for UK industry?

Dr Goater: This one will ultimately depend on how the EU's carbon border adjustment mechanism is designed. It is still going through its design process. My current expectation is that it will not have a substantial impact because the UK already has, or is setting up, a carbon price under its UK ETS. The purpose of the carbon border adjustment mechanism is to make sure that imported products are also paying a carbon price. Given that both the EU and the UK have a carbon price, I would not expect UK products to be subject to the border adjustment mechanism. Of course, we will have to see exactly how the final mechanism is designed and whether any friction is created. To my best understanding at the moment, I do not expect it to have a substantial impact.

Q18 **Charlotte Nichols:** This is my final part of this question, before I open it up to the other panellists for anything that they might want to add to what I have asked you. How should the Government use trade deals and

their role as COP 26 president to promote industrial decarbonisation?

Dr Goater: I will pick up on the need to have future policy on imported goods. There is important work to be done with the international community to help with this. First, we need to internationally agree on a way to measure the carbon footprint of goods, essentially so that we can say what good is, and what less good or bad is, to differentiate between products when applying policy to imports. That will require us to establish international measurement standards. Working with the international community and international standards organisations will be really important to help to establish those measurement standards. There will be an important role of bringing together the international community, whether it is using the COP presidency or G7, to help foster that development and a broader discussion around trade policies in these areas.

More broadly on trade deals, there is also the potential here to seek a commitment from other countries to pursue net zero and not to renege on their commitments under the Paris agreement. In the bigger picture, it will also help to ensure industrial decarbonisation.

Professor Maroto-Valer: COP 26 is a unique opportunity that we have. We need to make sure that we use this opportunity to build those international collaborations and links that are going to be key around areas of policy that have been set. It is also a unique opportunity for us to showcase how the UK is at the forefront of getting this policy, these business models and this technology together, and looking at this in a very holistic way that we do not see happening in many other countries. It is a good opportunity for us to continue building on all the international links that we have, but also put at the forefront all the good things that we are doing and how we can actively leverage them with other countries going forward.

Nick Molho: I just wanted to add to a few of the points that were covered in your three questions. Starting with the first question, it is worth stressing that there is a broader competitiveness issue that goes way beyond just carbon costs. It is around the electricity price and the differential between the industrial electricity price in the UK and in countries such as France, Germany and Italy. We are currently working on a report with UCL to understand that better and making concrete recommendations to close the gap.

We need to look at this as a key priority because it underpins this overall decarbonisation journey. We are going to need an awful lot of low-carbon, cheap electricity to decarbonise. Targets such as a 40-gigawatt offshore wind target for 2030 are really welcome, but we are going to really need to make sure we deliver that and go beyond. This will be fundamental to support electrification of industry, CCS and the production of green hydrogen. It is a really important topic not to lose sight of.

On the issue of the carbon border adjustment mechanism and how best to put that into practice, there is a broader strategic question that the Government need to think very carefully about. It is around the potential linkage between the UK and the EU ETS. Industry would favour it on the whole, especially if there was clarity around both sides of the markets aiming for net zero emissions by 2050. As long as there was consistency on the trajectory, that could be beneficial. It would create a broader market in terms of carbon trading. It was interesting to see just last week that the price of carbon in the EU ETS had significantly increased to just over €50 per tonne of CO2, which was more than double where it was back in March 2020.

On the issue of product standards that Dr Goater highlighted, we are strong believers that product standards that drive down embedded carbon, but also improve resource efficiency in industrial goods, could be a gamechanger, in sending a very clear market signal while creating a level playing field for a wide range of industrial goods. We would clearly support that.

This clearly links to the UK's trade policy. Our new trade agreements give us the opportunity to ensure, as Dr Goater said, that products that come on the UK market have to comply with those standards. They are also an opportunity to promote those standards abroad. In many ways, it is the holy grail. If we can develop some of those low-carbon product standards in the UK and promote them through our trade deals, which would really help to support the exports of UK low-carbon goods, we should put that at the heart of our trade policy.

Just to finish off on the COP issue, one thing that slightly surprised me in the Government's priorities for COP 26 was the lack of focus on green recovery. You may have seen two or three weeks ago that the International Energy Agency published a report showing that a lot of the initial stimulus investments that had been made around the world were not aligned with the goals of the Paris agreement. We urgently need a global commitment to aligning stimulus investments and recovery policies with the 1.5-degree goal in the Paris agreement. In addition to the very important objectives that the Government have already outlined for COP 26, I would make commitment and collaboration on how to deliver green recovery a priority over the next four to five months of negotiations.

Q19 **Charlotte Nichols:** I have one last question. It is going to be a bit of a meaty one because I was going to ask it in two or three questions, but I realise that we are getting to the end of our allotted time for the session.

If you could bear with me, Nick, this is a question for you. You have touched on some of this already, so it is just if you want to add anything on these points. What effect will delivering industrial decarbonisation have on consumers? How can costs most fairly be shared between industry, Government and consumers? You touched on the point about standards in your previous answer. I am interested to know whether voluntary standards and product labelling are sufficient to develop a

market for low-carbon products, and whether consumers will want low-carbon products if they are more expensive than higher-carbon ones. If you want to add any points on those aspects, that will be really helpful.

Nick Molho: No problem—I can answer that briefly. On the issue of cost, although on current estimate there is an increase in the cost of producing green steel or green cement, when you look at the impact on the end consumer in terms of an integrated product, the impact on cost is quite minimal. Just last week, Agora Energiewende and the Cambridge Institute for Sustainability Leadership published a report that estimated that the cost of producing green steel or green cement could be delivered at an abatement cost of around €100 to €130 per tonne of CO2. This means in practice that it would increase the cost of a €20,000 car or a €500,000 home by only 1% to 2%. Once you go from the production of the raw material to the integrated product, the impact on the final cost of that consumer product is quite minimal. That is based on today's estimate.

That leads me to the more important point here on costs. Ultimately, the extent to which we manage to reduce the cost of decarbonising heavy industry and producing low-carbon industrial goods fundamentally depends on the next steps we take on innovation and the policy package that we put in place. If you had interviewed a range of energy sector CEOs 10 years ago and asked them whether it would be a good idea to base a significant part of the UK power sector around offshore wind, the vast majority would have said it was a bad idea because of the perception of the cost of offshore wind 10 years ago.

We move forward 10 years and the cost of offshore wind has more than halved. In fact, some projects came out of the last auction at about a third of one of the first projects in the first auction we had a few years ago. We are now looking at multiplying offshore wind capacity by four in the space of a decade because it has become so much more technologically advanced and cheap. The challenge ahead of us is to do the same thing for industrial decarbonisation.

Voluntary standards and voluntary initiatives have a role. In fact, the Climate Group has an interesting initiative called SteelZero that gathers a range of companies, including some of our members such as WSP and Ørsted. It is all about committing to buying or procuring zero-carbon steel by 2050. Those initiatives have a role in stimulating the market, but you cannot base an industrial decarbonisation strategy on voluntary standards. You will always need mandatory standards, at the very least, to make sure that there is a clear floor that drives decarbonisation. Voluntary standards can work in conjunction with mandatory standards. The mandatory standards can be more about driving the floor and making sure that the bulk of industry follows the pioneers, while voluntary standards can allow some of the pioneer businesses to go above and beyond and drive the market even further. You can see both potentially working in combination.

On the issue of consumer demand, our ongoing work with Frontier Economics on our industrial decarbonisation project is showing us that there is a really growing demand for low-carbon industrial products at the business level. We are really seeing that taking off. Initiatives such as the Climate Group's SteelZero initiative show that there is really a demand for those products. If we can really minimise the costs of production of low-carbon industrial products on top of that, the future will look quite bright from that perspective.

Q20 **Chair:** This is a very quickfire question before we wrap up because we ran over. On a scale of 0 to 10, 10 being "the strategy gives you everything you wanted," 5 being "a good start, but more work to do," and 0 being "completely hopeless", what is your conclusion on the industrial decarbonisation strategy?

Dr Goater: Can I ask you to wait until our progress report is published in a month?

Chair: You can.

Professor Maroto-Valer: I will give it a high mark because it has set us on the right path to things, particularly around the clusters.

Nick Molho: I will go for a 6. The strategy touches on the next steps, but now everybody needs to look into those next steps in further detail. If your Committee does a follow-up inquiry to look at industrial decarbonisation in more detail, focusing on what the next policy levers and innovation commitments should be would be a great thing to focus on. Another issue we have not touched on is the role of Treasury. The innovation funding commitments and policy mechanisms that we are going to require to drive private investment will all require long-term Treasury backing. Looking at the role of Treasury and the net zero review as part of that will be really important.

Chair: Thank you so much to all three of you for your time and your answers this morning. Thank you to colleagues and Clerks on the Committee for organising today's session. For now, we bring today to an end.