HOUSE OF LORDS

Economic Affairs Committee

Corrected oral evidence: UK energy supply and investment

Tuesday 22 March 2022

3.35 pm

Watch the meeting

Members present: Lord Bridges of Headley (The Chair); Viscount Chandos; Lord Griffiths of Fforestfach; Baroness Kramer; Lord Livingston of Parkhead; Lord Monks; Baroness Noakes; Lord Rooker; Lord Skidelsky.

Evidence Session No. 9 Heard in Public Questions 133 - 145

Witnesses

I: Professor Michael Bradshaw, Professor of Global Energy, University of Warwick; Simone Tagliapietra, Senior Fellow, Bruegel; Dr Jack Sharples, Research Fellow, The Oxford Institute for Energy Studies.

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Examination of witnesses

Professor Michael Bradshaw, Simone Tagliapietra and Dr Jack Sharples.

Q133 **The Chair:** Good afternoon and welcome to this second session of the Economic Affairs Committee. It is very good to welcome you all here. Maybe you could introduce yourselves, starting off with Professor Bradshaw.

Professor Michael Bradshaw: Good afternoon, I am from Warwick Business School where I am professor of global energy. I am also the co-director of the UK Energy Research Centre, UKERC.

Simone Tagliapietra: Good afternoon, I am a senior fellow at Bruegel, the Brussels-based economic think tank, as well as an adjunct professor on energy and climate policy at the Johns Hopkins University SAIS Europe and the Catholic University of Milan.

Dr Jack Sharples: Good afternoon, I am a research fellow on the gas research programme at the Oxford Institute for Energy Studies, with a particular focus on the supply-side dynamics of the European gas market.

The Chair: Just a couple of boring housekeeping logistics: if you could, given there are three of you, try to keep your answers as brief as possible. Forgive me, but there is obviously a lot to get through so apologies in advance if I cut you off. Secondly, I say to my colleagues, if when they ask a question they can direct it at one of you, that will help let us all know who is meant to answer each question.

We were hearing in the last session—I do not know if you heard it—one of our witnesses saying that there is a danger that the Government risks turning off fossil fuels and the energy security that they bring before having a reliable and affordable source of energy to take its place. Do you think that the UK Government—and obviously we are focused on the UK Government here—have factored in energy security sufficiently into strategic planning over the last decade, as we have made the move towards a more renewable future? Let me ask that to Professor Bradshaw to start off with.

Professor Michael Bradshaw: It depends on what you mean by "energy security". There are a host of definitions, and I revisited Malcolm Wicks's report on energy security in the last day or so, and he distinguished between physical security—do we have enough gas, do we have enough electricity?—price security—is it affordable?—and geopolitical security—are we dependent on particular nations? That is problematic. In the current context that is probably an interesting way of looking at it.

It is probably fair to say that the Government are focused the most on physical security of supply, and if you look at reports produced by Ofgem and BEIS every year on their *Statutory Security of Supply*, we basically have enough pipes and we have a relatively diverse source of supply. But

then they simply say we rely on market forces to ensure that we have the energy that we need.

The challenge is around price security. Essentially we have ended up privatising, marketising and outsourcing our energy security. But that is a model we also exported to Europe, so we are all in this together

On the question of managing the transition, my concern is how you manage the downsizing of the fossil fuel sector at the same time as you build up the renewable clean energy sector. We have not had a strategy, for example, for managing the changing role of gas, which has changed quite significantly in the last decade or so, coming back up to intermittent renewables. I think there is a lot of work to be done, first, to think through our reliance on the market for security of supply and, secondly, to think through the challenges posed by the energy transition.

Simone Tagliapietra: Europe over the last years has not duly taken into consideration the issue of energy security; namely, the issue of gas security of supply. This was an issue that was high on the agenda in 2006, 2009, and again in 2014 after the annexation of Crimea by Russia, but certainly over the last years—at least after 2018—this issue has decreased in importance and in the priority of European Governments in general, and the EU also. The focus on decarbonisation has put this item further down the policy agenda.

Now, at the European level, we keep seeing a high reliance on Russian gas and Russian oil, which testifies how this issue has not been tackled sufficiently. The historical challenge for Europe overall will be one of delivering in some months—maximum a couple of years—the historical endeavour of switching away from Russia, which we did not accomplish in the past 10 or 20 years.

Dr Jack Sharples: A useful contextualising comment to add at this juncture is when we speak about physical security of supply it is quite clear that we are predominantly speaking about oil and natural gas. With oil obviously it is very clear that its predominant use in the UK is as a transport fuel and, to a lesser extent, in industry. For gas, as Professor Bradshaw has already mentioned, this is our back-up for renewables but also four-fifths of households in the UK use it for their space heating and hot water and we use it for high temperature process heat in heavy industry.

When we talk about our physical supply and how we may reduce our dependence on that, this is very much a multifaceted challenge. In terms of what has been achieved over the past decade, I think the UK is no different from the rest of Europe in that we have been picking the low-hanging fruit of rolling out renewable power generation at scale but we have not tackled the use of natural gas, for example, in households through the rollout of heat pumps. We have not tackled locational power generation and solar panels on the roofs of people’s houses. In terms of what could have been done, for the last five years at least, there is no

reason why new-build houses in the UK should not have all been built with heat pumps and solar panels just as standard.

Finally, the challenge of addressing our dependence on gas in the industrial sector—that is going to come back to our development of hydrogen, as discussed earlier in the session, because in certain industries where you require high temperature process heat, it is quite energy inefficient to do that with electricity.

When we discuss what has been done and what could be done, we need to keep in mind how we use the fuels and how they may be most efficiently replaced.

Q134 **Lord Griffiths of Fforestfach:** I would like to dig deeper into the issue of energy security on oil and gas but in a geopolitical context. Among potentially the leading suppliers—Qatar, USA, Saudi Arabia, Iran—do you think there is the willingness to enter into some sort of relationship, be it co-operation or integration or a framework or diplomacy? Can you just unpack that issue?

The Chair: Who do you want to ask that to, Lord Griffiths?

Lord Griffiths of Fforestfach: I would like to address that to all of you. You all started with very interesting questions because mine is, in a way, an addendum to what the Chairman just asked you.

The Chair: Maybe we should take it in reverse order. Dr Sharples, why do you not start?

Dr Jack Sharples: My expertise is in the sphere of natural gas. You are absolutely right to note Qatar and the United States as two of the world leading suppliers of liquefied natural gas, to which we also may add to those ranks Australia.

In terms of any agreements to secure supply, this is effectively a market; no exporter will offer us gas below the market rate. If we wish to secure the supplies physically, then we need to sign long-term contracts and take the volume risk inherent in that and accept, as well, that we are exposed to the pricing dynamics of the global market. So I think this is very much being done at a company-by-company basis. Intergovernmental agreements can smooth the way for that but I cannot foresee any intergovernmental agreements or co-operative agreements that would secure access to energy supplies below the prevailing market prices.

Professor Michael Bradshaw: I largely agree with that but these are different types of producer economies, as the IEA calls them. There is a big difference between the United States and the others in the sense that the others have national oil companies—or gas companies in the case of QatarEnergy—so there is a very close relationship between the state and the oil and gas industry itself. That does create space for energy diplomacy. There have been reports in the media about the German Government talking to the Qataris. It was also reported last autumn that

the UK Government have been in discussion with Qatar. But it has to be a business relationship that makes money otherwise it presents an opportunity cost to the resource-holding state.

The United States is a very different situation. It does not have a national oil company, for a start, and it is not in the gift of the Government in Washington to tell the oil industry what to do. One of the big questions at the moment, and we saw this at the oil and gas conference in Houston the other week, is how quickly and whether the oil and gas industry—particularly the light tight production in the United States—will respond. We have to bear in mind, if you go back to pre-pandemic, that this industry was hit by dramatic reductions in price and laid off a lot of workers in rigs. But there has also been a tightening of the purse strings from the financiers who do not want to necessarily lose any more money, but equally those financiers are increasingly concerned about environmental, social and governance issues—ESG. It is very uncertain as to whether the finance will come from the private sector to allow the rig count to go up and people to start drilling, added to which those companies have already said that they are more interested in paying off debt and returning to investors than they are drilling lots of wells.

It is not a game of chicken, but it is unclear how quickly the US sector can respond to this opportunity. We have huge volatility here. One of the benefits of light tight oil is its short cycle. You can turn it on and off but they would be wary about all rushing in again; billions have been lost in the shale industry in the United States over the last decade. They want to avoid that.

Saudi Arabia has already said Aramco has talked about increasing production. Of course, Iran is currently still under sanctions but has capacity to increase production.

The Chair: I am just going to jump in. Lord Livingston, you have a very quick question.

Q135 **Lord Livingston of Parkhead:** A very quick question, Professor Bradshaw. Just to clarify, from recollection the US did not actually export gas at all; it was very local until 2014, 2015, if my recollection is right. It is very much a domestic market there and they do not have the export capability. The US market is almost a very different market from looking at Qatar or anywhere else with the skilled export capabilities. We are getting some now but there is a lack of ability to export very large amounts at the moment.

Professor Michael Bradshaw: There has been a very rapid expansion in US LNG export capacity, and if you look at LNG imports into the UK you do not have to go back very far to find Qatar providing 90% of the LNG that we import, but most recently the United States has raced up the polls to second place. Ironically Russia was providing added diversity. I think you will find that there is quite significant capacity. Most of that gas has been going to Asia because they will pay more for it but, of late, the European market has had a higher price even and so gases come here.

There is more capacity being built. When it comes to natural gas there is a capacity to export it and of course the US Government changed the rules on exports of crude oil but they are not a major player in the way that they have become with LNG.

The Chair: I will bring in Simone to answer Lord Griffiths's question and then Lord Griffiths will come back.

Simone Tagliapietra: I think energy diplomacy will increasingly play a very important role because market dynamics will remain, are important, and so on, but there is here an increasing role of Governments to be played. From the European Union perspective there are many things ongoing. The EU will start to possibly purchase gas jointly as an EU 27 altogether, in order to increase its leverage over producers and its negotiating power. It will move together towards producers in order also to avoid fragmentation, which we are currently seeing because we see European Ministers lining up in Qatar to talk to the Emir, and in other producing countries in order to try to secure additional volumes of gas in the coming months and years. But for the historical challenge of filling up the storages in Europe during the spring and summer potentially without Russian gas, Europe will propose in April to do that jointly.

The European Commission, for example, has already talked to Japan, to South Korea, and to big Asian consumers of LNG, to try to understand and to secure from them certain LNG cargoes that they might be redirecting to Europe in case of an interruption from Russia.

Again, the transatlantic relationship here is very important. It is true that in the US the Government cannot dictate of course to private companies where to sell the gas. But it is also true that there are ways that the Federal Government can use to incentivise and gently ask them to prioritise the European market. We need to consider that they are among the big players in this space. We have European companies that buy LNG with portfolios, and can direct the cargoes to different markets.

I think we will increasingly see a role of Governments in this space and this will certainly increase should the Russian gas flows to Europe be interrupted.

Q136 **Lord Griffiths of Fforestfach:** A simple technical question: let us say Germany makes an agreement with Qatar, Qatar will supply oil to Germany or natural gas, and in return Germany would give some defence support to Qatar and the price of oil would be below the market price. What I have understood, as a complete lay man, so far is that there is this big pool of European oil. What exactly happens to that oil that goes from Qatar to Germany? Does it stay with Germany or does Britain maybe get some of it as well?

The Chair: Are you talking oil or gas, sorry?

Lord Griffiths of Fforestfach: Either.

The Chair: Who would like to answer that? Maybe just one quick answer

maybe from Professor Bradshaw. Would you like to pick that up?

Professor Michael Bradshaw: Just a quick example—one of the problems is that Germany does not have any LNG import terminals at the moment. It has to build those. If you take the example of the UK, QatarEnergy owns one of our LNG terminals. We have three LNG terminals and we have been having record deliveries of LNG from the United States, in particular—not so much from Qatar. But because we do not have a lot of storage in the UK, that LNG is coming into the UK and transiting through into Europe and being used in Europe and perhaps helping to replenish storage in Europe. That is not a problem in itself, but it does point to a problem.

Jack could perhaps back me up on this or not: if we approach the LNG market, think of it as a giant bathtub. That is all the LNG that will be available next winter. You have all these players who want that LNG. It is a zero-sum market. In other words, if Europe bids and attracts that LNG away, other buyers suffer. We are essentially exporting our gas in security.

Japan, South Korea and China can perhaps outbid us but there are other market players that cannot—Bangladesh has already suffered. We need to think about the fact that it is not about trying to solve a European problem— and it sounds like individual EU states have been trying to solve their own problem. We have a zero-sum game in Europe but also globally. This does need greater discussion. The Japanese did set up a producer consumer forum to discuss these very issues. That is probably a more constructive way of dealing with it than this current situation of a mad scramble.

Q137 **Lord Monks:** I think this is a question for Simone, for a non-British view of what the UK Government have been saying quite volubly in recent weeks, that the UK is less dependent on Russian gas than many other European countries. But the question arises: do we have greater energy security than other European countries or will our decentralised and rather privatised model be dependent upon spot markets? Is that a weakness in our security arrangements, which could come to haunt us? What are your views, Simone, of the British position on security of supply and security of price?

Simone Tagliapietra: My view as an EU citizen is that the UK is way better off than the EU in this moment. I would love to depend more on Norway than on Russia. You need to consider that there are countries in the European Union that import way more than 50% of their gas from Russia—Germany 50%, Austria 65%—not to talk about the eastern European countries where you also get to an 80% rate. Certainly these situations are now very delicate and finding a replacement for these big volumes coming from Russia is very difficult. The same goes for oil. As you know, the EU imports from Russia around the 25% of the oil it consumes, which is certainly not the case in the UK. This is the reason why the UK could announce a phasedown of the energy supplies from Russia this year, but this is not possible to be announced in the EU so

easily, and that is why, for example, the German Government have been saying very clearly, "Look, we cannot go for an energy embargo on Russia because otherwise, as the Chancellor said, we would put at risk the peace of the Republic".

For Europe this is a very difficult conversation. In my view, the European energy embargo on Russia will not materialise any time soon but what we will be seeing possibly is the introduction of a punishment tax on Russian oil and gas exports to Europe—in the form of a tax or a tariff—in order to limit the rent of Mr Putin out of these energy exports to the European Union.

Professor Michael Bradshaw: I am sure Jack will probably say the same thing—that we are not isolated from prices security. In some sense we are between a rock and a hard place because we have to compete with Europe and we are exposed to any gas price risks in Europe. We also have to compete on the global LNG market. Physical security, geopolitical security—yes, we are not overly dependent. We can move away but those same price signals are hitting us.

Dr Jack Sharples: Just to build on that. I absolutely agree with the comments made by both Professor Bradshaw and Dr Tagliapietra. For the UK, out of all the gas that we consume in a given year, in very big bold round numbers, we produce about 40% of what we consume every year and we import about another 40% from Norway, and then the last 20% we get from the global LNG market. But we are very much connected to the European market. We are physically connected to the Netherlands and Belgium by two interconnected pipelines. We have a national trading hub called the National Balancing Point. The Dutch equivalent, the Title Transfer Facility, is effectively the benchmark price in north-western Europe. So if the UK price is at a premium to that on the TTF, then traders will buy gas on the TTF in the Netherlands and ship it to the UK, and then sell it here at a profit. If the TTF price is higher than the UK price then they will buy gas here in the UK and ship it to the Netherlands and again sell it at a profit.

The reason this matters is that that mechanism keeps the UK wholesale gas price broadly in line with that of north-west continental Europe. Even though we are physically less dependent on particularly Russian gas than the rest of Europe, in pricing terms we are very much locked into any development on the European market. So when we come to the question of Russian supply, as Dr Tagliapietra was discussing, when that has a price impact we feel that impact as well.

Q138 **Baroness Noakes:** I have a UK-based question, which I think is for Professor Bradshaw and Dr Sharples. Is there a case for the UK Government to encourage more exploration and extraction of domestic oil and gas in order to improve our physical security? I accept it will not necessarily make much difference from an economic perspective. Would that make a significant difference to our physical energy security? Do you want to start, Professor Bradshaw?

Professor Michael Bradshaw: With the proviso that I am not an oil and gas expert in terms of the North Sea, but I have followed the policy structures and the current debate. The Oil and Gas Authority I think has just changed its name this morning—it is now called the North Sea Transition Authority—but we have a policy of maximising economic recovery. We have had some success in slowing down the rate of decline and stabilising production. But the North Sea is a mature basin. Most recently of course the Government have been concerned about the compatibility between maximising the economic recovery and net zero, and it has been consulting on this climate compatibility check.

There is a difficult trade-off here between encouraging new investment in the offshore and trying to meet our climate change targets. I accept that at the moment perhaps energy security trumps climate change concerns in an emergency, but we need to think about the longer-term consequences. Discussions around fields that could be revisited, and fields that are already being planned to be developed, are very different from a wholesale investment. They are talking about new licensing rounds. As I say, I am not enough of an expert to know if that will make a difference, but we are a mature basin and there are no easy finds out there, I do not think.

It may be more effective to focus on energy efficiency, demand reduction and electrification to constrain demand for gas more rapidly than seeking to bolster production. I think the two go hand in hand. Energy security tends to focus on supply rather than demand, and maybe demand reductions can happen much more quickly.

Dr Jack Sharples: I would absolutely agree. There is possibly one caveat, which is that up until very recently we were planning, of course, for a Europe-wide energy transition in which we would effectively have access to all the gas that we might possibly need and then, at a later date, we would choose to buy less as we ramp up our deployment of renewable sources of power generation but also reduce our gas demand through energy efficiency and heat pumps and so on.

What has been a real game changer is effectively the war in Ukraine and our shifted position now with regard to Russian gas imports. I will give you a sense of the scale. Even though the UK is not particularly Russia-dependent, the European Union imports about 90% of the gas that it consumes, and around 45% of that comes from Russia. But, as you will have seen, on 8 March, the European Commission published its plan to try to dramatically scale down European imports of Russian gas.

To bring this back to Professor Bradshaw's comments, we can think of not only the global LNG market but the European gas market as a whole again being like a giant bathtub. When you take a substantial portion of supply off the market, you are going to tighten the market and you will have higher prices. We thought that we did not perhaps need to invest so much in exploration production over the next decade, because we would effectively have all the Russian gas just sitting there nicely for when we wanted it as we gradually decline our demand. If that is going to happen

more quickly than we ever imagined for geopolitical reasons, then I think there is possibly a case to be made for saying, "Okay, we may need to try to sustain European production for a little bit longer than we thought we may otherwise have to". I would just add that as a bit of a caveat.

Baroness Noakes: Is there a case for the Government revisiting their policy on fracking?

Dr Jack Sharples: For that I will defer to Professor Bradshaw because I know he has some quite well-developed opinions on the subject.

Professor Michael Bradshaw: Yes, I am involved in a four-year research programme funded by NERC and ESRC on unconventional hydrocarbons in the UK energy system, and we are three and a bit years in. We have been looking in considerable detail at the possibilities of shale gas in the UK; of course, that is now under a moratorium because of the issues of seismicity.

We have been thinking about what have we found out from this. Our position is not for or against. This is the evidence if you like. I think there are a number of factors that would lead us to think that shale gas is not really part of the solution. First, they are geological in the sense that it has become increasingly clear that the UK's geology is very different from that of the United States and using the US as an analogue does not really work. The geology itself is more complex. There are greater issues around induced seismicity—in other words, triggering earthquakes from hydraulic fracturing.

Secondly, geology suggests that perhaps those initial estimates of the amount of gas in place are overly optimistic. If you turn to the economics of it, we do not have any proven reserves of shale gas in the UK today. We have an estimate of gas in place, how much gas is potentially in the rock but not how much gas we can get out at a level that is commercially profitable.

To do that we need to have an exploration programme, and we had only got three wells in and triggered two earthquakes and two moratoriums before the whole thing was brought to a halt. The industry suggests to drill 20 to 40 wells across a range of geologies to arrive at some meaningful reserve estimate, which will take time.

The final part of the puzzle is that again if you look at public attitudes and the views of communities impacted by shale gas, public support has been declining in terms of support for shale gas. This is evident from the Government's own surveys and surveys that we have collected. But equally we know from work in affected communities, they still remain deeply unhappy about the possibility of shale gas being something that comes to their community. More generally, I think, the population are concerned about how developing a newer onshore hydrocarbon, like shale gas, sits with climate change and net zero. If you add all those concerns up then you say it is very difficult for the industry, and it needs to have hundreds of pads and drill up to 2,000 wells to get to a significant

production, to gain the necessary pace and the scale needed to make a material difference.

The Chair: Can I just jump in? On a point of fact, as you understand it given all the research you have done, how long would that all take, all those extra wells? Just briefly. I am sorry to ask you to be brief.

Professor Michael Bradshaw: The industry organisation themselves, UK Onshore Oil and Gas, have produced their own study of how long all this would take. it depends how rapidly you get through the planning process because that slowed it all down. But if you think about that initial exploration phase, and that it will take two to four years to get through drilling those wells—and that is I think very optimistic—you are looking probably at another seven years to get to a significant level of production and, by their own figures, 17 years to get to maximum production. This is not something that will be delivered this decade.

Q139 **Lord Skidelsky:** We have been talking entirely about security in this session and I thought Professor Bradshaw made a very interesting distinction between physical security of supply and geopolitical security. I think that is very important. In focusing so much on security and developing independent secure sources of supply, are we not missing the larger picture? That is that we rely on global co-operation to secure the reduction of carbon emissions that we are looking for. If you start punishing countries for political crimes, how much are you encouraging them to co-operate with you in the wider reduction in global supply of fossil fuels?

Do you see any contradiction between going for greater energy security and achieving greater global co-operation in fighting climate change? Professor Bradshaw, perhaps you could start that, because you introduced the distinctions between different kinds of energy security.

Professor Michael Bradshaw: You make a very good point and if you analyse all the various scenarios out there which achieve a degree of climate action, particularly those that are compatible with the Paris target of 1.5 degrees, they all rely on a very high level of international co-operation. So that certainly is an area of concern. Even before recent events, it was questionable that there was that necessary co-operation. The position of fossil fuel producer economies was particularly challenging here. We saw them flexing their muscles at COP 26 and, although we did talk about phasing down coal, we were not able to be as aggressive about that.

We do need to see the world from their viewpoint and understand that we need to manage a transition. The challenge here is that managing that transition—managing a reduction in fossil fuels in a way that does not cause too many problems for current producer economies—also requires co-operation. I think we are in a Catch-22 when it comes to trying to deal with this problem. Maybe we need to be more realistic when it comes to what we think climate change negotiations can achieve, and perhaps we need to understand the fact that different parts of the world see these

issues as very different. Emerging economies see them really about security of supply to support economic growth. Of course, the forgotten people here are the global south—the people without access to modern energy and secure electricity. They again will be very early losers in this current price crisis. I think the point you make is important.

To get that co-operation, we need to understand a multitude of perspectives when it comes to energy security and climate change, not just the way we view it in the OECD.

Lord Skidelsky: I would like to ask a question of Professor Tagliapietra. Do you think it is a good idea to punish Russia with tariffs?

Simone Tagliapietra: Honestly, yes. The EU pays Russia every day around $400 million for the gas we get from Russia via pipeline, and the oil revenues of Russia are even higher. So it is clear that given the financial sanctions that have been put on Russia so far, this currency is now a lifeline to Russia and it is a major source of funding for the war.

I think having a tariff on these energy flows to Europe would be a way to limit this rent and therefore put Russia in an even more difficult situation, and of course also depriving Putin from a major source of funding for the war itself, as long as the situation in Ukraine stays as what we see every day. So I think it is a good idea and the EU should move in that direction as quickly as possible.

Having said that, there is a case for Europe to emerge from this war crisis by accelerating the energy transition because now it has become clear, at least to the Europeans very well, that energy efficiency, energy savings, and renewable energy are things that will make us more independent and more resilient, vis-à-vis what is happening in producing countries with of course the current situation.

In the short term, unavoidably Europe will need to scramble to get additional volumes of gas from energy producers and so on, but possibly reopen coal-fire powered plants, as an emergency plan for the next year or two. There is no doubt that there will be a double down on the green transition. The German Government have already announced a plan to fast-track renewable energy in order to get to a full renewable electricity system by 2035, for example. Italy is following suit. Other countries are going in that direction and certainly this will happen because, as the German Minister of Energy said recently, for Europe renewables are the energy of freedom, and that makes a lot of sense, which opens up other geopolitical questions.

The Chair: We will come on to that in just a second. I know that Lord Rooker and Lord Chandos wanted to ask very quick questions.

Q140 **Lord Rooker:** A very small supplementary question. As part of the background reading for this committee and the notes, I have been astonished to learn how much oil Canada has—the third largest deposits. Joe Biden closed down the pipeline. They are a country that we do not fall

out with, like the Middle East or Russia. I do not conceive that we would have disputes with Canada in the way we would have with other countries. Why does not Canada figure anywhere, given that it has these massive reserves of oil?

The Chair: Maybe Dr Sharples would like to answer that, just briefly.

Dr Jack Sharples: I can see Professor Bradshaw had his hand up.

The Chair: Sorry, Professor Bradshaw, I missed you. Quick answer.

Professor Michael Bradshaw: Those oil reserves are significantly bolstered by a very large amount of oil sands; unconventional oil. They need to be treated with extreme caution. That is expensive oil. It is also environmentally very damaging oil to produce.

The bigger problem they have is they do not have pipelines to get the oil to market because you said, quite rightly, the Keystone XL extension to the south is not there and there have been huge arguments over getting the oil out west via Vancouver. They are sitting on a lot of unconventional oil. There is a huge debate going on in Canada about this very issue at the moment. It is not a potential to realise any time soon, I do not think.

Q141 **Viscount Chandos:** Could I just follow up on Dr Tagliapietra's suggestion of a windfall tax on Russian gas imports? It is seductive, it maintains supply and still punishes Russia, but is it realistic? My understanding is Europe has primarily been buying short term rather than on long-term contracts but, either way, why should Russia accept essentially a reduction of 50% or whatever, in the price that they receive relative to the market? Surely it becomes another game of poker between Europe, that desperately needs the gas, and Russia that has it.

Simone Tagliapietra: At Bruegel, we have been finalising yesterday a study, with Ricardo Hausmann at Harvard and colleagues, exactly on this proposal. The key answer to your question is the inelasticity of Russian oil and gas supplies. Russia simply cannot redirect anywhere the gas it sends to the European Union. 90% of Russian gas exports go via a pipeline and they cannot move these pipelines. Last year they exported to Europe 155 billion cubic metres of gas; they exported to China 16 billion cubic metres only via the Power of Siberia pipeline.

In order to scale up supplies to China, Russia will have to build infrastructure connecting the eastern gas infrastructure serving the European market and the one serving the Chinese market that will have to build up new pipelines, which will take many years. If you look at all the projects that Russia is developing for the Chinese market, they will possibly, by 2030 only, send to China around 90 billion cubic metres of gas, which is still way below what they send today to Europe. Even if Europe put tariffs on this gas, Russia will keep sending the volumes because otherwise they will have nowhere to send this gas.

It is true that oil is more a global market, you can move oil more easily around because of the infrastructure—they mainly ship the oil and not

use pipelines—but again there are bottlenecks in the infrastructure because Russia will have to build pipelines to connect the eastern oil fields with the western ones serving the port that then allow them to ship to Asia. They will have to redirect oil exports via shipping that will entail also higher costs for Russia. We also need to consider that the Chinese oil refineries might not be able to get all this Russian oil because crude oil has several qualities. There is not such a thing as a uniform crude oil. There are several qualities of course. The Russian oil quality is what the European refineries have been fine-tuned to work with in the past and China might not have all the refining capacity to treat this Russian oil.

So there are several bottlenecks according to which, even for oil, it will be difficult. Think about self-sanctioning. Companies are already refusing to take up Russian oil because they do not want to touch it and the International Energy Agency said that next month 3 million barrels per day might not find a buyer for Russia.

The Chair: Thank you for such a fulsome answer to that question. I will move on to Lord Livingston.

Q142 **Lord Livingston of Parkhead:** One of the advantages of renewable energy is it is more secure because you produce it at home, or largely so. Something we were coming on to, that the Chair stopped because we want to do it in more detail now, is that is fine but are you not moving from one type of reliance on Russia and countries like that to another type of reliance on rare earth minerals largely either produced in China or particularly processed in China? I know that the European Raw Materials Alliance has been set up by the EU, and also that Simone Tagliapietra was very keen to talk about it. Two things, if I can start with you in terms of your thoughts about that and what the implications are of it.

Simone Tagliapietra: This is a major political challenge for Europe but also for the United States, for the UK, for all the OECD countries. We depend on China for the raw materials we need for green technologies—also for digital technologies—because China has been setting up the processing of these raw materials over the last decade. Even if some of these raw materials you find in specific countries, such as cobalt in the Democratic Republic of Congo, and so on, still the processing happens in China. For example, the European Union imports more than 65% of the raw materials it uses from China, and this is a serious question.

Lord Livingston of Parkhead: What is the answer to the question?

Simone Tagliapietra: The answer to the question is industrial policy. We need to develop research and innovation to find substitutes for these minerals in these technologies—for example, new generation of batteries that will require less amount of raw materials. So research and innovation is one thing.

Secondly, we must develop domestic supply chains, develop domestic processing capacity to treat these materials and then, of course, diversify as much as possible the supply of these materials away from China.

These are the three actions that the Government can take in order to lessen the dependency on China for these raw materials.

Lord Livingston of Parkhead: When you say "domestic" do you mean in countries—so Germany has one, the UK—or do you mean friendly nations, so US, Canada?

Simone Tagliapietra: Both. For example the European Union, with that alliance that you mention, also wants to start looking into domestic mining if and where the minerals are geologically available in Europe but then there is the issue of the processing. Another very important point is to build up the circular economy. The more we recycle these minerals the less we will need to import them. The recycling of these minerals is very important for the geopolitical perspective but also, for example, to lessen the carbon footprint of electric vehicles, for example.

Lord Livingston of Parkhead: Can I just ask Michael Bradshaw and Jack Sharples: first, do you agree with the thesis and, secondly, is the UK doing enough and if not what should it do?

Professor Michael Bradshaw: In general, I do but I had another comment as a follow-on. BEIS has created relatively recently a critical materials expert panel and the British Geological Survey has long had a role in terms of surveying the availability of critical materials. This is not a new issue; it goes back to the Cold War, because many of those materials are important for the military industrial complex.

The other comment I would make is we probably need to broaden it out because critical materials are only part of a bigger issue, which is around the geopolitics of renewable and clean energy. Of the two other examples, one is increased reliance on electricity interconnection. It may sound a trivial point, but it is not that long ago the French Government threatened to switch the power off to Guernsey because it had a squabble over fishing rights. But that just gives you the example that electricity interconnection is just like gas pipelines. Fixed infrastructures: it is electrons rather than molecules.

The other example I would give is the growing interest in international trade in hydrogen. If you look at some of the hydrogen strategies among European member states, particularly Germany, they are planning to import hydrogen. International trade in hydrogen is no different than trade in LNG. We need to understand that the low-carbon transition is not free from energy security and geopolitical challenges. We need to understand what they are and perhaps manage them better than we have managed those associated with the fossil fuels, because unfortunately this decade we have both. We have not got out of our reliance on fossil fuels, and we are beginning to be concerned about the geopolitics of renewables and low-carbon energy. It is a broader awareness that we need to develop.

Dr Jack Sharples: I would agree with the comments of my colleagues but I would add a caveat. When we talk about substituting dependence

on countries like Russia for fossil fuels with dependence on countries like China for raw materials—for example, for the construction of wind turbines and solar panels—there is one important distinction. If you have a gas-fired power plant you need a continuous supply of gas in order to continue generating electricity from that plant. If you build an offshore wind farm, once it is in place then that will keep—you might not be able to build any more if your supply of raw materials is interrupted but the infrastructure that you have will continue generating electricity. The implications of dependency are rather different between the two.

The Chair: We will suspend just for a few moments.

Sitting suspended for a Division in the House.

On resuming—

The Chair: Welcome back, sorry for that brief intermission. There may be some further bells.

Q143 **Lord Rooker:** Is there a case, from a security point of view rather than economic point of view, for the Government to invest more in energy storage facilities, whether it is gas, hydrogen or batteries? In terms of gas, it is pathetic. We are 10% of Italy and Germany, a quarter of France and other countries, and we do not have any strategic view about storage in this country. Is there a case for doing that? Finally, could you point to any countries that have a good coherent use of storage while we are going through towards the path of net zero?

Professor Michael Bradshaw: To the first question, you have defined your term "strategic storage" and, like a strategic petroleum reserve, the point about strategic storage is you do not use it unless you have an emergency. The storage that we have, I think you have also implied, is used by the market. There have been discussions in the past about strategic storage. The Rough storage facility that closed was not strategic storage; it was long-term, inter-seasonal storage. Do we want to build something to store gas and only for an emergency? I think it is probably late in the day to consider that as part of the solution.

The problem at the moment is that other levels of storage into grid-scale battery storage, and things, are not available at the price that we want, particularly from a strategic point of view. I do not think there is an easy answer to this in terms of building strategic storage. It has been discussed in the past. The key issue is who will pay for it. It is quite clear that if it is strategic storage the Government will pay for it. How much you have to build to make a difference, I really do not know. It is not really a viable solution.

I come back to the issues of efficiency, demand reduction and flexibility. Building greater flexibility into the system is important. The other thing we must consider, and it comes to your second question—I do not have an answer to the second question—is to say that the UK is a frontrunner in having to deal with this issue, particularly when it relates to gas, because we have effectively got rid of coal. Coal and coal-fired power

stations had a lot of energy storage in the form of heaps of coal, and we have lost that—for all the right reasons, but it does mean we are out there as a frontrunner in trying to manage our gas security in the absence of coal. I think that is also something to consider.

Lord Rooker: This is why we can boast so much about our reduction in emissions, as Greta Thunberg pointed out, because of the fast-tracking of the closure of coal. What is the view from the EU on this? Is that a fair question or is it individual countries in Europe?

Simone Tagliapietra: On storage I would like to say that the European Union has more or less 30% of the gas it consumes every year as a storage level, so the storage of gas in Europe is important. It amounts to more or less 30% of the yearly consumption and this is a very important buffer, not only to deal with the seasonality of the gas demand and so on but really also in the face of potential security situations. What is nowadays giving certain confidence to Europe that we will manage this winter comfortably if there is an interruption of Russian gas is that we still have some gas in storage.

This gas storage is utilised at the national level. There is no EU-wide gas storage co-ordination. There are countries such as Italy and France that on top of the commercial gas storage also have strategic storage control by Governments. Other countries, such as Germany, do not have strategic storage but now they are looking into developing it since they understand at this moment that that might be a good idea.

The European Union in April will present a strategy to also try to co-ordinate better this gas storage at the European level. One key item there, as I mentioned before, will be the joint purchasing of the gas as the EU, to get better bargaining power.

Dr Jack Sharples: An extra point of nuance is, as I mentioned, earlier the extent to which the UK is tied into the European gas market in trading terms. Part of the implication of that is, even though we do not have really any substantial gas storage in this country, we do make extensive use of gas storage in other European countries—so the interconnector pipelines that we have that link us with the Netherlands and Belgium. Generally what happens is the UK and Norway produce a bit more gas than they need during the summertime, because gas demand is very strongly seasonal, simply because of how much we use for heating purposes, so during the summer we tend to export gas to the European continent where it is either used or injected into continental European storage, and then during the winter we import some of that back through these interconnector pipelines. We might not have substantial amounts of storage at a national, discrete UK level, but we do have access to European storage. Again, it is market dynamics, supply and demand balances and pricing signals that tell the market where that gas needs to move to.

In addition to that, I think one of the elements that the UK has had to face over the last 15 to 20 years is that we have gone from a position in

the early 2000s where we were a net exporter of natural gas, so we could flex our own production up and down, instead of having storage. That was an implied form of storage, but now that we are dependent on imports to meet just over half of our annual consumption, that means that we do not have the same flexibility between seasons. Certainly, what we are lacking is any substantial storage that helps us deal with any unexpected interruptions—so, for example, if a key pipeline from Norway goes offline for unplanned maintenance, then you do not have substantial storage that you can draw on.

Q144 **The Chair:** How much of the storage would we need, to come back to the first point that Professor Bradshaw made? Just address that point.

Dr Jack Sharples: Sure. UK gross gas demand is about 75 billion cubic metres per year. We currently have about 1.5 billion cubic metres of storage capacity dispersed around multiple small infrastructures. The Rough storage facility that was in a depleted gas field off the east Yorkshire coast in the North Sea held about 3 billion cubic metres, so even before we lost the use of Rough in 2017 we did not have very much.

Regarding how much we might need, I can see that Professor Bradshaw has his hand up, so I will hand over to him.

The Chair: Professor Bradshaw, and then Lord Livingston wants to ask a final very quick question.

Professor Michael Bradshaw: It was not really that—it was just to add a caveat, and that is Brexit. It is very interesting to hear Simone talking about all these things the European Union are doing. In some ways I am glad that we are not part of the European Union, because I am not sure how they are going to work, but one of the concerns we should have is that we are now outside of the single European energy market and its solidarity mechanism. We do not know what that means if the European Union was to say, for example, "Stop exporting gas to non-EU members". The only saving grace is the fact that the Republic of Ireland relies on the UK gas infrastructure for the large amount of gas that it consumes. I am concerned that we are not sitting at a table in Europe having these discussions about collective buying, about access to storage, and so on and so forth, when we are part of the solution. Our LNG terminals are providing gas into Europe. I think there needs to be a more pan-European discussion around these things that is not confined by the borders of the European Union. It is difficult to orchestrate when you have left the party, as we have with Brexit, but I think we are part of the solution, we are not part of the problem and I would encourage the Government to try to have those kinds of discussions.

Q145 **Lord Livingston of Parkhead:** A very simple question to Jack Sharples. When we do the comparison of our storage compared to other people, it does seem to miss out the fact that a very large proportion of our gas is provided via pipeline from Norway and the UK's own market. If Germany or another country has 30% should we have that as well, because we can supply out of the winter a very large part of our own gas, subject to there

being a major problem with the pipeline. Would you agree that some of the comparisons that are done are a bit facile, because they are very different marketplaces because of the availability of piped gas?

Dr Jack Sharples: Absolutely. Across Europe there are vastly different situations between some of the major consumers of natural gas. The UK is in a very particular position, being able to meet four-fifths of our demand from either our own production or from Norwegian supply that we consider to be friendly and secure, even if we have to pay the going market rate for it. If you compare that to Spain and Portugal and the Iberian peninsula, they are almost entirely dependent on liquefied natural gas imports with a portion coming by pipeline from Algeria. If you look to the central and north-eastern members of the EU, there is a heavy dependence on Russian supply. If you go to south-eastern Europe, again there is a very heavy dependence on Russian supply. Yes, I think you are absolutely right, there is definitely room for nuance when we compare the UK with other European countries.

The Chair: Wonderful. Lord Rooker, I am checking you do not have anything else?

Lord Rooker: I was just going to make the point that it looks like the beginning of a European gas community, which is where we came in the 1950s, and perhaps it should be pan-European so the UK could join the new European gas community and still maintain Brexit.

The Chair: Excellent. With that comment and observation, before we go into another debate about Brexit, thank you all very much for joining us. It was a very interesting discussion and it helps us a lot with lots of interesting insight.