

DÁIL ÉIREANN

AN COMHCHOISTE UM CHUMARSÁID, GNÍOMHÚ AR SON NA HAERÁIDE AGUS COMHSHAOL

JOINT COMMITTEE ON COMMUNICATIONS, CLIMATE ACTION AND EN- VIRONMENT

Dé Máirt, 10 Iúil 2018

Tuesday, 10 July 2018

Tháinig an Comhchoiste le chéile ag 11 a.m.

The Joint Committee met at 11 a.m.

Comhaltaí a bhí i láthair/Members present:

Teachtaí Dála/Deputies	Seanadóirí/Senators
Timmy Dooley,	Tim Lombard,
James Lawless,	Michael McDowell.
Eamon Ryan,	
Bríd Smith,	
Brian Stanley.	

Teachta/Deputy Hildegard Naughton sa Chathaoir/in the Chair.

The joint committee met in private session until 11.15 a.m.

Petroleum and Other Minerals Development (Amendment) (Climate Emergency Measures) Bill 2018: Discussion (Resumed)

Chairman: By virtue of section 17(2)(l) of the Defamation Act 2009, witnesses are protected by absolute privilege in respect of their evidence to the joint committee. However, if they are directed by the Chair to cease giving evidence on a particular matter and continue to do so, they are entitled thereafter only to qualified privilege in respect of their evidence. They are directed that only evidence connected with the subject matter of these proceedings is to be given and asked to respect the parliamentary practice to the effect that, where possible, they should not criticise or make charges against any person or an entity by name or in such a way as to make him, her or it identifiable. I advise that any submission or opening statement made to the committee will be published on its website after the meeting.

Members are reminded of the long-standing parliamentary practice to the effect that they should not comment on, criticise or make charges against a person outside the Houses or an official, either by name or in such a way as to make him or her identifiable.

I remind members and those present to turn off their mobile phones as they interfere with the live broadcasting of the proceedings.

We are resuming our detailed scrutiny of the Petroleum and Other Minerals Development (Amendment) (Climate Energy Measures) Bill 2018 sponsored by Deputy Bríd Smith. Deputy Bríd Smith and the main delegates will speak for up to ten minutes. Deputy Bríd Smith may make an opening statement, if she wishes to do so.

Deputy Bríd Smith: I start by doing something I should have done at the end of the meeting last week. I thank everybody for giving witness to the Bill and engaging with the committee on it. I thank the delegates who attended last week - Dr. Amanda Slevin, Professor John Sweeney, the representatives of IBEC and the Irish Offshore Operators Association - and all those who are present today. I am doing so at the start of the meeting because I will forget to do so towards the end of our engagement as I will have become so excited by the argument. I also thank the Chairman and Ms Anita Gibbons and her team. They have been very co-operative and done a lot of work behind the scenes to make this happen.

The Taoiseach said quite recently that we were laggards in Europe in dealing with CO2 emissions and climate change and reaching the targets set for us in the Paris agreement. He also said the challenge posed by climate change was one of the greatest humanitarian challenges we would face in our lifetimes. I agree with him on both counts. It is welcome that today the Cabinet has given the green light to the Bill submitted by Deputy Thomas Pringle on fossil fuel divestment. That is a really good sign and I call on the Taoiseach and the Cabinet to do likewise in the case of this Bill and back it, as it would be another contribution by this country in the battle to stop the planet from overheating by more than 2° Celsius in the near future, something that will make the planet uninhabitable for many species. We are going through a very hot spell and lives have been lost in southern Quebec and Cyprus. Science tells us that we cannot take such events as examples of climate change and that the changes must be incremental for a number of years, but the fact is that we have witnessed the eight hottest years on record in the past 16 years. That is a sign that what was warned about at Kyoto over 26 years ago is happening

and faster than we thought, both at Kyoto and Paris. The question of how we deal with fossil fuel emissions and burning carbon and emitting it into the air is fundamentally important.

I am aware that members of the public are watching and that it is often baffled by the science. They do not understand what 350 parts per million means, or what carbon exchange mechanisms are, but they do understand oil, gas and coal are dirty fuels that are causing a lot of problems on our planet and they want to know how we deal with them.

I welcome the delegates who will present to us. Mr. Greg Muttitt who will speak first as he has to catch a ferry back to Britain is from Oil Change International. We met him last year in Bonn at a conference and I was very impressed by the research the organisation had conducted. He will tackle the question of fossil fuels, in particular, whether gas is a clean transition fuel. The gas industry argues that it is, but he will take on the challenge. I also welcome Mr. Paul Allen from Zero Carbon Britain, an organisation which is looking at a model for how we should move forward to full use of renewable energy resources. It is a sensible model, one about which we should think and adopt, not just at this committee but across Parliament. There are representatives present from the Sustainable Energy Authority of Ireland, SEAI, and Ervia, formerly Bord Gáis, which should make for an interesting debate.

I thank the environmentalist movement which has backed the Bill, given its support and collected petitions. Some of its members are in the Visitors Gallery to hear the arguments and will meet the Chair later to urge her to push the Bill forward. I asked the committee to allow Mr. Muttitt and Mr. Allen to make their submissions and everybody, including other delegates, to ask questions and challenge them, rather than taking all four presentations together.

Chairman: I remind members that there will be a PowerPoint presentation. I ask Mr. Muttitt to start.

Mr. Greg Muttitt: I thank the Chair and also Deputy Bríd Smith. I am very honoured to address the joint committee on the Bill which is of great national and I believe global significance. I hope I can contribute to the committee's deliberations.

I am research director of Oil Change International, a climate and energy think tank. My research focuses on what climate limits mean for energy production, in particular fossil fuels. Members have copies of my written statement and my slides. I will summarise the statement and refer to some of the slides. I will not go into the details of my research, but I will be happy to do so during the questions.

There is no need to tell members that the world is not on course to achieve the Paris Agreement goals and that Ireland is not on course to achieve either its climate commitments under EU legislation or its longer-term targets. The reason for this is an excess of fossil fuels in energy systems. With acknowledgements to my fellow witness, I will show a slide with some data taken from the Sustainable Energy Authority of Ireland, SEAI, projections of fossil fuel use in Ireland out to 2030, which I have converted into emissions using Intergovernmental Panel on Climate Change, IPCC, emissions factors, and compare that with the red lines in that graph for the target of reducing emissions from energy use by 80% to 95% by 2050. Members will see that while the numbers only go as far as 2030 there is too much oil and gas to be on course for the longer-term target.

I will share two pieces of my research with the committee. The first finds that achieving the Paris goals requires an end to the development of new fossil fuel projects. The second finds

that, as Deputy Bríd Smith mentioned, natural gas is part of the problem, not part of the solution. After addressing some of the common objections, I will conclude by explaining how this Bill will both help Ireland achieve its domestic target and also give Ireland an outsized influence in persuading other countries to meet their commitments towards the Paris goals.

The Paris goals are the starting point in my research. My next slide shows the carbon budgets associated with the Paris goals, which are taken from the IPCC. This is the total cumulative amount of emissions that the world can afford from 2018 on while meeting the Paris goals. In my research I have compared this with the emissions that will arise from the oil, gas and coal in fields and mines that are already developed and producing, that is, where the wells have been drilled, the pipelines have been built, the capital has been invested and so forth. That is the left-hand column in the next slide. The brown is oil, the blue is gas and the black is coal. This is the global picture and I have added on the top the most optimistic feasible further emissions from both land use change and from cement manufacture and the calcination process. It can be seen from the chart that the oil, gas and coal in already producing fields and mines would take the world beyond 2°. Even if we stopped burning coal tomorrow the oil and gas would take the world beyond 1.5°. In other words, we are not talking just about the reserves that are known but the reserves where the infrastructure has been built. The emissions from the already existing infrastructure are enough to cause a dangerous extent of climate change. I am flattered that Professor Sweeney referenced this study last week as well.

What happens if new fields or mines are developed beyond those in operation? They can only add to the left-hand column in the graph. Logically, that leaves two possibilities. The first is that if the world subsequently succeeds in limiting emissions to achieve the Paris goals, assets are stranded and fields and mines need to be closed down early with a loss to the financial markets, a disruption to the economy and a rapid loss of jobs. Alternatively, any new fields or mines will contribute to a lock-in effect, which I will return to, which will make us unsuccessful in limiting emissions. In that case we get very dangerous climate change with severe human and economic damage. The economist, Nicholas Stern, made the same point last week at a meeting in the Vatican to mark the third anniversary of the *Laudato si'* encyclical. Lord Stern said that new high-carbon investments will either commit us to high emissions, which is the middle scenario on this slide, or lead to early scrapping of infrastructure, which is the top scenario, with stranded assets. We suggest that the best pathway for economies, people and biodiversity is a managed decline of global fossil fuel production over the coming decades, with a ramping up of clean energy. This analysis tells us that all new investments in energy infrastructure need to be in zero-carbon energy.

Moving on to my second piece of research, which I would like to share, some people have suggested that gas, because it has lower emissions than coal, can be used as a transition fuel on the way to clean energy. I will argue that this idea is fundamentally flawed in two respects. While the idea of a transition fuel might have made some sense 20 or 30 years ago when the world was first setting out to address climate change and the problem was less urgent, it does not fit within today's depleted carbon budgets. I apologise for the slightly more complicated slide here. The left-hand side of it focuses on the power sector, which is the largest user of the natural gas in Ireland, but this is a global picture of the power sector. On the left are current emissions from power generation. The middle bar shows the projections from the International Energy Agency of what power sector emissions will be in 2040. To the right of that is what would happen if we replaced all of that coal with lower emitting gas and assumes that we have no leakage of methane from the gas systems. It can be seen that the total emissions from the remaining oil and gas are approximately five times the green column on the right, which is the

median of Intergovernmental Panel on Climate Change, IPCC, scenarios for the power sector that are aligned with keeping warming below 2° Celsius. It is not even 1.5° Celsius, but 2° Celsius. The conclusion of this is that we have far too much gas in the power system and we need to replace coal with zero carbon energy and reduce gas, not increase it. Gas makes the climate problem worse by slowing the transition. When one looks at the competitive costs of different energy sources, nine years ago, gas was primarily competing with coal and nuclear energy, but moving to the present day, the competition is largely between gas, wind and solar energy. The development of new gas will slow down the transition by competing with wind and solar energy.

I will show the lock-in effect. On the slide are projections for a discovery in the Porcupine Basin, which is Cairn Energy's Spanish Point prospect. The left-hand column shows the gas price that would be needed to make this viable, which is a bit higher than current levels, but if gas prices rise, Cairn Energy might decide to proceed. If, as a result of climate policy, gas prices subsequently fall, one ends up with a lose-lose scenario. As long as Cairn Energy is able to cover its marginal costs, even if it makes a loss on its original capital, it is in its interests to keep producing. That is a bit more than half of current gas price levels. If a climate policy is imposed which reduces the price, we end up with stranded assets, companies losing money, the emissions being locked in, the gas continuing to be produced and there still being a climate problem. This is what I mean by a lose-lose scenario.

I will skip over answering some of the objections because of limited time, but maybe they can come out in the questions. Moving to my last point, climate policy has traditionally focused on the point at which carbon is emitted into the atmosphere rather than the point at which carbon is extracted from the ground. Elementary economics tell us that markets are shaped by both supply and demand. I have shown the committee the problems of gas competing with renewables and of the lock-in effect which demonstrates that addressing supply is a necessary part of addressing both demand and emissions. As such, we need to address simultaneously supply of and demand for fossil fuels. Several recent studies have found that in many cases emissions can be more effectively and more cheaply reduced by addressing supply than by addressing demand.

This Bill will help Ireland to achieve its climate goals. If Ireland approves the legislation, it will join Costa Rica, France, Belize and off-shore New Zealand in ending new exploration. We know from private conversations that several other governments are considering following suit. As this coalition of countries grows, momentum will build for ever larger producers to join in the same model as the Powering Past Coal Alliance. There are already active debates on ending new licensing in the major oil producers Norway, Canada and California. By ending new exploration, Ireland would join a growing coalition, thereby adding momentum and gaining more international influence. The Bill is necessary to achieve the Paris goals. It is correctly targeted at oil and gas production and the energy transformation it proposes is achievable. The Bill will help Ireland at home and on the global stage.

Chairman: The next speaker is Mr. Paul Allen, project co-ordinator at the Centre for Alternative Technology. After Mr. Allen speaks, I will bring in the members. Anyone who wants to comment or ask a question should feel free to indicate. Mr. Allen has ten minutes and I will tell him when eight minutes have passed.

Mr. Paul Allen: I am putting up a PowerPoint presentation as it helps to have the graphs. It is an honour to be here. We are looking at how we can keep the lights on with 100% renewable energy. There is a yawning chasm between what is currently thinkable politically and what the

physics actually demands we do. If we follow what is politically thinkable only, we will end up butting up against the laws of physics in terms of climate change. We are rooting ourselves on the other side of that yawning chasm and beginning to explore what it would be like to do what physics demands. We seek to open conversations, stimulate debate and get people thinking. In our 100% renewables scenario, we design it to minimise lifestyle disruption and make it as much like everyday life as possible. It would be 100% renewable energy with no new nuclear and no improving carbon capture and storage. Basically, it would be to use only existing technology which we know works. It also means recognising where we are today. A typical Tuesday morning in Dublin, New York or London is not actually normal on any sort of historical timeline. We have reached a point of energy extreme lifestyles where we use far more energy than we need to deliver what society wants. That means Britain gives off 650 million tonnes of CO₂ every year, the vast majority of which comes from burning fossil fuels. The processes we are looking at include powering down the amount of energy we use and powering back from extreme energy lifestyles to deliver what society needs on a more rational and smart basis. We map out the sectors where we use energy in industry, transport and buildings and we show that we can make a 60% reduction over a period of approximately two decades in the amount of energy we use to deliver warm houses, personal mobility and active industry. At the same time, we are powering up indigenous renewables.

Fortunately, we are in an area of the world which is awash with renewable energy. It is one of the most energy rich areas in the world. That resource does not peak and decline in the way fossil fuel resources do. It is there in perpetuity for future generations. However, we have to work out how to harness it. We look at all of the different technologies which are available, their price, the rate of change of prices and how the cost of things are falling faster than many of us expected. The amount of land needed to generate the same amount of energy varies greatly, including whether it is PV or offshore wind, but across renewables we can begin to optimise the right mix. When we think we have the right mix we then have to show how we can actually keep the lights on with 100% renewables. We began modelling in great detail. We took ten years of real world Met Office data and modelled energy from all sorts of different sources. It shows we can achieve a reliable and robust supply system. One example is offshore wind. Looking at the output from offshore winds, we can take two offshore wind farm sites, put in our data set of ten years of hourly modelling and come up with an hour by hour analysis of what those offshore wind farms would do. Then we take the same data set and we scale it up for the best available shallow near shore offshore wind sites and come up with a very detailed model. We can then take the same data set and add onshore wind, PV, and all the different renewables to come up with an hour by hour map of when the energy would be available.

We then take the same data set again and we look at national grid statistics and weather statistics and we come up with a model of energy demand. Bearing in mind that we are powering down by about by 60%, it still varies by the time of day and the season. We have two variable things, we map them together in a detailed model and it identifies large surpluses and shortfalls. At that point, we can begin tweaking the installed capacity in respect of the mix of different types of renewables or where they are located to try to optimise the minimum peaks and the minimum troughs. When we have that we then look at what is the best case scenario and what it is we have to do to keep the lights on.

The data says that roughly about 80% of the time supply can meet demand and about 18% of the time there is a shortfall that gets big at particular times of year. We can then begin to look at what we can do to deal with that, particularly the very big drops. The first thing is demand side management. Price incentives and smart grid can be offered to move electrical loads like

charging of electric cars, doing the washing and industrial loads to particular times of the day and that can have an impact on the big peaks. We can also look at the short-term storage of energy. In the UK we have pumped storage hydro systems. We could also look at using the thermal mass of buildings, well insulated buildings heated by heat pumps and some major storage can be achieved there.

When we look at the scale of what that can deliver, it reduces the shortfall from about 18% to about 15%. It makes a difference of about 3%. We end up with a big 15% gap that we still have to fill, so we have to look at longer-term storage of terawatt hours of energy, huge amounts of energy. We looked at batteries, pumped storage, compressed air, huge flywheels underground but none of those has the capacity to deliver that amount of energy. What we really need is combined cycle gas turbines. They are flexible and they can start from cold within an hour but the problem is that if we continue to burn fossil fuels then we will not meet our Paris targets. We began looking at the idea of renewable gas. Power to gas involves taking those big peaks - something has to be done with them or else the grid will fail because the frequency and the voltage will not be met - and using them to split water into hydrogen and oxygen. It is electrolysis and ordinary level physics.

We can then use that hydrogen as an energy store which seems good in principle but when we look at trying to deploy mass amounts of hydrogen we do not have the infrastructure to do it. We can, however, upgrade that hydrogen to synthetic methane by capturing carbon dioxide out of the atmosphere with natural systems and then adding that to the hydrogen with a Sabatier reaction, which again is ordinary level physics, to give synthetic methane which can fill the gaps between the big renewables. When it is burned it gives back the carbon dioxide that was captured by the plants used in its manufacture so it is net carbon neutral.

We can also make some transport fuels because not all vehicles can be electrified as we move to a zero carbon future. Some large haulage vehicles will still need fuel and we might still need some fuel for aviation if we still keep some air flights. Basically, 82% odd of the time supply meets demand, the 18% shortfall can be reduced to 15% with short-term storage but that remaining 15% can be met with synthetic methane. The advantage of that is it means we really need the gas industry to do this. It has massive potential for the gas industry because we need to store, dispatch and move a lot of gas. Instead of the gas industry being our opponents we can collaborate with the gas industry, in a zero carbon island scenario, because there are huge amounts that we need to do with them.

We have published all of the details on our website, which Members can peruse. They can download the information from zerocarbonbritain.org. We have published the results in a peer reviewed journal called *The Management*. Again, the results are free to download from the zerocarbonbritain.org website. We can shift from this to where we need to be and reach net zero, which is quite an exciting future, and think about the potential co-benefits.

We have pulled together rapid decarbonisation scenarios from around the world in a report called "Who's Getting Ready for Zero?" The report includes case studies on Chile, Costa Rica, Bhutan, etc. One can see from my presentation that an increasing amount of hourly modelling is being done for countries and regions have showed that 100% renewable is viable.

Power to gas is growing. It has been calculated that around the year 2020 power to gas will reach a tipping point. In terms of cost, it will become a big disruptive force because there is huge amounts of surplus with renewables. Renewables are getting cheaper and increasing faster than anybody imagined so our grids will have a lot of renewables in them. Capturing

that surplus and using power to gas is going to be an exciting opportunity for the gas industry. There is a huge collaboration around the store and go project across the EU. There are pretty large test bed projects that are exploring this option. That is about to kick off. I think it would be very exciting for Ireland to begin modelling what a zero carbon Ireland would be like and to learn the employment and investment potential for the gas and renewable industries.

Chairman: I thank Mr. Allen for his presentation. Before I call on the members to comment I will introduce the other witnesses now in case they want to interact with the discussion but they will speak later. We are joined by Mr. Jim Scheer, head of low carbon technologies, Sustainable Energy Authority of Ireland. He is accompanied by Mr. Matthew Clancy, programme manager, bio-energy and combined heat and power, CHP, and low carbon technologies.

We are joined by a delegation from Gas Networks Ireland led by Mr. Denis O’Sullivan, head of commercial and corporate affairs, Gas Networks Ireland. He is joined by Mr. Brendan Murphy, commercial and regulatory director, Ervia.

We also have a delegation from the Department of Communications, Climate Action and Environment including Mr. Matt Collins, assistant secretary, natural resources, Mr. Bill Morrissey, principal officer, petroleum affairs division, and Mr. Martin Finucane, principal officer, strategic energy policy division.

I call Deputies Eamon Ryan and Brian Stanley, in that order, as they have indicated a wish to speak. The Deputies can direct their questions at Mr. Muttitt and Mr. Allen and then other members will contribute. I call Deputy Ryan to commence.

Deputy Eamon Ryan: I thank Mr. Greg Muttitt and Mr. Allen for their very interesting presentations.

I do not know whether Mr. Muttitt had a chance to see an earlier hearing when the International Energy Agency, IEA, made a presentation because the agency’s figures are quite different. I specifically asked it about the figures when I was here because I had seen some of Mr. Muttitt’s material. If I recall correctly, the IEA argued that an additional investment of \$7 trillion was needed in oil and gas infrastructure. The IEA recognised that there is a mathematical problem, in terms of meeting the Paris Agreement obligations. The IEA speculated that somewhere between 500 gigatons and 1,200 gigatons of carbon remain in use and recognised that there are 3,000 gigatons in existing reserves. The IEA seemed to argue that we would still need to use the larger quantity because oil, in particular, would be required for plastics, fertiliser, shipping and aviation. The IEA also argued that while some of the power and other sectors may be able to scale it back there would still be a demand for oil reserves in other sectors. I was uncertain how the agency could address the climate issue while this happened. I wonder has Mr. Muttitt had a chance to peruse the IEA presentation. If so, can he comment on its analysis? What is his view on the alternative position presented by the IEA?

I wish to mention a difficulty to Mr. Muttitt and maybe Mr. Allen might have an interest in the following as well. We are in this strange world where we want to stop the production of fossil fuels and for the price to go low. Interestingly, the IEA showed that with the drop in production reserves, it does seem in the past three years that there has been no major investment in oil and gas exploration. There is ongoing demand for over 90 million barrels of oil a day. In terms of the demand-supply equation, the price of oil is starting to increase again. Yesterday, Jeremy Leggett, somebody I know from the past, indicated it could go back to \$150 a barrel. I never believed we would ever get back to over \$100 a barrel. My understanding was that electricity

would replace oil in transport and it would keep demand low.

The various presentations the committee had last week stated that oil and gas extraction in the Atlantic margin might be feasible at \$50 a barrel. I believe the wildcat drilling off the west coast of Ireland is highly speculative and highly unlikely to strike oil. However, if it does and it can only earn \$50 a barrel, it comes into play. Have any of the witnesses any projections on both oil and gas prices? Both prices are rising at the moment. The International Energy Agency, IEA, presented an analysis that known reserves are tailing off, that there are no easy big finds but that there are large shale production possibilities. Where are prices going? How do we work the price factor in order that it helps us meet the Paris climate change targets?

I was interested in Mr. Allen's analysis, particularly about power to gas which we have not looked at in real detail. I have heard arguments that there is a problem in Britain and Ireland that in the middle of a winter with a high-pressure system when one does not have wind for three weeks, one can have a large heat load. Does that power to gas scenario cover that big spike in heat load in the middle of winter?

Did Mr. Allen look at interconnection? What levels of interconnection are his figures showing? Hopefully, Brexit will not stymie this. With an electricity network system that connects into Norwegian hydro, solar in the south, Alpine hydro and French nuclear, one gets a system where some of those spikes are more manageable.

I tend to agree with Mr. Allen's analysis. However, how does it square with the late David MacKay's analysis which showed the UK would require windmills everywhere? David MacKay's analysis was good because it always went back to the kilowatt-hour, kWh, measurement and was physics oriented, which I liked. How does Mr. Allen's analysis compare to David MacKay's?

Deputy Brian Stanley: I thank Mr. Allen and Mr. Muttitt for their interesting presentations. The debate is moving into the stage on how we generate not just clean power but have a consistent supply. How do we have power when the wind turbines do not turn on those calm and cold frosty nights in the wintertime when there is a high demand for energy or when the sun is not shining and we cannot get power from solar? This is the crux of the discussion and the witnesses' contributions are useful in that regard.

Sinn Féin has done some analysis of this space and how to deal with it over the past several years. We have come up with some proposals around biogas and other sources to generate power and to, at least, start to provide for a baseload for dispatchable power. Many renewables are intermittent which is a significant challenge.

I am interested in the point made by Mr. Allen that demand for power in Britain could be reduced by 60%. We are all agreed that we use significant amounts of energy unnecessarily through generating packaging, unnecessary transport and lack of clever thinking and economic development.

How realistic is the planned 60% reduction in CO₂ emissions over the next 20 years in the United Kingdom? The situation here is somewhat different but we need to move in the same direction in terms of reducing emissions. I ask Mr. Allen to explain the baseload more plainly. It is the main issue of concern for many people. Mr. Allen and Mr. Muttitt referenced renewable gas. Mr. Allen highlighted it as a solution in the scenario he presented. Has renewable gas been used elsewhere in a significant way? How does it compare with fossil fuel natural gas in

terms of CO2 emissions?

The presentation provided by Mr. Allen, which I read before the meeting, deals with the storage of energy. That issue has not been cracked, apart from the limited storage afforded by batteries in terms of charging motor vehicles at certain times and hydropumps, of which Turlough Hill is the one example in the State. When there is an excess of energy, water is pumped up the hill to a lake there and, when energy is needed, the water flows down and turns turbines. What other methods can be used to store energy? Industry figures have indicated that hydropower such as that generated in Turlough Hill only has the capacity to generate a very small percentage of our electricity needs. What is Mr. Allen's view in that regard?

The presentation by Mr Muttitt was very good in terms of addressing the bigger picture. He stated that using conventional gas will not get us to where we need to be in terms of the Paris Accord. We must remember that the 1.5% reduction agreed under the accord is the absolute minimum we must reach. Many members believe we must go much further than that. Mr. Muttitt stated that 100% renewable energy is possible. However, dispatchable power must form part of that.

Per head of population, the agricultural industry here is far larger than that in the United Kingdom and more land is used for agricultural purposes. There is usually excellent grass growth, except this year as there has been little rain over the past two months. How realistic is biogas as a source of energy? I brought forward a paper on biogas because I see it as a way forward. How realistic is the use of biogas in terms of meeting the significant amount of dispatchable power needed in Ireland, particularly given the size of our agricultural industry? The paper I presented outlined that it can produce 10% of electricity needed. Does Mr. Muttitt believe that percentage could be increased? What percentage of energy need in Britain can be met through biogas?

The good news is that the cost of offshore wind energy production is decreasing. There has been an aversion to developing offshore wind power in this country. Rather, onshore wind power generation has been pursued because that is what the multinational investors want. The part of the country from which I come, the midlands, is in the middle of the saucer. Giant turbines of 550 ft in height are being erected in many midlands areas. The turbines need to be of such a height to reach the appropriate wind current. How realistic is it to use offshore energy as security of supply? I know the wind blows more frequently on the sea. I was at the seaside in Wexford on Sunday and there was very little wind out on the Irish Sea. How much of a reduction do the witnesses expect in the percentage of CO2 emissions from coal and oil if we were to move completely to natural gas? The dominant thinking in governments in Europe is that we have plenty of natural gas, that there is more to explore off Ireland and that Russia has plenty. What is the difference in Oil Change International's analysis between the percentage of CO2 emissions of conventional gas compared with oil and coal?

Chairman: I will bring in the SEAI and Mr. Brendan Murphy, the commercial and regulatory director of Ervia, before calling Deputy Lawless, if he wants to wait.

Mr. Jim Scheer: Mr. Muttitt put up some of our national energy projections data and converted them into emissions. It is good to see that in the context of the longer-term future point target. I wanted to give everyone context about how we come to those numbers and what is included in that trend. I am not sure if he used the latest round of projections released earlier this year by the Environmental Protection Agency, EPA.

Mr. Greg Muttitt: Yes.

Mr. Jim Scheer: He did. That is great. We work with the Economic and Social Research Institute, ESRI, to establish a baseline for energy supply and demand for Ireland using its latest macroeconomic modelling and assumptions about fuel prices. We work with a range of stakeholders to work on the input assumptions to that modelling. The trends that the committee saw there are clearly not on track for the longer-term target. What is not included in that are the more recent announcements via the national development plan. I am aware that the Government has announced an increased ambition on renewable electricity, increased ambition on renewable heat, higher blending rates for renewable transport and bigger ambition with regard to efficiency, which are all very welcome. We had to model the impact of those additional measures on that trend. That is the context for those data.

Deputy Eamon Ryan: I understand that the EPA analysis is that the additional measures will increase our emissions because of the ongoing use of peat-fired power stations. Is that not correct?

Mr. Jim Scheer: Two scenarios are run every year. There is what is called a with measures scenario and there is a with additional measures scenario. What comes from the Commission is black and white about what policies and measures are loaded into those scenarios on the basis of the dates when different initiatives were announced.

Deputy Eamon Ryan: The with additional measures scenario shows our emissions getting worse.

Mr. Jim Scheer: Correct.

Chairman: I thank Mr. Scheer and will come back to him later. I call Mr. Brendan Murphy from Ervia.

Mr. Brendan Murphy: On the question about carbon capture and storage, CCS, the Intergovernmental Panel on Climate Change, IPCC, has talked about that being essential to mitigate our emissions. It says the cost of meeting decarbonisation is 138% higher without CCS. I wonder about the potential to reduce emissions from gas via CCS, which we think is very viable for Ireland. Mr. Paul Allen mentioned hydrogen. We are looking at the idea of hydrogen and can see the benefit of it. In the work we have done so far, the cost of producing hydrogen by splitting natural gas and storing the CO₂ is much lower than the cost of generating hydrogen from electrolysis. There is merit in it but the question is which is the cheapest.

Chairman: I thank Mr. Murphy for being so concise. Does Deputy Lawless want to come in now?

Deputy James Lawless: I will come in if that is okay.

Chairman: Sorry for all these questions. We can come back for clarification.

Deputy James Lawless: I thank the witnesses for the helpful presentation. I read it in advance and have listened to some here. Deputy Stanley asked about storage. I am interested in that too. I understand that storage is the great holy grail of the energy industry. If we could crack that, we could solve many problems. What options are presented by new technology? The witnesses may or may not have an answer to this question. We had a similar discussion on the same Bill last week and we had some geologists in the room. Those who oppose these mea-

tures suggest that we should not keep it in the ground but, rather, continue to explore and extract these potentially rich resources off the coast, particularly the west coast and possibly the south coast. However, Deputy Eamon Ryan posed the interesting question as to why, if there are such rich resources, they have not yet been brought onshore. Why has it taken 50 years to do so? I am somewhat sceptical of the potential of such fields, which may be speculative. Geologists pointed out to the committee that technology has advanced and there are new and better ways to detect and extract from previously unknown fields. I am interested in the representatives' views in that regard. Do such great resources exist? If they do, why are some people putting up such a fight in that regard?

On renewables, the maps provided by Mr. Muttitt show the prevalence of offshore wind in the United Kingdom, primarily on its west coast and off the coast of Scotland. There is huge potential for offshore wind off the west coast of Ireland. I recently attended a conference on international and pan-European energy security. Renewables offer a great opportunity to move energy such that when wind is blowing on the west coast of Ireland and people in Germany are waking up and boiling their kettles we can provide them with power, and *vice versa*, in the scenario of a mixed basket of energy with renewables in one part of the continent, a fossil fuel plant in another and a nuclear plant in another. The idea is that energy can be moved around. As demand in different time zones kicks into the grid, one place would be sustained by wind, another by an old-fashioned fossil fuel plant, etc. At the conference it was argued that such a combination of energy sources provides a high level of energy security and enables countries to trade energy, thus sustaining the European energy network. In a renewable-only scenario, is there a risk that energy security might decrease because all of our eggs would be in one basket or would there still be geographical interplay such that if the wind is not blowing on the west coast of Ireland, it may be blowing on the central plains of Germany? Brexit may cause problems in terms of British involvement in such a scenario. European energy agreements should be maintained even if change occurs in other areas as a result of Brexit.

There has been much community backlash in Ireland regarding onshore wind and many communities have not bought into the idea of having wind farms on their doorstep, which has caused many difficulties in the roll-out of onshore wind power. Offshore wind energy generation does not involve that difficulty. It is more expensive than onshore and involves engineering difficulties but it does not meet the same community resistance. Perhaps lessons can be learned from the British experience of onshore wind to find ways for communities to support rather than oppose such projects, which would make the process easier.

Chairman: A significant number of questions have been posed. The representatives may deal with them in any order they wish and members may seek any necessary clarification.

Mr. Greg Muttitt: I thank members for their questions and comments. I thank Mr. Scheer for his clarification on the data. They were obtained from the data portal on the Sustainable Energy Authority of Ireland, SEAI, website, which I assume is up to date. I thank him for the clarification that some new policies are yet to be incorporated in the data. From my limited understanding of the policies, they will lead to a small reduction in emissions, although that has yet to be modelled, as Mr. Scheer stated. As Deputy Ryan pointed out, the projections for the “with additional measures” scenario to 2030 show an increase from current levels, although it is relatively small.

Mr. Jim Scheer: The “with additional measures” scenario published by the EPA does not currently include the latest measures announced in the national development plan.

Mr. Greg Muttitt: I thank Mr. Scheer for that clarification and the helpful data published by the SEAI.

Deputy Ryan referred to the IEA. I read the presentation to the committee two weeks ago by Mr. Gould from that agency and the transcript of the following discussion. Mr. Gould presented two scenarios to the committee. The “new policy” scenario is the main focus of the IEA. It is a form of business-as-usual scenario which would lead to warming of approximately 3° Celsius and is extremely dangerous in terms of climate change. The IEA has also published a sustainable development scenario, to which Mr. Gould referred. Let us start there. The IEA argues that the natural decline rate for oil and gas fields, as pressures reduce and reserves become depleted, is between 4% and 7% per year and it varies according to the economics of the industry. A fortnight ago, Mr. Gould argued, and the IEA has argued previously, that that is a faster rate of change than they foresee in the energy system and hence we still need new investment to make up for the decline. The way the IEA argues that that is a faster rate of change is by reference to its sustainable development scenario that sees a 1% reduction in oil per year and an increase in gas consumption after 2040. I have a problem with that because its sustainable development scenario is not aligned with the goals stipulated in the Paris Agreement. The IEA’s scenario is based on one it developed in 2009, following the Copenhagen Summit, and aimed for a 50% chance of staying below 2°C. That aim does not align with the Paris goals of staying well below 2°C and aiming for 1.5°C. The IEA still uses a Copenhagen-era climate scenario.

Deputy Eamon Ryan: This is interesting discussion. Mr. Muttitt provided us with a graph. He has said that his most interesting finding is that even existing production would see us exceed the target of 2°C, not mention the 1.5°C. Can he explain the difference between his findings and that of the IEA?

Mr. Greg Muttitt: That is an excellent question. Is he referring to slide 20 of my slide deck?

Deputy Eamon Ryan: Yes.

Mr. Greg Muttitt: We found that if the projections of emissions under the sustainable development scenario are used, the 2°C carbon budget is fully exhausted at the end of that scenario in 2040 and requires emissions to suddenly drop to zero in 2040. The reason, as can be seen from the vertical red line in my graph, is there is a two in three chance of staying below 2°C rather than a 50:50 chance, and thus trying to get a bit closer to the Paris goals. A second reason is the IEA makes rather unfeasible assumptions about what will happen outside of the energy system to make more room for energy emissions. For instance, the agency conducted a study on how to allocate carbon budgets, and gave 90 gigatons for the rest of the century to non-energy emissions. That is just 15 years worth at current levels and primarily stems from land use change and cement calcination. In my graph we estimated the most optimistic feasible level, which is about double that amount. That requires both significant reforestation and the best plausible technology that can be achieved this century, according to the IEA’s cement roadmap. Apart from applying a lower probability of achieving the goal of 2°C, the IEA has assumed that more action will happen outside the energy system than I would say is feasible.

I shall return to the point made about carbon capture and storage, CCS, by Mr. Brendan Murphy. That is the third difference between the two.

A fortnight ago, Mr. Gould argued that the IEA’s sustainable development scenario was consistent with other scenarios that led to a 1.8°C outcome. His claim is only true if one assumes

a significant proportion of the excess emissions that occur during the scenario period are later sucked back out of the atmosphere using negative emissions technologies. Such technologies exist in the theoretical models but have never been applied in practice. Bioenergy technology has been used reasonably extensively and CCS technology has been used in a number of pilots worldwide. However, no one has tried to marry the two technologies to see how CCS copes with the more variable CO₂ streams that come from bioenergy than from fossil fuels. In addition, even if the technology works and is affordable, when one considers some of the studies, of which there have been a number over the past couple of years, and considers what that would entail in terms of land area, then some of the scenarios that the IEA uses for comparison would require a land area devoted to bioenergy that is 12 times the size of India. When we imagine that later in the century, with a likely larger global population, devoting that much land to bioenergy could have an extremely disruptive effect on food supplies.

Looking at a natural decline rate of between 4% and 7% in oil and gas fields, that is the kind of decline rate that is aligned with the Paris goals. The IEA uses a scenario that is not aligned with the Paris goals to suggest that the transition will be slower. If we look at the numbers in the Paris goals, even for a 2°C target we are looking at about a 5% global reduction in emissions per year. The target in Ireland is reducing greenhouse gas emissions by 80% to 95% by 2050. I have got the numbers in my written submission, but that is an annual reduction of between 7% and 10% per year in emission from fossil fuels.

What we are talking about here is a natural decline rate that is aligned with the Paris goals. It is not, of course, aligned with scenarios that fall short of the Paris goals. Deputy Ryan also asked about the IEA's point that oil and gas are used in a number of other applications. The non-combustion uses are relatively small. About 15% of global oil is used in non-combustion purposes, primarily petrochemicals, plastics and, to a smaller extent, building materials and about 10% of global gas use is non-combustion, primarily in fertilisers. There are some other combustion uses that are much harder to replace such as aviation. Looking at Ireland specifically, and oil use in transport, approaching half of that is in passenger vehicles where alternatives through electrification are available and almost the same cost today. Turning to gas, about half of Ireland's gas use is in power generation.

As we saw in the earlier graph of IPPC scenarios, the IPPC states that power has to be the fastest sector to decarbonise because the alternative technologies are readily available and at comparable cost to fossil fuels. That is particularly important in the Irish context where there is significant agricultural activity in the economy. Agricultural emissions are much harder to mitigate than power sector emissions so that is why it is important to move at the fastest available speed when it comes to the power sector.

The final question was on how does the oil price play in this. I was asked for a prediction of the oil price and I will decline that request. I have worked on oil for about 20 years and over that time I have seen people confidently predict that the oil price will never again go above \$15 or never again go below \$100 - it is currently about \$75 - and what I find is that the more confidently people make predictions of the future price, the more likely they are to be wrong. With apologies, I decline that request but I will note that there are prospects in Ireland at the moment. Some discoveries are being appraised to see if they are viable. I have studied some of the oil industry's own data and projections on how they look and they are certainly at the more expensive end of the cost curve.

One consultancy we particularly rely on, Rystad Energy, suggests that much of the production might be viable at something approaching or around current prices of \$75. The conse-

quence for Ireland of being at the high end of the cost curve if, as has been pointed out, the price subsequently falls - for instance, if climate policy reduces demand for oil and gas - is that it will be among the countries most affected by stranded assets and the economic damage that causes. That is a consequence of the greater production cost in Ireland compared with some other countries.

I believe I have answered all Deputy Ryan's questions. I will deal briefly with Deputy Stanley's questions because Mr. Allen is better placed to answer on many of the technical aspects, including on biogas. The Deputy first asked about the emissions comparison of gas versus coal and oil and, in particular, conventional gas versus coal and oil. Gas produces about half the emissions of coal in combustion. Slide 14 shows that where we replace the IEA's projected coal use in 2040 by gas it halves the emissions, but leads to the world being a long way off what is needed to achieve the Paris goals. At this stage of the climate problem we are no longer in the position of having to reduce emissions a little compared to a business as usual scenario. We know from the science and from the political agreement in the Paris Agreement what is a dangerous and intolerable level of climate change, and that gives us a specific amount of emissions that we can afford. We need to compare that conversion scenario not with the even worse scenario that has lots of coal in it but with the scenario up to the right of it, the green bar, which is what avoids the most severe dangers and disruptions of climate change.

On the question about the variability of renewables - Mr. Allen can talk more about this - there have been a number of studies in recent years of how we can get to high levels of renewables penetration, including 100%. I refer to some of the practitioners who have talked about this. The operator of the electrical grid in north-east Germany says its grid can handle 70% to 80% renewables, even with existing infrastructure. The Australian grid operator, TransGrid, has said it can do 100% renewable energy using existing technologies, including demand management, storage and efficiency. Germany and Australia are larger countries than Ireland and are part of larger continental land masses. TransGrid covers just about one third of Australia. They have different circumstances in some respects and every country must pursue measures that suit their circumstances. However, they demonstrate the growing ambition over recent years and the growing technological innovation in grid operators. Ireland's grid operator in one of its scenarios has up to 60% renewables penetration on the grid by 2030. The penetration in 2016 was 27%. There is room for significant growth there, but Mr. Allen can comment further on the technical aspect.

Deputy Lawless asked where storage fits in this picture. Slide 15 compares generation without storage. However, what is seen there is wind or solar compared with combined cycle gas turbine technology, which is primarily suited to base load rather than handling intermittency. Looking at the projections from Bloomberg New Energy Finance, including its new energy outlook released about three weeks ago, when one compares renewables plus storage with gas technology such as open cycle turbines, which are suited to dealing with variability, the costs are much more comparable. The storage technology is falling in cost rapidly to the extent that renewables plus storage are going to be competitive even with the base load, perhaps, in ten years or so.

The only question I have left is Mr. Murphy's about carbon capture and storage. Carbon capture and storage is a means of burning fossil fuels while catching the majority of emissions, up to 90%, and burying them underground. Until about five years ago it was seen as the saviour of energy systems because it was thought it would allow us to keep the existing means of generating energy, using fossil fuels, while dealing with emissions. A lot has changed in the

past five years and many of the proponents of CCS technology have stepped back from it, including the UK Government, the US Government, even under the Obama Administration, and many utilities. One reason is that in the 20 or 25 pilots that exist in the world for CCS applying to fossil fuels, the costs have come out as much more expensive than people were hoping they would be. It is a more costly way of mitigating emissions than renewables, even combined with technologies to deal with variations such as storage or demand management. To illustrate this, I will quote the chief executive of Enel, the Italian utility and one of the largest companies in Europe, who is also chair of the trade association, Eurelectric. He said:

I think CCS has not been successful. It doesn't work, let's call it what it is - it is simply too expensive, too cumbersome, the technology didn't fly.

In spite of the hopes of such companies that CCS would be a solution, in practice the confidence has greatly diminished and the solutions are now seen as not burning fossil fuels in the first place.

The IPCC comments on this were also referred to. The IPCC reflects the best science and has an extremely rigorous process of reviewing the already peer-reviewed science that has been published, which it does in the context of other peer-reviewed studies. It scrutinises the science and builds a consensus among scientific experts for what it all means. This appears in its assessment report which comes out every five to eight years. The most recent of these was published in 2013-14 and the next will be in 2021-22. There is a lot of rigour in its process and it does not try to publish an assessment every year. The greater degree of CCS, combined with bioenergy, shown in the fifth report of 2013-14 reflects how people thought up until 2011 or 2012, the period on which the assessment report is based. However, things have moved on significantly with the lessons that have been drawn from the pilot plants over the past five years and CCS is now seen as a much less promising prospect. It was supposed to combine with bioenergy to create negative emissions but a large number of papers in the peer-reviewed literature of the past year or two, which will be for a special report the IPCC is doing on achieving a target of 1.5°C and which will come out this October, show very few or no negative emissions and are looking at reducing emissions in the first place, rather than sucking them out later.

I have no objection to CCS, if it can be proved that it is safe. I am concerned about what happened with the Sleipner project in Norway which was thought to be safe until, after 20 years of operation, it was found not to be. If the experts can demonstrate that it is safe, that is fine, but let us not make decisions today, such as expanding our fossil fuels, on the assumption that someone later will make these technologies work. That would be unprecautionary and unwise.

Chairman: Does Mr. Murphy want to come in?

Mr. Brendan Murphy: I agree that the UK had moved away from CCS but I believe it is now moving back towards it. The UK climate change committee has, in the past couple of weeks, published a report advocating CCS very strongly. Several gas networks in the UK are looking at separating natural gas into hydrogen and CO₂, and storing the CO₂, as a solution. They are pushing back on it again because they realise electrification is not the silver bullet. There are several power plants up and running in the US, Canada and China where the CO₂ from exhausts is captured and stored. These are not pilot projects but large-scale, million tonne per annum plus capture projects which are working. They had some initial teething problems but they are working well. That is my view on where carbon control and sequestration, CCS, is at the moment. One has to be sure it is safe and secure. When one gets to that level of comfort, it would be much cheaper than most of the alternatives.

Mr. Paul Allen: When we are thinking about the cost of fossil fuel prices, it is also useful to bear in mind the IMF's working paper from 2015 on the hidden costs of fossil fuels. If one looks at the costs in terms of subsidies, plus the medical costs from dealing with emissions and related lung diseases, as well as future adaptation costs, the IMF estimated it was \$5.3 trillion in addition to what we were currently paying for 2015 alone.

We did the figures for power to gas for the middle of the winter. It is challenging. That is why we need the big power to gas plants and gas storage. One of the advantages of needing that is that it creates a market for the peak electricity throughout the year. One is taking peak electricity and making it into storable gas, which means one has a market, even though it takes four units of energy initially to give one unit of energy back when one needs it. Dealing with peaks in a large renewable grid is a problem. One is creating a market for that. One is also creating opportunities for a large gas infrastructure in terms of investment and jobs.

There is potential for exploring more high-voltage DC connectors across the EU. If we can do it on a stand-alone basis, we can do it on a shared high-voltage DC basis.

Deputy Eamon Ryan: I take it then that Mr. Allen's scenario did not include additional interconnection.

Mr. Paul Allen: We used the existing connection that was there.

Deputy Eamon Ryan: Yet it is tiny.

Mr. Paul Allen: It was not massive. We wanted to show it would work on a stand-alone basis. If we can show that, then sharing energy is an option. There is room for lots more modelling. There is nowhere near enough modelling being done around 100% renewables for the UK or for Ireland. There are big potentials which need to be explored.

I very much enjoyed the company of David MacKay. He regularly presented to our students at CAT, the Centre for Alternative Technology. At one point he said if we were going to do what we were suggesting, then we would need to cover the entire area of Wales with wind turbines. I then asked about an equivalent area out at sea to which he agreed. It is a large area but it does not have to be all onshore as offshore has a lot less visual impact. One wants to get social licence for that. The core to it is community ownership. When people see a wind turbine putting money into the local economy, that changes how they see it. That leads into the sort of research in the report, *Who Owns the Wind?* It is interesting how ownership can actually help how contracts for maintenance are deployed in the local community, as well as how the sourcing of the equipment and the labour can put money into the local economy.

To respond to Deputy Stanley's questions, baseload is a dead concept. It is a static amount of energy which one cannot change. What one really needs is flexible backup. That is the problem with nuclear. One cannot turn it off. It is useless when one has a big peak. Biogas has enormous potential. However, there are two types of gas storage. One is the biogas which is produced from natural systems. The other is the carbon dioxide captured by natural systems to upgrade the hydrogen. We have both of these working together in the scenario.

It is community ownership which creates the social licence for that. There is enormous potential for that to be integrated with a zero-carbon agricultural strategy for Ireland.

Deputy Brian Stanley: What percentage of power can be provided via biogas? In the paper that I produced on it, we estimated about 10% in the case of Ireland. Has Mr. Allen's organisa-

tion done any figures in respect of Britain or Ireland? We have a large agriculture sector and an agricultural waste problem. That is leading us into problems with EU regulations, never mind the damage to the environment.

Mr. Paul Allen: In the scenario, 15% of the time the energy supply is backed up by a mixture of synthetic methane and biogas and it is roughly one third biogas and two thirds synthetic methane. The powering down is pivotal. Society knows it is using too much energy. We are awash with designer obsolescence, such as washing machines and fridges that break far earlier than they need to. That has been challenged by legislation in France and we need to do so here. If they were not deliberately designed to break, we could get a lot more life out of all the material goods that we spend energy and materials manufacturing. Then there is the issue of hauling identical products around when we can selectively re-localise production of stuff. People are aware of that. We see things like repair cafes springing up in towns and cities. People are fed up of throwing things away that they know could be fixed.

The cost of hydrogen is something we have to think about but if we are looking at the rate of fall of renewable energy, as we see offshore deployments scaling up around India, they are going to come down in price. Having a mechanism for dealing with the peaks and capturing that energy is an added benefit. It is not really a cost. A peak in production will push the voltage or frequency up so we have to deal with that. Having that as a store is a benefit rather than a cost.

We have covered CCS fairly well. In response to Deputy Lawless, if we are going to be moving energy around with more interconnectors and if we are thinking about linking up, it is great to do models but they have to be rooted in the physics. It has to be rooted in the delivery of the well below 2° Celsius or 1.5° Celsius scenario of the Paris Agreement. We must think about how we can get the social licence for that. If we were to see Ireland's renewable resources as an intergenerational resource, not something to be taken by transnational corporations but something belonging to the future generations of Ireland, a bit like what Norway did with its North Sea oil and gas, that would create great potential excitement and opportunity for social licence. We should begin to think about it.

Chairman: Thank you, Mr. Allen. You will have an opportunity to come back in. I am going to continue with our witness presentations.

Mr. Paul Allen: I have available a physical copy because not everybody likes to read things online. If anybody wants to read a physical copy, I will pass it on to them, but everything is available for download online.

Chairman: Thank you. I invite Mr. Matt Collins from the Department of Communications, Climate Action and Environment to make his presentation.

Deputy Eamon Ryan: May I put a brief question to Mr. Allen first?

Chairman: Yes, very briefly.

Deputy Eamon Ryan: Both witnesses have mentioned Germany running 70% renewables. I presume that is at a moment in time and not over a year. We are probably one of the most advanced countries in the world in respect of integrating renewable power in a synchronised, isolated system. We have tested the edge of what is possible. Our best engineers tell me that it is not just voltage and frequency stability that are of concern but also inertia in the system. Has Mr. Allen looked at that? I believe we will go to 100% renewable and will probably be one of the first countries to do it at scale. Has Mr. Allen looked at the issue of inertia? How does he

answer the grid engineers? When I tell them to go further and do more, they tell me the physics of the inertia issue are not insignificant. It is one of the questions I have for Mr. Allen. As in Ireland, UK energy consumption is rising by 1.5% to 2% per annum. I agree fully that the emphasis must be on energy efficiency and a dramatic reduction in energy consumption. We have been thinking and talking for 40 years about how we switch from rising consumption. No matter what we think should happen, that is the reality of what is happening. Is there a policy measure or single silver bullet whereby we can make that switch and start to reduce demand by 5% to 8% per annum versus the current increases in consumption? What is the policy measure to achieve that?

Mr. Paul Allen: I will try to answer those very good but very detailed questions quickly. It is very difficult to predict what the wind will be six weeks in advance, but we can predict what it will be an hour in advance. We can start a combined-cycle gas turbine from cold within an hour. As such, predicting wind speeds an hour ahead and beginning to get backup systems ready to synchronise with them is not an impossible task.

Deputy Eamon Ryan: We still have an inertia issue on the grid system apparently and according to the best engineers.

Mr. Paul Allen: We can design out the inertia. If we can send people to the moon and Elon Musk's car playing David Bowie into space, we can design the inertia out of the grid system if we choose to do so. It is a matter of deciding to do it and investing in it. It is a big opportunity for universities, technical colleges and researchers if we set that as a national goal.

On the Deputy's other question, we must recognise the need for a cultural shift. The scene is set for a cultural shift. People know we have to change. We have seen cultural shifts around race, class, gender and in the #MeToo campaign, and people know that continuing to damage the environment and burden future generations is no longer culturally acceptable. Institutional systems will have to shift to deal with that.

Mr. Greg Muttitt: The Deputy asked a factual question about the Germany case which I can clarify. He is referring to annual average and saying this is what we could get to without having any technological issues. Germany is at about 40% annual average and I believe it has reached 100% on an hourly basis. When he says 70% to 80%, that is an annual average.

Chairman: I will bring Mr. Collins in for his presentation now.

Mr. Matthew Collins: I thank the Chair and members of the committee. It is a pleasure to be here. Ireland's energy policy seeks to strike a balance across three pillars to ensure a sustainable, secure and competitive energy system for Ireland. The key challenge for us is to ensure that Ireland's energy sector achieves a transition to a low emissions energy system which is reliable and secure at affordable cost. The proposed ban on exploration in Ireland would not reduce Ireland's greenhouse gas emissions. If the ban had been law, it would not have helped Ireland reach its 2020 emissions and renewable energy targets. It has been accepted that the proposed ban will not help Ireland reach its 2030 targets or its 2050 emissions reduction goal. Affordable energy is needed for businesses, which provide employment and create wealth, and for households, which need affordable energy and protection against energy poverty. The choices we make in energy policy affect our three goals. The lowest cost approach may not lower our emissions and may not help our security. Similarly, relying only on one or two renewable energies, like wind and solar which fluctuate significantly, may undermine our competitiveness and our security. Across the electricity generation, built environment and transport sectors, Ireland

has a long-term commitment to reduce carbon dioxide emissions by at least 80% by 2050 compared with 1990 levels.

The 2015 White Paper on Energy, Ireland's Transition to a Low Carbon Energy Future, sets out a vision of a low-carbon energy system where emissions from the energy sector will be reduced by between 80% and 95% by 2050 compared with 1990 levels. The reduction will require a significant increase in the share of renewables in primary energy supply. Fossil fuels will continue to make a significant but progressively smaller contribution to Ireland's fuel mix. In this low CO₂ emissions energy system scenario, the fossil fuels oil and gas will account for 26% to 51% of Ireland's primary energy supply in 2050. By banning exploration in Ireland's seas, we will be requiring Ireland to import all its oil and gas in the future. Both the International Energy Agency and the International Renewable Energy Agency recognise that around 70% of the global energy supply mix in 2050 will need to be low carbon and say the largest share of the emissions reduction potential up to 2050 relates to renewables and energy efficiency. However, all low-carbon technologies, including nuclear and carbon capture and storage, play a role internationally.

The proposed ban would not encourage the use of renewable energy nor support improved energy efficiency, both of which are fundamental to reducing emissions cost-effectively. We have seen that countries, like Norway, Denmark, Portugal, with active petroleum exploration or production, can also have high shares of renewable energy.

Therefore, the International Energy Agency and the International Renewable Energy Agency acknowledge that fossil fuels will still be needed in 2050. Natural gas would continue to play an important role in the energy transition, first, to ensure system flexibility and inertia with more renewables in the power sector and, second, to substitute for fuels with higher carbon emissions for heating purposes and in transport. The use of oil would fall as it was replaced by less carbon-intensive sources, but its substitution is challenging in several sectors, such as aviation, marine transport and petrochemicals.

A proposed ban on Irish exploration fails to recognise that, even as Ireland transitions to a low-carbon energy system, we will still use oil and gas. Oil will most likely be used for aviation, marine and heavy goods transportation and petrochemicals in the longer term. In addition, gas will be used to produce cleaner electricity, first by replacing peat and coal and later in combination with carbon capture and storage.

UCC's MaREI's energy policy and modelling team is the only research team nationally that has developed scenarios to explore long-term possible energy futures for Ireland, exploring the context of climate mitigation and energy security. MaREI's previous work informed the White Paper on Energy. It showed that the 80% reduction in CO₂ emissions by 2050 would still have significant levels of oil and gas in our energy mix. This was because some of the gas is used together with carbon capture and storage, CCS in electricity generation, and oil is gradually removed from Ireland's energy use, apart from in aviation and maritime transport.

MaREI also looked at deeper emissions reduction scenarios for 2050, taking account of the Paris Agreement. These all implied very significant challenges to our energy system which will require further consideration. At a broad level, it suggests that onshore wind energy and natural gas dominate the generation mix to 2030, after which gas-CCS, bioenergy and bioenergy-CCS become prevalent. It is understood that MaREI can provide additional information to the committee if it would be of assistance.

It can also be seen in a range of low-carbon energy system scenarios between now and 2050. There is a small but significant role for fossil fuels, mainly natural gas and oil, used together with CCS. In that context, it simply does not make sense to ban exploration for Ireland's resources and make Ireland 100% dependent on imports for gas and oil needs in the future when we know that Ireland's indigenous production at Corrib is going into decline.

It does not make sense to copy a policy from one country to another country without taking account of Ireland's circumstances. As the committee members know, Ireland has low energy self-sufficiency, being energy import dependent, having an isolated island electricity grid and having the largest agricultural share of emissions in Europe. In contrast, France, with many grid connections to other EU countries, will rely on nuclear power for 50% of its electricity by 2025. Ireland has a more ambitious goal: to produce 55% of its electricity from renewable sources over the next decade. Almost 80% of New Zealand's electricity comes from large-scale hydro and geothermal power. Similarly, almost 90% of Costa Rica's electricity comes from large-scale hydro and geothermal power.

It has been accepted that the proposed ban on exploration for Ireland's natural resources does not reduce our greenhouse gas emissions. The exploration ban offers nothing to the renewables sector and it would not improve energy efficiency. The exploration ban will not increase Ireland's energy security or keep our energy costs down.

Chairman: I thank Mr. Collins and I invite Mr. Scheer from SEAI.

Mr. Jim Scheer: I thank the Chairman and committee members for the invitation to make a presentation today. The Sustainable Energy Authority of Ireland, SEAI, is Ireland's national energy authority. A central part of the SEAI's remit is to contribute to the evidence base for policymaking in Ireland. This is supported by statistics and modelling functions based on a range of data sources, including the collection of data from programmes delivered by the SEAI on behalf of the Department of Communications, Climate Action and Environment across the household and business sectors. This work encompasses a focus on energy supply and use and hence energy related emissions.

In the context of the debate on the Bill at hand, in our submission we provided some statistics that highlight the extent to which we rely on fossil fuel energy use in Ireland at present and the associated CO₂ emissions. Some 92% of our energy demand is delivered by fossil fuels. This accounts for 61% of total green gas emissions in Ireland with the remainder mostly in agriculture. Since Corrib gas has come online, Ireland's reliance on imports reduced to 69% of total energy requirement. This is an improvement on the longer-term average of approximately 90% import dependence. We import all of our oil, and in the next few years as Corrib gas depletes, our reliance on imported gas will return to the historic average. The SEAI's statistical overview of energy security in Ireland, published in 2016, includes an energy supply and demand index as a measure of medium to long-term energy security over the entire energy system. An overall decreasing trend or worsening security is observed between 2000 and 2014, largely due to the increased shares of oil and gas ultimately sourced from outside the EU and OECD. Increased renewable energy penetration from local sources and greater levels of energy efficiency serve to improve this index by reducing Ireland's exposure to variations in prices of imported fossil fuels.

Looking closer at the data and focusing on energy supply, 56% of natural gas used in Ireland in 2016 was used in combined-cycle gas turbines to produce our electricity. This gas-fired generation provides system flexibility and other essential grid services to enable high levels of

variable renewable penetration. These technologies reduce emissions from electricity generation. In 2016, the level of avoided emissions from renewables on our electricity system was in excess of 3.4 million tonnes.

Focusing on the end-use sectors, we have around 800,000 homes and more than 25,000 businesses that use natural gas for heating and some high intensity industrial processes. Our transport sector is almost totally reliant on imported fossil fuels and is on a longer-term course to move passenger vehicles to electricity and freight and aviation to biofuels and biomethane.

There is a current and ongoing demand for fossil fuels in Ireland on both the energy supply and demand side. In our submission we provided a limited selection of international and national references, illustrating a range of future energy scenarios globally. What is evident from them all is that, in the long run, we need to reduce our fossil fuels to very low levels at least by mid-century. In scenarios specific to Ireland produced by UCC, where we contribute our share as part of the EU commitment on the Paris Agreement, three important but very much linked points or assumptions are crucial for decision-makers to understand. First is that the UCC Paris scenarios indicate that fossil fuels can play a role over the period to 2050 but must be on a decreasing long-term trend. At the same time as reducing fossil fuel use, according to the same projections, we must significantly scale up energy efficiency improvements across the economy and deployment rates of renewable energy sources for heat, electricity and transport starting now. If we continue to use fossil fuels to support renewables and provide heat and transport services in the medium to long term, they must be accompanied by technologies such as carbon capture and storage, somewhere between 2040 and 2050. If we delay on decarbonisation, the challenge becomes greater.

Our long-term carbon commitments mean we have a finite carbon budget. Any delay in the shift to sustainable energy technologies and practices means more emissions in the next few years, leaving less in the budget for the future. This means that we will have to eliminate fossil fuels sooner than the current scenarios indicate and the adoption of more expensive carbon capture and storage, CCS, and negative emissions technologies will need to occur sooner, so this will increase the cost of decarbonisation in the long term.

The SEAI's own modelling in the context of our role in producing national energy projections which inform the Environmental Protection Agency, EPA, national emissions projections highlight the anticipated impact of current Government policies and measures. In the latest EPA publication, 2018 projections estimate a 47 million tonnes to 52 million tonnes shortfall on current EU emissions reduction targets for Ireland to 2030. This analysis will be updated to include the impact of more recently announced policy and measures by the Department of Communications, Climate Action and Environment in the context of the national development plan. These will go some way to closing that gap but will not do so fully.

There are a number of measures that can be undertaken to make a significant difference now. First, in energy efficiency, most often the cheapest and most secure unit of energy is the one you do not use. A strong programme of energy efficiency is under way across the household, business and public sectors. This is yielding results and there is remaining potential to redouble efforts on energy efficiency across all sectors.

On renewable electricity, we anticipate that we will be close to our 40% target for renewable electricity by 2020 and we are modelling 55% renewable electricity to 2030. Others suggest that more may be possible. EirGrid is leading the way internationally on this and we have one of the highest penetrations of variable non-synchronised renewable generation in the world.

On decarbonising gas supply, actions to enable low-cost sustainable biomethane injection into the gas grid hold promise. That could further reduce the carbon intensity of electricity, given our gas use in the electricity sector and in heating. Our support scheme for renewable heat will soon be launched to support Irish businesses looking to switch to renewable forms of heating such as solid biomass, a low cost form of renewable energy.

Another initiative that will be required is the delivery of district heating networks in our cities and towns that make use of heat currently being wasted, for example, utilising waste heat from the Poolbeg waste to energy facility in Dublin. On transport, accelerated delivery of electric vehicles and increases to biofuel blends can have an impact. Finally, and, importantly, will be the establishment of long-term carbon pricing signals to drive investment across all sectors of the economy, combined with policies to support the less well-off who could be disproportionately impacted by resultant price increases. These examples are just a short list of what is possible and should be pursued from now.

Bringing these points back to the Bill under consideration, we acknowledge the current and likely ongoing role of gas, both as a heat source and an enabler of high penetrations of renewable electricity as illustrated in current practice and in the modelling; the need to minimise the negative environmental impact of ongoing fossil fuel use which could include, for example, using local sources of gas where they are found to be less carbon intense than imports; the need for accelerated deployment of renewable energy technologies and energy efficiency to enhance security of supply and, in the context of our commitment to the Paris Agreement, the range of existing analysis and the inherent uncertainty in scenario modelling.

On the basis of those points, we encourage debate to ensure the Bill includes sufficient flexibility so as not to eliminate the possibility of utilising local non-renewable energy resources where such use may be deemed the best option for the State and where it recognises our climate commitments and security of energy supply considerations for the long term.

Chairman: I thank Mr. Scheer. I call Mr. Denis O’Sullivan, head of commercial and corporate affairs, Gas Networks Ireland.

Mr. Denis O’Sullivan: Gas Networks Ireland develops and operates the natural gas network in Ireland, with 700,000 business and residential customers relying on natural gas every day. We recognise that what is at the heart of this Bill is the urgent need for Ireland to address climate change. While we strongly support climate action, we believe the measures proposed in the Bill will not assist Ireland in achieving climate change targets but instead will potentially commit Ireland to importing the vast majority of its energy needs. We believe there are more effective ways of tackling climate change while maximising the potential for cost efficiency and ensuring supplies of energy from indigenous sources.

As an energy source, natural gas is of key strategic importance to Ireland, representing 30% of the country’s primary energy mix and, importantly, 52% of Ireland’s electricity is powered by natural gas. Natural gas underpins the Irish economy and is a key driver of job creation and economic growth. As it is clean, flexible and cost efficient, it is the fuel of choice for employers in Ireland’s key economic sectors such as food, pharmaceuticals, information technology, IT, tourism and leisure and a key consideration for foreign direct investment companies coming to this country.

The development of the Corrib gas field significantly enhanced Ireland’s security of supply. Approximately 50% of our current natural gas is supplied from the Corrib field. According to

current estimates, this field will be substantially exhausted by 2025, albeit it will continue to produce thereafter. The Kinsale gas field has already ceased meaningful production. If the Bill were passed, within a decade, Ireland's gas supply could potentially be 100% imported, a situation not seen since 1978. It should also be noted that the Corrib project supported over 1,400 jobs in construction and development and continues to directly employ about 150 people. Having an indigenous gas supply such as the Corrib gas field gives us greater security of supply and diversification.

Where possible, all our energy should be indigenous, supporting Irish jobs and ensuring security of supply.

As it stands, approximately 10% of Ireland's total energy supply is renewable and 90% is based on fossil fuels. All current research and projections on energy demand envisage a substantial requirement for natural gas up to and beyond 2050. In the committee's session two weeks ago, Mr. Gould, the expert witness from the International Energy Agency, IEA, stated that in a scenario which achieved key environmental, health and social objectives, natural gas use will grow.

The 2015 White Paper on Energy, which lays out a pathway for decarbonisation, identifies the importance of natural gas and the gas network in decarbonising Ireland's economy. Natural gas is the cleanest fossil fuel and should not be seen in the same light as coal, oil and liquified petroleum gas, LPG. As such, we strongly advocate the continued replacement of more heavily polluting fuels, such as coal, peat and oil, with natural gas to help lower Ireland's emissions.

Natural gas has proven to be an essential enabler for renewable energy. While Ireland has excellent renewable energy sources and potential, such as wind and solar, renewable energy is intermittent and needs the reliability of gas. EirGrid's target for renewable growth is predicated on having natural gas to support this target. The members are probably aware that within the past fortnight, wind generation has fallen as low as 24 MW, which equates to approximately 0.5% of required supply at the time.

Ireland will require, for the foreseeable future, power generation from gas. Our challenge is to reduce the carbon intensity of that generation to the greatest possible degree. The International Energy Agency, IEA, has indicated that one third of global carbon reductions can come from carbon capture and storage, CCS. CCS is a technology which takes the carbon from the generation process and injects it into storage facilities. CCS can reduce the carbon emissions from gas power generation by up to 90%, while still ensuring a secure and flexible energy supply. Ireland has an ideal storage point in the depleted Kinsale gas field, which has some unique advantages as a potential carbon store. Much of the infrastructure is in place and a number of gas fired power stations are located in close proximity. CCS could capture emissions from gas power stations saving 2.1 million tonnes of CO₂ per annum. We are currently undertaking a feasibility study on the potential to use the Kinsale gas field for CCS.

Ireland has the highest potential in Europe for the development of renewable gas. Renewable gas not only provides an indigenous and sustainable energy source, it also provides a significant boost to the agri-sector. It can provide revenue streams for rural communities and it has the potential to create up to 6,500 jobs. Importantly, it can significantly address the emissions from Irish agriculture.

This year, 2018, will see the introduction of renewable gas onto the Irish gas network for the first time with the development of our first renewable gas injection facility in County Kildare,

which is currently under construction. This facility will have an initial capacity of 90 GWh per annum, enough renewable gas for approximately 9,000 homes. The renewable gas will be produced from agricultural and food wastes through a process of anaerobic digestion. Over the next five years, we plan to construct additional renewable gas injection facilities, with a total combined annual capacity of 1,450 GWh or 145,000 homes. By 2030, we are targeting 20% renewable gas in the network, a figure supported by a recent Sustainable Energy Authority of Ireland, SEAI, report on renewable gas potential. Achieving this target, however, will require support and policy change.

A recent KPMG study commissioned by Ervia has established that using renewable gas in the State-owned gas network can dramatically reduce CO2 emissions generated by heating 1 million homes located near the gas network and at one third of the cost of electrification. In addition to the existing 700,000 homes and businesses connected to the gas network, there are a further 300,000 homes within 20 m of the gas network. Converting these homes from oil to natural gas would result in a 30% reduction in CO2 emissions, with the potential of making these homes carbon neutral through the use of renewable gas.

Transitioning to a zero carbon society requires a shift in demand as well as supply. Another area where significant change can be made is transport. Currently, commercial vehicles using diesel account for 3% of the vehicles on Irish roads but 20% of the total energy used and 30% of the total transport emissions. Gas Networks Ireland is developing a network of compressed natural gas, CNG, refuelling stations for public and private transport operators. The first public station, located at Dublin Port, has been commissioned and will open to the public in the coming month. It will have the capacity to fuel up to 70 large commercial vehicles per day with an average fill time of less than 5 minutes, similar to that of diesel. Moving our public transport fleet to renewable gas should be a key priority and a key policy goal and can make a real contribution to Ireland's climate change objectives.

While this Bill is laudable in its goal of tackling climate change, we believe it is flawed and, in many ways, counterproductive. It could reduce our security of energy supply and will not contribute in any meaningful way to emission reduction. Gas Networks Ireland's view is that the best means of addressing climate change in a secure and cost-effective way is to promote policies which will support a seamless transition to low carbon. We support the committee in its endeavours and we would welcome its support for the initiatives we are undertaking. Addressing climate change is a key priority for our business. Ireland's natural gas network can play a major role in decarbonising our society, while still maintaining the security and cost-effectiveness of our energy supply.

Chairman: I thank Mr. O'Sullivan. I have one question for the SEAI and Gas Networks Ireland. Mr. Scheer referred in his opening statement to the University of Manchester research that indicates that by 2035, the substantial use of fossil fuels, including natural gas, within the EU's energy strategy will be incompatible with the temperature commitments in the Paris Agreement. Given that 2035 is only 17 years away and we need to start reaching our targets, as well as the unlikelihood of gas being discovered here in the future, would it not be better to ban the exploration of gas or oil? I ask the witnesses to bank that question for now.

Deputy Eamon Ryan: I will direct questions to each witness, starting with Mr. Collins. First, there needs to be an understanding of where the environmental community is coming from on the issue of banning exploration. After almost 50 years, we have learned that the culture change which Mr. Allen is seeking is a difficult one. Rather than us always putting the attention on the individual, is the Department using the right approach? People like Mr. Bill

McKibben and 350.org have shifted the way the environmental community sees this. We have to stop the problem at source. Rather than putting all the emphasis on the consumer, we need to stop it at the well head, the coal mine and the gas field. We do not see emissions as Irish emissions or American emissions. Regardless of from where the emissions come, they all go into the one atmosphere and remain there for hundreds of years.

If we can achieve an end to exploration here, it will have a real effect in that there will be no emissions therefrom going up into our collective atmosphere. Whether this accrues to Ireland in an accounting exercise within the European Union or otherwise, is a separate issue. The primary concern is stopping the emissions. It is global emissions and real emissions that we are interested in. This makes sense for a country regardless of the accounting issue. Owing to the approach we have taken of trying to have Ireland exempted, the Climate Action Network, Europe and others are citing Ireland as the second worst, only beaten by Poland, in terms of our policy approach. This is not an insignificant cost to this country in reputation. The argument is that this will not affect Irish emissions. It will affect the world's emissions and that is what is important. This is what we need to address and change.

Second, in terms of ongoing demand, I understand we have just agreed in Council and the trilogue process to an increase in the mandatory European energy efficiency target to 32.5%, with the prospect of a further increase in 2023. My understanding - I am going back a couple of years in this regard - is that the EU energy efficiency target had been set at 30%. I recall it being stated in a Commission paper that if we achieved that, gas demand in Europe would decrease by 23% to 35%%, which is lower than the European Network of Transmission System Operators for Gas, ENTSOG, targets or expected ongoing business-as-usual increase in production. If our European targets on efficiency are to mean anything, surely it should be a reduction rather than an ever increasing demand in gas supply.

My third point is a specific criticism, which I cited at our last meeting and will repeat now. If the Department's policy is based on the UCC modelling, I fundamentally disagree with those assumptions but that is not an argument to maintain exploration. I have said this to the excellent academics in UCC. I have no disagreement with their capability and intentions but I do not agree with them that we will see a world in 2050 where burning biomass for power generation is a viable sustainable or economic solution. I would love to hear from Mr. Collins how he thinks this might work. Are we, as seems to be the plan of Bord na Móna, to buy up Florida native forest, ship it here and burn it and watch two thirds of the waste energy go up a chimney and then do CCS on top of it? That is an incredibly expensive form of CCS. Even if CCS is viable and it is possible to do it at Kinsale gas field, shipping over a forest from Florida to burn it and waste two thirds of the heat and then attach CCS to it is never going to be economic. The environmental community is never going to accept it because as stated earlier by one of the witnesses, the amount of land we would require to power our future by burning biomass for power generation is plain unsustainable. To my mind, it is never going to happen. If it is happening, as I said earlier, the EPA projections show our fanatical plan to keep burning peat, while throwing in a bit of biomass and claiming this as a sustainable future, increases our emissions, as well as providing for a huge direct cost to the Irish people. I fundamentally disagree with the UCC analysis that CCS or CCS and biomass will be a viable alternative. I ask Mr. Collins to outline how he thinks this is going to work? How are we going to be burning biomass in a way that is sustainable in the future?

As the SEAI mentioned statistics I do not think are in the written presentation, I ask Mr. Scheer to repeat them. If I understood him correctly, he said that the current analysis is that

even with existing measures and the burning of peat, we would be short 47 million tonnes in terms of our 2030 target. This is before the 2030 target increases again, which will be the case following the agreement to raise the EU ambition agreed in the Council and trilogue process. This means even before that increased ambition, which we know is coming, we are already 47 million tonnes shy, if I heard Mr. Scheer correctly. He also said that the national development plan might help in this regard in terms of the commitments regarding the retrofit of 45,000 homes and on electric vehicles. Who is doing the analysis as to what the additional savings might be and does Mr. Scheer have a rough estimate of that saving? Why do we put together a national development without factoring in the carbon consequences of it? How is it that that plan was signed off before we worked out what the carbon consequences would be? What sort of planning is that? Mr. Scheer might elaborate on who is in charge of that analysis and when it will be published. If he does not know the answers to those questions, of whom should I ask them? This new climate committee is tasked with considering this issue. How do we find out, before going into the new committee that is being set up, what those measures and figures are?

My next question is to the witness from Ervia. If we are going to have 20% renewable gas in our network by 2030, where will it come from and how much of it is expected to come from grass rather than waste products? I am very supportive of the switch to anaerobic digestion for gas and similarly from food waste to other waste sources. How much of the 20% mentioned comes from waste and how much comes from grass? I am conscious that we cannot feed our cattle at present and must import fodder to feed our national herd. I would be slightly nervous if we are projecting that all that grass be used to go up a power station chimney rather than to feed our animals, which we are currently unable to do.

Why did Ervia increase its network in the midlands recently? Can I see a copy of the economic analysis that showed the case for expansion of the gas network at a time when everything indicates we should be contracting and managing our contraction of our fossil fuel system and fossil fuel use? What was the expansion of our gas network recently and where can I see the analysis of that in terms of cost benefit on the investment decision? I understood from previous experience that Ervia had gone to all of the big energy users and there was no big demand source for gas and so I was surprised when I heard it was expanding its network. I thought those days were over.

Deputy Bríd Smith: I ask the Chairman to allow Mr. Muttitt, who has to leave at 1.30 p.m., to put his question now and that it be addressed first.

Mr. Greg Muttitt: My apologies for leaving early but I have to catch the last ferry that will get me back to London today without flying. As we are discussing the climate emergency, that is my preference. I have a couple of questions for Mr. Collins on the other country comparatives. Mr. Collins said that France would have 50% nuclear in its generation mix by 2050. My question is about at which scenario the Department is looking because, under both the Hollande and Macron governments, the target was to reduce the proportion to 50% by 2025, although recently it was suggested the year might be pushed out to 2030. We expect it to be a lot lower by 2050. In one sense, all of the challenges associated with replacement make it more difficult for France than Ireland.

Reference was made to the analysis of the differences between the Irish case and those of France, New Zealand and Costa Rica. I was wondering whether the Department had also considered the similarities, particularly the fact that all three were significant importers. None of them is an exporter of oil and gas. All three have combined the restriction on new exploration with aggressive measures to expand the use of clean energy resources. Has this been consid-

ered?

The final question is on a comparator that is not a country. There is a very obvious difference. I am referring to the World Bank Group which announced in December that it would be ending the provision of finance for oil and gas extraction in order to align with the Paris goals. Has the Department, in its study of the Bill, produced or published an analysis of why it believes restricting supply does not affect the achievement of the climate goals by contrast with the analysis of the World Bank and quite a large number of economists who have argued that both must be addressed?

Chairman: I thank Mr. Muttitt. I shall bring in Mr. Collins or whoever wants to answer those questions from the Department. I will then come back to Deputy Bríd Smith.

Mr. Matthew Collins: It was stated the other three countries were importers and also encouraging technologies. Was the question about whether this was relevant to Ireland?

Mr. Greg Muttitt: My first question was about the scenario that would involve a 50% nuclear mix in France by 2050. That surprises me by comparison with the current policy position. If the Department does not know the answer, I will be very interested in finding out afterwards.

In its presentation the Department drew out the differences between Ireland and the three cases I mentioned. It also examined the similarities such as the challenges they faced as importers. How have they addressed them?

Mr. Matthew Collins: I have not examined the lessons they have drawn in terms of their imports policy. The lesson about which we are talking is that a number of years ago the Kinsale gas field was depleting. If the Corrib gas field had not arrived on the scene and not been developed, we would now be 100% dependent on natural gas. That would lead to full dependency on energy imports. That is the rationale regarding the link and the question as to why the restriction would not have reduced our emissions. We would have continued to use natural gas, but it would have been imported.

With regard to Costa Rica, the two countries are very different. We are not excluding or promoting any of the technologies used. The challenge we face is that we recognise the range of uncertainties in how future technologies and policies will work and how effective they may be. We are not excluding particular technologies. What we want to do is keep all available options on the table that will operate in delivering sustainable, secure and affordable energy supplies. It is not simply possible for us to focus on one single objective. That is why we urge that policy entail an integrated approach. The IPCC has advised that a wide range of measures should be adopted in mitigation strategies, partly for impact but also in terms of their cost-effectiveness.

Mr. Greg Muttitt: I thank Mr. Collins. I also thank the Chair and members for having me today. I apologise again for having to leave early.

Chairman: Not at all. I thank Mr. Muttitt for taking the time to travel over. It is very much appreciated. We will continue with the answers to the rest of the questions asked. Mr. Finucane may respond to Deputy Eamon Ryan's questions.

Mr. Martin Finucane: To clarify for Deputy Eamon Ryan, it is certainly not our intention to increase the amount of emissions or the use of peat in our system. By 2025 we will be out of coal. Before 2030 we will be out of peat. These two measures on their own will have the effect of halving the overall level of emissions.

In increasing the electrification of transport, particularly domestic vehicles, and the use of electrification in heating and cooling, particularly through the increased use of heat pumps, etc., there will be a bigger increase in the amount of electricity used by comparison with other sectors. Therefore, it is very important to us that the decarbonisation of electricity generation take place. There will be no point in using more electricity on the system unless its generation is increasingly decarbonised.

Deputy Eamon Ryan: I argue that we should stop the use of peat in electricity production today. We are to wind down its use by 2030. We will not have any peat left by 2030. My understanding is that what is proposed involves using up what is left. We had a meeting at the national economic climate dialogue, at which it was stated that in meeting the national objectives that would save us energy - I refer to the deep retrofitting of buildings - one of the biggest constraints would be that we would not have workers in the midlands. Why do we not just switch the workers from peat production which is highly uneconomic, massively subsidised and very dirty? Why not reskill those brilliant skilled workers in the energy world to achieve retrofitting in order that we could make energy efficiency savings? To say we are getting out of the use of peat by 2030 as if it were a good news story is not appropriate. From a climate perspective and based on any independent energy analysis, it makes no sense. Why are we doing it?

Mr. Martin Finucane: It is part of the transition in the electricity system. In pulling Monypoint and the three peat fired stations out of the system approximately 1.2 GW or so of dispatchable power will come off the system. In the same time period, over the decade, there will probably be a number of older gas fired plants retired from the system. The Deputy mentioned the DS3 programme. It is allowing us to use increasing amounts of intermittent renewables. In order to balance this with the dispatchable and dependable load, we have to manage our way through the transition. It is not that we can switch everything off tomorrow morning and suddenly replace it. It is a question of moving across in a balanced fashion and a way that will also allow us to plan for the replacement of these stations. In the time something comes onto our system, is built and becomes operational, a few years will elapse. Therefore, this is part of a managed transition across-----

Deputy Eamon Ryan: We would have a new interconnector with France and could and should have another with the United Kingdom. The supply of power would pretty much match exactly the power we would lose from the peat and coal fired power stations. The gas fired stations are under-utilised and not profitable. We have a large fleet of modern CCGT to match our renewables. We could run the country tomorrow with wind energy and gas supplies and through interconnections without a problem.

Mr. Martin Finucane: If one examines the projected growth levels in the economy, even in terms of the recent democratic data associated with Project 2040, in respect of which we are expecting the population to grow by 1 million by 2040, one will realise increases in interconnections, by way of the Celtic interconnector and the additional Greenlink interconnector with the United Kingdom, will help. Combined with new economic demands, the demographic growth and the retirement of older plants, there will be a need for increased electricity generation in the period in question. All of the things the Deputy signalled will help, but any of them on their own will not be sufficient. It will involve a combination of all of them.

Deputy Eamon Ryan: Let me get to the fundamental point. Rather than betting on the Irish stock market and offshore gas exploration, in respect of which there is no certainty and a chance of success of up to 40:1, should we not invest the same amount of money in wind energy generation off the west coast and in the Irish Sea and further interconnections? Instead of

doing that, should we not invest the same amount of money in offshore wind off the west coast and in the Irish Sea and further interconnection? We know the resource is there, the technology is sound and the price is decreasing. What are we doing betting on offshore gas exploration instead of investing in resources on the Stock Exchange? Good Irish companies are involved in this area. What is the economic rationale for going with risky, dangerous, polluting and uncertain bets versus known technologies, known prices and meeting our carbon targets? How come we are not thinking about using the grid connection to feed 5 GW generated off the west coast of Shannon into Moneypoint and doing the same on the east coast?

Mr. Martin Finucane: A number of different options to broaden the range of technologies deployed, particularly in renewables, are being considered. As we develop the national energy and climate plan, NECP, for 2030 and beyond, we will see significant deployment of the additional technologies that are being indicated as probabilities during that time span. At this point in time, it is a question of when these technologies will be deployed, not if.

Chairman: I will invite Deputy Smith to contribute before I ask the other witnesses to answer questions.

Deputy Bríd Smith: Mr. Collins stated that we had to keep all available options on the table. I question that. One of the available options - the extraction of fossil fuels - will not help us meet our Paris targets. Unless Mr. Collins refutes the science involved, then it is widely recognised scientifically that 80% of known fossil fuels must stay in the ground. As such, why would we fly in the face of that scientific knowledge by seeking to extract more? The Bill is simple, even though its details might make it look like it is creating complications. Evidence from Mr. Paul Allen, who is sitting close to me, shows that it will be possible to keep the lights on without the use of fossil fuels. Through this Bill, we are trying to tell everyone involved that we need to take decisive action now and not to view this situation as something that we can move towards further down the line.

I am not here to argue that the lights must go out and all activity must stop. It has been admitted that we can rely on the energy from the Corrib field until at least 2030. If we are to extract more fossil fuels, we would be locking ourselves into a fossil-fuelled future for another 20, 30 or 40 years. As we discussed last week, that is the time taken between the licence being issued and the resource being extracted and brought into use. I would like the witnesses to comment on these points.

Does Mr. Scheer understand that many of us are surprised that he is present in opposition to the Bill? The SEAI is the authority for sustainable energy, yet fossil fuel extraction is not sustainable. I assume that he accepts the scientific view that at least 80% should be kept in the ground and, therefore, we should not be seeking to extract more. Has the SEAI's board discussed the Bill and do all of its members agree that the position Mr. Scheer is taking in not supporting the Bill is in line with the SEAI's establishing ethos?

Mr. Scheer might clarify whether he accepts that gas is a continuation of the use of fossil fuels, is not fully clean and is not a bridging fuel. From his comments, I am unclear as to whether he accepts that.

My final questions are for Gas Networks Ireland. Arguing that our supplies are insecure because of Brexit or a reliance on, for example, Russian gas is scaremongering. The International Energy Agency made the same argument, but it used its figures to justify the assertion that the technology for extracting and storing carbon was a solution. It referred to a 50:50 chance of

meeting our Paris obligations with that sort of technology. As we have heard today, however, that technology is not possible yet. We are relying on something being available in the future rather than something that is decidedly an alternative now. Does Gas Networks Ireland accept that, if we found gas in the morning, we would still be locking ourselves into a carbon future, given that it could take up to 40 years for that gas to become usable? We would not necessarily benefit from it either. There are supplies coming in from the Corrib field, but given how the gas regime is structured in this State, there is no obligation on companies to sell it back to us. By the way, they would be selling back at market prices a natural resource that belonged to the Irish people.

Chairman: We will start with Mr. Scheer, then go to Gas Networks Ireland and the Department in that order. A number of questions were asked.

Mr. Jim Scheer: Three or four were to me. The Chairman asked about the University of Manchester study. It was a good example of another scenario that considered the EU budget flowing from Paris. Its conclusions about the substantial use of fossil fuels beyond 2035 not being consistent with the commitment are strong. I agree with that, and we are not discussing long-term substantial use. In everything we are saying, the UCC scenarios that are relevant for Ireland and all of the long-term trajectories, gas reduces to a low proportion of demand. That is combined with those kinds of technology that are on trial and of which there are some working examples, but that are more expensive and challenging. However, there are opportunities for them in Ireland. We need to consider the local situation.

The SEAI is 100% behind a 100% renewable future. Right now, it is a question of how to transition to that with our current technologies.

I mentioned an important point in my opening statement. A future with any fossil fuel in it - Mr. Allen talked about the important role of gas in his 100% renewable scenario - will concurrently require significant increases in the efficiency of renewable energies. If we do not do that, all of the scenarios will need to be rerun. As the transition from fossil fuels rushes towards us, we will quickly need to shift to, for example, negative emission technologies. However, such technologies are not necessarily proven and are expensive. The “no regrets” options are to go long on renewables and efficiencies now while acknowledging that gas is required to support a high level of renewables penetration, for example, in our electricity grid, to reduce the emissions factor for electricity, and to decarbonise heat where gas is used for that purpose in homes and businesses. There are probably thousands of ways to stay within a carbon budget. In our existing system, gas plays an important role and can play a role in the future, but only if we focus on efficiencies and renewables now and in the medium term.

That probably segues into Deputy Smith’s question. It is not an official SEAI board position, in that I did not get the paper or a position from the board. Rather than opposing the Bill, the focus in our recommendation was on including some flexibility. There has been much debate about various sources of gas for the future, be it the UK and the North Sea or elsewhere - they are likely to shift further and further east - and including liquefied natural gas, LNG, in the mix. The UK has increasing levels of LNG. The line of argument in our recommendation, which is consistent with the SEAI’s stand on a transition to a sustainable energy future, is that we should not get locked into a future in which we have to import gas from a country that is using gas with a greater carbon footprint than gas we might be able to source locally.

Deputy Ryan asked about the targets. I can respond from a modelling perspective. The SEAI does not make policy. Rather, we conduct analysis based on evidence and feed that into

the Department so that it can make policy. We pass on our energy projections to the EPA. They put it through their sheets and come out with the emissions projections and they combine that with agriculture to show us how we are going. The latest set of projections show that shortfall to the 2030 point-in-time target for the EU, which was only set for Ireland and agreed at EU level recently. In response to that what is seen is, and the Deputy has been involved in the process, an immediate response from Government in terms of announcing a range of new and enhanced policy measures. That is not inconsistent with the shift to a sustainable energy future. In that context, there are lots of moving parts in the modelling. What we have seen in the context of the economic recovery until quite recently was a prolonged period of low fossil fuel prices and a big increase in the projections for energy demand in the country. This will make our targets more challenging, given that there will be more demand for renewables and more carbon will have to be taken out of the system. We work very closely with the Department via our own modelling capacity to illustrate where we might go with the current rate of assumptions around the macroeconomy, with the current fuel prices and with the current suite of policies and measures that are announced and we do scenario testing to check how those projections might vary for different ranges of ambition. There is a question of timing in terms of when targets are announced, how things are modelled and all of that and ultimately we could be well in front of the game in anticipating a target from Europe and we could model how we will get there. We do not do that ourselves necessarily, we do the policy bottom up type modelling but the UCC-type modelling, which is the optimisation of the whole system and how we hit those long term targets, is also part of the decision-making process that the Department enters into and hosts. A technical research and modelling group is the clearing house for much of the research and modelling that is going on in this area. That is hosted by the Department and other members on that group include the EPA, ESRI, ourselves, the Departments of Finance, Taoiseach, Agriculture, Food and the Marine, Public Expenditure and Reform and Business, Enterprise and Innovation, Teagasc and analysts such as UCC and UCD. What we are essentially doing there as a group is modelling where we think we are at and where we are going, where we need to be, what the gaps are, and getting a much better of those and feeding all that back to the decision makers for that next push. We work closely with that interdepartmental group.

Deputy Eamon Ryan: Was the figure 47 million tonnes?

Mr. Jim Scheer: It was 47 million to 52 million-----

Deputy Eamon Ryan: Is that the shortfall across all sectors?

Mr. Jim Scheer: Yes. That could be made up in any one or a combination of the different sectors. The national development plan measures will eat into that somewhat and where we are at in the process now is that we have run those analyses from the energy side and later this week they will get passed to the EPA. The EPA will then run its full emissions model again to give us an update on that gap. We will get an update on that and make sure the committee is made aware of that.

Deputy Eamon Ryan: I ask about one aspect of this because it is specific. We are in the middle of devising the new national energy and climate action plan, which requires us to meet the 2030 target, and we have to keep in the back of our minds that the target will probably increase in a few years because of what has just been agreed. We are saying that we are between 47 million and 52 million tonnes short of what we have committed to and-----

Mr. Jim Scheer: That is the challenge for the group now, to sit down and-----

Deputy Eamon Ryan: -----that has to feed into the new national energy and climate action plan to do something more. Some of it will come from the national plan and from retrofitting but it is likely we will have to do a load of other stuff, even to meet the existing target, let alone the higher target that we know is coming.

Mr. Jim Scheer: Yes, absolutely. That technical research and modelling group becomes the discussion point for that when we continue to update the numbers and to think about the pathway forward so mapping the future pathways to target achievement is part of what that group will be charged with.

Chairman: Are there more questions Mr. Scheer wishes to answer?

Mr. Jim Scheer: I had one other. It was on how much of the biogas in 2030 will be from grass and the answer is that it is greater than 70%.

Chairman: We will move onto Gas Networks Ireland. I call Mr. O'Sullivan.

Mr. Denis O'Sullivan: I will address Deputy Ryan's questions first. The first one was on the 20% renewable gas on the gas network by 2030. Based on the work that we have done on that we envisage, similar to the SEAI, that approximately 70% of that will come from grass and the other 30% will come from farm waste such as slurry. While we examined at other waste streams, we have not gone into detail on them as of yet as to their potential but we believe that the best benefit is to be had from the agricultural sector.

Several studies have been undertaken on the impact of that on food production, including by UCC, and we have undertaken our own study. We are nowhere close to impacting on food production with that level of renewable gas production. Some of the reports suggest that we could go at least 50% higher before there would be a concern. On the more immediate term and the current drought conditions, the feedstocks for the production of biogas are not produced at the moment they are required for the production of biogas; they are produced a season ahead. The type of ground that is used for that is not grazing ground that is used for cattle. While there are issues with grass growth at the moment, there would not be a conflict in that regard but that is something that would be managed. Finally on that, Teagasc undertook some research which indicated that approximately one third of the productive farmland in Ireland is underutilised at the moment and not producing at its capacity. There is certainly huge scope for that. Our figures do not include that additional capacity that sits there as well.

Over the past three years we have expanded the gas network to Nenagh and Wexford. We have just completed an extension into Listowel and we are working on an extension of the network to Ballymahon, County Longford. In each case an anchor load has signed up with us for a gas supply. The Center Parcs development in Ballymahon is a significant load demand and the company has signed a contract with us for the supply of gas which facilitated the extension to Ballymahon. In completing that extension we are upgrading the pipe size because the cost of upgrading the pipe is proportionately small when all of the civil work is being done on the land anyway. In due course that will allow us to expand the network if sufficient load signs up. In making that decision we assess the potential load demand in Longford town and other areas around there and there is more than sufficient load in that area to sign it up and that underpinned our decision to upgrade the pipe, but the decision to expand into Longford is underpinned by an anchor load in the form of Center Parcs.

I will address some of Deputy Smith's questions but I will pass the question on CCS to my

colleague. I did not make any reference to Brexit, Russia in the context of security of supply. My statement mentions that the greater the diversity of supply that we have, the more secure our supply will be. In general, the gas network has proven itself to be extremely robust but without an indigenous supply, we are dependent on the interconnector to Scotland and where we to have multiple sources of gas coming into the network that is a more secure position to be in. Indigenous supplies of gas benefit the economy more than importing gas does in terms of employment and opportunities in that area, but also in terms of emissions. Transporting gas from Scotland consumes energy, albeit a relatively small volume. Indigenous sources are better in that regard.

Deputy Bríd Smith: Mr. O’Sullivan is not arguing that we are putting our energy security at risk because of our current connection with Moffat, which he has been saying for years is secure.

Mr. Denis O’Sullivan: In terms of energy security, there is the physical security of the network and its capability to provide the required amount of gas. In that regard it is extremely secure. In fact, that is what we continue to work on, and in the network development plan we publish every year we give an update on the activity we do to enhance the security of the network. One of the activities under way is the twinning of the last section of pipeline in Scotland. There is a single point of failure in Scotland and we are twinning that pipe to ensure that if one pipe fails there is an alternative. However, that will not solve some of the issues raised about the potential political impacts that could affect the supply of gas. The Moffat entry point, or the interconnector, is still a single point of entry from an economic point of view, but from a technical point of view we are confident it is secure. We are not involved in the procurement of the gas. Our role is to transport it. It is brought to our network and we take responsibility for transporting it and providing it to the customers on behalf of the shippers. The shippers are the people who need to deal with the question on the economic security of the supply of gas.

Deputy Eamon Ryan: I do not believe that oil and gas exploration off the west coast is a security response because there is no guarantee whatever we will ever find anything. The alternative would be a liquified natural gas terminal in Shannon or Cork. At our previous meeting, IBEC was very clear in its analysis that this is not a viable solution because of higher emissions and it not being economic. Does Ervia share the analysis that IBEC presented?

Mr. Denis O’Sullivan: We believe there is an opportunity for diversity of supply through liquified natural gas, and certainly for liquified natural gas driving competition in the market. This is evident in other markets where liquified natural gas follows the pricing of gas. I do not agree that liquified natural gas is unviable. On the contrary, there is an opportunity for liquified natural gas to become part of the mix. However, we cannot be totally dependent on liquified natural gas. By its nature, it poses a higher risk of supply interruption, even though what we have seen in the international market is that it is resilient but not as resilient as piped gas.

Deputy Bríd Smith: When Mr. O’Sullivan speaks about liquified natural gas security he refers to having all of the mixes on the table, including liquified natural gas, locally supplied fossil fuel sources and piped gas from Moffat. He wants all of these mixes on the table and available to Gas Networks Ireland. At the same time, he recognises the science that states 80% of known fossil fuels must remain in the ground. The point Deputy Ryan is making on IBEC’s submission is that liquified natural gas is more dangerous in terms of emissions and much more expensive. Mr. O’Sullivan still wants all of these on the table but he is telling us that he accepts the science. It does not add up in terms of making a contribution to reducing our emissions and keeping this country in line with the agreement we made in Paris.

Mr. Denis O’Sullivan: What we are dealing with is the reality that Ireland will need a natural gas supply for the foreseeable future, out to 2050 and beyond according to all of the research I have seen. To do this in the most secure way possible and to ensure we maintain the level of security of supply we have had previously, we would argue we should have more than one supply source or point. In this regard, we see that a follow-on indigenous supply from the Corrib would be an important part of it.

In terms of liquified natural gas, I accept the 80% figure. However, this is a practical argument. The more sources of gas we have coming to the network, the more we can be confident in securing the supply of gas to our customers. If the Bill were to be passed, once the Corrib field is depleted we would be 100% dependent on the interconnector. We argue that being solely dependent on the interconnector for our gas supply is not the most secure way.

Deputy Bríd Smith: I remind Mr. O’Sullivan that we heard evidence from Mr. Paul Allen earlier that continued reliance on gas competes with the renewable industry and pushes it back. How do we rely on gas and, at the same time, promote renewables in a realistic way that allows us to meet the requirements of the Paris Agreement?

Mr. Denis O’Sullivan: I do not necessarily agree with that point. If we look at the Irish energy sector, what natural gas, particularly in power generation, has done in recent years is act as a backup for renewables. The renewables have come on the system and gas has been set aside. In recent weeks, in particular, when renewables have not been generating to any great extent, gas has come back in. Gas is not pushing out renewables. The opposite is the case because renewables are pushing out gas. As I stated, we do not object to this. We are trying to support it in terms of finding ways of decarbonising the gas network so it can complement the renewable energy coming from wind and solar. The fact of the matter is that solar and wind are intermittent and, at present, we have to have gas to back them up. There may very well be good solutions at some point in future, but they are not available today, nor will they be available in ten years’ time.

Deputy Bríd Smith: Mr. O’Sullivan is speaking about 2050.

Mr. Denis O’Sullivan: Indeed, out to 2050. If we look at the broad range of research that has been done, I have not seen credible research, although there may be some out there, that would suggest we will be fossil fuel free or have completely eliminated our dependence on natural gas by that time.

Deputy Bríd Smith: What Mr. O’Sullivan has seen, and he acknowledged it, is that we are hurtling towards an overheating of the planet. He accepts the science on climate change. He has acknowledged it and he knows it is the case. Why would he not support a Bill to leave fossil fuels in the ground? It is simple. We will not have to rely on other supplies of gas until 2050. We have Corrib and, at the same time, we are importing gas. That gas has already been extracted from the earth.

Mr. Denis O’Sullivan: There are varying views on this. The International Energy Agency suggests we need more exploration and sites. It comes back to the fundamental point. If we continue to require gas up to 2050, our role is to ensure the supply of that gas is the most secure possible. Multiple entry points to the gas network are more secure than a single entry point. That is the simple point.

In the statement we submitted, we acknowledge there has to be a reduction in emissions.

We want to support the country meeting its targets and we have put forward several measures we believe will significantly assist in this. In terms of continuing to use gas for power generation, we strongly believe carbon capture and storage in the Kinsale gas field needs to be driven forward and explored. At present, nobody can put a credible alternative on the table that would allow gas power generation to be shut off.

Deputy Bríd Smith: Nobody is arguing that gas power generation should be cut off tomorrow. We are saying we have to transition from where we are to almost fully using renewables. We have heard many arguments about this today. Mr. O’Sullivan cited the International Energy Agency several times. Two weeks ago, representatives of the IEA informed the committee that we have a 50:50 chance of meeting our Paris targets. I put it to Mr. O’Sullivan that he would not get on a plane if he was told it had a 50% chance of crashing. He would not get on that plane and nor would I. This is what we are doing with our environment and planet, particularly by arguing that we will lock ourselves into a gas fuelled carbon fuelled economy by allowing the further extraction and exploration of oil and gas off Ireland.

Mr. Denis O’Sullivan: I agree with the Deputy that I would not get on a plane with a 50% chance of crashing, but that is the challenge we have. I do not see that banning exploration or banning the provision of undertakings to those who already have licences and have moved on significantly in terms of developing those opportunities in any way contributes to the 50:50 target. This means that instead of using an indigenous source we are going to use an imported source. We will probably differ on that point.

I refer to the Deputy’s point on sale of gas to the State. I believe that is correct, although I do not know what commercial arrangements the field operators have. My understanding is that there is not an obligation but from a practical point of view, taking the Corrib Field as an example, it has no alternative but to supply the gas into Ireland. If they were to look at an alternative, they would have to go building costly liquified natural gas, LNG, infrastructure, which is not practical when there is a market through the pipeline. They cannot bypass Ireland either in terms of the pipeline, because physical flow of gas from Ireland to the UK is currently not possible. It has to go onto the Irish network. Beyond that, I do not know what commercial arrangements are in place for any of the other operators.

Mr. Brendan Murphy: On Deputy Smith’s question as to whether CCS is a proven technology, CCS has been running since the 1970s. There are about 17 large-scale CCS plants around the world right now. Four are being added this year. It is a proven technology. The issue of cost has been holding it back, but cost is coming down. There is one plant in Saskatchewan in Canada, for example, where they reckon if they did it now the cost would be 50% less than what it was when they did it a couple of years ago.

This ties into the rest of the conversation with Mr. Allen earlier about the use of hydrogen, which we fully understand. There are two ways of getting hydrogen; one is from wind farms and the other is from splitting natural gas, storing the carbon dioxide and pumping hydrogen through the network. It is the same hydrogen. The idea that we would not use our natural gas to burn in power stations and capture the emissions, or split the natural gas, pump hydrogen and store the CO₂ - it seems like a very settled way of using natural gas.

In respect of 80% of fossil fuels having to be left in the ground, much of that is coal. Clearly, coal is a much more polluting fossil fuel than gas. The question is whether the world can get to a point where coal is left in the ground but gas, as the cleanest fossil fuel, is used in this long-term path.

Mr. Matthew Collins: I will try to cover the questions from Deputies Ryan and Smith. I reiterate my statement in terms of addressing whether we accept climate change science. I cannot recall when we last had that debate in Ireland. We are clear that all our policies are set in the context of international climate objectives to which we have agreed and European policy. For energy policy, the three pillars I identified at the start are important, namely, sustainability, security and competitiveness. Sustainability is the element under which we want to address our greenhouse gas emissions and that is at the heart of our energy policy. However, it is not just a single objective that we need to take account of. We want to achieve security of supply of energy sources for business and householders. We want to ensure that we achieve this transition and balance our security and sustainability goals in an affordable manner. That results in support for families and businesses in terms of competitiveness. Balancing those three objectives is at the heart of the energy policy but at the core of it is clearly sustainability. Within the EU, we have signed up to the framework convention on climate change and to the Kyoto and Paris accords.

Deputy Ryan mentioned UCC and scenarios. The role of scenarios was to provide context for deliberations and decisions. I will not defend or elaborate on the different scenarios they have proposed. I am sure the Deputy could engage directly with the centre in Cork.

Deputy Eamon Ryan: I have.

Mr. Matthew Collins: I am sure it would be informative for both parties to take part in that deliberation and inform the debate on this Bill.

In the context of sustainability, the challenge for this Bill is that it has been accepted it does not reduce our greenhouse gas emissions. That is the greatest flaw in it. It does not deliver on one of the pillars that I have set out and it will have an impact on security and competitiveness.

In terms of the question of whether exploration off the west coast will lead to improved security, clearly the discovery of the Corrib field had a significant impact in terms of our security. Our import dependency fell from 88% in 2015 to 69% in 2016. There is a practical recent example of how exploration can contribute to security of supply.

The other issue with the Bill is that it simply does not provide any stimulation to renewable energy and energy efficiency. These are also some of the issues that the Deputy mentioned in trying to shift the balance from actions from the individual or householders to the companies. One of the key measures that has been identified by the IPCC is the role of energy efficiency. Energy efficiency is a gain for householders as well as businesses. Renewable energy targets are being imposed on the generation sector and we are targeting the business sector as well in terms of who must take action. It is also to be aware that if we take decisions that inadvertently rule out options or have knock-on implications for the cost of the transition or security aspect, higher energy costs will have impacts on end users, such as householders, as well. We need to be able to balance the effect of all the impacts on the end users as well.

The issue of lock-in was described. The lock-in is being talked about in terms of how long it takes a project to come on stream. We are all aware how long the Corrib field took to come on stream. At the same time, other natural gas projects have come on stream in Ireland, such as Seven Heads, in a four-year time horizon. That is an example of a project that could be brought on stream in a timely manner and contributed to the overall objectives of our energy policy. It assisting our sustainability because it enabled transfer from more polluting fuel sources to lower polluting gas but also improved competitiveness in industry based in Cork and energy security for Ireland.

Chairman: I thank Mr. Collins. Would Deputy Smith like to make her closing remarks?

Deputy Bríd Smith: The Department is trying to make a case that the Bill denies the country energy security, that it does not contribute to the reduction of emissions and that it does nothing to incentivise renewables. I strongly reject all three grounds.

First, there is nothing secure, either energy-wise or any other way, in a planet that will overheat by more than 2°C and will fail to deliver on the Paris agreement. We have witnessed that in the past few weeks in places such as Quebec and Siberia where temperatures have been the highest ever on record. People have died. In Cyprus, old people are dying because of overheating. One can argue that is not evidence of climate change but we have just heard how everybody here accepts the science and the warnings that we need to keep fossil fuel use to a minimum.

The main argument we want to make is that this planet does not recognise borders when it comes to climate change. Emissions from China, Britain, Ireland or America impact on climate change. We have to do our bit to ensure that what is required for the future is done, that is, leaving fossil fuels in the ground.

I do not accept that the Bill will fail to incentivise the renewable energy sector; I believe it will. I accept the evidence from Mr. Allen that it incentivises renewables to undermine the production and the promotion of gas. Using gas is very much pushed on the community. It is advertised very heavily as a green form of energy, with blue and green imagery used in television advertisements, etc. Again, I accept that it is less harmful than coal and oil, but it is not a clean fossil fuel. There is leakage of methane which makes a contribution to the overall impact on climate change. The Bill sets out to say to everyone in the country, including employers, industry, the Government and beyond, that we need to do something decisive now and stop waiting to rely on future technologies to deal with the problem of global warming. We need to begin to deal with it now. As it has been on many other issues such as same sex marriage, Ireland can be a leader, instead of a laggard, as the Taoiseach said. I appeal to him, the Department and all of the parties to think long and hard about that because we are running out of time. What nature and physics are telling us cannot be denied. We will not have a second chance or a second bite at the cherry.

Chairman: I thank the Deputy. On behalf of the committee, I thank all of the delegates for coming before us and their substantive engagement with us. It is proposed that the committee publish the opening statements and submissions received on its website. Is that agreed? Agreed.

The joint committee adjourned at 2.05 p.m. until 1.30 p.m. on Wednesday, 11 July 2018.