IN-DEPTH ANALYSIS

Requested by the ITRE committee

European Parliament

A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany

Workshop Proceedings

Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
Author: Trinomics B.V
PE 638.411 - June 2019

EN

A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany

Workshop Proceedings

Abstract

This report summarises the presentations and discussions of the workshop on "A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany", which was organised for the ITRE Committee and held on 19th February 2019.

This document was prepared by Policy Department A at the request of the Industry, Research and Energy (ITRE) Committee.

This document was requested by the European Parliament's Committee on Industry, Research and Energy.

AUTHORS
Federica GERBER, Trinomics B.V.
Koen RADEMAEKERS, Trinomics B.V.

ADMINISTRATOR RESPONSIBLE
Frédéric GOUARDÈRES
Francesca BELTRAME

EDITORIAL ASSISTANT
Irene VERNACOTOLA

LINGUISTIC VERSIONS
Original: EN

ABOUT THE EDITOR
Policy departments provide in-house and external expertise to support EP committees and other parliamentary bodies in shaping legislation and exercising democratic scrutiny over EU internal policies.

To contact the Policy Department or to subscribe for updates, please write to:
Policy Department for Economic, Scientific and Quality of Life Policies
European Parliament
L-2929 - Luxembourg
Email: Poldep-Economy-Science@ep.europa.eu

Manuscript completed: June 2019
Date of publication: June 2019

This document is available on the internet at:
http://www.europarl.europa.eu/supporting-analyses

For citation purposes, the study should be referenced as: Gerber, F., Rademaekers, K., *A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany*, Study for the Committee on Industry, Research and Energy, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg, 2019.

CONTENTS

EXECUTIVE SUMMARY 4

1. OPENING REMARKS 6

2. THE ENERGY TRANSITION AND OPPORTUNITIES FOR EU INDUSTRIES 7

3. INTEGRATION OF CLIMATE NEUTRALITY, CIRCULAR ECONOMY AND ENERGY TRANSITION AS OPPORTUNITIES FOR EU BASIC INDUSTRIES 10

4. THE ROLE OF HYDROGEN IN ENERGY FLEXIBILITY, AVAILABILITY, SECURITY, AND DECARBONISATION 12

5. MARKET OUTLOOK FOR HYDROGEN TECHNOLOGIES IN EUROPE 14

6. PHASING OUT COAL FROM THE ELECTRICITY GENERATION SECTOR IN GERMANY 16

7. "ENERGIEWENDE" IN GERMANY - PHASING OUT COAL FROM ELECTRICITY GENERATION 18

8. QUESTIONS AND ANSWERS 19

8.1. The energy transition and opportunities for EU industries 19

8.2. The role of hydrogen 21

8.3. Coal phaseout 23

9. AGENDA 25

10. ANNEX: BIOGRAPHIES OF THE SPEAKERS 26

10.1. The energy transition and opportunities for EU industries 26

10.2. Integration of climate neutrality, circular economy and energy transition as opportunities for EU basic industries 27

10.3. The role of hydrogen in energy flexibility, availability, security, and decarbonisation 28

10.4. Market outlook for hydrogen technologies in Europe 29

10.5. Phasing out coal from the electricity generation sector in Germany way forward 30

10.6. "Energiewende" in Germany - phasing out coal from the electricity generation 31

NOTE 32

EXECUTIVE SUMMARY

Background

On Tuesday, the 19nd February, the Committee on Industry, Research and Energy (ITRE) of the European Parliament hosted a workshop on 'A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany'.

This workshop, chaired by Mr. Jerzy Buzek, was organised as the ITRE committee of the European Parliament has expressed its strong support for a common energy policy addressing competitiveness, security and sustainability issues. The Parliament has been striving for greater energy market integration and the adoption of ambitious, legally binding targets for renewable energy, energy efficiency and greenhouse gas reductions. In this connection, Parliament supports the adoption of stronger commitments to the EU's own targets, underlining that the new energy policy must support the long-term objective of reducing the EU's greenhouse gas emissions by 80 to 95% by 2050.

On the demand of the ITRE committee, the workshop touched on 3 different topics:

1. The potential offered by the energy transition to transform EU conventional industrial processes and preserve employment;
2. The role of hydrogen in opening new windows of opportunity in energy flexibility, availability, security, as well as improved efficiency contributing to the decarbonisation of the economy;
3. The case of energy transition in phasing out coal from the electricity generation sector in Germany.

The workshop consisted of six presentations by high level speakers, followed by a question and answer session.

The first speaker, Prof. Dr. André Faaij, Director of Science, ECN part of TNO, highlighted that there is no energy transition without transforming our industry. He emphasised that energy efficiency and diverse energy sources are not the final solution to the problem; instead, we should look at a diversity of industrial processes. Energy efficiency could lead to about 30% possible improvements, either through the latest generation of industrial processes or through completely new processes. About 20% of emissions reductions could be achieved through CCS. The rest should come from (green) electrification options, circular economy (by using fewer primary materials) and the deployment of green energy and hydrogen.

The second speaker Prof. Dr. Stefan Lechtenböhmer, Director, Future Energy and Mobility Structures, Wuppertal Institut, illustrated that basic industries are very important from a climate change perspective because 5 basic materials are responsible for over 20% of global greenhouse gas emissions: steel, cement, plastic (and other chemicals), paper and aluminium. He emphasised the importance of decarbonising materials production, developing solutions that go beyond energy efficiency. Prof. Dr. Lechtenböhmer highlighted 4 fields of intervention, including circularity, and 6 concluding recommendations, including market creation.

The third speaker, Dr. Paul Dodds, Assistant Professor & Senior Lecturer, Bartlett School, Faculty of the Built Environment, University College London (UCL), suggested that it's quite an interesting time for hydrogen and fuel cells. While the electrification of the mobility sector currently dominates, hydrogen is expected to emerge as a competitor.

There are many possible designs for hydrogen vehicles of the future and innovation will continue to be essential for price reductions. Dr. Dodds concluded by asking the question: where does Europe sit in this picture?

Currently, Europe is not in the lead in this sector.

The fourth speaker, Mr. Jorgo Chatzimarkakis, Secretary General, Hydrogen Europe, was keen to underline the different roles of hydrogen in Europe, in particular to enable the largescale integration of renewables into the system and as an enabler to combine both the power and the gas grid. Largescale commitment and investment in infrastructure will be necessary. To conclude, Mr. Chatzimarkakis illustrated come examples from around the EU.

The fifth speaker, Mr. Rafał Bajczuk, Research Fellow, Department for Germany and Northern Europe, Centre for Eastern Studies (OSW), illustrated the current decarbonisation commitments in Germany and challenges achieving these. According to Mr. Bajczuk, there is an understanding among German politicians and industry that there is a need for energy transformation because it provides opportunities for economic growth. However, coal remains a problem and there is a general consensus that a coal exit should take place. Mr. Bajczuk concluded by considering how the coal exit would affect power prices.

The sixth and final speaker, Prof. Jürgen-Friedrich Hake, Head, Institute of Energy and Climate Research - Systems Analysis and Technology Evaluation, Forschungszentrum Jülich, began by underlining that there is a general agreement on how we should transform our national energy systems. He proceeded to describe the German "Energiewende." According to Prof. Hake, the focus is therefore about jobs and money and the structural changes needed. Prof. Hake continues by illustrating the challenges implementing the Energiewende in Germany, including some of the challenges to be expected following a coal exit.

During the question and answer session, a lively discussion took place. Members of the audience asked several questions, for example expressing concerns about some of the technical aspects discussed in the presentations, to which the presenters provided responses in turn.The executive summary should be a maximum of 7500 characters without spaces, roughly 2 - 3 pages.

1. OPENING REMARKS

The workshop was chaired by Mr. Jerzy Buzek. He began by briefly summarising the importance of the energy transition which were to be discussed in the context of the main topics of the workshop. Mr. Buzek welcomed the participants and introduced the 3 main sessions of the workshop:

1) addressing the potential offered by the energy transition to transform EU conventional industries and industries and preserve employment;
2) explore the role of hydrogen in opening new windows of opportunity in energy flexibility, security and availability and how to improve efficiency contributing to the decarbonisation of the economy; and,
3) present the case of energy transition in phasing out coal from the electricity generation sector in Germany – in essence, the Energiewende.

Mr. Buzek proceeded by introducing the speakers and highlighting their backgrounds and expertise, prior to each presentation.

2. THE ENERGY TRANSITION AND OPPORTUNITIES FOR EU INDUSTRIES

Prof. Dr. A.P.C (André) Faaij, Director of Science, ECN part of TNO

Prof. Dr. Faaij began by thanking the chairman and the audience and setting the scene regarding the challenge of the energy transition. Prof. Dr. Faaij highlighted that there is no energy transition without transforming our industry. He illustrated that industry is a huge part of our total emissions depending a bit on the country but it constitutes about one third overall at the European scale if you include indirect emissions also used for feedstocks in the chemical industry and the production of power going into these industries. He emphasised that energy efficiency and diverse energy sources are not the solution to the problem.

In fact, there are many different kinds of energy use that have to be considered including very high temperature levels of the high temperature processes in the chemical industry and steel, etc. which set specifically high-power demands. And also the feedstock part, which is important. So, it is a diversity of industrial processes that we are looking at.

The first thing to consider is improving energy efficiency. Here, Prof. Dr. Faaij presented a graphic that looks at shorter term potentials for efficiency improvement throughout the EU. The graphic showed that all sectors can deliver energy efficiency improvements, including industry. However, in industry this is to a limited extent since many industries have already improved their processes over the years. As such, efficiency improvement will help but it is not the final solution to the problem of industry emissions. Some of these energy efficiency measures include very down to earth measures such as improved pumping, for example, which is often done in a crude way with valves but it can also be electronically controlled for increased energy efficiency. Overall, we're looking at about 30% possible improvement in energy efficiency, either through the latest generation of industrial processes or through completely new processes, but what is clear is that we need to do more.

Prof. Dr. Faaij highlighted a very interesting example in the steel industry – the so-called Hisarna process demonstrated in the Netherlands at TATA Steel[1]. This process skips cokes production and the pellets used in the classic furnace, meaning that the factory is actually much simpler, resulting in fairly concentrated CO2 as the main exhaust due to being oxygen fed. The process is about 30% more efficient compared to conventional steel. Additionally, it is possible to capture the exhaust CO2 at a fairly low cost in this process, which could result in 80% emission reduction, while the expectation is that it will be cheaper per tonne of steel than conventional steel production.

The CCS possibility is deemed essential to bring the emissions of heavy industry down considerably. Here, Prof. Dr. Faaij exhibited an older graphic from the IEA described, which showed that heavy industry was already considered an important target to lower emissions and also bio-based conversion was highlighted as important for bio-based fuels and chemicals. In this context, once the bio-based economy/ infrastructure is in place it can be very important to lower emissions of heavy industry, especially the chemical industry. If bio-based industry is combined with CCS, then there could be negative emissions in these industries, and such fundamental changes are needed. These types of changes are also highlighted by the IPCC as one of the fundamental pathways forward. However, deploying CCS requires a lot of new infrastructure.

[1] https://www.tatasteel.nl/nl/duurzaamheid/innovatie/Hlsarna

Prof. Dr. Faaij used a map of the Netherlands to illustrate CCS infrastructure at full scale of deployment. He stated that at the moment we are talking about 20% of emissions reductions achieved through CCS in the next half century and beyond. CCS needs to be coordinated also in the North Sea region, where the largest CO2 storage potentials are, so it is a matter of European collaboration. The Rijnmond area features some of the largest oil refineries in the world and the installation of pipelines would need to be done in a collective way including all relevant stakeholders, combining efforts of different factories, to get economies of scale. This is where the clever solutions lie. The Rijnmond area is trying to coordinate such efforts, to implement CCS infrastructure connected to the North Sea for the decades to come.

Refineries have a long list of options for which the CO2 reduction potential was calculated in combination with the cost. For a refining complex with bio-based, CCS and energy efficiency, this combination can bring down emissions of implementing complexes by 80-90% and in some cases even achieve negative emissions. It is therefore the whole mix of options that needs to be considered at refineries, for example.

Another key element is circular economy, which also counts heavily in reducing emissions. As soon as fewer primary materials are needed in our economy, such as primary steel, cement, plastic, then there will be considerable energy and emissions savings. Product and monomer (chemical) recycling are therefore also options that still have major potential to contribute but such changes will also affect value chains: flows of mass in the economy, infrastructure, organisation of logistics (logistics in particular will require a major effort).

There are also electrification options to reduce emissions in industry. Given the high heat demand in industry in several specific processes, it is especially electrification that can bring down heat demand, for example in distillation, drying, but also in particular chemical processes such as from power to hydrogen and CO2 chemistry. Depending on the type of factory being considered, these options come into play, but often considerable innovation is needed, such as the development of specific catalytic materials (e.g. cathodes). Innovation is also a major way to bring green energy into industry and at the same time improve energy efficiency.

Prof. Dr. Faaij emphasised that the key message of his presentation is that there is a whole portfolio of options: energy efficiency, new processes, the use of renewable feedstock (e.g. bio-based), the deployment of green energy and hydrogen, CCS and recycling/circularity. In total, the message is positive because bringing down industrial emissions by 90% or more (or, negative in some cases) is possible through various combinations of options. The big complexity is in how to find the right mix per sector and also depending on geography. Key questions could be: where is the available CCS infrastructure? Or, do we have enough green hydrogen available at reasonable cost? These factors will affect decisions of these industries in the coming decades, which is the big puzzle that needs to be solved.

So far in this presentation, we considered the factory level. But we must also consider how the energy system changes around these industries. Questions that come up concern some of the most important variables, such as: What percentage emissions reduction in industry should we target? Do we have CCS or not? Is there lot of biomass or not? What is the level of technological development for power to hydrogen?

Prof. Dr. Faaij presented a 2050 energy flow diagram where 90% emission reductions are achieved through hydrogen and solar for example, highlighting that this can be a future.

But as soon as there is more CCS and biomass available, the system can change a lot resulting in lower cost too. Negative emission systems that could emerge can create space in the rest of the energy system.

The environment in which these industries are changing is uncertain and yet will be a determining factor over time for choices and investment decisions. The power system is also changing with more intermittent power from solar and wind giving more fluctuations and we need response capabilities for this which can come from industry, for example power to heat or power to hydrogen. Industry will therefore become more intertwined with the energy system. We also hope that this future will bring low hydrogen cost, which is in principle possible. Similarly, the possibility of achieving green hydrogen with lower costs is also a reality. However, there are a lot of conditions that need to be met for that and the timing will also vary from place to place.

To conclude, Prof. Dr. Faaij presented a rather complex graphic showing the major interactions of a given factory with the changing energy system. It is this interaction that we need to understand in detail, which can also include many interesting business cases. A key example comes from the DelfzijI2 delta in the north of the Netherlands, where there is a lot of chemical industry that is becoming bio-based. Additionally, illustrating developments in the industry-energy interface, in that region they receive a lot of wind power arriving at the coast with new cables and there are already demonstration projects for electrolysis and underground storage. Industries in this region are combining different and innovative features. Over quite a large area there is a more and more integrated system developing and the business cases cross over the different sectors. These dynamics are very interesting and are also where industry sees a lot of opportunity. Overall this is good news and there are sufficient potential measures to decarbonise our industry (potentially negative emissions). There are several transformation pathways which can actually become competitive in time, for example Hisarna. Prof. Dr. Faaij highlighted the importance of understanding how competitive transformation pathways can be achieved from case to case and then carry out the planning accordingly to mitigate costs and avoid losing any competitive position. Planning and innovation are key to bring the costs down and ensure a sustainable industry in the future. It is essential to mix the options to achieve balance, while stability in these pathways and in the innovation system is key.

[2] https://www.delfzijl.nl/

3. INTEGRATION OF CLIMATE NEUTRALITY, CIRCULAR ECONOMY AND ENERGY TRANSITION AS OPPORTUNITIES FOR EU BASIC INDUSTRIES

Prof. Dr. Stefan Lechtenböhmer, Director, Future Energy and Mobility Structures, Wuppertal Institut

Prof. Dr. Lechtenböhmer began by thanking the chairman, the MEPs and the audience and expressing an honour to be there to discuss on the important topic of climate neutrality, circular economy and energy transition as opportunities for EU basic industries.

There is a major European cluster of energy intensive industries on the river Rhine towards the Rijnmond area. Northwest Germany, the Netherlands and Belgium represent a significant cluster for industrial activity. The topic of industrial emissions reduction has to be discussed internationally because of the very fact that the industries and the emissions cross borders.

Basic industries are very important from a climate change perspective because 5 basic materials are responsible for over 20% of global greenhouse gas emissions: steel, cement, plastic (and other chemicals), paper and aluminium. These represent more than 10 Gt of emissions globally, and they are all materials that we will also need in a sustainable future. In Europe, production of these materials is more or less stable but worldwide it is growing at a high pace, doubling in the decades to come. It is therefore critically important to tackle the issue of how to reduce emissions in these hard to abate sectors.

Prof. Dr. Lechtenböhmer is hopeful that it is not impossible to carry out deep decarbonisation of materials production but that we have to develop challenging solutions that go beyond energy efficiency, for example direct and indirect electrification, where indirect refers mostly to hydrogen. There is also CCUS and biomass, and circularity is the third important strategy.

To implement these strategies, we need breakthrough technologies much more so than in other fields such as, for example, buildings, where it is also challenging but where the technology mainly is already there. For basic industries, we need to develop technological solutions and also invest them under high market risks. We also need huge infrastructure for the significant amount of renewable energy and/or hydrogen that these breakthrough technologies would need. Where the CCS option is being considered, it will also be necessary to ensure connection to or installation of specific infrastructure. Cost structures must also be tackled, since many of these processing industries will change significantly once the breakthrough technologies are implemented. This could be disruptive for a couple of big and central companies and also for important regions employing many employees in the EU. If we consider steel, cement and chemistry production in the EU, these 3 sectors currently emit half a billion tonnes of CO2 and the challenge is to be close to zero by mid-century for these sectors.

Together with a company called Material Economics, the Wupperthal Institut has depicted a scenario analysis of 3 main pathways: the first one is circularity and reduced primary energy demand (e.g. if we use secondary steel we can have high quality product at 90% less emissions, the same holds true for aluminium, and while it's also possible for chemicals and chemistry but it's much more challenging). According to our scenarios, circularity will deliver 20-50% of required emissions reductions. The second pathway considers a breakthrough regarding renewable electricity, again including hydrogen for example for steel making but also for many other processes. Breakthroughs in renewable electricity will be the biggest share of the solution delivering between 44-64% of emission reductions needed in these sectors.

Last, Prof. Dr. Lechtenböhmer presents the pathway of CCUS and CCS, which makes up 20-25% of emissions reductions in the scenarios presented. These scenarios illustrate the strategies we have at our disposal to decarbonise basic industries. It will be essential to have a comprehensive view of these industries and to consider them from circularity perspective and as individual innovation systems. While these industries have not been very innovative so far, it is essential to really look at the whole innovation system. Prof. Dr. Lechtenböhmer then proceeded to give a flavour of what value chain perspective means for steel, as an example.

Currently when we talk about steel, we are talking about primary steel making, secondary steel making, hot and cold rolling and this makes steel. The steel sector currently emits 200m tonnes of CO2 in the EU. However, Prof. Dr. Lechtenböhmer highlighted the subsequent value chain of steel: the manufacturing component, such as the building of cars and houses; the consumption of these goods; the huge stock of steel in the EU amounting to several Gt of steel; and the steel recycling that is taking place, where much of the recycled goods are exported. There are innovation fields all along this entire value chain so while it's important to go for decarbonising primary steel making, using lots of hydrogen, we can improve much more if we take into account the whole value chain. Additionally, taking into account the whole value chain allows us to better tackle and find new business opportunities in the sector.

Prof. Dr. Lechtenböhmer highlighted 4 fields of intervention. First, green energy supply will be essential if we want to decarbonise the basic industry sector. Significant of R&D and investments into new technology will be needed. While much of these technologies are already invented, significant investments are needed to ramp up, scale and achieve successful market introduction. Since this last point concerns lots of investment in insecure fields, the right tools are also necessary to enable that. Thirdly, we also need to create the demand for these products since initially they will be more expensive than traditional high carbon products. And finally, we need to support circularity since this is the main lever to reduce primary energy demand. We need an integrated package of climate and industrial policy, which should in turn also be integrated with energy policy and resource policy. Nevertheless, while research and innovation is essential, we must not forget structural policy because these industries are concentrated in a small number of regions, and often these are also the coal regions, so we are talking about significant challenges also on a regional level.

Prof. Dr. Lechtenböhmer concluded his presentation with six bold recommendations from himself but in collaboration with IT-503. (1) a sort of flagship and mission-oriented R&D program will be needed for low carbon and circular economy in these energy intensive industries; (2) strategic alignment of energy and industry strategy will be needed because we need to have (3) huge amounts of renewable energy at these industrial points, (4) financing will be required to for investment in these industries, because basic industries haven't invested substantially in the last decades and if they have they tended to do this in Asia as opposed to in Europe; (5) strategic industrial and low-carbon infrastructure, planning and development will be required, including political acceptance for all the cables, pipelines, etc.; and finally, (6) market creation will be essential for those goods.

[3] https://europeanclimate.org/industrial-transformation-2050-ecfs-new-flagship-project-helps-to-deliver-a-thriving-industry-in-a-net-zero-emissions-europe-by-2050/

4. THE ROLE OF HYDROGEN IN ENERGY FLEXIBILITY, AVAILABILITY, SECURITY, AND DECARBONISATION

Dr. Paul Dodds, Assistant Professor & Senior Lecturer, Bartlett School, Faculty of the Built Environment, University College London (UCL)

Dr. Dodds began by thanking the chairman for his introduction. In his research Dr. Dodds uses energy system modelling to model how to decarbonise economies at least cost. He states that it is interesting to see what these models actually tells us, what works and why. In his research he applied these models to find the cheapest way to decarbonise the UK economy and the result showed that by 2050, 25% of final energy consumption (around 1400 petajoules) is from hydrogen, with about 40% of this decarbonisation relating to industry. It's interesting to compare this research result with what other researchers have done. Dr. Dodds showed a comparison with similar JRC research and the JRC results found hydrogen final energy use of around 500 petajoules for transport and across Europe, a bit less for hydrogen in industry and no hydrogen for decarbonising heating. So there are a few differences in the research, which is interesting.

Dr. Dodds suggested that it's quite an interesting time for hydrogen and fuel cells, for example now you can actually buy a hydrogen fuel cell powered car, which is a new development that has emerged. Largescale production of these vehicles has only started in the last few years and this development reduces costs and spurs innovation. There are many other vehicles also involved too, e.g. forklifts, buses and we've seen the first trains in Germany. This reality is interesting because in his model, Dr. Dodds didn't have much hydrogen transport.

According to research by the IPCC, electrification is going to dominate the market and is already dominating the market and that won't change in the years to come. However, according to the automotive executive survey by KPMG[4], 71% of senior executives in Europe believed that fuel cell vehicles would be the breakthrough technology for mobility. This result suggests that hydrogen and battery vehicles will compete. Indeed, hydrogen advocacy has ramped up recently and there has been a number of McKinsey-backed reports, for example by the Hydrogen Council and people are very positive in this space at the moment. However, there is a lack of credible alternative studies on the potential of hydrogen, particularly globally, which is something to work on in the future.

Dr. Dodds illustrates the basic design of hydrogen vehicles in his slides, highlighting that there are many possible designs for hydrogen vehicles of the future, such as plug-in hybrid hydrogen. It is interesting to look at the cost of ownership for hydrogen cars, where fuel is a small proportion of the total cost of ownership of a hydrogen vehicle and infrastructure even smaller. The vast majority of the cost is the capital cost of buying the car or the operating cost. From around 2030 onwards, all of the various power trains have a cost somewhere between GBP50,000 and GBP60,000 and we have to accept that the cost of many of these technologies are uncertain. Despite this uncertainty, the costs of hydrogen vehicles are likely to converge with those of all other fuels, so other vehicle elements (e.g. size and range) are likely to be more important. Innovation is key in these areas and we have an innovation race between all the different technologies, with an uncertain outcome. Innovation does actually work to decrease prices over time[5].

[4] https://home.kpmg/xx/en/home/insights/2019/01/global-automotive-executive-survey-2019.html

[5] Not everybody realises that currently most fuel cells are used for heating not for vehicles.

Dr. Dodds concluded by asking the question: where does Europe sit in this picture? Japan and Korea have more patents granted in hydrogen than the EU – the EU is not in the lead in this sector. Japan has put a lot of effort and funding into both fuel cells for heating and for vehicles, while Germany has also made investments in these areas, the EU looks a bit behind in terms of funding overall.

5. MARKET OUTLOOK FOR HYDROGEN TECHNOLOGIES IN EUROPE

Mr. Jorgo Chatzimarkakis, Secretary General, Hydrogen Europe

Mr. Chatzimarkakis thanks the chairman and starts by also acknowledging the importance of hydrogen in the future, including several companies. The Joint Undertaking that Mr. Chatzimarkakis deals with in his role as Secretary General of Hydrogen Europe is between the public (EC) and also industry and research. It has had several successful projects in the field of energy and transport but also cross-cutting projects. It's very important to understand the several different roles that hydrogen has and why there is such a "buzz" about hydrogen. He highlights that hydrogen is not a hype; hydrogen is here to stay, even according to the IEA.

The first role of hydrogen is to enable large scale renewable integration in power generation into the system. A lot more renewables need more storage, which opens the door for hydrogen. Second, the distribution across sectors but also regions – if you transport an electron that has been produced renewably it's 10-20x more expensive (depending on which country you're in) than using the gas grid, so it is affordable if it is transported in this way. Hydrogen then also acts as a buffer between the power and the gas grid, increasing the system resilience that we don't have at the moment. Then, you can decarbonise the end uses – transportation, industrial energy use, building and heating power and hydrogen as a feedstock (e.g. refining, chemical industry and steel).

The enabler to combine both the power and the gas grid is hydrogen. Power to gas technology is a key technology to help the limited and small power grid to be stronger by using the gas grid. Hydrogen is the only solution to that. In the long-term strategy described by Mr. Chatzimarkakis there are 8 scenarios, most of which have a big part for hydrogen, with one scenario focused exclusively on hydrogen. There is also one full electric scenario described, but the power grid would then need to be ramped up, which is not happening currently. The likelihood to decarbonise through the gas grid is therefore higher than by going through the power grid. The McKinsey study launched quite recently on Europe shows that if we go the hydrogen pathway, we could have an abatement of 560 mega tons of CO2 yearly in Europe, 24% of the final energy demand based on hydrogen, an annual revenue of hydrogen and hydrogen technology of €820 billion per year, reduction of local emissions by 15% and 5.4 million direct jobs in hydrogen or hydrogen related sectors[6]. There are several different applications of hydrogen that we can expect to reach mass market penetration in the years to come, for example in the mobility sector mass market penetration is expected in the next 7 years.

If we have more renewables, we need more storage and hydrogen provides some of this increased storage capacity. Europe already has sizeable storage capacity for hydrogen: its gas grid has capacity of 36 billion cubic metres assuming 10% blending and could thereby immediately store up to 100 terawatt hours of hydrogen. In the future, salt caverns and depleted gas fields could also serve as storage. Assuming a capacity of 80%, Europe's 18 billion cubic metres of salt caverns offer storage for about 40 terawatt hours of hydrogen.

This is possible in Europe, although there will be regional differences since some countries have better or more salt caverns, but the gas grid can be considered to be very developed everywhere.

[6] https://fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf

Hydrogen today is a business worth €1.3 billion turnover per year but in which sectors is it currently used? Mr. Chatzimarkakis illustrates that it is currently used significantly in the refining sector, which is the biggest hydrogen user in Europe. Then comes ammonia, used mostly for fertilisers, followed by methanol used in the chemical industry – in total, 325 terawatt hours of hydrogen currently used. In the future, the use of hydrogen in the refining sector will decrease but use of hydrogen in the chemical sector will definitely increase, especially ammonia, methanol and CCU. In the steel sector up to 2050, there will be a demand of 390 petajoules for hydrogen.

To conclude, Mr. Chatzimarkakis illustrated come examples from around the EU. Gasunie, a member of Hydrogen Europe, is the Transmission System Operator of gas in the Netherlands and in some parts of Germany. Mr. Chatzimarkakis illustrates that Gasunie has a strong roadmap that they are implementing for hydrogen, including the integration of offshore wind and the reduction of gas infrastructure. Another Dutch example illustrated by Mr. Chatzimarkakis is at the Port of Amsterdam where Nouryon and Tata Steel have a joint cooperation for a large green hydrogen cluster[7]. Additionally, Royal Dutch Shell has also been active at a Köln refinery using electrolysis not only to produce hydrogen as a feedstock that they need but also to balance the local power grid, since there are also a lot of renewables available. Mr. Chatzimarkakis mentions another steel project H2 Future, an Austrian company, where hydrogen is under serious consideration[8] and highlights that also thyssenkrupp[9] is investing significantly in hydrogen thanks to new leadership priorities in the area of carbon direct avoidance, with an investment of €10 million until 2050.

[7] https://www.portofamsterdam.com/en/press-release/nouryon-tata-steel-and-port-amsterdam-partner-develop-largest-green-hydrogen-cluster

[8] https://www.h2future-project.eu/

[9] https://www.thyssenkrupp.com/en/

6. PHASING OUT COAL FROM THE ELECTRICITY GENERATION SECTOR IN GERMANY

Mr. Rafał Bajczuk, Research Fellow, Department for Germany and Northern Europe, Centre for Eastern Studies (OSW)

Mr. Bajczuk expressed his honour to speak in from of this distinguished audience. After a short introduction of his workplace, the OSW, Mr. Bajczuk started by stating that Germany's energy strategy, passed in 2010, is a long-term strategy. The goal is to decarbonise the energy system and the economy – by 2050 emissions should go down by 80-95% and the share of renewables in Germany is supposed to grow. It is a long-term strategy that creates a secure environment for business to grow. When we look closer at the qualitative goals of the strategy, we can see that the strategy is very much about business, innovation and economic growth. Therefore, it can be understood not only as an energy strategy but as a strategy for the economic modernisation of the country. There is an understanding among German politicians and industry that there is a need for energy transformation because it provides opportunities for economic growth.

How is Germany accomplishing its goals? Germany is on a path to achieve its renewable energy target by 2020. In 2018 the share of renewables in the electricity sector reached 40% so Germany was way above target here. With regard to climate policy, Germany is not on its path to reach its emissions reduction target of 40% by 2020. However, Germany still plans to reach the 2030 goal of reducing emissions by 55% and this year the German government wants to pass a climate policy bill that will bind emitters by law. Coal generation remains the problem in the electricity generation sector, high emissions but low electricity. There is no set strategy yet about the coal exit but there is a consensus that the exit will take place.

In the electricity sector, electricity generated from coal remains a problem due to the significant emissions involved. With regard to the coal exit, there is no set strategy yet but there is a political consensus that the coal exit will take place. A coalition of experts and lobbyists has debated this issue for the last half year and a proposal was presented in early 2019. The proposal involves the following: coal fired power stations should be switched off by 2035/38. The structural funds available for regions that are currently most dependent on coal was significantly debated. So far, the program that the Coal Commission has come up with should cost around €40 billion over the next 20 years. The coal exit is not set by law but we must take into account that this exit will take place. Impacts on electricity mix: renewable energy will grow and by 2035 the share of renewables in the electricity sector will be at least 60% and up to 40% of electricity production will be from natural gas by 2035, with significant implications for the European natural gas market.

The reason for the coal exit is of course to reduce CO2 emissions in line with climate change commitments. However, emissions from electricity are not everything. In order for Germany to meet its emissions targets, additional actions will be necessary in the building, transportation and industry sectors. According to Mr. Bajczuk the transportation sector will be the most challenging sector to decarbonise in Germany, since the country's car industry is very influential and hasn't delivered so far.

Mr. Bajczuk concluded by considering how the coal exit was going to affect power prices. The expected coal exit will also affect power prices. The increasing share of renewable energy in power generation will contribute to decreasing power prices. In terms of the political impact of Germany's coal exit, only a minority of eastern and south-eastern countries will remain on coal once Germany exits, which can potentially create conflicts and a lack of political unity with regard to energy and climate policy.

Mr. Bajczuk suggests it could be necessary to produce some incentives for the other countries to also embark on coal exit. He suggests that if we don't want to see lignite machinery being transferred from the German coal exit to the Balkans, for example, we must also find some incentives or instruments for the Balkans to exit coal.

7. "ENERGIEWENDE" IN GERMANY - PHASING OUT COAL FROM ELECTRICITY GENERATION

Prof. Jürgen-Friedrich Hake, Head, Institute of Energy and Climate Research - Systems Analysis and Technology Evaluation, Forschungszentrum Jülich

Prof. Hake began by thanking the chairman. He emphasised that what can be concluded from the debate is that there is a general agreement on how we should transform our national energy systems – we know what is needed and we have our target systems (which differ from country to country) on the table. Prof. Hake then began to focus on the present situation in Germany.

The "Energiewende" was published 10 years ago to transform the national energy system. At that time, it was highly debated because the transformation was not well-received in all parts of the German society and it was also observed with suspicion by neighbouring countries. In a nutshell, the ultimate priority of the "Energiewende" is the mitigation of greenhouse gas emissions in all sectors. If this target disappeared, there would be a huge impact on the structure of the future energy system. Subsequent to discussions on nuclear phase out, Germany is now having discussions on coal phase out, which will be a tough challenge. There are voices that phasing out coal is not possible but Prof. Hake has a more realistic approach. The major issue at play when we discuss the phasing out of coal regards the future of lignite and the focus is: what type of structural change will we have in the appropriate regions? According to Prof. Hake, the focus is therefore about jobs and money.

On the one hand we are shrinking our technology portfolio options through the Energiewende and coal phase out would increase this reduction of portfolio options. Together with this reduced technology portfolio, we will have to manage increasing volatility at least in electricity supply. Although the risk of blackouts has been brought up in discussions, so far this volatility has been well-managed and despite the challenges, Prof. Hake suggests there is no need to be afraid of volatility and blackouts if the coal phase out is managed in a rational and technically sound manner.

There are also challenges with regard to the restructuring of the grid, which has seen a lot of delays in Germany. Furthermore, there is a debate about costs for example with regard to underground cabling, which is increasingly in demand, which are far more costly. According to Prof. Hake, the public acceptance issue (the so-called "NIMBY") remains relevant, even if there is a high-level support for the overall goals of the Energiewende. The Coal Commission report that was recently published and submitted to the German government but there is a debate regarding stakeholder representation and the involvement of German parliament. Furthermore, it remains unclear whether the €40 billion have a sound basis and what is also not so clear is the ultimate goal for this structural change. According to Prof. Hake, the focus is too much on the transformation of the energy system. In his regard, the more important question is how, and in what direction, we should transform our economy. Otherwise, we will not have public support for these transformation processes in the future.

Finally, Prof. Hake highlights that when we phase out of coal, people may fear/expect that there will be a gap between the renewables and the "hole" left by coal but perhaps this could be "filled" with gas from the gas infrastructure being developed in the Baltic.

8. QUESTIONS AND ANSWERS

8.1. The energy transition and opportunities for EU industries

8.1.1. Questions

Mr. A. Gierek [10] (MEP) thanked the speakers for covering a lot of ground in the presentations. We have seen that this transition is moving in two different directions. On the one hand, an increase in energy efficiency over and beyond what is required by regulation. The directive on energy efficiency was a in his view a mistaken enterprise, limiting possibilities. Mr. A. Gierek communicated his view that energy efficiency should be the optimisation of existing non-renewable primary energy resources. On the other hand, reducing emissions for example through CCS or bio-based methods, provides countries the possibility to achieve legislative objectives. If we are to compare the efficiency of industries in different countries, then you see major differences, for example Denmark 80% and Poland at 70% energy efficiency. For hydrogen, we can of course use electrolysis but in coal mining areas, hydrogen can be produced using what we call hydrogen gas and the Hisarna technology. Hydrogen metallurgy is thus a much more interesting proposition, that the presenters could speak about in great detail.

Mr. C. Ehler[11] (MEP) thanked the speakers and had a few comments. The issues have been picked up by the European Parliament in the form of amendments to the proposal for Horizon Europe. When it comes to the steel industry, the presenters suggested that the technology is not particularly innovative. Mr. Ehler commented that actually there is evidence of projects for the removal of carbon and replacement with hydrogen at steel plants. In Germany and other countries, the main problem is that the power to gas storage cycle would replace combustion and there are clear regulatory limits. Mr. Ehler suggested that this was not a possibility in Germany because of the feed in system. Mr. Ehler asked the question if we need blue sky or basic research or scaled research? When it comes to CCS storage in Europe on land, it's failed. This means we have to look at producing infrastructure at the regional level, with suitable facilities for offshore CCS, which is a challenge. Mr. Ehler therefore poses the question of how the very specific examples mentioned in the presentations can be extended on a more general basis. The Council is quite sceptical on such matters and national governments have also not supported research suggestions in this regard.

Ms. K. van Brempt[12] (MEP) thanked the presenters for their presentations and for their optimistic contribution to the debate. Ms. Van Brempt suggested that indeed there is still some doubt about the exact mix of solutions but that the hope is that by 2050 we can develop a climate neutral industry. A few practical questions - as politicians, we need to know what sort of regulatory framework we need to develop. Where there are new chemical plants, using current state of the art technology, how can the technologies that you suggest being integrated and how much technological progress can we secure? With regard to CCS/CCUS, do you think we should be imposing this technology as a prerequisite for the building of these new plants? We're talking about very expensive infrastructure. Is this infrastructure being developed elsewhere in Europe? Clearly, cooperation is needed. However, industries are reluctant to pay the money upfront for the development of such infrastructure.

[10] http://www.europarl.europa.eu/meps/en/28379/ADAM_GIEREK/home

[11] http://www.europarl.europa.eu/meps/en/28226/CHRISTIAN_EHLER/home

[12] http://www.europarl.europa.eu/meps/en/5729/KATHLEEN_VAN+BREMPT/home

So, how can it be achieved and what policy proposals are therefore needed? When you talk about financing, what would you suggest? Should we tighten the rules and/or do we need a new CO2 tax?

If we introduce the CO2 tax in Europe, would be then have the finances needed to bring about this transition?

Mr. B. Jávor (MEP) thanked the speakers and asked specifically, what is the cost of the different technologies mentioned in the presentations? Instead of trying to set up a mix of different technologies as a regulator, perhaps first it would be best to know the cost first to be able to reduce CO2 emissions of our industry. CCU/CCS is very costly. How could this information on cost shape the mix of technologies?

Mr. D. Škrlec (MEP) asks a question on circular economy, which will be an important driver of the European economy until 2050. Currently there are a lot of problems regarding infrastructure. However, currently there are certain Member States that blocked using incineration or landfilling to manage the waste and the challenge will be how to reach these Member States. There is a lot of industrial waste (e.g. aluminium and iron), which are currently exported out of the EU because it is more profitable for these companies who deal with industrial waste to sell outside the EU. Our capacities within the EU are therefore not used properly. The second question is about innovation and the R&D needed in the next years. There is a need to get these technologies affordable and available to the non-developed parts of the EU, not just developed parts of the EU. The third question is about buildings energy efficiency. How do you see the change in the materials that we use to construct buildings, for example replacing cement with wood, i.e. not just new technologies but also materials? Finally, what are your views on transport (e.g. trucks) and which year will be the breaking point of the scenarios discussed, to decide which scenario to take into the future.

8.1.2. Answers

Prof. Dr. Faaij thanked the MEPs for their questions, expressing gladness that people, decisions and policies are connected to the complex technical issues and that the EP is already acknowledging these issues more than what is currently in the Directives. He expressed agreement that it wise to shift our policies to overall achievements in emission reduction, rather than just efficiency, to avoid lock-in. An integral view should be the basis and the solutions, which must be tailor made, will be different depending on what industries are there and what opportunities are available in the region. Scenarios show short term and long-term steps (for example, when you need a new technology to become available) and such flexibility in the short and long term is necessary in policy frameworks. Innovation in industry and energy infrastructure is essential. We do know many of these learning pathways, how they can be realised and how cost reduction can be achieved, and there are great achievements in solar and wind, which are lessons that can be repeated for example for CCS, bio-based, etc. What is required to achieve this is policy and innovation stability. The joint undertakings that the EU facilitates in certain areas are a good example that can be done at the European level and at the industry level. We know how it can be done but we need to apply consistent pressure to realise it and achieve the cost reduction resulting in business cases. With regard to planning, particularly regarding infrastructure, it is more a matter for government coordination than for individual industries and needs to be done multilaterally, which can save huge amounts of money compared to uncoordinated approach (e.g. a difference of 2-3 hundred billion euros in the North Sea region). There are numerous opportunities to keep our industry competitive. The chemical industry in Europe is one of the most important in the world. However, the prospects of this industry are currently poor due to lack of cheap oil and gas and we therefore have to innovate to keep the industry in the EU.

Developing this competitive advantage will be a major asset for the future, when carbon will be more expensive. There is a need to be innovative and while there is a real will in industry, policy coordination will be essential.

In his response, Prof. Dr. Lechtenböhmer thanked the MEPs for their questions. He highlighted that it cannot be overemphasised that there is a danger that EU will have less of these industries in the future because they are under a lot of pressure. Going in the direction of circularity and low carbon is one of the opportunities that these industries have to remain relevant in this future. Innovation and new business cases with circularity will be needed in all fields but particularly for energy intensive industries we need scaling. Innovation funds represent an important tool to support these investments, since they are the large volume investments that we need. While hydrogen in steel making is essential, and most steelmaking companies have announced that they want to go in this direction (e.g. at 20% higher costs), it is not clear how realistic these industry plans are. Furthermore, it depends on the infrastructure available and we need green hydrogen specifically. The use of CCS and CCUS depends a lot on regional geography but in a very targeted manner it will be part of a tailor-made solution. It all costs a lot, which makes it challenging to decide which is the right pathway. Policies and political debates need to support this decision making. Nevertheless, it is clear that the systems must be changed to make sure that companies that engage in producing products that are carbon neutral are supported and rewarded.

8.2. The role of hydrogen

8.2.1. Questions

Mr. A. Gierek thanked the presenters and began his comment by highlighting a concern that hydrogen is a very dangerous gas, asking the question: how do we put in place the necessary protection in pipelines? He emphasised the necessity to protect ourselves from any accidents. Mr. A. Gierek also illustrated the two options available for hydrogen production – hydrolysis or production from coal, asking which is the best technology for the future in terms of technological efficiency?

Mr. B. Jávor also thanked the presenters, beginning by underlining that when it comes to a more general approach to gas usage in Europe, this is understood to be a mixture of different gases from different sources. He reiterates the statement from the presentations that hydrogen can be mixed with gas for storage and transportation through pipelines, suggesting that also the gas industry regards this approach as an additional technology that can be applied to the traditional gas infrastructure network. Bio-gas is also discussed in this context. There is also quite some uncertainty in terms of different definitions of green gas, decarbonised gas, etc. It's important to make it very clear what we are talking about and to avoid vague definitions of decarbonised gas. Secondly, Mr. B. Jávor also mentions that hydrogen can be produced from coal but that we need strong sustainability criteria for the production of hydrogen because hydrogen might be a good tool for the energy transition but it isn't the goal itself to use more hydrogen. Mr. B. Jávor 's third remark is a question regarding grid regulation, which is a big question for the future, where storage could play a role, which could decrease the price.

Mr. C. Ehler comes back to the Hydrogen Undertaking supported under Horizon 2020. The track record of this undertaking was a tricky one. It was directed at the car sector, which had technical and cost issues. Therefore, in terms of a future hydrogen undertaking, Mr. C. Ehler asks what should it look like

and what goals should we set it? We have to think together with industry in terms of a future hydrogen undertaking but what would the interests of industry be and what would industry see in it?

8.2.2. Answers

Dr. Dodds begins his response by highlighting that we have a lot of experience storing hydrogen in pipelines and there are about 3000km of hydrogen pipeline worldwide and the first one opened in 1938 in the Rhine-Ruhr and is still operating. Hydrogen is a dangerous gas, as is natural gas, but they are dangerous in different ways so they are not comparable safety wise. It's not that one is safer than the other, it's just that the safety issues are different. Dr. Dodds suggests that personally, he would worry much more about carbon dioxide pipelines and the potential risks of leaks from those because it doesn't escape as easily. With regard to how hydrogen is produced, biomass could potentially produce negative emissions potentially in combination with CCS. With regard to mixing hydrogen and gas in the infrastructure, Dr. Dodds agrees that the gas networks have been pushing for this in order to continue using their infrastructure – this has been a big thing in the UK. Injection is a good option for hydrogen, particularly if you have constrained generation, but you can't go higher than about 20% injection while using existing appliances because of various issues with the speed of the hydrogen. Therefore, it is not a long-term solution. If you want to use hydrogen in natural gas pipelines, in the longer term you need to convert the infrastructure and the appliances. In the case of this conversion, most of the cost of conversion is on the appliances not on the pipeline network itself so the costs might actually be manageable. On the sustainability of hydrogen, the terminology that people seem to be adopting is that green hydrogen is low carbon and renewable, whereas blue hydrogen is low carbon and non-renewable. A number of green hydrogen standards have been proposed (CERTIFY at the EU level is probably becoming the most advanced).

Mr. Chatzimarkakis began his response on the topic of mixing hydrogen into the gas pipeline. He suggests that indeed this solution makes sense for a certain period of time. Up to 10% mixing is no problem but indeed, more than 20% it becomes an issue and pipes and boilers need to be changed. But for a transition period in order to ramp up the hydrogen business, Mr. Chatzimarkakis suggests that this mixing solution might make sense. In the long run however, dedicated hydrogen pipelines are needed, which indeed do already exist but we need much bigger pipelines. In the Netherlands, we see some first steps to do this. Safety standards exist in hydrogen and there have been no accidents and new safety standards are being developed for transportation by pipelines and for salt caverns. With regard to the different ways of producing hydrogen, the most traditional way of producing hydrogen is through gas and gasified coal, which produces 95% of hydrogen today. Electrolysis is coming up as another alternative for production. Actually, only 20% of the hydrogen price today is based on electrolysis, with 80% of the price due to the electricity price. A third option, introduced by BAASF, is pyrolysis. This is a way of producing hydrogen and solid (powder) carbon, which can be used as a feed stock or can be buried, for example in closed coal mines. BAASF recently announced that pyrolysis is 5 times cheaper than electrolysis. When it comes to Poland, Europe's biggest coal company JSW asked to become a Hydrogen Europe member to start using depleted fields for the production of electrolysis for hydrogen, instead of coal, illustrating high levels of innovation. Countries have announced significant funds for the transition period: Germany €40 billion, Spain €5 billion. Regarding the joint undertaking, yes indeed the joint undertaking targeted vehicles and the use of clean hydrogen in cars. Indeed, in the vehicles sector there is a bottleneck based on insufficient hydrogen vehicles because European OEMs are too slow. The EP also played a role, putting too much focus on batteries.

The future Joint Undertaking should not focus just on transportation, but rather about sector integration because hydrogen as such is not a goal but rather it is a key technology to help with sector

integration. Finally, Mr. Chatzimarkakis suggests that while it is hopeful that energy ministers now have hydrogen as a key topic of discussion, they need to be faster because China and Asia more generally are moving much faster at the moment.

8.3. Coal phaseout

8.3.1. Questions

Mr. A. Gierek thanked the speaker for allowing the last question in Polish and asks how does coal exit affect electricity generation? And, how this will affect the transition to gas. For example, if the Nordstream 2 project comes online, this could change the target energy mix further. Would this affect turbines or steam production in terms of electricity production?

Mr. C. Ehler makes a comment and asks a question regarding the Energiewende. One of the major weaknesses of the Energiewende is that Germany ignored its location in the centre of Europe, as well as ignoring its impact on neighbouring countries and European politics overall. Stepping out of nuclear had and will have a lot of impact on neighbouring countries. Mr. C. Ehler's question is whether in Germany there is a growing understanding of being in the middle of Europe both in terms of geography but also with regard to infrastructure? In his view, current energy policies in Germany are not sound in this regard. Mr. C. Ehler's second comment is that the Energiewende is not consistent in achieving a CO2 reduction system. While Germany is in favour of a strong CO2 reduction system, the whole regulatory framework backs the highest CO2 emitters. In the long run, is there any way to ease the contradiction between an emission trading system, which has a different logic, and practical measures currently being used for CO2 reduction? And, in terms of coal phase out (which is a reality), if we had not introduced CCS, would we have had more time to react to this contradiction? Mr. Ehler highlights that volatility in fact has become an issue, for example in February 2018 in the transmission net in eastern Germany risked failing, which was quite alarming in terms of being very close to a black out. Mr. Ehler concludes by emphasising that in the end it is Europe's contradiction but Germany is the show case for this.

Mr. J. Buzek concludes the question session by asking to which extent the example of the energy transition in Germany could be used as an excellent example for others?

8.3.2. Answers

Prof. Hake responded to Mr. Ehler by highlighting that the energy transition debate in Germany is a very emotional one. The quality of German energy has been more and more stable over the past decade but there are increasing challenges abounding in terms of managing this type of quality in terms of frequency and capacity. With regard to the question from Mr. Buzek, Prof. Hake observes t that each country has their own future energy system depending on their unique characteristics. Poland, for example, will continue to use (clean) coal. In all national systems, there is huge potential to increase efficiency in political decision making, legislation and industry. However, we are in a process and Prof. Hake is optimistic regarding a Germany that is connected with the rest of Europe.

Mr. Bajczuk thanked the audience for the questions. Mr. Bajczuk began his response by responding to

Mr. Gierek that in the coal exit report by the Coal Commission, heat and power stations are included. However, we have to keep in mind that in Germany most heat and power stations are owned by communal energy companies, which also have their own climate and energy strategies.

In addition, many cities in Germany have their own strategies for investing in alternative heat sources, for example Munich is looking at geothermal power and other German cities are investing in natural gas heat and power generation, or heat storage from electricity. This is a broad topic. With regard to the question about what kind of gas-powered stations are going to be build, Mr. Bajczuk suggests that this depends on the market. Siemens, the German company, is providing some of the most efficient natural gas power stations in the world and we will witness a growing market for this type of electricity generation and there will be large investments in this sector in 2020. With regard to the question of whether there is a growing understanding of Germany being in the middle of Europe? Mr. Bajczuk only brings the example that for the Nordstream 2 pipeline, concerns of eastern Europe regarding this project were not really addressed. When it comes to the electricity sector, Germany is involved in infrastructure development with other countries, e.g. Norway. However, Mr. Bajczuk suggests that there should be more global thinking in Germany when it comes to energy policy in general. Finally, what lesson can we learn from Germany? Germany is using the strategy to modernise its economy and this is the most important lesson – to see energy policy as an opportunity for industry and business and to make business cases out of it.

9. AGENDA

WORKSHOP

A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany

Tuesday, 19 February 2019 from 11:00 to 12:30

European Parliament (Brussels), Room: Josef Antall 2Q2

Organised by Policy Department A at the request of the Committee on Industry, Research and Energy (ITRE).

Chair: Jerzy Buzek, ITRE Chair

PROGRAMME

11:00 – 11:05
Welcome by the Chair, opening remarks

11:05 – 11:15
The energy transition and opportunities for EU industries
Prof. Dr. A.P.C (André) Faaij, Director of Science, ECN part of TNO

11:15-11:25
Integration of climate neutrality, circular economy and energy transition as opportunities for EU basic industries
Prof. Dr. Stefan Lechtenböhmer, Director, Future Energy and Mobility Structures, Wuppertal Institut

11:25-11:35
Q&A

11:35-11:45
The role of hydrogen in energy flexibility, availability, security, and decarbonisation
Dr. Paul Dodds, Associate Professor & Senior Lecturer, Bartlett School, Faculty of the Built Environment, University College London (UCL)

11:45-11:55
Market outlook for hydrogen technologies in Europe
Jorgo Chatzimarkakis, Secretary General, Hydrogen Europe

11:55-12:05
Q&A

12:05-12:15
Phasing out coal from the electricity generation sector in Germany
Rafał Bajczuk, Research Fellow, Department for Germany and Northern Europe, Centre for Eastern Studies (OSW)

12:15-12:25
"Energiewende" in Germany - phasing out coal from the electricity generation
Prof. Jürgen-Friedrich Hake, Head, Institute of Energy and Climate Research - Systems Analysis and Technology Evaluation, Forschungszentrum Jülich

12:25 – 12:35
Q&A with closing remarks by the Chair

10. ANNEX: BIOGRAPHIES OF THE SPEAKERS

10.1. The energy transition and opportunities for EU industries

Prof. Dr. A.P.C (André) Faaij

André Faaij (1969) is appointed as Director of Science of ECN part of TNO (since 1st November 2018), the largest energy research organisation of the Netherlands. He focuses on strategy, large research initiatives and collaboration with academia. He combines this position with a part time chair as Distinguished Professor Energy System Analysis at the University of Groningen (RUG). Prior to this position he was Chief Scientist of the New Energy Coalition (including the Energy Academy Europe). In this position, he worked with many stakeholders on energy transitions from regional to international level. Until spring 2014, he was Professor and scientific director of the Copernicus Institute of Utrecht University (130 scientists).

The research he coordinated was in core areas such as Energy System Analysis, Bio-based Economy and Carbon Capture and Storage. His ongoing research covers energy system integration questions, modelling, transition processes towards low carbon energy systems and related innovation and policy questions.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

10.2. Integration of climate neutrality, circular economy and energy transition as opportunities for EU basic industries

Prof. Dr. Stefan Lechtenböhmer

Stefan is a Director of the Future Energy and Mobility Structures Division at the Wuppertal Institut. He is also since 2015 an adjunct Professorship in Environmental and Energy Systems with a special focus on future sustainable energy systems at Lund University. Stefan's research expertise focuses (among other topics) on sustainable construction and planning and GHG emission inventories and projections.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

10.3. The role of hydrogen in energy flexibility, availability, security, and decarbonisation

Dr. Paul Dodds

Paul Dodds is Associate Professor in Energy Systems and a Senior Lecturer at the Bartlett School, Faculty of the Built Environment at University College London (UCL). He specialises in modelling energy systems across all sectors of the economy, from engineering and economic perspectives. Paul has led academic efforts to understand the opportunities for using hydrogen in future energy systems through the publication of four White Papers that examine heat, energy security, energy systems and economic opportunities. He pioneered the recent interest in converting the UK gas networks to deliver hydrogen through a journal paper in 2013. He is interested in policy issues surrounding hydrogen and recently led projects on green hydrogen and on hydrogen's value to the energy system. Paul is the UK Government's alternative delegate at IEA Hydrogen. He also leads projects on energy storage and interconnection, and is a member of the UK Energy Research Centre and the UK CCS Research Centre.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

10.4. Market outlook for hydrogen technologies in Europe

Jorgo Chatzimarkakis

Jorgo is Secretary General of Hydrogen Europe since 2016. Before he was Representative of Infineon Technologies in Brussels and Member of the European Parliament (2004 – 2014) inter alia in the ITRE Committee (Industry, Technology, Research and Energy) where he could contribute to lay the cornerstone for the first and the second Joint Undertaking on hydrogen and fuel cells. In 2007 he was elected "MEP of the year" by his colleagues of the European Parliament in the category "Research and Innovation". In 2015 he was appointed ambassador at large for Greece. He is frequently publishing in international media and started to write novels with a political background. Mr Chatzimarkakis was born in Duisburg, Germany. He holds German and Greek nationality, and a degree in political science from the University of Bonn.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

10.5. Phasing out coal from the electricity generation sector in Germany way forward

Rafał Bajczuk

Rafał Bajczuk is an energy policy expert at the Warsaw based think-tank OSW (Centre for Eastern Studies). His research interests focus on Germany's energy and climate policy. He is an author of numerous articles and publications concerning this topic. Mr. Bajczuk graduated from the Institute of International Relations at the University of Warsaw and holds a postgraduate diploma in energy markets from the Warsaw School of Economics. He is currently pursuing a PhD in political sciences at the University of Warsaw.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

10.6. "Energiewende" in Germany - phasing out coal from the electricity generation

Prof. Jürgen-Friedrich Hake

Jürgen-Friedrich is Head of the IEK-STE institute (Institute of Energy and Climate Research - Systems Analysis and Technology Evaluation) at Forschungszentrum Jülich. He is and expert on the German energy transformation and energy economy. He is also actively involved in IEA Implementing Agreements dealing with coal technologies and GHG reduction technologies. He holds a Diploma in Mathematics/Physics, Bielefeld University and is himself a Professor for Energy Policy and Energy Economy at Aachen University of Applied Sciences, as well as a Lecturer at Bonn University and an Adjunct Professor at the University of Technology Sydney. Additionally, Jürgen-Friedrich is the Chairman of the Executive Committee IEA TCP Clean Coal Centre.

Presentation available at:

http://www.europarl.europa.eu/committees/fr/itre/events-workshops.html?id=20190211WKS02201

NOTE

This report summarises the presentations and discussions of the workshop on "A just energy transition, opportunity for EU industries, the role of hydrogen in the future and the example of energy transition in Germany", which was organised for the ITRE Committee and held on 19th February 2019.
This document was prepared by Policy Department A at the request of the Industry, Research and Energy (ITRE) Committee.

PE 638.411
IP/A/ITRE/2019-01

Print ISBN 978-92-846-4979-2 | doi: 10.2861/329933 | QA-04-19-464-EN-C
PDF ISBN 978-92-846-4978-5 | doi: 10.2861/360477 | QA-04-19-464-EN-N