# Briefing for Director-General Juul Jørgensen

**Meeting with CEFIC [redacted], 03 December 2019**

## KEY MESSAGES

**CEFIC:**

**Our mid century vision**

Thank [redacted] for his engagement in preparing decarbonisation of the European industry. [redacted] represents the chemical industry in the High Level Group of Energy Intensive Industries (HLG EII) contributing to the Industrial Masterplan. Prior to the Masterplan, the HLG-EII developed the study "Industrial Value Chain. A bridge towards a carbon neutral Europe" that was input to the long term decarbonisation strategy.

CEFIC's new report "Molecule Managers" is largely aligned with the EU target of net-zero GHG emissions by 2050.

**our role in delivering the European Green Deal. Your expectations for our sector's input into the policy process.**

Developing the Green Deal requires a bottom up process for determining: the technologies needed; the investment requirements; renewable energy deployment targets; infrastructure planning; etc. The Commission counts on MS and stakeholders to contribute to this bottom up effort

**electricity consumption**

The chemical industry has a long **tradition of improvement** in energy efficiency and decrease of $CO_2$ emissions. Further decrease in emissions will require a more circular economy and more integration across industrial sectors, as well as switching to renewable feedstock and energy sources. **Electrification** is identified as a main decarbonisation pathway for industry.

But this assumes that the production of electricity will need to be increased very significantly – some sources quote as much as 2000 TWh/year[1] increase for the European chemical industry (although this depend on the technologies used). Furthermore, the decarbonisation through electrification assumes that also the electricity used is fully decarbonised.

We are aware that industry is concerned that the increased need for electricity will conflict with energy efficiency targets. The analysis carried out in preparation for the long term strategy suggests that there is still considerable potential for energy savings in industry. However, in the long term (i.e. after 2030) this concern is well funded. The Commission keeps monitoring the consistency of the EU energy and climate targets.

**infrastructure on electricity and gas and $CO_2$/CO**

Electrification means huge investments in upgrading the electricity grid capacity. Sector integration and the use of different energy vector might be an option for reducing costs. It may be more efficient to develop renewable sources where it is the most cost effective (solar in the south, wind energy along

[1] For comparison, today total electricity consumption in Europe is approximately 3000 TWh/year.

coasts,…), produce the hydrogen ($H_2$) locally, then transport it in pipelines, however grid compatibility is an issue[2].

For the same construction cost, a gas pipeline can carry 10 to 15x more power. Moreover we can adapt existing Natural Gas pipelines to $H_2$ at a fraction of the initial cost. Hydrogen can also be transported in ships in either $H_2$ or ammonia ($NH_3$) form.

This is an optimisation that must be done at European level taking into account not only the renewable energy production investment but also the grid investment (electrical or gas), in order to get the energy where and when needed at the lowest cost, for maintaining the industry competitiveness.

**circular and net neutral economy – Chemical Recycling**

Beyond the energy efficiency and the switch to renewable sources, the increased circularity of materials becomes ever more important to reduce emissions, optimise raw materials' and reduce investment needs.

To increase circularity during the production step, cooperation between industrial sectors and with the energy sector will be enhanced in an industrial symbiosis model is increasing, calling for a timely development of adequate infrastructure, notably in the fields of electricity, heat, gas/hydrogen, $CO_2$ transport and storage.

**carbon tax**

Decarbonisation will have an impact on the cost of the products. We understand that a market for cleaner products must be created in Europe but also measures are needed to ensure a level playing field for the European industry. These are the challenges addressed in the Master Plan of the HLG EII.

Carbon Border Tax (CBT) would be another tool to support decarbonisation globally. It should be WTO compliant and compatible with the Paris Agreement. This could influence the current carbon leakage regime (the free ETS allowances and state aid compensations).

CBT's design has not been decided at this stage (It will have to be assessed whether to include direct carbon costs, indirect carbon costs, effects on value chains, etc).

Ask if CEFIC has views about the application of CBT to chemical sectors. In the EII HLG meeting in September 2019, [redacted] stated that CEFIC is split about the benefits of a CBT for the European Chemical sector.

**R&I and SET Plan**

The **SET Plan Action 6 aiming at "Making EU industry less energy, resources and emissions intensive and more competitive"**, in which the Chemical & Pharma sector was selected as a priority because of its large energy consumption, energy savings potential, large employment (1.7 million in 2012), large value added (€230 billion in 2013). CEFIC has been contributing actively to the SET Plan Action6: Implementation Plan endorsed in Sept 2017, active contribution to the organisation of the Workshop in June 2018; It is expected that CEFIC continues its contribution, namely in our next Workshop on "cooperation and funding on energy efficiency in industry" on 4 Dec 2019

[2] This is particularly important for the chemical industry that uses natural gas in chemical processes that might be sensitive to small amounts of $H_2$.

**Hydrogen contribution in the chemical industry**

Thanks to the rapid cost reduction of solar PV and wind power, new opportunities for decarbonising the industry through electricity and hydrogen arise. For example, green hydrogen could be used as feedstock in those industrial sectors that have a large hydrogen demand, such as steelmaking, refinery and fertilisers.

There is a clear potential for greening the production of ammonia in Europe through renewable electricity and hydrogen. The provisions under RED II, in particular on Guarantees of Origin and counting renewable electricity for the production of e-fuels should support building a business case. However, industry is also advocating for public incentives to stimulate investments. Another option to decarbonise the ammonia industry may use Steam Methane Reforming (SMR) with CO2 capture, more competitive in areas with a low gas cost.

The refining industry requires hydrogen in the processes of hydro-treating, hydro-cracking and desulphurisation of fuels. The most common process to produce hydrogen for refineries is Steam Methane Reforming, which is highly carbon intensive. Using green or blue hydrogen could considerably reduce CO2 emissions. However, from a cost perspective, the production of green hydrogen from electrolysis is still more expensive than that obtained from steam reforming. To encourage these applications, some industrial players stress that a change in the regulatory framework is needed, to make sure that the synthetic renewable hydrogen integrated into refinery fuel processing could count fully against GHG reduction obligations.

| Topics | **KEY INFORMATION** |
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| **Meeting DG ENER (C1) – CEFIC on 15/11/19** | Main topics discussed:<br><br>CEFIC's new report on the European chemical industry in climate neutral economy: offers technology-focused vision of chemical industry based on full sector integration (incl. electric crackers, chemical recycling, the use of waste resources (circular economy), and renewables-based feedstocks and fuels (hydrogen/methanol/$CO_2$ capture and use)<br>Chemical industry can be the *'battery'* for the electricity sector, with enhanced demand response possibilities. But CEFIC highlights needs for new regulation (especially on tariffs & taxes). C1 requested more geospecific information on industrial sites and their possibilities for electrification.<br>Chemical industry sees options for usage of waste (materials to fuels & chemical recycling), possible implications for waste directive/ RED-II. C1 requested more information on chemical recycling, and its implications.<br>Chemical industry can play major role as 'industrial waste supplier', but this would require an 'intermediate' to reduce supply responsibilities of the industry.<br>CEFIC highlighted possible consequences of 'negative' trade-off of renewables and energy efficiency, with 'recycled/renewable energy resources' requiring more energy than fossil products to be converted into products |
| **CEFIC and the Chemical industry** | CEFIC represents the Chemical sector in Europe: 28,000 companies, of which more than 27,000 SMEs and less than 100 big players (like BASF, TOTAL, EXXon, …), 1.2 million jobs, €540bn sales, €170bn added value in EU.<br><br>(As per data from 2017) Over the last 20 years (1995-2015), the EU chemicals sales have increased by 60% (from €326 to 519 billions) but the EU market share was halved from 32.3% to 14.7%. From 2015 to 2030, it is expected that the China market share increases from 39.9 to 44%, while EU would reduce from 14.7 to 12%. The global chemical market is booming and the EU is missing this opportunity. Main reasons: EU regulatory cost, which doubled over the 2004-2014 period, mainly due to increasing chemicals and ETS costs. Energy costs in EU between 2008 and 2015 fell (from 7.1% of the production costs to 5.7%)[3]. Over the 1990-2014 period, EU chemicals production rose by 78% while energy consumption was reduced by 22% (meaning an energy intensity decrease by 56%, although there could be some stagnation over the last decade)[4] and GHG emissions were reduced by 59% (meaning a GHG emissions intensity reduction by 77%). |
| **The Industrial Masterplan** | The Masterplan originates from a collective industry wish to address sustainability and future competitiveness of EU industry in a global context. This can only be achieved through collaboration between industry, MS, researchers and civil society. The work on the Masterplan is divided in three sub-groups:<br>• Creation of markets for climate-neutral, circular economy products<br>• Developing climate-neutral solutions and financing their uptake<br>• Resources and deployment<br>The social dimension of industrial transformation is a transversal issue and will be addressed in each of the sub-groups, recognising that public support would be essential for the transition to a climate-neutral. |

[3] SWD accompanying the 2018 Energy Prices and Costs report

[4] Latest trends (2008-2015) on energy intensity show some stagnation or even a slight increase. See graph in annex from SWD accompanying the 2020 Energy Prices and Costs report.

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| **CEFIC mid-century vision "Molecule Managers"** | policy recommendations in the report include:<br><br>2050 is only two industrial investments cycles away. More than ever, there is an urgent need for a policy framework to help the European chemical industry stay competitive in the context of less ambitious policies among Europe's global competitors.<br><br>Europe should promote European environmental, chemical and circularity standards in international agreements.<br><br>To become the best place to invest in new breakthrough technologies, Europe should for example enable EU state aid rules to cover refurbishment, deploying cost-effective alternative feedstock (e.g. CO2, biomass, wastes) and innovative electricity storage technologies and include using liquid ammonia or hydrogen for electricity storage.<br><br>The chemical industry needs a policy framework that combines climate objectives with measures to ensure European industry's continuing competitiveness:<br><br>o If Europe wants to promote a hydrogen economy, it will need to develop a framework to promote the emergence of a working hydrogen-based infrastructure in Europe where hydrogen could be used both as an energy carrier and as electricity storage and a feedstock for the chemical industry.<br>o Securing access to and availability of sufficient low carbon and renewable resources (energy and feedstock).<br>o Rewarding and creating demand for low-carbon and circular value chains, for example by developing a standardisation framework based on measuring carbon cycle productivity and raising sustainability standards and assigning the right monetary value to sustainability.<br>o Identifying solutions to mobilise the necessary financial resources. Europe needs to invest in energy storage and other infrastructure, for example by implementing an EU-wide investment plan modelled on the "Juncker Plan" of 2014.<br><br>Consensus building platform: Cefic's vision is to work towards the creation in Brussels of platforms for strategic dialogue between businesses, national governments, European policy makers, academia and civil society to embrace the cross-sectoral character of the 4th industrial revolution in the context of the UN SDGs.<br><br>The CEFIC mid-century vision also includes some observations on the Commission's Long-Term Strategy "A Clean Planet for All":<br><br>CEFIC believes the chemical industry has a significant role to play in all of the scenarios discussed in the Commission's LTS.<br><br>The Commission needs to assess in more detail the economic impact of the two scenarios that aim to achieve climate-neutrality for industry. These may rely too heavily on either politically sensitive demand-side measures or costly negative emissions technologies and their use by the chemical industry. The most ambitious scenarios would require the chemical industry to double the rate of CO2 abatement that prevailed between 1990 and 2015, but abatement becomes more expensive as the potential of 'low-hanging fruit' such as energy efficiency is exhausted.<br><br>All the scenarios presented by the Commission foresee a relatively stable rate of emissions reductions by industry until 2030 and a steep decline afterwards. This is the result of the time needed to pilot potential technological solutions before scaling up |

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| | the most promising solutions. This confirms Cefic's view that the next 10 years will be crucial for scaling up cost effective low-carbon technologies.<br><br>It could be useful to design additional scenarios, aiming for climate-neutrality, which combine all supply- and demand-side measures in a balanced way. |
| **The European chemical industry's engagement in the energy transition** | As Europe's biggest industrial consumer of electricity, the European chemical industry has a big stake in the transformation of Europe's energy systems.<br><br>The European chemical industry has decreased its greenhouse gas emissions by around 60% since 1990. By 2050, they might be able to reduce GHG emissions a further 50% compared with today's levels. However, in CEFIC's view that would require an enormous effort by industry and society and the right framework conditions. All technical solutions, including carbon storage and re-using $CO_2$ as a feedstock, will be necessary.<br><br>For the European chemical industry to contribute even more would require breakthrough technologies in other sectors and increased cooperation across and along value chains.<br><br>CEFIC expects a continued push toward more renewable energy sources in the energy mix, which will lower the chemical industry's carbon footprint.<br><br>But the chemical industry believes fossil fuels will remain the most important source of feedstock, enabled by a sustainable and circular management of carbon cycles. They expect carbon pricing mechanisms – either market based or through taxation – will remain and incentivise emissions reductions. |
| **Ammonia production from Hydrogen** | More than 90% of ammonia today is produced via the Haber-Bosch process and about half of the $H_2$ produced today feeds the Haber-Bosch process. To operate the Haber-Bosch process, around 3%-5% of the world's natural gas production is consumed, which corresponds to about 1%-2% of the world's annual energy supply. $H_2$ production from steam-reformed methane is the main energy driver (approximately 75% of the total energy input). Replacing $H_2$ obtained from steam-reformed methane with green hydrogen from renewable would drastically reduce the $CO_2$ emissions associated with this process. Besides the generation of hydrogen, all other subsystems in an ammonia plant are electric. Electric ammonia plants would be simpler than conventional ones and they would not require the devices to address natural gas impurities. |
| **Hydrogen in refineries** | Under the REFHYNE project, supported by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), a new hydrogen electrolysis plant will be built at the Shell Rheinland refinery in Germany. The plant is expected to commence operation in 2020 and will be able to produce about 1300 t $H_2$/annum, which can be fully integrated into the refinery processes. The electrolyser will be operated in a highly responsive mode, helping to balance the refinery's internal electricity grid and also selling Primary Control Reserve service to the German Transmission System Operators. |

## CV

**DEFENSIVES**

***Do we have enough electricity to decarbonise our industrial sectors?***

All analyses and studies indicate the important role electrification will play for industry. Significant amounts of electricity will be required to decarbonise industry, which needs to be clean, adequate and reliable.

Recent studies, including the industry association 2050 roadmaps and work by Eurelectric, find that at least 3,000 TWh of electricity – equal to today's electricity consumption in EU28 - will be required in 2050 for the purpose of decarbonise industry alone.

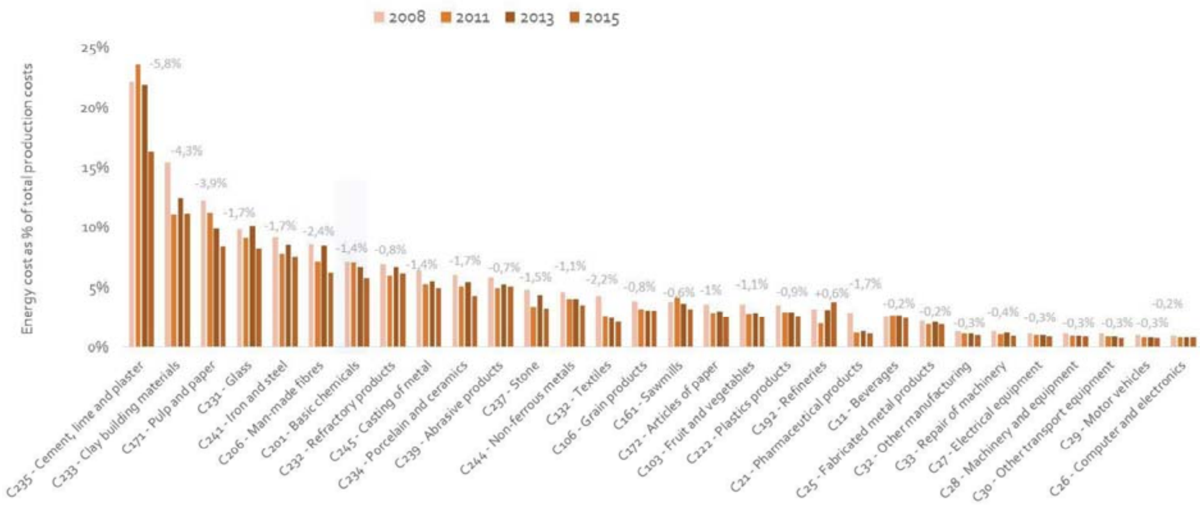
The scenarios developed by the energy intensive industries raise this figure up to 4,400 TWh, including e-fuels production in refineries, also for consumption in other sectors.

Our own estimates, using two different models (PRIMES for the whole energy system and FORECAST for industry only), are indeed in-line with these numbers, notably for the scenarios that achieve the highest ambition of net zero GHG emissions and rely mainly on technology development to achieve this.

We estimate however that it will possible to meet such demand of clean electricity. We also project that most of these amounts will be delivered by renewable energy and in a reliable manner, as the power system will be sufficient flexible (with enough storage capacity from different sources to ensure that).

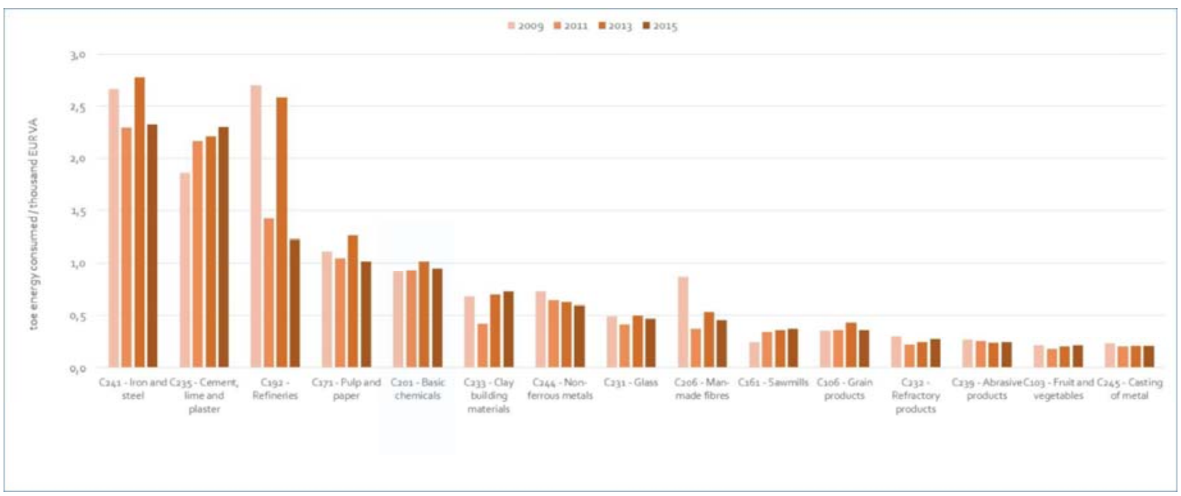
Energy costs for energy intensive industries

(Source: SWD accompanying the Energy Prices and Costs report, Figure 120)




Energy intensities in Energy intensive industries

(Source: SWD accompanying the 2018 Energy Prices and Costs report, Figure 124)




**Contributors:** [redacted] (DG ENER, A4), [redacted] (DG ENER, C2), [redacted] (DG ENER, A4), [redacted] [redacted] (DG ENER, N2), [redacted]