1 October 2018

EU STRATEGY FOR LONG-TERM GREENHOUSE GAS EMISSIONS REDUCTIONS

Fortum's key messages for the preparation of the strategy

- The EU should align its long-term climate ambition with the Paris Agreement with the view of being carbon neutral by 2050, i.e. achieving a balance between greenhouse gas (GHG) emissions and carbon sinks.
- In addition, the EU should establish an emission trajectory towards 2050 with an ambitious intermediary target for 2040, and it should revise the 2030 GHG target. In the interest of cost-efficient decarbonisation, the focus should be on early actions. At the same time, maintaining economic competitiveness during the decarbonisation transition is vital for the EU.
- Fortum believes that electrification will be a key enabler for decarbonisation in many sectors, notably in transport, heating and cooling as well as industrial processes. However, electrification only makes sense if the electricity is supplied by low-carbon energy sources. Electrification will be best supported by a strong carbon market that delivers meaningful pricing for GHG emissions.
- In order to reach carbon neutrality, it will not be enough to abate GHG emissions from various sectors; different technologies to remove carbon dioxide (CO_2) directly from the air or from the flue gases will also be needed. In order to make these technologies commercially viable, the EU should develop a market mechanism to reward the removal of CO_2 and dedicate an integrated part of its research and innovation programme to these technologies.
- In Fortum's view, a number of new technologies will be needed for a full decarbonisation of different sectors, such as:
    - Indirect electrification through green hydrogen and green methane to decarbonise heating and cooling.
    - Carbon-free electrification, increased recycling and abatement of non-CO_2 emissions to decarbonise different industries.
    - If carbon capture and storage (CCS) becomes more cost effective, it can play an important role in decarbonising e.g. waste incineration or industrial processes. Carbon capture and utilisation (CCU) still requires technology development and an increasing economic reward for the use of captured CO_2.
    - In addition to the large-scale electrification of transport, hydrogen is likely to play a role in the decarbonisation of light vehicles, long-distance freight road transportation and marine transport, while sustainable biofuels will be most viable in aviation and long-distance freight road transportation.
- Forests and agricultural land produce renewable biomass that can substitute carbon-intensive products or fuels. The focus should be shifted from the energy use of biomass to the use of biomass to produce higher value-added bio-based materials and products.
- The EU research and innovation programme (Horizon 2) should focus on finding new solutions for fast carbon-free electrification, commercial usage of removed CO_2, enhancing natural sinks in soil and the forest, and the circular economy in all sectors.
- Energy transition requires a vast amount of capital; private investors will and should play the key role in financing the market-based transition. The role of public spending should be primarily in providing support or other risk-sharing mechanisms to pilot first-of-kind commercial decarbonisation projects.

1 October 2018

STRATEGY FOR LONG-TERM EU GREENHOUSE GAS EMISSIONS REDUCTIONS

Fortum's messages for the preparation of the strategy

Fortum considers climate change as one of the biggest challenges for mankind, and mitigation requires strong political commitment as well as ambitious and prompt action. Climate change has long been recognised as an issue where coherent EU action is needed, both inside the EU and internationally. We welcome the Commission's initiative to publish a long-term decarbonisation strategy including a holistic analysis of transition options across all key sectors of the economy. The strategy will be an essential guide for policy makers to get Europe on the track to meeting the ambition of the Paris Agreement. However, it has to be followed by ambitious targets and a policy framework that enable cost-efficient decarbonisation towards 2050. All industries need clear and consistent signals on political direction and long-term climate ambition in order to make investment decisions and to enable the low-carbon transition.

The EU to reach a balance between GHG emissions and carbon sinks by 2050

In order to keep the global temperature rise below 2ºC, the European Council reconfirmed in 2011 the EU objective of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990. The objective was based on the assumption that the EU would aim to reduce its internal emissions by 80%. The additional reduction, to 95%, could be reached by using offsetting through the international carbon market.

Since then, new scientific evidence on climate change has been presented and the global Paris Agreement has been signed. The current 80-95% goal is not in line with the Agreement.

The upcoming IPCC 1.5 degree report is likely to urge further climate action: all countries should increase their ambition. The EU should lead by example and aim at achieving a balance between GHG emissions and carbon sinks by 2050.

In addition, the EU should define a cost-efficient emissions trajectory towards the ultimate 2050 goal with an ambitious intermediary target for 2040 and focus on early action. A revision of the 2030 target to at least 45% should also be considered, because the recently agreed ambitious 2030 targets for renewable energy and energy efficiency will contribute to further emissions reduction. Coherence between the three targets is necessary in order to not undermine each other.

High climate ambition will provide opportunities by boosting technological development that will lead to low-cost carbon-free energy and energy-efficiency improvements. Decarbonisation of the EU's economy with market-based instruments will improve the Union's competitiveness and energy security by making member states less dependent on fossil fuel imports. It will also result in improved air quality and, consequently, health benefits. We also believe that decarbonisation will bring about more green jobs. As the low-carbon transition will be a necessity in all parts of the world, Europe as an early mover will be able to provide solutions to other regions of the world.

To achieve the ambitious targets, all sectors of society have to contribute. We also need the close collaboration of business, politics and innovation. The EU must provide policy instruments that enable the development and deployment of all technologies and tools needed for the transition.

Particularly, this necessitates a strong carbon market that delivers meaningful pricing of GHG emissions, where also the removal of carbon dioxide (CO2) from flue gases or directly from the air is rewarded. Channelling of technology-neutral climate and energy financing toward the relevant technologies is also needed.

The EU, with roughly 10% of global emissions, will not be able to tackle climate change on its own. Progress internationally is the only way to solve the climate challenge, and the EU must continue to engage its partners. By formulating and implementing ambitious domestic climate change policies for more than a decade, the EU has already brought many other countries on board. The EU should further work towards a gradual development of global carbon markets to support the efforts of developed and developing countries to implement low-carbon development strategies.

EU ETS to be further strengthened

The rules for the EU emissions trading system (ETS), including revision of the market stability reserve (MSR), have been recently fixed until 2030. The anticipation of the MSR start in 2019 has already been reflected in the EU allowance price that has more than tripled during the last twelve months. In the upcoming revision of the MSR in 2021, the current temporary double intake rate (24% annually) of MSR needs to be made permanent; otherwise, there is a risk for a new oversupply situation in the carbon market. The linear reduction factor (LRF) of the ETS should also be increased to at least 2.6% in the scheduled review in 2024.

Fortum also supports an expansion of the EU ETS to new sectors, in particular heating and cooling. Heating and cooling covers about 40% of the carbon emissions in the EU. Bringing more emitting activities into the market will improve efficiency and deliver cost savings, ultimately making it easier to achieve higher ambition.

One of the key reasons behind the poor functioning of the EU ETS in the past has been the impact of overlapping policies with the ETS, both at the EU and national level. The future policy framework should ensure that the emission reductions from the overlapping policies are assessed and the consequent cancellation of allowances is carried out from the ETS. This concerns, for example, the national decisions to phase out coal before 2030, decisions to apply national carbon price floors as well as higher renewable energy and energy-efficiency targets at the EU level.

Both direct and indirect electrification needed to decarbonise heating and cooling

Roughly 75% of the EU's greenhouse gas emissions originate from the energy sector (including transport). Heating and cooling represents about 50% of the final energy consumption, transport about 30% and electricity 20%. By now, the electricity sector has clearly made the biggest decarbonisation effort based on significant deployment of renewables.

Energy transition will fundamentally change the energy system: energy will become a non-limited resource during surplus wind or solar generation hours, but flexibility will be a limited resource. Capacity structure optimisation and market-based valuation of flexibility will be the key. Focus should be on the whole energy system instead of the electricity system alone and on regional solutions instead of national ones.

1 October 2018

As electricity as an energy carrier can be both clean, affordable, reliable and secure, electrification will be a key enabler of decarbonisation also in other sectors. Decarbonising the whole energy system would give a clear upside to electricity demand and enable fitting more renewable electricity production into the system. In addition, managing the balance of the power system will become easier with an increasing number of flexible elements.

Carbon-free electricity will play a central role in the low-carbon economy. In Fortum's view, renewable electricity from hydro, wind, solar and biomass, nuclear power, electricity storage, hydrogen produced in a carbon-neutral manner, and E-fuels derived from hydrogen play the most important role in the clean energy transition. Natural gas, although a fossil fuel, will be needed to provide flexibility and security of supply during the transition.

The decarbonisation of the heating sector is one of the biggest challenges ahead: over 80% of heat consumed in the EU is still produced from fossil fuels. In heating and cooling, energy efficiency and design of intelligent low- or zero-energy buildings is generally the key tool for emissions reductions. District heating and cooling based on low-carbon fuels and waste are expected to continue playing an important role in some parts of Europe and providing a good solution for densely populated areas like cities. Shifting energy consumption towards low-carbon electricity, including heat pumps and renewable energy (e.g. solar heating, biogas, biomass), as well as taking care of excess heat, also provided through district heating systems, would be important in emissions reduction.

In order to fully decarbonise the heating sector in the long term, both direct electrification through carbon-free electricity and heat pumps and indirect electrification through green hydrogen and green methane are needed. According to recent scenarios by the European Electricity Industry, 45% to 63% of the energy consumption of buildings could be electric in 2050 driven by the adoption of electric heat pumps. Methane could be produced from green hydrogen and from captured CO2.

The biggest challenge is ensuring security of supply and affordability of electricity and heat while simultaneously decarbonising the energy system. Each energy production technology has its pros and cons, and the optimal mix of "baseload" and "flexible & firm" or "dispatchable" electricity will vary by country and region. Also public acceptance of various renewable generation forms and other technologies, e.g. increased grid connections, remains a challenge that needs to be overcome.

We prefer technology-neutral and market-based policy mechanisms that create incentives for innovation and a level playing field for competition across technologies internationally. All low-carbon and carbon-free production technologies and other technologies (storage, flexibility) have to be developed without any political choices. The EU ETS will be critical in driving a wide range of low-carbon technologies into the market, so that the energy sector itself can adapt its investment and operational strategies to changing energy prices and technology.

Currently there are still some legal barriers and contradictions in regulations related to the utilisation of hydrogen. Most important is that green hydrogen should be counted as renewable.

1 October 2018

Electrification, recycling, abatement of non-CO2 emissions and resource efficiency are the key in the decarbonisation of industry

Industry has a diverse set of greenhouse gas emissions sources and, consequently, a number of mitigation options. The application of more resource- and energy-efficient industrial processes and equipment, carbon-free electrification, increased recycling, as well as abatement technologies for non-CO2 emissions (e.g. nitrous oxide and methane), could make a major contribution to emissions reduction. In addition, the use of more efficient industrial processes and equipment, carbon capture and storage (CCS) may also need to be deployed on a broad scale after 2030 to capture industrial process emissions (e.g. in the cement and steel sector).

In our view, the construction industry may be closest to technical maturity to actually remove gigatonnes of CO2 annually. Over 4 billion tonnes of cement is manufactured every year, and there are several carbon-negative alternatives to Portland cement that are beyond pilot stage. Concrete presents a permanent storage option for captured CO2.

High mitigation potential is available in the steel industry through hydrogen and biomass, in the cement industry through electrification and CCS, and in the chemical industry by utilising biomass and CCS. This potential could be realised beyond 2030. According to recent scenarios by the European Electricity Industry, a series of industrial processes can technically be electrified with 38-50% direct electrification in 2050. The relative competitiveness of electricity against other carbon-neutral fuels will be the critical driver for this shift.

Electrification, hydrogen and sustainable biofuels enable the low-carbon transition in transport

Transport also has a diverse set of greenhouse gas emissions sources and mitigation options. In our view, large-scale deployment of electrification is currently feasible in railroad traffic, light vehicles, short-distance freight road transportation and short-distance ferries. According to recent scenarios by the European Electricity Industry, 29-63% of total final energy consumption in transport could be electric by 2050. Synthetic bio-based liquid fuels offer an option for closed carbon cycle in the transport sector. Economically, they may play an important role in monetising the usage of captured CO2 directly or through biomass. Hydrogen will provide solutions for light vehicles, long-distance freight road transportation and marine transport beyond 2030. Sustainable biofuels are considered a viable alternative fuel in aviation and long-distance freight road transportation with strong growth in these sectors after 2030.

CCS and CCU require technological maturing and economic reward for the captured CO2

Fortum believes that both carbon capture and storage and carbon capture and utilization (CCU) are essential in reaching the goals of the Paris Agreement. Large-scale deployment of CCU, however, requires technology development and maturing, declining cost of capturing technologies, and an increasing reward for the use of captured CO2.

In electricity production, CCS is not expected to play an important role, because coal and other fossil fuels are likely to be phased out to a large extent. CCS is not feasible for intermittent reserve

1 October 2018

and peak capacity based on natural or synthetic gas. Bio-CCS is an interesting option to get "negative emissions" and would be cost-effective in large-scale CHP plants. However, the challenge is that biomass-fired power plants are typically small scale. CCS in waste incineration will play an important role even in the long term, because, despite the increasing rate of recycling, there will be always "reject" materials that cannot be reused. Combining waste incineration, CCS, and district heating and cooling is a long-term solution with a large potential for emissions reduction.

A barrier of CCS is related to the building of a CO2 transport and geological storage infrastructure where safe disposal and public acceptance are key. CCS with enhanced oil recovery (EOR), for one, may not become a long-term solution, as the world should in any case eliminate the use of fossil oil. But in the transition period, CCS+EOR might be necessary in order to create co-financing for large-scale removal of CO2 from the atmosphere or compensating for emissions in industries where carbon-free solutions are challenging in significant volumes.

CCU – and especially utilisation of captured CO2 in long-lived products – provides an interesting option for the future. However, a significant barrier is the unbalanced supply and demand of captured CO2. New large-scale commercial applications for CO2 are needed. Therefore the EU policy and funding for CCU development should focus on finding new commercial uses for captured CO2.

Public financing is also required for end-to-end large-scale demonstration of carbon capture from industrial processes and carbon capture directly from the air. However, subsidies for CCS should remain medium term (around 10 years), in order to avoid similar problems that have occurred with continued subsidies for solar PV and wind power. In the long term, CCS should be market-based.

Cascading(* use of biomass could enable enhanced resource efficiency

Forests and agricultural land have to be considered primarily as resources for bio-based products and as a carbon sink and storage. The land-use sector becomes more important also in reducing emissions and creating carbon sinks, when aiming for a lower CO2 concentration in the atmosphere. Improved, climate-smart agricultural and forestry practices can increase the capacity of the sector to preserve and sequester carbon in soils and forests. In order to develop land-based carbon sinks faster, policies and an economic reward for removing CO2 from the atmosphere are needed.

Forests and agricultural land produce renewable biomass that can be used to substitute other carbon-intensive products or to produce bioenergy, which in turn reduces the use of fossil fuels and raw materials. Use of biomass should follow the cascading principle, preferring bio-based high-value materials and using reject biomass as an important transitional energy source. In energy production, biomass is most efficiently utilised in advanced CHP plants in connection with industrial or district heat production or in other CHP-integrated processes.

(* *Cascading refers to a resource-efficient and circular use of woody biomass, respecting subsidiarity and sustainability and optimising its value in increasingly parallel and/or circular use schemes. In our view, cascading has to be market-based and not regulated in legislation.*

1 October 2018

All use of biomass – whether in solid, liquid or gaseous form – has to be sustainable. The key sustainability concerns to be addressed include the climate impact (greenhouse gas emissions) and the impact on biodiversity. In the EU, use of biomass takes place in the limits of sustainably available resources under the framework of LULUCF and REDII legislation. Fortum welcomes the sustainability requirements for solid biomass adopted in the revision of the EU Renewable Energy Directive.

Education, R&D and innovation to be focused on solutions with largest mitigation potential

Education, R&D and innovation are key in the transition to sustainable levels of CO2 in the atmosphere. R&D efforts will be needed in all sectors, but they should focus on the solutions with largest mitigation potential: fast carbon-free electrification, commercial usage of removed CO2, and enhancing natural sinks in soil and forests, and the circular economy in all sectors.

In Fortum's view, R&D and large-scale deployment of particularly the following innovative technologies is needed. The EU research and innovation programme (Horizon 2) should focus on finding new solutions for all these areas, but they also need investment support to accelerate the commercialisation of technologies after piloting.

- Increasing flexibility in the electricity sector, but also across sectors. In order to decarbonise e.g. the heating and industrial sectors, power to gas (i.e. hydrogen, methane and further products) is needed
- Long-term energy storages for electricity and heat
- Carbon-free electrification of transport
- Circular economy solutions: targeting to increase circulation of materials and gradually reducing waste-to-energy
- Resource-efficient use of biomass (e.g. fractionation technologies) to replace fossil and unsustainable textiles, including cotton, fossil chemicals and plastics, and other fossil raw materials
- Utilisation of low-value waste heat
- CCS and CCU to find large carbon sinks

Private financing is crucial for a market-based low-carbon transition

The price tag of climate action is extremely high. The IEA has estimated that global investments of USD 16 trillion are required in the electricity sector alone by 2035 in order to reduce emissions. These investments cannot be financed by public money, so private financing is crucial. In addition, the low-carbon transition as well as climate change itself will most likely affect the value of the existing investments and assets of companies.

At the moment, the greatest bottleneck is the financing of first-of-kind commercial projects, which require investment support or other risk-sharing mechanisms. Some of the new concepts are not yet commercially viable, even though the technology is quite well developed. The private sector is willing to share in some of the risk, if it opens business opportunities, but public financing is also important. The development projects should clearly aim at market-based and competitive solutions.

1 October 2018

Subsidies should be only transitory and targeted to technologies that are not yet commercially viable, but deemed critical for large-scale decarbonisation. Examples of such technologies include CCS/CCU, biogas, green hydrogen and climate-smart farming and forestry.

Sustainable finance will also play a key role in channelling investments in line with the Paris Agreement. Fortum welcomes the EU action plan and initiatives relating to sustainable finance, but is sceptical about the need for detailed top-down EU regulation. The finance market is already voluntarily moving towards this direction, as public and private investments are reoriented towards a low-carbon economy. It is important to maintain a market approach in investments; otherwise, there is a risk that investments will be driven by politics rather than by markets.

Adaptation measures to be planned locally and technology specifically

The energy sector is one of the most vulnerable sectors to climate change that has both direct physical impacts on energy production and indirect impacts through climate and energy policies/regulation and through changes in energy demand. In addition to mitigation actions, the energy sector needs to consider adaptation measures of its operations in anticipation of more frequent extreme weather events as well as long-term changes of the climate.

While the general effects of climate change are global, the specific impacts of climate change and the greater frequency and intensity of extreme weather events will be local and specific to each technology. The most significant impacts originate from rising temperatures and sea levels, floods, storms and water shortages. Rising temperatures will also reduce the efficiency of thermal and solar generation, and heat waves will significantly increase peak demand of electricity.

Adaptation actions in the energy sector to prepare for the likely effects of climate change include, for example, flood control, prevention of forest fires, and reinforcement and protection of the seacoast. The impacts of climate change on hydrological conditions (precipitation, discharges, water levels) and, consequently, on hydropower production, production planning and dam safety are essential issues to be analysed. Changes in seawater levels and temperatures may entail a safety risk for power plants located in coastal areas.

Best practices in increasing the resilience of the power sector have been reported in, e.g., the WBCSD Electric Utilities Project's "Building a Resilient Power Sector". The project concludes that all utilities need to develop adaptation strategies. The necessary adaptation measures depend on the local circumstances of each asset and utility.

For further information:

Kari Kankaanpää, Senior Manager, Climate Affairs, kari.t.kankaanpaa@fortum.com
+358 50 4532330