The European Commission
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Public consultation on the EU funds for investment, research & innovation, SMEs and single market

We appreciate this opportunity to submit this position paper.

To support EU's goals for deep decarbonization of Europe towards 2050, the Framework Programme 9 (FP 9) needs an overriding mission that drives broad innovation in the energy sector. This mission should be to develop - by 2030 - a full toolbox of solutions necessary for providing clean energy for all. Therefore, technology development to reduce GHG emissions should address the needs of all areas, including those where electrification through renewables remains difficult. This mission could be guided by three objectives:

1. Rapid expansion of clean electric solutions
2. New solutions for the difficult to electrify sectors
3. Becoming a leader in carbon management

These objectives will allow the missions approach to deliver credible decarbonization pathways for the entire economy, in Europe and beyond. We are convinced that rapid and growth-creating transformation of Europe's energy, transport and industrial systems will benefit immensely from the innovations and markets that the approach can help to create. When based on the more exciting and attractive attributes of market creation as opposed to mere market fixing, the approach can build further enthusiasm among Europeans for research and innovation.

It is also important that missions are clear, quantifiable and solutions neutral. These conditions are needed to allow for the innovation and fair competition which creates the winning solutions and prospective markets. This must be supplemented with strategic policy support that combines supply side and demand side stimulation to ensure scaled technology adoption of market ready technologies. Regulatory challenges must therefore not be dealt with in isolation, but in parallel with FP 9.

The submission introduces our mission proposal and the three guiding objectives mentioned above. Secondly, it presents hydrogen, CCS and offshore (floating) wind as examples of research areas with a game-changing potential in reaching all high-hanging fruits of Europe´s decarbonization. Finally, we highlight the importance of aligning the public private partnerships with the missions based approach.

Kind regards,

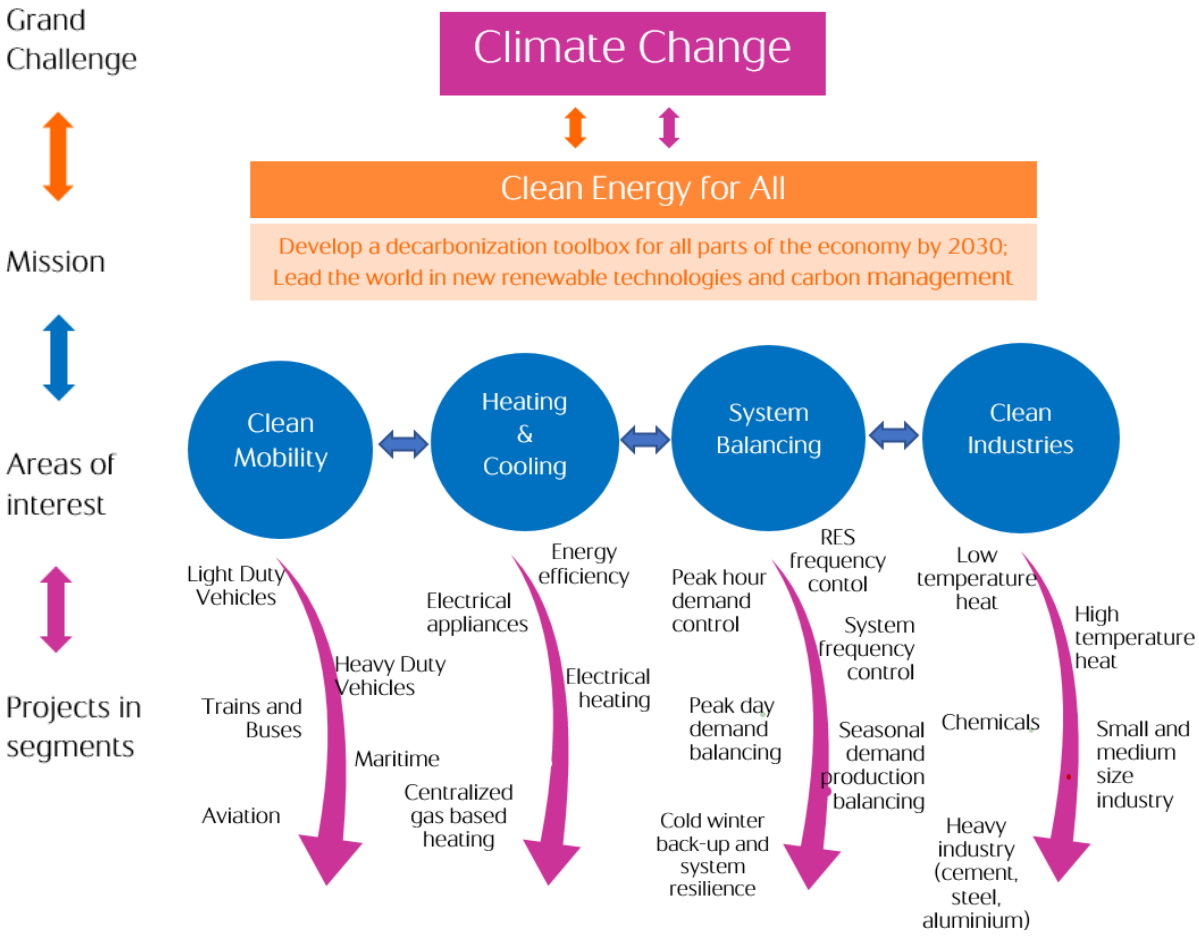
Statoil ASA

1. A full energy and climate solutions toolbox by 2030

The EU needs to integrate UN Sustainable Development goals no. 7 (affordable and clean energy or all) and no. 8 (decent work and economic growth), into a mission developing a full toolbox of solutions, whose deployment will be necessary for the 2050 deep decarbonization target. These solutions need to be developed now, to allow for their rapid deployment after 2030. Succeeding on this mission is essential for Europe to achieve innovation driven growth and to live up to the Paris agreement.

FP9 comes at a crucial time. Going into the FP9 period we see many promising solutions and technologies that with rapid implementation and scaling up can offer credible decarbonization alternatives for all parts of Europe's industrial, transport and energy systems. The successes of batteries, wind and solar renewables and the accelerating electrification of cars stand out as particularly promising. But at the same time, there are large parts of Europe's energy, transport and industry systems where similarly promising solutions are not yet developed to the same maturity and promise. As illustrated in section 4, these are hard to electrify parts of our economy where renewables may not contribute much.

But coming out of the FP9 period, Europe will need to have in place the full set of promising and "industrial-scale-ready" solutions, ready for implementation at massive scale during the 2030's and 2040's. It is in this period where Europe´s decarbonization must speed up dramatically. The key challenge for achieving this competitive, value-creating and carbon neutral Europe by 2050 is to speedily develop solutions that are needed for the non-electrifiable parts of the economy. And all parts mean all parts of the energy, transport, industry and other systems, as well as all geographical parts of Europe. It is here that industrial-scale-ready solutions are urgently needed.



1. Rapid expansion of clean electric solutions

EU should continue to promote renewables with storage solutions wherever economically viable to electrify the power sector and large shares of road transport. FP9 should sustain this momentum by supporting the development and commercialization of second generation of renewables and remaining intermittency challenges, such as large volume energy storage, clean back up power capacities and smart grids. This should also be extended to increasing the efficiency of renewable energy value chains, as these can bring further cost reductions.

2. New solutions for sectors difficult to electrify

To decarbonize, EU should in addition support new solutions for the “difficult to electrify” sectors, such as heating of buildings and industries, maritime, heavy-duty transport and back-up and balancing power generation capacity. In order for Europe to be ready for a truly deep decarbonization, one will need to develop affordable solutions also for those sectors. The need for action is evident also in the context of EU´s Industrial Strategy, which aspires to increase industry´s share of value added to the European economy from 16% to 20%. Such industrial growth requires credible decarbonization alternatives, which in turn rely on new breakthrough technologies and energy carriers.

Hydrogen, when produced and used at scale, has the possibility to complement electricity to provide Europe with a credible pathway towards carbon neutrality in virtually every sector of the economy. Hydrogen would also secure the European industrial base with the development of low carbon industrial systems, generating both socio-economic and environmental benefits and showcasing Europe´s technological leadership. The key research areas here are hydrogen production from electrolysis as well as reforming of natural gas with Carbon Capture and Storage, both with reduced cost and increased efficiency as key R&D targets. Improved solutions for large-volume transport and storage of hydrogen as energy carrier is also needed, as well as technologies for flexible large-scale power generation based on hydrogen. Finally, solutions for safe transport, storage and large-scale use need to be developed and demonstrated, to build acceptance and trust.

3. Becoming a leader in carbon management solutions

The energy transition also requires carbon management solutions. Further research and innovation in Carbon Capture and Storage (CCS) is needed. CCS brings about great emission neutralization potential in sectors difficult to electrify, such as industry. CCS is an essential component in 114 of 120 scenarios with 0.9–2.3°C global warming in the IPCC Fifth Assessment Report. The vital role attached to CCS in these energy transition models is not (yet) translated broadly enough into policy support at EU and national levels. The world needs to reduce CO2 emissions by 4,000 million tons per annum, which is not feasible by renewables alone. CCS is needed, but currently CCS facilities in operation or construction are around 40 million tons per annum not nearly at the scale needed. Not developing CCS at scale increases the risk for the EU and the world of not having a full toolbox of solutions necessary to stay within the 2 degrees target of the Paris Agreement.

When prioritizing funds for the development of carbon capture, utilization and storage solutions, the EU must understand the immense mitigation potential difference between CCS and carbon capture and utilization (CCU). According to research published in Nature Climate Change, CCU may be a “costly distraction” from the real task of mitigation. Authors find that chemical conversion of CO2 is unlikely to address more than 1% of the mitigation challenge (Dowell et. al,2017).

2. Examples of Research Areas with Game-changing Market Potential

We believe that hydrogen, CCS and offshore wind (floating) can become major game-changers to Europe's climate ambitions. The reason is that our experience with these technologies shows they are reliable, have a strong cross-sectoral element and a great potential for cost reduction, scalability and rapid uptake. In other words, they meet all pre-conditions for creation of new markets underpinned by business models and successful research and innovation.

Scale and uptake potential: Hydrogen has the potential to provide a versatile second decarbonized energy carrier as complement to electricity. Today's technology allows for production of hydrogen at scale from natural gas with CCS. This can build hydrogen markets, applications and infrastructures, which at later stages be served by electrolysis-based hydrogen once that technology matures. CCS can be scaled in Europe´s most industrialized regions.

Cross-sectoral: Hydrogen can be used in the residential sector for heating and cooking purposes if adjustments are made to boilers, burners and parts of networks. The biggest energy-intensive industries (steel, aluminum, cement, chemicals and refineries) are reliant on large energy volumes for heat generation. They could be converted to carbon neutral hydrogen pending adjustments to burners, furnaces, turbines and distribution networks.

Affordability: Hydrogen is well placed to benefit from existing natural gas infrastructure that would otherwise become stranded because of its functionalities that non-gas based heating systems don't benefit from.

Reliability: Hydrogen is a very reliable energy carrier available for use at any time of the day. It can be produced from a range of sources including natural gas with CCS, as well as from renewables with electrolysis. It is transportable in large volumes and over long distances as ammonia or in other forms. An energy system based on two decarbonized energy carriers would benefit from increased optionality and energy security compared with a single carrier system. Storage of CO2, be it from hydrogen production or from industrial capture, is a safe and secure technology. Statoil has 20+ years of experience from several CO2 storage projects without a single incident.

Market creation: Europe´s R&I spending aspires to move towards market creating instead of market fixing public interventions. Floating wind, hydrogen and CCS would all become technologies spearheaded first by the EU. This means Europe would not only win the race in providing credible decarbonization solutions for the "difficult to electrify" sectors, but also find new export markets, maintaining and providing new jobs and manifesting Europe´s climate leadership within the Mission Innovation

3. Aligning the Public-Private Partnerships with the Missions Approach

Public and private partnerships need to evolve to correspond to the new mission's approach. Legal frameworks of Joint Undertakings should be reviewed so their scope addresses the most recent research development and new directions and priorities set by the missions.

Statoil believes that Joint Undertakings could become more interdisciplinary. This could be achieved by gathering more experts form different research and technology disciplines and opening to a wider variety of industry actors, including entrepreneurs, large firms, SMEs, private financial institutions and consumer associations. It is only when strategic research directions are set by such an open pallet of stakeholders, that undertakings will deliver on their goal of technology commercialization. Failure to do so runs the risk of financing small research niches of a closed club of enterprises and thereby compromising the much-needed technology adoption.

This is the reason why we recommend that the Fuel Cell Hydrogen Joint Undertaking (FCH JU) is reviewed to account for new missions based priorities and cost reduction realities on the ground. This means that the legal mandate of the FCH JU in the Council Regulation NO 559/2014 should be expanded to allow for research and penetration of hydrogen combustions solutions and hydrogen production from natural gas through steam methane reforming with CCS. Despite

the regulation´s ambition of “developing a strong, sustainable and globally competitive fuel cells and hydrogen sector in the EU”, major hydrogen areas of great promise such as hydrogen from natural gas, and combustion of hydrogen in natural gas plants, boilers or cooking stoves are disregarded in FCH JU´s research objectives. The Mission approach, with its focus on desired outcomes and quantitative measurement of success, provides a promising framework for getting R&I programs right.

4. Illustration of Possible Solutions for the Full Energy and Climate Toolbox

Transport		Domestic, Service, Commercial		Industry		System Balancing	
Segment	**Solutions**	**Segment**	**Solutions**	**Segment**	**Solutions**	**Segment**	**Solutions**
Short distance LDV road transport	BEV, Hydrogen	Electrical appliances	Electricity	Low temperature heat	Renewable electricity, hydrogen	Renewable frequency control	Batteries
Buses	Biofuels BEV Hydrogen	Electrical heating	Heat pumps	High temperature heat and refineries	Hydrogen, CCS	Peak hour demand control	Batteries, Demand side response
Long distance LDV road transport	Hydrogen, BEV	Gas heating	Hydrogen, biogas, H2 &Heat Pump hybrids, Fuel cells	Chemicals	Hydrogen, CCS, biofuels	HVAC system frequency control	Nuclear, hydrogen power
Short distance maritime transport	BEV Hydrogen			Small-medium size industry	Electricity, Hydrogen	Peak day demand balancing	Pumped hydro, interconnectors, hydrogen power
Long distance HDV road transport	Hydrogen, biofuels			Cement and Steel process	Hydrogen, CCS	Seasonal demand-production balancing	Hydrogen, interconnectors
Long distance maritime transport	Hydrogen, biofuels					Cold winter back-up and system resilience	Hydrogen
Aviation	Biofuels BEV						

Light Blue – Easy to Electrify; Medium Blue – Medium Difficulty to Electrify; Dark Blue - Difficult to Electrify