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Dear Ms Donnelly,

Consultative Communication on Carbon Capture & Storage

Shell welcomes the opportunity to respond to the European Commission (EC) Communication on Carbon Capture & Storage (CCS). This response should be treated as complementary to Shell's response to the Consultation on the 2030 energy and climate policy framework, which has been submitted to the EC in parallel.

Executive Summary

CCS is an essential technology for meeting global and European long-term energy and climate goals. A robust European demonstration programme is essential to build public and policy-maker acceptance of the viability and value of CCS. CCS remains a safe and tested technology; however public acceptance, in particular of storage related issues, will only be possible if successful demonstrations at industrial scale have taken place within the EU itself. For the EU to be able to deploy CCS as an essential low carbon technology in the long-term it will need to demonstrate the technology in Europe in the short-term – rather than risk relying on imported expertise from regions such as US and Canada.

The pace of the technology's deployment has fallen below the EU's own commitments (12 industrial demonstration projects which would test a number of CCS applications). Failure to deliver an EU demonstration programme risks increasing the long-term costs of deployment and therefore decarbonisation.



At the commercial stage (in reference to figure 1 below), a robust carbon price signal is the most efficient means to drive all low carbon technology investments and deployment. It should be noted that CCS is the only low carbon technology that is exclusively driven by climate protection goals. Unlike other technologies, CCS generates no revenue and, as such, its deployment would be entirely driven by a carbon price.

It is Shell's view that the EU Emissions Trading System (ETS) should be immediately strengthened and should be the central policy mechanism in delivering the EU's climate and energy objectives in the post 2020 period. Like all low carbon technologies, CCS needs additional policy support during its demonstration and pre-commercial phase. Specific recommendations to this effect are:

1. An extension to the NER 300 funding mechanism in a manner that can offer support for the demonstration of CCS, as well as other emerging and innovative low carbon technologies.
2. Additional policy measures to ensure operational viability during the demonstration and pre-commercial phases may also be necessary and should be examined further. This examination should include a system of CCS Certificates (CCSCs), direct financial support via Member States (MS) and strengthening of existing capacity mechanisms.
3. Proposals to structurally reform the EU ETS should be brought forward as soon as possible and no later than the end of 2013. This will send a long term signal and will, over the long term, give operational support to all low carbon technologies including CCS. A pre-requisite to a strong ETS is the introduction of an economy-wide single greenhouse gas (GHG) reduction target from 2020 as the central mechanism in the climate and energy framework.

Shell would welcome the opportunity to discuss these solutions in further detail with the Commission, industry, MSs and other relevant experts in the context of the upcoming policy milestones around 2030 and ETS reform. The outcome and impact of these critical decisions is an important consideration when developing a CCS policy.

Background

To meet the challenges of rising global energy demand and rising GHG emissions, new low carbon technologies will need to be developed. The International Energy Agency (IEA) estimates that by 2050, fossil fuels may represent 60% of the world's energy mix, even as renewable energy technologies continue to grow. Therefore CCS will become a critical technology to mitigate the environmental impact of fossil fuels whilst keeping these resources in the energy mix.

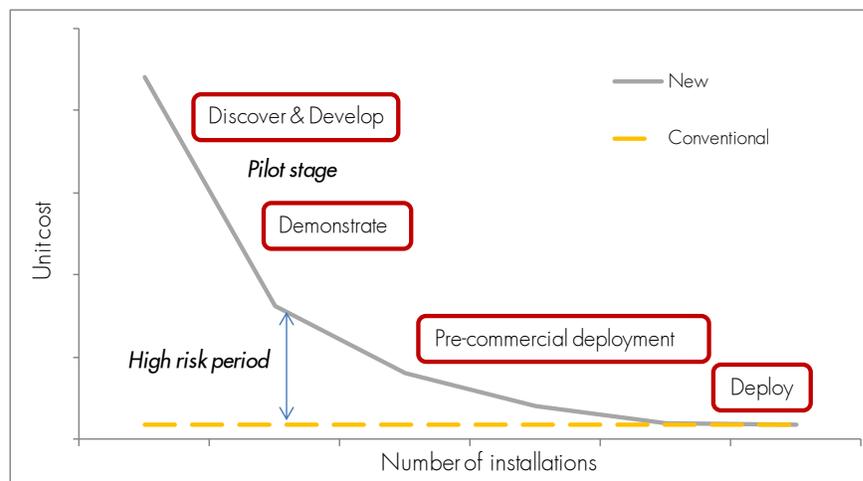
The way in which carbon dioxide (CO₂) easily accumulates in the atmosphere but is very slow to depart means that the system can be likened to a stock pollution problem. CCS is the only technology which directly addresses this stock problem in the energy system by beginning to remove CO₂ from the combustion of fuels and storing it deep underground. Other technologies which improve efficiency help to slow down the rate but not the total volume of CO₂ in the atmosphere.



The issues of energy demand and the need to address climate change therefore combine to mean that CCS will, in Shell's view, be a core technology in Europe's future energy landscape. According to the IEA: "Without the deployment of CCS or an alternative low-carbon technological breakthrough in industrial processes, industry would struggle to reach the levels of decarbonisation necessary to achieve the 450 ppm Scenario [consistent with limiting the risks of climate change]..."¹ Indeed the IEA also states that significant delays to the widespread deployment of CCS technology are likely to increase the cost of decarbonisation in worldwide electricity generation by USD 1 trillion.

New technologies, such as CCS and renewables, tend to move through a technology learning curve as outlined in Figure 1. This curve illustrates how the cost of a technology tends to reduce as the technology matures. However the market alone does not pull technologies along this curve and so at key phases further support from policy makers will be needed.

Figure 1: Technology learning curve



The technology pathway can be divided into four distinct phases (i) discover & develop, (ii) demonstrate, (iii) pre-commercial deployment and (iv) commercial deployment and each phase requires specific policy responses as described below.

- The **discover and develop phase** (i.e. research and development) is where new ideas are generated and tested. This requires collaboration and funding from government, industry and academia.
- The **demonstration phase** is important to enable low emission technologies to be tested at industrial scale in demonstration plants. The initial capital costs of demonstrating technologies can be high, but it is an important step to overcome technical and non-technical risks as well as bringing down costs. Demonstration funding is vital to deliver both CCS and innovative renewable technologies. For example, the EU ETS currently provides funding for the demonstration of emerging low carbon technologies from the revenues from the auctioning of 300 million allowances from the New Entrant Reserve (NER300). Under this framework there is role for targeted support to enable the

¹ IEA, Redrawing the Energy-Climate Map, World Energy Outlook Special Report (2013)



development of alternative energies in the **pre-commercial phase**. This is when technologies can operate at scale but are still not competitive with conventional technologies and need support in order to bring down costs.

- In the **commercial deployment phase**, low carbon technologies can be commercially deployed under the dedicated policy mechanism designed to achieve emissions reductions for the sector.

Today we believe CCS has been discovered and developed and now needs to move through the demonstration phase. A CCS demonstration programme is vital to bring down the costs of the technology, build public acceptance and develop the supporting infrastructure.

Three elements have historically underpinned the development of low-carbon technologies and CCS is no different:

1. **A clear long-term signal that the technology has a role to play in Europe's decarbonisation:** A commitment to deliver a CCS demonstration programme together with policy options to ensure this should form an integral part of the 2030 framework;
2. **Capital support to drive upfront investment in demonstration projects:** An extension of the NER 300 and a policy framework which allows technologies to move through the pre-commercial phase; and
3. **Operational support:** To ensure that once demonstration projects are operational they are economically viable: A strengthened EU ETS.

Shell & CCS

Given the importance of CCS technology, and the need to move ahead with its demonstration, Shell is active with the following CCS projects today:

- Shell took the final investment decision on the Quest project in Canada in December 2012. Construction is now underway on this large-scale application of CCS, which when up and running will store around 1 million tonnes of CO₂ per year from Shell's Scotford Upgrader;
- Shell's Gorgon CCS project is underway in Australia;
- Shell is a partner in the CCS facility at Technology Centre Mongstad in Norway;
- Within the EU Shell is progressing the Peterhead project – an application of CCS in the power sector – in the UK.

Shell has therefore taken significant action to progress CCS technology and now looks to policy makers to set out the way ahead for the technology over the long-term.



1. *Should Member States that currently have a high share of coal and gas in their energy mix as well as in industrial processes, and that have not yet done so, be required to:*
 - a. *develop a clear roadmap on how to restructure their electricity generation sector towards non-carbon emitting fuels (nuclear or renewables) by 2050*
 - b. *develop a national strategy to prepare for the deployment of CCS technology.*

The development of a clear strategy that addresses how to achieve this level of ambition by 2050 would be welcome both at a European and MS level. Some MSs have already developed national strategies and support mechanisms to deliver the technology. MSs (regardless of their energy mix) should therefore be encouraged to develop CCS strategies, which will give a clear political signal in support of the technology – in turn supporting project investment. MSs can also play an important role in progressing CCS technology by supporting cross-border knowledge sharing. Active and developing CCS projects can benefit from learning from each other since appropriate sharing of best practice will bring down the construction and operation costs of CCS.

Overall a long-term strategy to move CCS from the current point through the demonstration, pre-commercial and ultimately to commercial deployment is vital to the EU's efforts to meet GHG reduction aspirations. CCS cannot move forward without a clear signal that it is going to be a strategic technology in the EU's journey to a low-carbon economy.

Such a long term signal, together with the policy options required in the short and long term, should be embedded in the 2030 policy framework and fully integrated in the EU's existing approach to the Internal Energy Market, climate and energy policy; and the ETS.

2. *How should the ETS be re-structured, so that it could also provide meaningful incentives for CCS deployment? Should this be complemented by using instruments based on auctioning revenues, similar to NER300?*

A well functioning ETS that delivers a robust carbon price, incentivising decarbonisation in power and industry, is the most clear and effective mechanism to support all low carbon technologies. Today the ETS is not functioning and urgently needs structural reform.

Regarding CCS deployment:

- (i) Short term (Backloading): Shell supports efforts to link backloaded ETS allowances to an extended NER funding mechanism for low carbon technologies as proposed by the Environment Committee of the European Parliament.
- (ii) Long term (Structural Reforms): The EU ETS must retain the flexibility to respond to macroeconomic event and deliver the necessary support to low carbon technologies, including CCS, at the demonstration and pre-commercial stage. Policy instruments to support further support CCS while strengthening the EU ETS, such as CCS Certificates and an extended demonstration funding mechanism, should be examined as part of the proposals on ETS Structural reforms – in particular linked to discussions about stabilisation or supply side mechanisms.



ETS reform presents an opportunity to create a new, dedicated demonstration fund for low carbon technologies including CCS as per point (i) above. This could succeed the NER300, once the current process is complete, but could also incorporate design changes to improve the effectiveness for CCS. Such a fund would address the technology's need for capital support.

The current NER300 fund was originally intended as a CCS demonstration support mechanism – and Shell was supportive of this objective – although the experience was ultimately a disappointment with no CCS projects funded through the first round. It is nonetheless possible to design a demonstration that addresses these issues. The key principles underpinning the objective of the fund should be:

- **Transparency about the level of funding available.** Potential co-financers of CCS projects (e.g. MS or private investors) will require confidence that such a fund is sufficient to support a programme of CCS projects. Therefore caution should be taken that, if a fund is linked to a flexible resource such as a given number of ETS allowances, the design of the fund does not prevent sufficient capital being available;
- **Flexibility regarding the funds available to a single project.** The design of the fund should avoid excessive caps on the proportion of capital that can go to any one project;
- **Integration with other sources of funding for CCS.** To ensure a successful programme, CCS projects should be able to leverage existing EU support for low carbon technology (e.g. European Energy Programme for Recovery and Horizon 2020) alongside any support from the demonstration fund;
- **Design that is subject to a consideration of the lessons from the current NER300.** The completion of the current fund before 2014 offers the Commission the opportunity to review the experience of the existing NER300 before launching a successor mechanism.

3. *Should the Commission propose other means of support or consider other policy measures to pave the road towards early deployment, by:*

- a. support through auctioning recycling or other funding approaches*
- b. an Emission Performance Standard*
- c. a CCS certificate system*
- d. another type of policy measure*

Back in 2007/8 when the European Council committed to a CCS demonstration programme the expectation was that a strong ETS (e.g. current estimations were that the price today would be close to €30/t) and an NER programme (the value of the NER300 fund is seven times smaller than expected as a result of the fall in EUA prices) would be the key planks of support for successful delivery. Shell continues to believe that a NER demonstration fund in combination with a robust carbon price would deliver a demonstration programme and therefore support both an extension of the NER programme beyond 2015 and a reform of the EU ETS.



The expectation for CCS should be that, at a minimum, the EU sees a suite of demonstration projects (1-3) active by 2020 with a more robust demonstration programme (in the order of magnitude of 5-12 projects) active by 2030 in preparation for larger scale deployment of the technology. The suite of projects should also ensure that: first, the application of CCS is demonstrated across a range of applications, with the application of CCS on Gas-fired power generation included as a strong component, and; second, that CCS is demonstrated in key MSs.

The Commission should consider other targeted support measures if ETS and NER 300 appear insufficient to provide the support needed for successful demonstration. In-depth analysis of the pros and cons and implementation concerns of possible support measures should precede their launch. The interaction between possible support measures and the existing instruments of the energy and climate policies should receive particular attention. With specific regard to the above suggestions:

- a. Shell supports efforts to extend the NER 300 funding mechanism and support the proposals made by the Environment Committee of the European Parliament;
- b. An Emissions Performance Standard delivers an environmental outcome and will not, by default, promote the technology. It therefore should not be considered at this point in time since an EPS is not suitable for technologies in their demonstration phase. The technology needs to move through the demonstration and pre-commercial stage as a priority and an EPS will not guarantee this;
- c. A system of CCS Certificates is an alternative that should be examined alongside the ETS Structural Reforms;
- d. Other types of policy measures should also be examined in the context of both ETS reform and the 2030 package and framework, in close collaboration with MS such that they map their CCS roadmaps. Such mechanisms should ideally be based on market principles and build on implementation of existing measures but direct financial support by MSs and building on full implementation of existing policies such as capacity mechanisms may also be considered – such measures have successfully supported renewable in moving through demonstration and commercial phases.

4. Should energy utilities henceforth be required to install CCS-ready equipment for all new investments (coal and potentially also gas) in order to facilitate the necessary CCS retrofit?

'CCS readiness' is most commonly defined as setting aside sufficient plot space to retrofit the technology. The concept actually has a potentially broader application and should be treated with caution. The issue of plot space refers only to Capture readiness. But Storage readiness is also a matter for consideration – to be 'ready' in the proper sense an asset would need to have preparations for pipeline corridors, injection facilities, pore space and geological studies. For MS where storage is currently prohibited or geologically challenging it is therefore difficult for assets to be built in a way that makes them truly 'ready' for CCS.



5. Should fossil fuel providers contribute to CCS demonstration and deployment through specific measures that ensure additional financing?

As outlined in earlier responses a properly functioning demonstration mechanism that delivers capital support for key projects, alongside efforts to reform the ETS, should be expected to provide adequate financing for CCS during the demonstration phase. Furthermore solving the issue of financing is important but will not automatically deliver CCS demonstration given the non-financial aspects to CCS demonstration.

CCS is a technology that will play an economy-wide role. Whilst fossil fuel providers will need to deliver the technology on some of their existing, and new, assets by 2030, so too will power generators (who do not themselves provide the fuel) and industry. Shell believes that energy companies need to make efforts to deliver CCS, which is why we are progressing CCS projects in Canada, Norway and Australia and bidding for a CCS project in the UK.

CCS also provides wider socio-economic benefits – it will play a role in allowing Europe to meet both decarbonisation goals alongside growth and competitiveness objectives.

6. What are the main obstacles to ensuring sufficient demonstration of CCS in the EU?

A weak carbon price undermines confidence that the market will provide a long-term incentive to pay for the costs of taking decarbonisation measures. As a result, given the risk that even if projects are developed they will not be economic to run, investor confidence in CCS is low.

CCS also suffers from the lack of a long-term signal that it will play a key role in EU decarbonisation efforts. CCS has a huge potential to support EU decarbonisation goals. Low carbon technologies have historically succeeded by policy makers giving a clear indication that they will play a role and by setting appropriate milestones for their development and deployment.

In addition to a long-term signal, CCS projects have suffered from a lack of capital support. Q2 above notes the need for an effective demonstration fund, potentially linked to the ETS, which improves on the experience of the NER300 and delivers much needed investment support to CCS projects. As evidenced by the progress of many new energy technologies, the costs of CCS will come down provided there is sufficient demonstration activity. Whilst investment costs in CCS today are relatively high these will come down over time and are lower than the total investment required when compared to the delayed application on CCS. Finally, elements of the CCS Directive², particularly liability issues create significant risk to private investment and can potentially deter projects taking final investment decision. Shell looks forward to the opportunity to contribute to the review of the Directive in 2014.

² Directive 2009/31/EC of the European Parliament and of the Council, April 2009



7. How can public acceptance for CCS be increased?

The best way to build public support for CCS is through a successful demonstration programme in Europe – so that communities can see real CCS projects delivered safely and cost-effectively. While it is true that CCS is well beyond proof of concept, a demonstration programme serves to facilitate the process of best practice discovery for CCS at scale. Demonstration is also important for delivering essential cost reductions that will reduce the burden of applying the technology throughout Europe at a later stage. Therefore the more projects across a range of technologies and storage applications the more learning and cost buy-downs will be available.

Developing demonstration plants in Europe is an essential first step to building the 'clusters', local networks of shared resources for the technology, that will make CCS viable in the longer-term. This includes establishing early CO₂ transport infrastructure and identification of storage sites, which in turn provide a base for expansion. Furthermore, given the strategic importance of CCS, the establishment of such clusters allows Europe to develop its own CCS industry including dedicated expertise that will enable the region to be competitive with jurisdictions such as the USA and China which are already early movers in the technology.

Many thanks for the opportunity to respond to this Communication.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Ivan Martin'.

Ivan Martin

Head of EU Liaison for Shell Companies