Response to the Consultative Communication on "The Future of Carbon Capture and Storage (CCS) in Europe"[1]

2nd July 2013

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?**

   In answer to both a and b above, it is advisable for Member States to develop a detailed and robust decarbonisation strategy that incorporates coherent targets, plans and roadmaps for particular technologies, including CCS, and sectors, expected to deliver the overall strategy. It is also important to ensure coherence between national and EU plans/strategies. National roadmaps are needed now, to support the fundamental foundational shifts needed to make adequate progress by 2050. Major infrastructure investments made now will in many cases "lock in" high fossil paths for decades to come, so they must inherently support low carbon performance either immediately or as a definite consequence of binding rules governing their use over time.

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?**

   It is highly unlikely that the ETS alone could drive development of CCS in Europe. Thus complementary measures are essential if CCS is to be an economic option before 2030, and possibly even by 2050. If relying on the ETS carbon price to provide a meaningful incentive for CCS deployment, the price would need to be persistently high at a level where operation of unabated fossil plant is economically unattractive and where investment in CCS makes economic sense. In wholesale electricity markets, a high carbon price significantly raises the clearing price (due to the non-linear nature of the marginal cost dispatch curve) leading to transfer payments for existing generation of lower marginal cost. This is paid for by increases in electricity users' power bills that translates to very high decarbonisation costs (€/tonne), much higher than the price of carbon and higher relative to alternatives. **Dramatic increases in the retail price of electricity are politically undesirable, particularly in times of economic downturn or stagnation.**

   The cost of fuel dominates the short run marginal cost of fossil fuel plants. Wholesale gas and coal prices can be extremely volatile and in recent years the EU ETS carbon price has not been high enough to incentivise fuel switching from coal to gas. It has been more profitable to operate unabated coal-fired power plants with the consequence of less carbon-intensive and more flexible

[1] COM(2013)180. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the Future of Carbon Capture and Storage in Europe. Available at http://ec.europa.eu/energy/coal/doc/com_2013_0180_ccs_en.pdf.

gas-fired power plants operating at reduced load factors, with some even being mothballed.[2] **A fixed price or minimum/floor price might increase the likelihood of changing the merit order but provides no certainty.**

The Industrial Emissions Directive (IED) is currently forcing critical investment decisions. Operators of large combustion plants will need to decide by 2016 whether or not to retrofit existing plant and invest in emissions cleaning technologies (for SO_2, NO_x and particulate matter). At the same time it is certain that CO_2 from fossil fuel plant will need to be abated in the medium term if EU decarbonisation targets are to be achieved, as set out in the European Commission's Low Carbon Economy Roadmap. **Certainty as to when baseload fossil plant will be required to be fitted with CCS would provide greater market foresight and investor confidence. Such certainty would not only reduce the risk of stranded assets but also drive the development of CCS supply chains.**

The EU ETS carbon price can be effectively complemented by additional policies which, if well designed, can achieve long term policy objectives at least cost. [This is discussed in more detail in the response to the next question.]

The heavy industry sector has limited options for decarbonisation strategies compared with the power sector. From the perspective of EU competiveness, it would be logical to focus commercialisation of CCS in heavy industry applications. For the power sector, CCS can contribute to a technology and resource diversification strategy, but will need to compete against alternatives which may be able to deliver decarbonised, sustainable energy at lower cost while at the same time reducing or ridding the EU of its dependence on fossil fuel imports.

Importantly the EU ETS sets a cap for carbon but even more importantly, a low or reasonable carbon price provides Member States with essential revenues for carbon mitigation without causing dramatic increases to electricity users' bills – if carbon revenues are invested in delivering low-carbon solutions. There will be competing demands for the ETS revenues but affordability/competitiveness is a key pillar of EU energy policy and therefore a priority for any decarbonisation policy pathway. To bridge the gap between demonstration and commercialisation, the NER300 fund can be used to incentivise early adoption of CCS and achievement of SET plan objectives. The latter could be strengthened by including targets for CCS demonstration and conditions that should be met, including siting of suitable CO_2 storage near source.

Recycling the resulting ETS revenues into both NER300 and energy efficiency programmes,[3] ensures a decarbonisation pathway that supports competitiveness in EU heavy industry and affordability of electricity bills.

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?**

      Yes, as set out in answer above.

[2] Kjetil Malkenes Hovland, K.M. (May 2013). Statkraft Sheds E.ON Shares, Mothballs German Gas Power Plant. The Wall Street Journal: Washington, DC. Available at http://online.wsj.com/article/BT-CO-20130508-703718.html.
[3] Sijm, J.P.M, et al. (May 2013). Investing EU ETS Auction Revenues into Energy Savings. Cambridge Econometrics: Netherlands. Available at http://www.ecn.nl/docs/library/report/2013/e13033.pdf.

b. an Emission Performance Standard?

Effective decarbonisation policy for the EU power sector would ensure that the energy resources least able to satisfy the EU's three pillars of energy policy – sustainability, affordability, security of supply - are retired first. Disinvestment and risk management need to be key elements of the EU's decarbonisation strategy. As mentioned above, there is a high risk that gas-fired power plant will be retired ahead of more carbon intensive and less flexible coal-fired power plant, with the latter receiving life extension. This is the opposite of what should be going on.

CCS deployment will have to be pulled into the market by forcing existing high-carbon options out of the market and prohibiting high-carbon alternatives from meeting the need for new investment. A carbon price cannot guarantee the latter; certainty can, however, be provided by complementing the EU ETS with a well-designed emissions performance standard (EPS). **Given the rapidly reducing timeframe available in which to reduce global carbon emissions to a safe level, reducing the risk of policy non-delivery is now critically important.**

The US state of California (see Annex) used an EPS to send a clear signal to investors that the state intended to procure much less carbon intensive electricity. The state's EPS regulation was particularly effective as it imposed the obligation on electricity retailers supplying consumers in California. This ensured that imports into the state were covered by the regulation. An EPS would need to be applied at EU-level if negative distorting effects on the internal electricity market are to be avoided. Where Member States introduce an EPS in isolation from the EU, the risk of leakage could be high, as cross-border trade is expected to increase with full implementation of 3rd energy package legislation.

During its rule-making proceeding which led to the adoption of an EPS in 2007, the California Public Utilities Commission (CPUC) noted that the EPS helped prevent development of some 30 unabated coal-fired power plants that would otherwise have served California's power market.[4] The case of California demonstrates that an EPS is clearly effective in preventing the new build of carbon intensive generation such as unabated coal-fired power plant. A well designed EPS can then be ratcheted down to force retrofit with CCS, plant operation with reduced load factor, or switching to alternatives, whichever is most economically efficient. It is worth pointing out that California does not rely on the EPS alone to deliver its decarbonisation strategy. The state has ambitious energy efficiency, demand management, and renewables initiatives, and introduced a carbon cap and trade scheme in 2012.

c. a CCS certificate system?

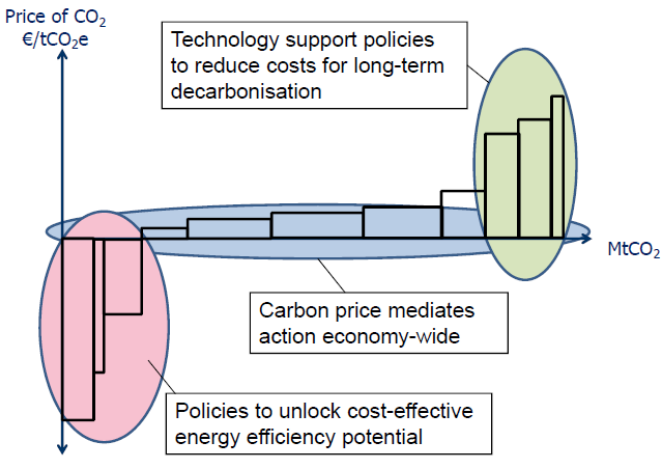
The IEA's (2011) *Summing Up the Parts* report illustrates how policies interact. Figure 1 below, taken from this report, shows how the carbon price (EU ETS) is effective at mediating action economy-wide. Evidence has shown that renewable support schemes (e.g. renewable portfolio standards, renewables obligations, and feed-in-tariffs) have successfully delivered investment in renewable

[4] California Air Resources Board. (December 2008). Climate Change Scoping Plan Appendices: Volume 1 Supporting Documents and Measure Detail. Available at http://www.arb.ca.gov/cc/scopingplan/document/appendices_volume1.pdf.

technologies,[5] reducing costs, and ensuring scale up. Despite the fact that energy efficiency is an investment that pays back (often handsomely) over time, policies are still needed to overcome market barriers to efficiency investments. Well-designed energy efficiency programmes can effectively overcome barriers to deliver energy savings that could not be achieved through price alone. The vast majority of the recent investment in renewables in Europe would not have occurred if Member States were relying on the economic "pull" of the carbon price alone.

Carbon capture and storage (CCS) is a high cost, not yet commercially available, technology that would sit to the right hand side of Figure 1 below. Commercialisation of CCS should be supported just as it has been for renewables. As mentioned above, NER300 can be used to support demonstration projects. In addition, **a certificate/quota scheme could be introduced to complement an EPS, providing greater assurance that some CCS will be built, enabling its commercialisation.**

Figure 1 (IEA[6]): The core policy mix: a carbon price, energy efficiency and technology policies.



A quota/certificate scheme (similar to schemes commonly used to support renewables in various parts of the world, also known as a 'renewable portfolio standard' or 'renewables obligation') would be more appropriate for CCS compared with a fixed price scheme (also known as Feed-in-Tariffs (FiTs)). While the latter have successfully delivered investment in renewable energy technologies in Europe such as wind, solar, and biomass, they are unlikely to be appropriate for CCS investments which are large and infrequent. For example, the use of degression - a key feature of a well-designed FiT which ratchets down the supporting fixed price as costs reduce over time – has been effective in promoting small installations built by small promoters/owners but would not be effective with CCS as there simply will not be sufficient volume of projects to deliver cost reductions associated with mass production of parts and streamlining or standardisation of processes. The costs of feed-in-tariffs are usually socialised across all electricity consumers. Alternatively, a scheme involving a CCS quota with tradable certificates, would be in line with the polluter pays principle.

[5] Renewable Energy Policy Network for the 21st Century Renewables 2013: Global Status Report. Paris, France. Available at http://www.ren21.net/gsr.

[6] Hood, C. (2011). SUMMING UP THE PARTS: Combining Policy Instruments for Least-Cost Climate Mitigation Strategies. Paris, France: International Energy Agency. Available at http://www.iea.org/publications/freepublications/publication/Summing_Up.pdf.

A CCS quota/certificates system is more appropriate for large, infrequent investments but it needs to be emphasized that such a scheme should not be introduced without an EPS. In the absence of an EPS, a CCS quota scheme, such as the one in Illinois mentioned in the consultation document,[7] has the following limitations:

- It only promotes the development of a small number of CCS plants;
- It does not prevent the construction of other carbon intensive (non-CCS) plants;
- It does not prevent incremental investments in life-extension of existing high-carbon plants; and
- It does not address existing high-carbon plants.

These short comings would be addressed with the implementation of an EPS. Because of the certainty with which an EPS can achieve desired policy outcomes, as mentioned above, a certificate/quota scheme should be used to complement an EPS and should not be introduced without an EPS.

Further, if a certificate/quota scheme were to be introduced, the following should be considered:

- An "alternative compliance payment" (ACP) option should be applied. An ACP payments cap on the certificates system, set at a high "circuit breaker" level, ensures against CCS developer mismanagement. It permits compliance through payments if the cost to comply by purchasing power from a CCS facility rises above a certain threshold; and
- A quota/certificates scheme could be supported by EU ETS revenue recycling if necessary.

The consultation document suggests that, compared to an EPS, a certificate/quota scheme would interact more effectively with the EU ETS. The document states that a certificate scheme would work with the EU ETS *"provided the volume of CCS certificates that would be required would have its equivalent in ETS allowances, which would have to be permanently withdrawn from the market".* For an EPS it is stated, *"an EPS would replace the carbon price signal from the ETS as an incentive to decarbonise, without allowing the sectors concerned the flexibility as foreseen under the ETS."*

It is at best highly debatable whether there is any more certainty about the quantity of emissions reduced by the application of a CCS quota/certificate scheme than there would be about the quantity of emissions reduced by the application of an EPS. It is impossible to say for sure what would have been built, or if anything would have been built, in the absence of the introduction of a CCS quota/certificate scheme. Instead a "baseline" would have to be constructed administratively against which to measure the level of emissions after construction of the fossil-with-CCS plant(s), which is not meaningfully different from the process by which one would assess the level of emissions achieved by introduction of an EPS. In fact, the same argument could have been made in support of renewables quota schemes, with the installation of a wind turbine or a PV panel presumed to replace a fossil fuel plant that would have been built instead and resulting in a measurable quantity of ETS allowances to be permanently withdrawn from the market. Indeed this has never been proposed. The argument put forward in the consultation document regarding compatibility of a certificate/quota scheme with the EU ETS is invalid when applied either to new construction or to the retrofitting of CCS to existing fossil plants. For new plants it is not possible to be sure what would have been built in the absence of the quota/standard as it is necessary to take

[7] COM(2013)180 final.

into account the impact of other complementary policies, particularly the EU ETS, acting on the market. The latter also applies in relation to the continued operation of existing plant in the absence of the quota/standard as EU ETS and other policies may lead to alternative decisions, for example, reduced load factor, fuel switching, or construction of renewables. In other words, a CCS quota scheme is no more or less compatible with the ETS than is an EPS; **compatibility with the EU ETS is not an argument that should be used to support adoption of a certificate/quota scheme as a preferred alternative to an EPS. In addition, we would argue that an EPS would not replace the carbon price but would be complementary, making the EU ETS more effective by providing certainty that desired policy outcomes as described above will be achieved.** The uncertainty regarding future wholesale fossil fuel and carbon prices is too great, no matter how the EU ETS might be restructured, to be confident that lock-in of high-carbon generation or stranded assets will not result. Further, we would argue that **flexibility is retained under an EPS as it does not mandate the construction of CCS and alternatives can be pursued. However, by complementing an EPS with a certificate/quota scheme, construction of some CCS would be mandated, which along with use of NER300 to support demonstration particularly in heavy industry, would enable CCS commercialisation.**

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?**

   Yes, however, "CCS-ready" needs to be defined in a meaningful way. An important consideration is proximity to feasible storage options.

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

   Yes, though this will need to be incentivised. A regulatory package, as set out above, provides certainty that emissions reductions, and very likely CCS, will be required.

Contact: Sarah Keay-Bright, Associate
Email: skeaybright@raponline.org
Tel: 02 789 3012

ANNEX: Comparison of Emissions Performance Standard (EPS) Regulation in US States

Available in more detail from www.raponline.org/docs/RAP_ResearchBrief_Simpson_EPS_Updated_2010_08_12(2).pdf.

State	Year Adopted & Review	Level	Scope	Existing Plants	Design	CCS Provision
California	2007	1100 lbsCO2/MWh (approx. 500 gCO2/kWh): performance level to be no higher than emissions rate of a combined cycle gas turbine (CCGT).	Any and all long-term financial commitments with 'baseload' facilities that designed/intended to operate at capacity factor 60%+	Some are exempt (grandfathered): existing baseload facilities owned by investor-owned or public utilities unless they becomes subject to new long-term commitments; existing CCGT pre-June 2007. The following will trigger EPS in existing plants: ○ If generation capacity of pre-2007 CCGTs are increased 50MW or more. ○ Extension of life of power plant by 5 yrs or more. ○ Intention to convert non-baseload power plant to baseload power plant.	○ No offsets. ○ No averaging over plant portfolio. ○ Flexibility for regulator to give exemption for reasons of reliability or unforeseen circumstances (catastrophe). ○ Renewables are compliant, including biomass. ○ Methodology adopted to calculate emissions rate for cogeneration.	○ CCS ensures EPS compliance. ○ Need for reasonable, economically, and technically feasible plan for permanent sequestration of CO2.
Washington	2007 Review every 5 years	Standard is lower of: a) 1100 lbs of GHG per MWh (approx. 500 gCO2/kWh); or b) average available GHG emissions output (of new CCGT as determined by Department of Community, Trade & Economic Development (CTED). survey every 5 yrs).	Any and all long-term financial commitments with 'baseload' facilities that designed/intended to operate at capacity factor 60%+	Pre-June 2008 baseload generation are exempt (grandfathered), until subject to new long-term financial commitments ○ EPS compliance required if existing unmodified station generating capability is 350MWh or greater. ○ Increase to the facility is greater of the following measures: a) increase in station-generating capability of more than 25 MWh; or b) increase in CO2 emissions output by 15% or more.	○ Flexibility for regulator to give exemption for reasons of reliability or unforeseen circumstances (catastrophe). ○ Renewables are compliant, including biomass. ○ Pre-June 2008 cogeneration (natural gas or waste gas) until subject to new ownership interest or upgraded	○ CCS ensures EPS compliance. ○ Need for financially, economically, and technically feasible plan for permanent sequestration of CO2. ○ Requirement that carbon sequestration begins within 5 years of plant operation with penalty if failure to achieve implementation on schedule.

State	Year Adopted & Review	Level	Scope	Existing Plants	Design	CCS Provision
Oregon	2009 Review every 3 years; can modify EPS by rule and GHGs included under EPS.	1100 lbs CO2/MWh (approx. 500 gCO2/kWh)	New, long term financial commitments (5yrs +) to baseload facilities entered into by the utility.	Improvements or life extensions will trigger the EPS for existing plants except for: ○ maintenance and repair; ○ installation of emissions control equipment; ○ improving heat rate of facility or GHGs/MWh; ○ modification to maintain reliability; ○ acquisition of an additional interest.	○ Renewables exempt. ○ Excluded are any generating source that uses natural gas or petroleum distillates as a fuel source and is primarily used to serve either peak demand or to integrate renewable energy. ○ Pre-July 2010 cogeneration is exempt unless subject to new long term financial commitment. ○ Flexibility for regulator to give exemption for reasons of reliability or unforeseen circumstances (catastrophe). ○ Combined heat and power emissions determined using an output based methodology. ○ Certificate/license of electricity service provider can be revoked if it provides electricity in the state using baseload generation of non-compliant facility.	○ EPS does not apply where plan in place to become a low carbon emissions resource, if sufficient documentation (CCS not explicitly mentioned but clause intended to allow for CCS). ○ Implementation date, 7 yrs.