To the SET Plan Secretariat
For the attention of Karina Firkaviciute

Subject: Response to issues paper No. 9- CCS and CCU date: 25 April 2016

Dear Ms. Firkaviciute,

Many thanks for the opportunity to comment on the present issues paper for CCS. In this input letter we describe the position of ETP ZEP on the proposed targets/priorities.

We welcome the Introductory part of the issues paper clearly pointing out the need for CCS, especially after the COP21 agreement to move towards a target of 1.5°C warming, substantially below 2°C warming compared to pre industrial time. Concurrent with the Paris agreement, the world needs to change the emission trajectory as fast as possible and to balance greenhouse gas sources and sinks in the second part of this century to achieve the targets. The timely availability of sinks clearly calls for fast deployment of CCS in power, industry and biofuels. There may also be an urgent need for massive deployment of carbon negative solutions employing bio-CCS. It is thus not a question whether CCS is to be deployed at commercial scale but rather when and how we choose to pay for it. Delay in the deployment of CCS will cause unnecessary costs due to misallocation of resources, making the ramp up task more difficult and will certainly delay the dates for reaching CO_2 emissions milestones. The later the introduction the more costly and demanding this will be on resources. Means to ease the transition and opportunities for an early start should indeed be taken into account, most notably the use of CO_2 in products, as a solvent and EOR to gain experience and to strengthen individual project business cases.

We also welcome your action list. Actions have to be taken now to support CCS infrastructure investment to make CCS, which is already a competitive low carbon technology, timely available for large scale deployment by 2025-2040. It is thus commendable that the paper mentions storage as a key element and that it describes actions to make a European transport and storage infrastructure available. This is a key element for deploying CCS in Europe as it cannot be sourced from technology and service providers elsewhere. We fully agree that it is important that PCI's are developed to this end because an infrastructure cannot be based solely upon connecting nationally developed infrastructures.

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With respect to the Issues paper No 9 ZEP would like to provide the following comments:

1. The issues paper should strongly reflect the urgency of making CCS investible. The paper seems to suggest that CCS won't be deployed until 2030. ZEP underlines that action is needed now because of the significant lead times and in order to retain economically important CO_2-emitting industries and associated employment. Without CCS these industries will simply have to leave the European Union if we wish to meet the emissions reductions. The issues paper proposes that member states won't have to decide until 2030 on whether they will opt for CCS to achieve their targets. ZEP is of the opinion that industry and other stakeholders cannot be asked to invest in CCS in the next decade if member states decide only in 2030 whether to embrace CCS. The issues paper mentions the objective of delivering feasibility studies for applying CCS in all major clusters of energy and carbon intensive industries by 2035. ZEP believes that this is much too late. Such feasibility studies should be carried out as soon as possible, in order to unlock the time consuming transition process to a new low-carbon industrial society and prevent technology-lock-in. CCS is not the kind of technology that can be picked up from the shelf in 2030 and plugged in. Even though we understand that the paper can be interpreted in different ways we ask that the issues paper makes it absolutely clear that no time can be lost with taking actions for making CCS investible. The significant lead time for the development and permitting of geological storage, of the order of 7 – 10 years suggests that activities should start as soon as possible.
2. ZEP asks for more attention and action for regulatory aspects because the market for electricity and the financial instruments alone may not be able to sufficiently drive deployment. The only financial instrument to incentivise the deployment and operation of CCS has been the ETS. The price of EUA's has been too low for CCS projects to be bankable by investors. This has not affected deployment of solar and wind energy as these do not rely on the ETS. The consequent increase in peak electricity production has depressed the market for electricity, reducing the ability of utilities to invest in CCS. Therefore the long term business case for CCS will not only need to be shaped by the ETS and other financial incentives but possibly also by the regulatory framework (a group of adjustments of the regulatory framework that could include an EPS and support to offset the negative impact it will have on industry). We suggest an action to develop and implement the policy and regulatory frameworks necessary to make CCS investible at the earliest opportunity
3. ZEP asks for an effective set of objectives. In 2015 ZEP discussed with commissioners Maroš Šefčovič and Miguel Arias Cañete an executable plan for enabling CCS in Europe. This plan is built on ZEP's insights into the principles for making CCS investible in Europe and is supported by the commissioners. Therefore we ask that it is to be taken into account. The principles that are essential for deployment of CCS include the need to decouple the business of capture of CO_2 from transport and storage, the need to develop CCS in phases through (expanding) infrastructure hubs, the need to optimise available funding and create mechanisms to commercialise CCS. In addition, much more attention needs to be given to CCS for the energy

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intensive industry. Table 1 of annex I proposes a set of objectives that respects these principles and builds on new insights, as an alternative to the set of objectives proposed in the issues paper.

4. ZEP proposes a simplified and more appropriate set of KPIs (Key Performance Indicators). Table 2 of the annex proposes a set of KPIs which ZEP considers are appropriate. A recent study of ZEP (the Market Economics 4 study) demonstrates that the true value of CCS lies in its ability to provide a low cost route to decarbonisation. For power this includes the provision of stability to the grid. This huge value from CCS is hardly affected by changes in LCoE, since the alternatives are much more expensive. Therefore ZEP believes that deployment indicators will be more appropriate. LCoE indicators, as suggested in the issues paper, could provide additional reference for the impact of R&D efforts for power plants only, but need to be chosen so that they are relevant for the role that power plants are expected to play in the integrated energy system of the future (load following and intermittent rather than base load). For industrial processes we propose to define deployment indicators. We note that Europe seems to be lagging behind on many of the proposed KPIs, therefore we suggest to develop a small set of leading and realistically achievable indicators. The ZEP is ready to work with you over the coming weeks to firm this up.
5. While ZEP agrees that CCU will be a technology that can be helpful, it believes that the true potential of the contribution of CCU for atmospheric CO_2 emission abatement still needs to be established. The work on CCU should therefore not distract from doing what is really needed: making CCS investible.
6. ZEP considers that the role of hydrogen in the future energy and transportation system must be seen in conjunction with CCS. Sustainable production and use of hydrogen, 96% of which is currently produced with fossil fuels, will in the near future inevitably require CCS. This should be expressed in the set of objectives and KPIs.
7. ZEP asks for a strong commitment of EC and member states to demonstration project realisation, either in EU member states or or in other Set Plan countries such as Norway. The purpose of the demonstration projects is to move to the next stage of the innovation and implementation process. Industrial companies have invested heavily over the last decade to create CCS technologies that are now ready for demonstration and deployment. The appetite for further investment by industry will be dependent on a clear indication that there will be either a market incentive or regulatory requirement. The funding mechanisms of the modernisation and innovation funds, if applied and targeted at CCS demonstration, could form such an indication and could make demonstrations bankable.
8. ZEP asks for clear commitment of member states to CCS and CCU by 2020, expressed in a 'CCS master plan' or 'CCS roadmap' for each relevant member state. Such master plans are needed for CCS because of the long lead times associated with development of CCS and required infrastructure.

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9. ZEP considers targeted R&I actions for CCS and CCU to be important. Albeit CCS can be deployed it is not yet optimised. Similar to technologies for photo-voltaic energy and offshore wind energy CCS needs a significant R&I effort to improve its competitiveness. At present CCS R&I is underfinanced in the H2020 programme and the volume of actions is not consistent with the large expectations that rest with CCS and CCU. A ramp up is required to ensure efficient and next generation technologies for Bio-CCS, CCS for hydrogen production and the integration of CCS in the energy system, in particular as regards fuel flexibility and operational flexibility. R&I is also necessary to strengthen the link with low emission mobility, in particular regarding the production of biofuels and hydrogen. Furthermore the CCU topic needs to be researched especially with respect to new concepts with a storage efficiency close to geological storage. This is typically research at a low Technology Readiness Level, to be carried out in the timeframe 2020-2030.

For your convenience annex II contains a word-version of the issues paper No. 9 with some detailed comments on particular parts of the paper. Please let us know if you would like to discuss any of the above or if you would like additional information.

In your document that describes the implementation process and expected outcomes you ask a number of questions, the answers to which we provide below.

Question: Do you agree with the targets set in the issue paper?

Answer: The objectives as stated in the issues paper are: “deliver the commercial-scale demonstration of the full CCS chain, and further reduce the costs of CO2 capture through Research and Innovation”. ZEP agrees to both objectives but underlines that the main objective is to make CCS investible so that it can be commercially deployed. This requires a range of R&I activities that go well beyond demonstration and cost reduction and include i.a. the removal of barriers for

- The development of infrastructure that enables industries to join the CCS value chain.
- The integration of CCS and RES into an integrated energy system
- A regulatory framework that can drive the deployment of CCS

Question: Do you think that the level of ambition is correct?

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Answer: ZEP thinks that the correct level of ambition is “to make CCS technology investible”.

Question: Are there any standing issue(s) in the way of reaching the proposed targets/priorities?

Answer: As argued in the first part of this input paper the issues are urgency, focus and commitment. ZEP is concerned about the perceived lacking of the sense of **urgency**. It is not only important to achieve the objective of having an investible technology but it is even more important to achieve this target as soon as possible. This sense of urgency does not emanate from the issues paper. ZEP believes that the task of making CCS investible requires sufficient **focus** of all parties involved (industry, EC and member states). While certain activities, e.g. CCU-research, will certainly be helpful they should not distract. ZEP asks **commitment** from all parties involved to make CCS investible as soon as possible. In that respect ZEP asks that member states decide on their commitment to CCS well before 2035, the year suggested in the issues paper.

Question: What are your specific recommendations on prioritising R&I activities on these issues (and building where appropriate on relevant existing initiatives)?

Answer: Priorities follow from ZEP’s executable plan that was discussed with commissioners Maroš Šefčovič and Miguel Arias Cañete and our joint input with the EERA CCS JP to the integrated roadmap under the SET Plan. Additional to the CCS demonstration project, the plan prioritises the development of infrastructure hubs for local clusters of industry for gathering CO_2 from multiple sources and providing access to bankable storage. It also stresses the importance of CCS for energy-intensive industry.

Question: Who are the best placed actors to implement the targets/priorities (Industry, EU, Member States, regions, groups of countries/organisations/etc.),?

Answer: ZEP believes that the magnitude of the task of making CCS investible requires full commitment of all stakeholders: industry, European Commission, the CCS relevant Set Plan countriesas well as local organisations.

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Question: identify possible barriers (when not done already in the Integrated Roadmap) related to regulation, cooperation issues, standardisation / industrialisation / manufacturing, socioeconomics, etc.

Answer: As argued in the first part of this input paper ZEP is of the opinion that the market for electricity and the financial instruments alone may not be able to sufficiently drive deployment of CCS. The long term business case for CCS will not only need to be shaped by the ETS and other financial incentives but possibly also by the regulatory framework (a group of adjustments of the regulatory framework that could include an EPS and support to offset the negative impact it will have on industry). We suggest an action to develop and implement such policy and regulatory frameworks necessary to make CCS investible at the earliest opportunity

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Question: Identify possible gaps or duplication of efforts in the R&I priorities (based on the Integrated Roadmap);

Answer: ZEP has not identified such duplication of efforts, the concern is the low share of funding which is directed to CCS and CCU.

Question: Identify priorities where there is scope for and benefit in more coordination and/or cooperation across EU, Member States, regions, Research Institutions and/or industry;

Answer: ZEP stresses the need for joint actions in transport and storage including the application of ship transport. This is an activity that could benefit from more co-operation and joint action like PCI's. It is also clear that the CCS and Hydrogen communities must co-operate closer- especially in the fields of CCU, industrial use of hydrogen from fossil fuels with CCS. This includes co-production of renewable hydrogen and hydrogen from fossil fuels with CCS and common use of infrastructure.

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Question: Identify best practices of past or present coordination and/or cooperation that can be used as an example or as a starting point.

Answer: ZEP expresses its appreciation for the efforts made by Member States, the European Commission and industry for their continuing support for the CCS demonstration projects.

With kind regards,

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Annex I: proposed objectives and KPI's

proposal for objectives
2020 proposed key objectives and targets by 2020
1 completed CCS projects currently in pipeline
2 3 developed clusters / storage hubs
completed feasibility studies
an approved project of common interest
market-maker frameworks for T&S infrastructure on commercial basis
incentivised value chain where needed
an initiative for an industrial CCS demo-project in any of the clusters
3 storage projects
3 appraise sufficient geological storage capacity : 6 gigatonnes
4 new technologies
for cost reduction in value chain,
for integrating CCS&RES and
capture processes in energy-intensive industries
5 explore CCU(S)
feasibility studies for CCUS for fuel and Value added chemicals
6 CCS master plan' or 'CCS roadmap' developed by member states
2030 proposed key objectives
1 roll out CCS clusters
2 pilots for CCUS technologies for value added chemicals
3 develop retrofit power plants by 2040

Table 1, proposed set of objectives

proposal for KPIs
deployment indicators
integrated demos in operation
CO2 avoided
member states actively supporting CCS
industry sectors actively pursuing CCS
companies actively pursuing CCS

Table 2, proposed KPIs

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