

**CONCEPT NOTE FOR NEW PI ACTION IN CHINA****KEY IDENTIFICATION DATA:**

Title/Number:	<b>China Carbon Capture and Storage (CCS)</b>
Category:	<input checked="" type="checkbox"/> Operations <input type="checkbox"/> Policy Support Facility Actions <input type="checkbox"/> Public diplomacy actions
Country(ies)/Region	China
Total cost:	Total estimated cost: Tbd depending on site selection Total amount of the EU contribution: 5 m€
Total duration and target start date of implementation:	36 months 1.1.2016-31.12.2018
Method of implementation:	Indirect Management with the EIB

**DESCRIPTION OF PROPOSED ACTION****1. Programme summary**

The proposed China Carbon Capture and Storage (CCS) project aims to provide crucial technical cooperation and assistance for applying CCS technology in this partner country's power and/or industrial sectors. Greenhouse-gas mitigation measures at Chinese coal power plants are an absolutely vital part of the global fight against climate change. The project consists of the drafting of a major feasibility study at one Chinese power plant or industrial plant site, to be proposed by the Chinese side, as well as other accompanying technical assistance, EU outreach, and expert contacts. The new project will be part of NZEC, the long-standing China-EU 'Near Zero Emission Coal' cooperation.

**2. Background / Context/ Rationale for PI funding**

The project fits well into objective 1 of the Partnership Instrument Regulation (article 1a), insofar as it supports a major EU bilateral cooperation partnership by promoting policy dialogue and by developing collective approaches and responses to challenges of global concern. 'Progress made by key partner countries in the fight against climate change', mentioned explicitly in PI-objective 1, is the core aim of the activity. It also corresponds with the EU-China 2020 Strategic Agenda for Cooperation (chapter Climate Change and Environmental Protection). The wish of China to get EU support on CCS has been expressed in several EU-China high level statements since the start of the NZEC cooperation in 2005. It corresponds also to priority 2 of the Europe 2020 Strategy, to promote a more resource efficient, greener and more competitive economy, by fostering EU-China industrial cooperation on a key global climate change challenge of our time.

In terms of the bigger picture, by the end of this century global warming is likely to exceed 2°C above the average temperature in 1850-1900 and could be as much as 5°C, if little or no action is taken. An increase of 2°C compared to the temperature in pre-industrial times is seen by scientists as the threshold beyond which there is a high risk of dangerous and possibly catastrophic changes in the global environment. Global greenhouse-gas (GHG) emissions however are still rising.

China became the largest CO<sub>2</sub> emitter country in 2006. In the last reference year, 2012, China emitted 28,5% of global CO<sub>2</sub>-emissions, according to the most authoritative scientific report in the EU.<sup>1</sup> With per capita emissions of 6-7t of CO<sub>2</sub> per year, China has already reached the same level as the EU, while still being significantly poorer in GDP per capita terms. Effectively limiting GHG-emissions in China is therefore an absolute must, should hopes for taming global warming remain intact.

Around three quarters of China's CO<sub>2</sub> emissions stem from the energy sector, according to the United Nations Framework Convention on Climate Change (UNFCCC).<sup>2</sup> Coal supplied 69% of China's total energy consumption in 2011.<sup>3</sup> Although the Chinese government is actively supporting renewable energy sources like wind and solar, as well as energy efficiency programmes, coal will likely remain the main source of energy production and greenhouse-gas emission in the country in the foreseeable future. The deployment of Carbon Capture and Storage technologies in China is therefore a key potential instrument to hold global warming below 2°C.

CCS technology allows for the capture of CO<sub>2</sub> emissions from coal-fired power plants and certain types of industrial plants, and its subsequent storage underground, for example in exploited oil or gas fields or in sealed geological strata, thereby avoiding CO<sub>2</sub> emissions into the atmosphere. However, the deployment of the CCS technology is associated with extra investments to retrofit the power plants and to compensate for the loss in energy outputs. In recent years, international and Chinese interest is also directed towards Carbon Capture and Use (CCU) which seeks to use the carbon separated from emissions as a potential input into industrial processes such as fertilizers, construction, and other uses.

The EU and China Partnership on Climate Change signed in 2005 has as one of its main goals to develop and demonstrate in China by 2020 near-zero emissions coal technology (NZE) through CCS. Following the positive conclusions of 2006-2009 NZE phase I (research and knowledge sharing) financed by the EU<sup>4</sup> and UK, the Commission in Communication COM (2009)284 pledged 7 MEUR for the NZE phase II.<sup>5</sup> At the 2009 Summit, China and EU jointly agreed to finalise the feasibility of a CCS demonstration plant in China, and a

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<sup>1</sup>Trends in Global CO<sub>2</sub> Emissions. 2013 Report, PBL Netherlands Environmental Assessment Agency, Joint Research Centre. While other sources differ, and there are divergences between CO<sub>2</sub> emissions and overall greenhouse-gas emissions, China's current annual contribution to climate-relevant emissions is generally given as between 23 and 29% by most sources.

<sup>2</sup> [https://unfccc.int/files/ghg\\_data/ghg\\_data\\_unfccc/ghg\\_profiles/application/pdf/chn\\_ghg\\_profile.pdf](https://unfccc.int/files/ghg_data/ghg_data_unfccc/ghg_profiles/application/pdf/chn_ghg_profile.pdf)

<sup>3</sup> <http://www.eia.gov/countries/cab.cfm?fips=ch>

<sup>4</sup> COACH project, Cooperation Action with CCS China-EU, funded by DG RTD with 1,5 MEUR in 2006-2009. For the COACH final activity report see <http://cordis.europa.eu/documents/documentlibrary/125670091EN6.pdf> A second DG RTD project Support to Regulatory Activities for Carbon Capture and Storage (STRACO2) was implemented January 2008 to August 2009, please see [http://ec.europa.eu/clima/events/docs/0028/straco\\_en.pdf](http://ec.europa.eu/clima/events/docs/0028/straco_en.pdf)

<sup>5</sup> The 2009 Communication also included a pledge of 50 MEUR for NZE phase III (construction and operation). This amount is subject to viable financing scheme and continued political support by both sides. The commitment from the EU to cooperate with China on CCS has been confirmed in 2009 by the ENV Council Conclusions and the EU-China Summit joint Statement.

Memorandum of Understanding has been signed between the EC and the Ministry of Science and Technology (MOST). Due to political differences between China and NZEC co-financer Norway, unfortunately one year in the NZEC-process was lost around 2011. Further difficulties were related to logistical issues, such as long delays for visa issuances on both sides (see final report MWH on framework contract Nr 2010/242372, July 2013).

Joint interest in CCS was reconfirmed in an EU-China Summit statement in 2012. NZEC Phase II is organised into two stages, namely the on-going NZEC-IIA (pre-feasibility and project selection) co-financed by Norway and the Commission (advisory services<sup>6</sup>), and the planned NZEC stage IIB to complete the feasibility and engineering studies, which is the subject of the proposed project.

Finally NZEC phase III implementation will consist of the construction of a CCS demonstration plant in China, ideally until 2020. As of January 2015, the European Investment Bank has reconfirmed its theoretical interest in co-financing NZEC phase III, but the decision how to structure the eventual investment project will be on the Chinese side. In a written communication to DG CLIMA of January 2015, the EIB has clarified its role on potential China coal sector investments: While electricity-only coal-fired plants (without biomass co-combustion or without CCS) are not eligible for the bank mainly because their emissions exceed a limit of 550 gCO<sub>2</sub>/kWh, a CCS project for a coal-fired plant would have much lower emissions, and would therefore be eligible from an environment and energy policy point of view. This is in harmony with the 2013 EIB Energy Lending Criteria, which state that 'the Bank will continue to support projects in research, development and deployment of clean fossil fuel technologies, including CCS demonstration projects.'<sup>7</sup>

In July 2014 the Chinese Ministry of Science and Technology has sent to DG CLIMA three draft prefeasibility studies for the locations of Shengli Oil Field, Tianjin power plant, and Hauneng power plant. Initial assessment by DG CLIMA and the EIB has been positive. The full versions of these prefeasibility studies shall be provided to the Commission at the next NZEC Steering Committee, to be held in Beijing in early 2015. The climate and environment counsellor at the EU Delegation Beijing is also involved in preparations. At the next NZEC Steering Committee in early 2015, the EU side should be in a position to give a provisional financing commitment for the feasibility study, and therefore continue the successful NZEC CCS cooperation with our strategic partner China.

On 12<sup>th</sup> of January 2015, the foreseen China CCS/NZEC IIB project was discussed in high-level talks between DG CLIMA and the National Development and Reform Commission (NDRC) in Beijing. The NDRC coordinates climate change policy in China, as well as the country's stance in international UNFCCC climate negotiations. In the meeting the NDRC leadership expressed its belief that CCS with enhanced oil recovery looked most promising at present. CCS is assumed to be widely used in China after 2030 in the modelling for China's peak emissions.<sup>8</sup>

### **3. Programme description**

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<sup>6</sup> Framework contract Nr 2010/242372 between DG DEVCO and company MWH SA of 195.506 Euro, implemented from July 2010 until July 2013.

<sup>7</sup> See [http://www.eib.org/attachments/strategies/eib\\_energy\\_lending\\_criteria\\_en.pdf](http://www.eib.org/attachments/strategies/eib_energy_lending_criteria_en.pdf) p.V.

<sup>8</sup> In the major US-China Joint Announcement on Climate Change of 12.11.2014 between President's Obama and Xi, China has committed to 'achieve the peaking of CO<sub>2</sub> emissions around 2030 and to make best efforts to peak early

The core of the proposed project is a feasibility study for the implementation of one concrete CCS project. Most likely the Chinese Ministry of Science and Technology will propose for this purpose one of the three sites for which pre-feasibility studies have already been prepared in the previous phase of the EU China cooperation on carbon capture and storage NZEC (see above).

This selected site will then have to be confirmed in another EU China Memorandum of Understanding, or other appropriate document with binding character between the European Commission and the Chinese Ministry of Science and Technology. Only after site selection will it become possible to elaborate a detailed work-plan, with EIB technical experts in a leading role. Consultancy services for drafting of the feasibility study are then expected to be tendered by the EU, or by a competent Chinese authority with a strong involvement (veto right) of the EIB. In Operations financed under resources from third parties (the Partnership Instrument in this case), the EIB can restrict participation in the tender to countries of the EU, plus the beneficiary country.<sup>9</sup> The selected consultants will then prepare detailed terms of reference covering NZEC phase III, implementation of a CCS plant at one of the three pre-selected sites.

As mentioned, implementation is foreseen through the EIB, which is represented in China through an office in Beijing. The EIB is deeply involved in CCS, both EU internally through the NER 300 programmes where the bank evaluates proposals submitted by Member States, to sell NER 300 allowances on its behalf, and to manage the revenues and the payment of funds to Member States during project implementation. Externally the EIB is an active partner in China CCS cooperation, e.g. as peer reviewer of project proposals by the Chinese side in NZEC phase IIA. While the bank has not yet actively financed CCS projects, according to its own declarations 'the EIB is prepared to finance CCS R&D and Demonstration plants.'<sup>10</sup> A technical expert with around ten years of experience in the CCS sector will likely be the project manager of this new Partnership Instrument on the EIB side, and will have an important role in further developing this project on the bank's side.

An alternative implementing organisation is the Asian Development Bank (ADB), which has been contracted on China CCS by the UK Department of Energy & Climate Change. Close cooperation with the other active donors UK and Norway will be sought. As China has been upgraded from bilateral DEVCO-cooperation, and technical cooperation with CCS pilot projects in the EU (UK, Netherlands, Germany) is an element of this project, the PI would seem like the best instrument.

#### **4. Impact/sustainability**

Financing of a feasibility study under IIB of the China-EU Near Zero Emission Coal cooperation is a long-standing political commitment from the EU side, and absolutely vital for keeping the EU's credibility towards key Chinese partners on climate change. The impact of NZEC for the Chinese power and industrial sector is potentially huge, but the sustainability can only be assured by ambitious Chinese climate policies and commitments on a national and international level.

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<sup>9</sup> See [http://www.eib.org/attachments/thematic/procurement\\_en.pdf](http://www.eib.org/attachments/thematic/procurement_en.pdf) p. 32.

<sup>10</sup> [https://www.fenco-era.net/lw\\_resource/datapool/pages/pdp\\_146/FENCO-ERA-WS-06\\_04.pdf](https://www.fenco-era.net/lw_resource/datapool/pages/pdp_146/FENCO-ERA-WS-06_04.pdf)

## **5. Implementation arrangements**

The proposed implementation arrangement is indirect management with the European Investment Bank, or alternatively the ADB. The EIB is a long-term project partner in NZEC, and represented with an office in China. The ADB is also active in the sector, and has been contracted by the UK on China/CCS (see chapter 7 for more information).

The foreseen project partners on the Chinese side are the Ministry of Science and Technology, especially its Administrative Centre for China's Agenda 21, the National Development and Reform Commission as coordinator for climate policy issues in China, as well as the administration of the selected site that will be chosen for the feasibility study. The Chinese National Energy Administration will also be closely associated.

Within DG CLIMA, the Low Carbon Technologies Unit C1 which manages the NER 300 Programme and intra-EU CCS issues more broadly will be associated to project implementation, while general project coordination will likely stay with the DG CLIMA China desk in unit A2. The FPI and EEAS will be strongly supported in their overall guidance and management of the project.

The foreseen international financing partners are the UK and Norway, which are both active long-term donors on China CCS.

## **6. Risk assessment and management**

Carbon capture and storage is a complex, relatively new approach which poses challenges and risks in terms of technology, project management and finance. Implementation of the China-EU NZEC programme has been slower than expected in the last years, but is still considered a success by all involved parties. In order to keep the momentum, a quick financing decision by the Partnership Instrument, even if preliminary, would be vital to keep the process on track, and to allow the organisation of the next NZEC Joint Steering Committee in which the further cooperation between China, the EU, UK and Norway in NZEC phases IIB (feasibility study) and later phase III (construction of pilot project) shall be established.

The main strategies as far as project management risk on the EU-side is concerned is a strong guidance of the process by the China desk in DG CLIMA A2, with a stronger than before involvement of the responsible technical unit for Low Carbon Technologies, including CCS, DG CLIMA C1. To be noted that a recent call under the EU NER (New Entrance Reserve) 300 Programme, overseen by the DG CLIMA Low Carbon Technologies unit, has resulted in a funding decision of 300 million Euro for the White Rose project in the UK. The China desk of DG ENER shall also be closely associated in the implementation of the new China CCS project under the Partnership Instrument, as well as the EU Delegation in Beijing.

In terms of broader energy and climate policy in China and worldwide, there is the major policy consideration that any investment in carbon power plant technologies might make this sector of power generation more ecologically acceptable and thereby prolong its lifespan. However, as outlined in chapter 2, the position of coal in Chinese power production is currently dominant to an extent to which a quick phase-out seems utterly unrealistic. In reality all available low- and non-polluting will likely have to be developed and deployed in parallel, if any realistic possibility to limit global warming to 2 degrees Celsius shall remain intact.

In terms of Intellectual Property Rights (IPR), there is likely no major risk for the European side in the proposed project, which will cover phase IIB of NZEC, complete feasibility and engineering studies for one Chinese side. In a way, the IPR risk lies even more on the Chinese side for this phase, as it will have to provide detailed site-related information to the EIB-selected contractors. IPR issues for the EU-side could indeed arise in NZEC phase III, implementation. It will be the task of the consultants to be selected and contracted by the EIB to look in detail into these issues.

The final risk of the project is that phase III of the project, implementation of a CCS pilot project in China, does not find sufficient financing. This risk is mitigated by China's long-term commitment to the NZEC programme, as well as more stringent international and national mitigation targets, both to be expected under the planned 2015 global new Paris Climate Agreement, and the 13<sup>th</sup> Chinese 5-year plan 2016-2020.

## **7. Complementarity**

The UK is considering funding the Tianjin CCS project through the Asian Development Bank, as well as another CCS full-chain project in Guangdong, which will focus on capture, transport and offshore storage. The UK has provisionally agreed funding of 11 million USD from the ADB CCS Trust Fund to fund the construction of the CO<sub>2</sub> capture plant. This is a pilot-scale full chain CCS demonstration project. The key components of the project are: i) construction of a CO<sub>2</sub> capture plant ii) transportation to Dagang oilfield; iii) partial utilisation of the captured CO<sub>2</sub> for pilot-testing of CO<sub>2</sub>-Enhanced Oil Recovery; and iv) partial injection of CO<sub>2</sub> in a depleted oil well for pilot-testing geosequestration of CO<sub>2</sub>. The project development is well advanced, technical planning, cost estimates and implementation strategy for the project are in the process of being completed; project sites have been identified; and the environmental impact assessment has been submitted to the Tianjin environmental bureau for approval. In October 2014 the UK Department for Energy & Climate Change has confirmed its interest to cooperate with the EU, should a financing decision be taken on our side.

Norway is another active donor on China/CCS. The Norwegian Ministry of Petroleum and Energy (MPE) was already involved in previous phase of NZEC-projects and is pleased to see that the overall cooperation with China on carbon capture and storage is progressing well. In initial talks with DG CLIMA, the Norwegian MPE has confirmed its interest to continue cooperation and potential co-financing with the EU and UK. Exact modalities will have to be negotiated and agreed upon between the three European partners, as well as with our Chinese interlocutors at the next NZEC Steering Committee, based upon an initial positive funding decision by the Partnership Instrument.

## **8. Other**

N/A

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Date: 10.10.2014  
Concept Note up-date on 21.1.2015