



# Strategic Analysis of the Global Status of Carbon Capture and Storage

Report 3: Country Studies  
China

Final Report



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## 1. Executive summary

Under the current PRC regulatory regime, no laws or regulations specifically address CCS technology or projects. Despite this, the PRC is in the early stages of conducting feasibility studies, research and development, and launching pilot programs on CCS technology deployment. Most of these activities have their basis in several general policy documents and international cooperation initiatives.

The PRC has demonstrated a willingness to cooperate with foreign entities on the development of CCS technologies and demonstration projects although it may in future increase direct financial support for CCS.

From now until 2020, the PRC aims to spend a significant portion of its own GDP on technology research and development. GHG reduction initiatives such as CCS could capture a significant portion of those funds.

The absence of specific CCS laws and policies in the PRC may not ultimately impede development of that technology in that country to the same degree as in other States given the high degree of control which the PRC Government has over both major industrial enterprises and the levers of economic planning.

## 2. Glossary

APP	Asia-Pacific Partnership on Clean Development and Climate
BT	Business tax
CBM	Coal bed methane
CCS	Carbon capture and storage
CCS 863 Program	National High-technology Research and Development Program on CCS Technology as one of the programs under the so-called 863 Program
CDM	Clean Development Mechanism
COACH	Cooperation Action within CCS China-EU
COD	Chemical Oxygen Demand
CSLF	Carbon Sequestration Leadership Forum
CUCMB	China United Coalbed Methane Corporation Ltd.
DRC	Development and Reform Commission
ECBM	Enhanced coal bed methane
EIT	Enterprise Income Tax
EOR	Enhanced Oil Recovery
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse gas
HNTE	High and new technology enterprises
IGCC	Integral gas combined cycle technology
MEP	Ministry of Environmental Protection
MOFCOM	Ministry of Commerce of the PRC
MOST	The Ministry of Science and Technology of the PRC
NDRC	National Development Reform Commission
N <sub>2</sub> O	Nitrous Dioxide
NO <sub>x</sub>	Nitrous Oxide
NPCSC	National People's Congress Standing Committee
NZEC	EU-China Near Zero Emissions Coal
PCC	Post-combustion capture
PRC	People's Republic of China

PRC Civil Code	<i>General Provision of the Civil Code of the Peoples Republic of China</i> (NPC 1 January 1987, adopted 1986)
RMB	renminbi
UK	United Kingdom
USDOE	United States Department of Energy
VAT	Value-added tax

## **3. CO<sub>2</sub> pricing**

### **3.1 Introduction**

Currently in the PRC, no costs are imposed upon the emissions of most GHGs. There are currently no national emissions trading schemes in place in the PRC.

However, sulphur dioxide (SO<sub>2</sub>) emissions-trading platforms are established in various locations in the PRC, but these platforms are still in the experimental stages. In addition, current regulations mandate reporting obligations on nitrous oxide (N<sub>2</sub>O) meaning that its emission triggers indirect costs. These two schemes may be used to inform a scheme relating to CO<sub>2</sub> pricing.

### **3.2 Mandatory cap and trade schemes**

There are no mandatory cap and trade schemes for GHGs in the PRC. There are no formal CO<sub>2</sub> costs pass-through mechanisms, no emission reduction obligations for CO<sub>2</sub> or any CCS-specific incentive provisions in the PRC.

### **3.3 Non-mandatory emission reduction schemes**

There are no formal voluntary CO<sub>2</sub> emission reduction schemes (completed, currently undertaken, or planned) in the PRC.

### **3.4 CO<sub>2</sub> taxation schemes**

There are no current or proposed PRC laws, regulations, and policies that impose a tax on CO<sub>2</sub> emissions.

### **3.5 Indirect cost imposition: renewable energy schemes**

#### **3.5.1 Portfolio energy standards**

Under the *Medium-long Term Development Plan of Renewable Energy*, the National Development Reform Commission (NDRC) set a target that 10 percent of total primary energy consumption in the PRC should be from renewable sources by 2010. This target is increased to 15 percent by 2020.

Under the *Regulations Concerning the Management of Power Generation of Renewable Energy* (NDRC, 5 January 2006, in Fa Gai Neng Yuan No. 13 (2006)), power generating companies are obliged to actively invest and construct renewable energy projects and fulfil any quota of renewable energy production that might be imposed upon them. However, as of June 2009, no specific quota has been published.

#### **3.5.2 Feed-in tariffs**

Feed-in tariffs for renewable energy projects are governed by the *Trial Measures for Administration of the Allocation of the Price and Expense of Electricity Generated From Renewable Energy* (NDRC, 4 January 2006, in Fa Gai Jia Ge No. 7 (2006)). Under these regulations, electricity prices are either

government fixed or government guided; the latter involves determining the winning bid price through a concession tendering process which is then confirmed by the PRC Government.

In general, government-fixed prices are set by the PRC pricing authorities based on the principle of reasonable cost plus reasonable profit. For biomass projects, feed-in tariffs are determined by the PRC Government based on the 2005-benchmark grid prices of electricity from desulphurized coal fired generating power plants in the applicable Province plus a subsidy of RMB0.25 per kilowatt-hour (US\$0.04). From 2010 onwards, this tariff is slowly phased out as the RMB 0.25 subsidy for newly approved projects will be 2 percent less than that for projects that were approved during the preceding year.

### 3.6 Greenhouse gas emission and energy use reporting schemes

The PRC does maintain a reporting system that covers the emission of one Kyoto Protocol GHG, namely N<sub>2</sub>O.<sup>1</sup> The emission of N<sub>2</sub>O must be reported because it is a type of nitrogen oxide (NO<sub>x</sub>) that is regulated in the PRC as an air pollutant.

Although the PRC currently has no legislation concerning CO<sub>2</sub>, in June 2007, the NDRC issued *China's National Climate Change Program (2007-2010)* (Central People's Government, 2007). The program targets a reduction in energy consumption per GDP by 20 percent by 2010 over 2005 levels and a corresponding slow down of CO<sub>2</sub> emission.

Moreover, the PRC has introduced certain regulations to monitor energy efficiency. Under the *Law of the People's Republic of China on Energy Saving* (NPCSC, 28 October 2007, in Standing Committee Gazette, No. 77, (2008)), key energy consumption entities and public institutions are required to report their energy use.

Only "key energy consumption entities" and public institutions are captured by the energy consumption reporting obligation. Applicable PRC laws and regulations define "key energy consumption entities" as "energy consuming entities having an annual energy consumption of more than 10,000 tonnes of standard coal; or energy consuming entities having an annual energy consumption above 5,000 but below 10,000 tonnes of standard coal as designated by the relevant department of the State Council or the energy conservation administrative departments of the people's governments of provinces, autonomous regions and municipalities directly under the Central Government". On the other hand, public institutions are defined to include "all state organs, public institutions, groups and organizations that wholly or partly use fiscal funds".

As a general remark, under the *Law of the People's Republic of China on the Promotion of Clean Production* (NPCSC, 29 June 2002 in Standing Committee Gazette, No. 72, (2002)) and related legislation, the PRC Government is implementing a regulatory framework aimed to reduce production and emission of pollutants in industrial or production processes, but these initiatives currently do not specifically target CO<sub>2</sub>.

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<sup>1</sup> The PRC has also introduced certain regulations to control the discharge of other air and water pollutants and monitor the efficiency of energy utilisation. In order to facilitate monitoring, some preliminary reporting requirements have been developed in recent years. For example, on 3 February 2009, the Ministry of Commerce (MOFCOM) and the Ministry of Environmental Protection (MEP) jointly issued The Notice Regarding Strengthening Statistics Works for Energy-saving and Environmental Protection of Foreign Investments, which requires all FIEs in the PRC to report to the competent approval authority (MOFCOM or its local counterparts): (1) estimated annual sulfur dioxide (SO<sub>2</sub>) emissions and Chemical Oxygen Demand (COD) when applying for FIE approval, and (2) actual SO<sub>2</sub> emission data and COD when changes are made to the FIE. Ministry of Environmental Protection of the People's Republic of China, viewed 8 June 2009, <[http://www.mep.gov.cn/law/gz/bmhb/gwygf/200902/t20090223\\_134509.htm](http://www.mep.gov.cn/law/gz/bmhb/gwygf/200902/t20090223_134509.htm)> (Chinese language only).

## 4. Existing CCS initiatives

### 4.1 Introduction

In general, the PRC is still at the stage of conducting feasibility studies, research and development, and launching pilot programs on CCS technology. Most of these activities have their basis in several general policy documents and international cooperation initiatives.

In February 2006, the State Council issued the *National Medium and Long-term Science and Technology Development Plan (2006-2020)* (Central People's Government, 2006). The plan sets a target for the PRC to contribute more than 2.5 percent of its Gross Domestic Product (GDP) to technology research and development by 2020. The plan lists 68 priority areas for development and 8 cutting-edge areas for development. Two of these priority areas are relevant to CCS. The first relevant area, under the category of priority areas for development, is the “monitoring of and action in response to global environment change”. It includes, among others, “technology to control and utilise GHG (including CO<sub>2</sub>)”, “biological carbon sequestration technology” and “carbon sequestration technology”. The second relevant area, under the category of cutting-edge areas for development, is “advanced energy technology”. It includes, among others, “high-efficient, clean and near zero CO<sub>2</sub> emission technology to explore and utilise fuel energy”.

*China's National Climate Change Program (2007-2010)*, which targets a reduction in energy consumption per GDP by 20 percent by 2010 over 2005 levels and a corresponding slow down of CO<sub>2</sub> emission, lists “clean and high-efficient technology to explore and utilise coal” as a key technology to be further developed for greenhouse emission reduction. This key technology includes, among others, “integral gas combined cycle technology” (IGCC) and “carbon capture, utilization, and storage technology” (Central People's Government, 2007).

In June 2007, the Ministry of Science and Technology (MOST), the NDRC, and several other ministries collectively issued *China's Special Science and Technology Action in Response to Climate Change (2007-2020)* (Central People's Government, 2007a), to further implement the two above-mentioned policy documents. This climate change response document lists key tasks to be developed to control GHG and mitigate climate change. Those key tasks include: “CO<sub>2</sub> capture, utilisation and storage technology” (including research and development of key technology and measures, enacting a technical roadmap, building capacity and demonstration technology), “biological carbon sequestration technology” and “carbon sequestration technology”.

In addition to the aforementioned policy initiatives, the PRC Government participates in several CCS cooperation projects with foreign governments and entities, including the following:

## ASIA-PACIFIC PARTNERSHIP ON CLEAN DEVELOPMENT AND CLIMATE (APP)<sup>2</sup>

APP is an international non-treaty agreement among Australia, Canada, India, Japan, the PRC, South Korea and the United States, announced in July 2005. The APP focuses on expanding investment and trade in clean energy technologies.

### CO<sub>2</sub> SEQUESTRATION LEADERSHIP FORUM (CSLF)

The CSLF is a ministerial-level international climate change initiative focused on the development of improved cost-effective technologies for the separation, capture, transport and long-term safe storage of CO<sub>2</sub>. The CSLF endorses collaborative research, development, and demonstration projects that reflect its members' priorities and are consistent with its charter. The CSLF has acknowledged two projects in the PRC: the Regional Opportunities for CO<sub>2</sub> Capture and Storage in China (Carbon Sequestration Leadership Forum, 2008) and China Coalbed Methane Technology/CO<sub>2</sub> Sequestration Project.

The first project, the Regional Opportunities for CO<sub>2</sub> Capture and Storage in China, was sponsored by the United States Department of Energy (USDE) and MOST. A project team consisting of Tsinghua University, US/China Energy and Environmental Technology Centre and other entities carried out the project from 2005 to 2007. The project aimed to compile key characteristics of large anthropogenic CO<sub>2</sub> sources (including power generation, iron and steel plants, cement kilns, petroleum and chemical refineries, etc) as well as candidate geologic storage formations that exist across the PRC, and to develop estimates of geologic CO<sub>2</sub> storage capacities in the PRC. The project's key findings include: (i) the PRC has over 1,620 large stationary CO<sub>2</sub> point sources with total emissions of more than 3,890MtCO<sub>2</sub>/yr; (ii) the PRC has a potential storage capacity of 2,300 Gt CO<sub>2</sub> in onshore reservoirs; and (iii) there appears to be strong potential for CCS technologies to offer significant emissions reductions in the PRC at a cost less than US\$10/tCO<sub>2</sub> for transportation and storage.

The second project was based in a Memorandum of Understanding signed between the Canadian and PRC Governments on CBM technology and CO<sub>2</sub> sequestration on 15 March 2002. China United Coalbed Methane Corporation Ltd. (CUCMB), Alberta Research Council and other Canadian entities carried out this project from March 2002 to December 2006, under the leadership of the Canadian International Development Agency and the MOFCOM. The project involved a pilot test that injected CO<sub>2</sub> into a single coal seam in Qinshui Basin of Shanxi Province. The project concluded that (i) enhancement of CBM recovery and storage of CO<sub>2</sub> is feasible in the anthracitic coals of Shanxi Province; and (ii) the prospect for similar storage in other coal basins in the PRC are good. The project recommended proceeding to a full scale pilot test at south Qinshui Basin (See Section 4.5.4).

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<sup>2</sup> The seven partners have approved eight public-private sector task forces covering: aluminium, buildings and appliances, cement, cleaner fossil energy, coal mining, power generation and transmission, renewable energy and distributed generation, and steel. Asia-Pacific Partnership on Clean Development and Climate 2009, Asia-Pacific Partnership on Clean Development and Climate, viewed 5 June 2009, <<http://www.asiapacificpartnership.org/english/default.aspx>>.

## EU-CHINA PARTNERSHIP ON CLIMATE CHANGE<sup>3</sup>

The PRC and the European Union (EU) issued a Joint Declaration on Climate Change (Ministry of Foreign Affairs 2006), thereby establishing the bilateral Partnership on Climate Change, at the EU-China Summit in Beijing on 5 September 2005. Activities carried out by the partnership to date include, among others, EU-China Near Zero Emissions Coal (NZEC) and Cooperation Action within CCS China-EU (COACH) (Cooperation Action within CCS China-EU, 2007).

The EU-China NZEC agreement was signed in September 2005 as part of the EU-China Partnership on Climate Change. In support of this arrangement, the United Kingdom (UK) - China NZEC initiative was developed (UK-China Near Zero Emissions Coal, 2009). The UK-China NZEC project aims to implement large-scale polygeneration energy facilities with options for coal-based electric power generation, as well as production of hydrogen and synthetic fuels and CCS (including use for enhanced oil or gas recovery). The project includes three phases: (i) phase 1 from November 2007 to 2009 for exploration of options for demonstration and capacity building for CCS in the PRC; (ii) phase 2 for further development work on CCS options; and (iii) phase 3 support for construction of a demonstration plant by 2014.

The second major initiative, COACH, started in 2007 and aims at establishing broad cooperation between the PRC and the EU in the field of CCS. COACH addresses three areas of cooperation: (i) coal gasification for appropriate polygeneration schemes with CCS; (ii) identification of reliable geological storage formations in the PRC, and (iii) societal anchorage including legal regulatory and public issues. COACH has been organized in five work packages (WP1 to WP5), including (1) WP1 on knowledge sharing and capacity building; (2) WP2 on capture technologies; (3) WP3 on geological storage and large scale use of CCS; (4) WP4 on recommendations and guidelines for implementation; and (5) WP5 on project management. COACH aims to support the construction and operation of a demonstration plant in the PRC by 2014.

In addition to government-level cooperation above, certain PRC universities and companies participate in international cooperation projects. For example, under MOST's supervision, Tsinghua University and the Chinese Academy of Sciences participate in the EU GeoCapacity Project (Chen, 2009). Furthermore the China Huaneng Group has joined FutureGen Industrial Alliance (FutureGen Alliance, 2005).

### 4.2 Acreage releases

There is no policy or legislation specifically relating to the release of acreage for CCS technology deployment or demonstration projects. Land use therefore is subject to the general PRC regulatory framework (See Section 5.3.1 for a general description).

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<sup>3</sup> The partnership's key objectives are to: Strengthen dialogue on climate change policies and exchange views on key issues in the climate change negotiations; significantly improve the energy intensity of our economies through cooperation; strengthen practical cooperation on the development, deployment and transfer of low carbon technology, to enhance energy efficiency and promote the low carbon economy; encourage low carbon technology development, deployment and dissemination and work jointly to ensure that the technologies become affordable energy options; explore financing issues including the role of the private sector, joint ventures, public private partnerships, and the potential role of carbon finance and export credits; co-operate to address barriers to the development, deployment and transfer of technology; develop and demonstrate in China and the EU advanced, near-zero emissions coal technology through carbon capture and storage; reduce significantly the cost of key energy technologies and promote their deployment and dissemination; strengthen the implementation of the clean development mechanism (CDM), exchange information on CDM projects and encourage our companies to engage in CDM projects co-operation; exchange information and experience on the design and practical implementation of other market-based instruments such as emissions trading and on assessing the costs and benefits of their use; strengthen cooperation on adaptation to the impacts of climate change; enhance cooperation in capacity building and strengthening institutions.

### **4.3 Government or government-business research facilities**

Several research and development projects on CCS are currently underway in the PRC.

In 2006, MOST launched a National Basic Research Program on Geologic Carbon Storage with Enhanced Oil Recovery as one of the programs under the so-called 973 Program (973 Program, 2007). The program aims to enhance oil recovery by using CO<sub>2</sub> (instead of water) as an oil displacement agent. The program includes four areas of research: (i) reservoir geology for CO<sub>2</sub> underground storage and CO<sub>2</sub> drive, (ii) physical chemistry in the course of CO<sub>2</sub> drive and storage, (iii) nonlinear flow mechanics in the course of CO<sub>2</sub> drive, and (iv) capture of CO<sub>2</sub> and anti-corrosive technology. The project will conclude in August 2011.

In 2008, MOST launched a National High-technology Research and Development Program on CCS Technology as one of the programs under the so-called 863 Program (CCS 863 Program) (Zhejiang Torch Centre 2009).<sup>4</sup> The program focuses on three technologies: (i) CCS technology using the attraction method, (ii) CCS technology using the adsorption method, and (iii) storage technology. For these three research areas, the PRC Government will make available up to RMB 20 million (US\$2.93 million) with a requirement for the research institutes to provide at least RMB 10 million (US\$1.46 million). The program will conclude in December 2010.

In March 2009, Tsinghua University partnered with the World Resources Institute to develop guidelines for the PRC's deployment of CCS technology to ensure its compliance with the relevant environmental targets (Forbes, 2009). The project is funded by the United States Department of State and aims to draft guidelines for safe and effective CCS in the PRC modelled after the Guidelines for Carbon Dioxide Capture, Transport and Storage in the United States. The project will conclude in 2010.

### **4.4 Government funding**

#### **4.4.1 Mapping and data collection and sharing**

Please see the international cooperation between USDE and MOST described above in Section 4.1.

#### **4.4.2 Research, development and commercialisation**

Sections 4.1, 4.3 and 4.5 discuss the publicly-available projects on research, development and commercialisation that have PRC Government funding.

#### **4.4.3 Technology demonstration and early deployment incentives**

Sections 4.1, 4.3 and 4.5 discuss the publicly-available incentives and policies regarding technology demonstration and early deployment.

### **4.5 Government-business joint ventures**

There are various CCS-related projects currently being undertaken in the PRC, most of which have large-scale PRC state-owned enterprises as participants. These projects rely on substantial government involvement and intergovernmental cooperation.

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<sup>4</sup> The 863 Program is the national high tech R&D program available at: [http://www.most.gov.cn/eng/programmes1/200610/t20061009\\_36225.htm](http://www.most.gov.cn/eng/programmes1/200610/t20061009_36225.htm). viewed 22 June 2009.

#### **4.5.1 Post-combustion capture (PCC) pilot project in Beijing**

In June 2008, China Huaneng Group,<sup>5</sup> in partnership with CSIRO and the Thermal Power Research Institute, started the PRC's first pilot project for PCC at its Gaobeidian power plant in Beijing (Hepeng, 2008). The technology uses solvents to capture CO<sub>2</sub> from power station flue gases and has the potential to reduce CO<sub>2</sub> emissions from coal-fired power plants by more than 85 percent. The Huaneng pilot plant is designed to capture 3,000 tonnes of CO<sub>2</sub> per year for sale to beverage companies. Australia's CSIRO partnership also provided access to support for these facilities with funding from APP and the South East Australian Climate Initiative (South East Australian Climate Initiative, 2009).

#### **4.5.2 CCS and utilization of Integral Gas Combined Cycle Technology (IGCC)**

##### **IGCC - CCS DEMONSTRATION PLANT IN TIANJIN**

With the support of NDRC and MOST, GreenGen Co. was established in 2005 by seven State-owned energy companies<sup>6</sup> and the State Development and Investment Corporation (Green Gen, 2008). Peabody Energy is the only foreign shareholder in GreenGen Co (Peabody Energy, 2009).

The GreenGen project will be rolled out in three phases: (i) phase 1 from 2006 to 2009 to build a 250 MW IGCC demonstration plant with CO<sub>2</sub> separation at a pilot scale in Tianjin, (ii) phase 2 from 2010 to 2012 to improve IGCC and polygeneration technology and build a 400 MW IGCC unit with CO<sub>2</sub> capture at the 100 MW level,<sup>7</sup> and (iii) phase 3 from 2013 to 2015 to build another 400 MW GreenGen demonstration unit. The demonstration unit built in phase 3 will include H<sub>2</sub> production, and fuel cell and H<sub>2</sub> power generation with CCS (over 80 percent of CO<sub>2</sub> to be separated and stored).<sup>8</sup>

The Tianjin plant, as an IGCC demonstration projects of the CCS 863 Program, received financial support from MOST and was supported by the NDRC in its request for a capacity development technical assistance from Asian Development Bank.

GreenGen Co. is engaged in international research programs for near-zero emission power generation technology, including COACH and UK-China NZEC and shares data in the FutureGen Industrial Alliance.

##### **120 MW IGCC DEMONSTRATION PLANT IN TIAN MING, AND 4X200 MW IGCC DEMONSTRATION PLANT IN SUN STATE, DONGGUAN, GUANGDONG PROVINCE (YOU, 2009)**

In 2007, MOST recognized a project consisting of two demonstration plants developed by Dongguan Power and Chemical Industry Co., Ltd. as an IGCC demonstration project under the National 863 Program. The details of these plants are (i) a reconstructed 120 MW IGCC demonstration plant in Tianming, Dongguan and (ii) a newly-constructed 4x200 MW IGCC demonstration plant in Sun State, Dongguan, an investment estimated to be RMB 6.45 billion (US\$944 million). As of April 2009, the

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<sup>5</sup> China Huaneng Group is a central-government-administered State-owned energy enterprise.

<sup>6</sup> The seven state-owned companies are China Huaneng Group, China Datang Corporation, China Huadian Corporation, China Guodian Corporation, China Power Investment Corporation, Shenhua Group, and China National Coal Group.

<sup>7</sup> Other sources report that CCS will be used from phase 2 (instead of phase 3). See for example, Liu 2009.

<sup>8</sup> Other sources report more specifically that in phase 3, CO<sub>2</sub> will be either used for EOR in Dagang or Shengli oil field or stored at a saline aquifer at a further to be determined location. See for example, Kalaydjian 2009.

Tianming plant received all government approvals and commenced construction, while the Sun State plant was still applying for government approvals. Both plants are slated to utilise CCS technology.

### **IGCC ELECTRICITY AND METHANOL CO-GENERATION DEMONSTRATION PROJECT IN TENGZHOU, SHANDONG PROVINCE**

In October 2005, Yankuang Group constructed the PRC's first IGCC power and methanol co-generation demonstration project in Tengzhou, Shandong Province, an investment of RMB 1.58 billion (US\$231 million). The project has since entered into operation. It received financial support from the National 863 Program. The project co-generates 80 MW electricity and 240,000t/yr methanol. The project is planned to be expanded to a IGCC polygeneration project of 80 MW electricity, 300,000t/yr methanol and 600,000t/yr acetic acid (Chem CN China, 2009).

### **OTHERS**

Various other IGCC projects are at the planning or construction stage (Dian168 2007).<sup>9</sup> However, it is uncertain whether these projects plan to utilise CCS technology.

#### **4.5.3 Enhanced Oil Recovery (EOR)**

##### **EOR RESEARCH PROJECT AT LIAOHE OIL FIELD, LIAONING PROVINCE**

In 1998, Huafu High-Tech Group and Liaohe Petroleum Exploration Bureau carried out a research and development project on CO<sub>2</sub> geological storage by pumping boiler flue gas (containing 12 to 13 percent CO<sub>2</sub>) into an oil reservoir located at Liaohe oil field to increase oil recovery (IEA Greenhouse Gas R&D Program, 2009).

##### **EOR RESEARCH PROJECT IN JILIN PROVINCE**

From April 2007 to 2009, China National Petroleum Company carried out a research project (including on-site trial) on the exploration of CO<sub>2</sub> (containing natural gas), CO<sub>2</sub> storage and utilisation in its Jilin oil field. An on-site trial in 2008 demonstrated a 10 percent enhancement of oil recovery by using CO<sub>2</sub> as oil displacement agents (cippe.net, 2008).

#### **4.5.4 Enhanced CBM recovery project in Shanxi Province**

Following the successful completion of the CBM Technology/CO<sub>2</sub> sequestration project initiated by the Canadian and PRC Government as mentioned under Section 4.1, CUCBM, Enviro Energy International Holdings and Petromin Resources Ltd. signed a 5-year contract in January 2008 for a project that intends to collect CO<sub>2</sub> generated by power plants and chemical plants and sequester CO<sub>2</sub> to enhance CBM recovery in Shanxi province. Several deep wells will be drilled in an area unsuitable for commercial coal exploration. The total investment for the first phase is stated to be approximately US\$1.4 million, and an additional US\$2.13 million will be funded for the second phase. The project received financial support from MOST and will receive technical support from the Alberta Research Council (Department of Climate Change, 2008).

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<sup>9</sup> In 2007, MOST recognized Hangzhou project of China Huadian Corporation as one of three IGCC demonstration projects of the National 863 Program. The project involves construction of a new 200 MW IGCC plant by adopting coal-water slurry gasification technology. The plant is expected to operate in 2010.

#### 4.5.5 Others

##### **CCS DEMONSTRATION PROJECT IN ORDOS, INNER MONGOLIA**

As of March 2009, Shenhua Group<sup>10</sup> was in the process of researching, developing and assessing the PRC's first CCS demonstration project at its 1-million-tonne-direct-coal-to-liquids plant in Ordos, Inner Mongolia. The plant launched its trial operation at the end of 2008 and is expected to enter into full operation later in 2009. The CO<sub>2</sub> capture facility is expected to be put into full operation by 2011 (Stanway, 2009).

##### **CO<sub>2</sub> CAPTURE PROJECT IN XINJIANG**

In April 2009, an affiliate of China Huadian Corporation commenced a feasibility study on Huadian's first CO<sub>2</sub> capture project. The project plans to capture CO<sub>2</sub> and sell purified CO<sub>2</sub> to the food industry (news.bjx, 2009).

##### **CLEAN ENERGY COMMERCIALIZATION CENTER IN SHANGHAI**

In November 2008, BP and the Chinese Academy of Sciences agreed to establish a US\$73 million joint venture—the Clean Energy Commercialization Center—in Shanghai, to commercialize technologies such as CCS and gasification in the PRC. The joint venture is expected to be established in early 2009 (Green Car Congress, 2009).

##### **JOINT VENTURE ON LOW CARBON TECHNOLOGIES**

In May 2009, China Energy Conservation Investment Corporation and Carbon Trust signed an agreement to form a UK£10 million joint venture for the development and deployment of low carbon technologies in the PRC (Carbon Trust, 2009).

#### 4.6 Taxation incentives

Currently there are no PRC laws granting tax incentives specifically to CCS technology or projects.

##### 4.6.1 Applicable Taxes

##### **ENTERPRISE INCOME TAX (EIT)**

CCS project developers in the PRC must include the revenue from the sale of CO<sub>2</sub> and emissions credits (if possible) in their operating income for EIT purposes. EIT is levied on net income at a standard rate of 25 percent.

##### **TURNOVER TAXES**

Potentially, CCS project developers could generate revenue in the following two ways: the sale of CO<sub>2</sub>, and (potentially) the sale of emission credits. Current PRC tax laws and regulations do not expressly address PRC turnover tax on the transfer of emission credits.

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<sup>10</sup> Shenhua Group is a central-government-administered State-owned enterprise and China's largest coal miner.

The two main turnover taxes in the PRC are value-added tax (VAT) and business tax (BT). VAT is levied on the sale and importation of goods, the provision of processing services, and repair and replacement services. It appears that sale of CO<sub>2</sub> would be subject to VAT.

The transfer of intangible assets are subject to BT. There do not appear to be any instances in which VAT or BT has been levied on the sale of emissions credits. In the absence of State Administration of Taxation guidance, a local tax bureau might seek to levy BT on the sale of emissions credits as a form of intangible asset.

#### **4.6.2 Research and development**

A 15 percent EIT rate (instead of the statutory rate of 25 percent) for qualified high-and-new-technology enterprises (HNTE) is available if an enterprise meets the qualifications and obtains the approval necessary for HNTE status under the PRC's applicable tax laws and regulations.

#### **4.6.3 Project development**

The PRC provides various tax incentives for Clean Development Mechanism (CDM) or environmental protection projects. CCS projects might qualify for those incentives if the projects meet the applicable requirements. Those incentives include:

- Exemption from EIT for the eligible CDM project's net profit for three years starting the year in which the income is first derived, followed by a 50 percent EIT reduction during the next three years;
- Exemption from EIT on income from qualified environmental protection projects for three years starting the year in which the income is first derived, followed by a 50 percent EIT reduction during the next three years;
- Preferential treatment under the *Catalogue for Comprehensive Utilisation of Resources Qualified for Enterprise Income Tax Preferential Treatment*, which means only 90 percent of the income derived from a qualifying project will be subject to EIT; and
- a 10 percent offset against the EIT owed by an enterprise (and carry-forward of an excess amount for five years) for its investment in qualified special equipment that is purchased by that enterprise for environmental protection, energy efficiency and water conservation purposes.

#### **4.7 Liability for failure to capture**

There are no PRC laws and regulations that impose liability upon a failure to capture CO<sub>2</sub>.

#### **4.8 Other incentives**

There do not appear to be any other incentives available that support CCS technology deployment.

#### **4.9 Evaluation**

There is little substantive policy and legislation addressing CCS technologies. The main initiatives appear to be focused on IGCC technology, with an aim to support the domestic development of the technology rather than continuing the reliance on imported foreign technology.

CCS is being considered as an element of the deployment of IGCC, but so far only for the demonstration plant in Tianjin, as part of the PRC's positioning in international initiatives and cooperation on climate change issues.

The *National Medium and Long-term Science and Technology Development Plan (2006-2020)*, described above in 4.1, aims to dedicate 2.5 percent of GDP towards research and development. This plan clearly indicates that climate change initiatives and CCS are within the scope of this plan. Concrete initiatives under this plan could have a significant impact on the deployment of CCS technologies.

## 5. Capture of CO<sub>2</sub>

### 5.1 Introduction

Currently, there is no legislation that specifically addresses the capture of CO<sub>2</sub>. Instead, a CCS facility would be governed by the generally applicable regulations on the development, construction and operation of that type of facility. In this Section, where relevant, the various regulations that might apply to facilities for the capture of CO<sub>2</sub> have been indicated.

### 5.2 Integrated policy and legislation

Under the current PRC regulatory regime, there is no integrated policy and legislation on the capture of CO<sub>2</sub>.

### 5.3 General policy and legislation with applicability to CO<sub>2</sub> capture

#### 5.3.1 Planning requirements

Facilities in the PRC that capture CO<sub>2</sub> are subject to the general planning requirements for the development and construction of projects. The specific regulatory requirements for these facilities will depend on the nature of the investors in these facilities and the specific size, nature, and location of the facility.

The generally applicable regulations that govern project approvals are the *Decision of the State Council on Investment System Reforms* (State Council, July 16, 2004, in Guo Fa [State Council Gazette] No. 20 (2004)), the *Provisional Measures for the Approval of Enterprise Investment Projects* (NDRC, 15 September 2004, Order No. 19 (2004)), and, for foreign investment, the *Provisional Administrative Measures on Examination and Approval for Foreign Investment Projects* (NDRC, 9 October 2004, Order No. 22 (2004)) and related regulations, including applicable industry plans and investment catalogues. Under this regime, projects must have approval from the relevant government agency at the appropriate level before commencing work. Depending on the nature and scope of the project or investment involved, these approvals are issued by the local-level Development and Reform Commission (DRC), the provincial-level DRC, the (central-level) NDRC or the State Council (which is also a central-level body).

Furthermore, if a project involves foreign investment, the Ministry of Commerce or its local counterpart must approve the applicable incorporation documents. Moreover, both foreign-invested and domestically-invested projects must undergo and complete registration procedures with the relevant local, provincial, or central-level bureau of the State Administration for Industry and Commerce.

The development of the facilities is further subject to local zoning regulations under the *Law of the People's Republic of China on Urban and Rural Planning* (NPCSC, 1 January 2008, Standing Committee Gazette No. 74 (2007)) and related legislation. Land issues are governed by the *Law of the People's Republic of China on the Administration of Land* (NPCSC, 28 August 2004, Standing Committee Gazette No. 28 (2004)) and related regulations.

Under the PRC's regulatory regime governing land, there are two types of land ownership: (i) state ownership; and (ii) collective ownership. "Private" land ownership does not exist in the PRC. If land is

state-owned, it means that the relevant land is owned by the PRC Government. Land under collective ownership means that the land is owned by a local “rural collective of peasants”. Typically, land in urban areas is under state ownership whereas land in rural and suburban areas often is under collective ownership. The PRC Government may acquire and convert collective land in rural and suburban areas into state-owned land by following statutory procedures set forth in applicable laws and regulations.

Commercially speaking, the concept of “land use rights” rather than “land ownership” is the relevant legal concept when describing entitlement to land use in the PRC. This distinction is necessary because PRC law prohibits land ownership by persons and entities. Accordingly, PRC land law permits the PRC Government (acting through its local land bureaus) and other “land owners” to transact *use rights* in their land. The entity that is interested in constructing CO<sub>2</sub> capture facilities may purchase these use rights.

There are currently four types of land use rights in the PRC, namely: (i) granted land use rights; (ii) leased land use rights; (iii) allocated land use rights; and (iv) collective land use rights. Granted land use rights, generally speaking, are a long-term transferable leasehold interest in state-owned land – and, thus, they are the type of land use rights more likely to be of interest for CCS projects. Typically, granted land use rights are acquired pursuant to a “land grant contract” signed between the competent local land bureau and the land user. Under the land grant contract, the land user will pay a substantial “land grant fee” to the land bureau up front, and the land bureau will grant the land use rights for a fixed term to the land user for a specified use.

Under relevant PRC laws and regulations, only competent local and land bureaus have the legal authority to enter into a land grant contract which grants land use rights to a land user. No other entity has the authority to grant land use rights. It is worth noting that the grantee of those rights, subsequently may transfer its granted land use rights to other land users in accordance with statutory procedures. Such transactions, however, are more in the nature of a land transfer than a land grant.

Design and construction of the facilities are subject to the provisions of the *Construction Law of the People’s Republic of China* (NPCSC, 1 March 1998) Standing Committee Gazette No. 91 (1997)) and related legislation. Under this regulatory framework, governmental review and approval of the design drawings is required, and a licencing and qualification regime is imposed upon design institutes and construction companies undertaking the work. Moreover, projects must apply for and obtain various permits and approvals from the applicable construction authorities before commencing construction.

Finally, the PRC imposes controls and restrictions on transactions with foreign parties (which includes those parties established in Hong Kong, Macau or Taiwan). These controls and restrictions implicate additional regulatory compliance requirements which directly affect payments and financing arrangements – regardless of whether they involve movement of funds to or from current or capital accounts and/or into and out of the PRC.

### 5.3.2 Retrofitting

In the absence of specific regulations, any retrofitting of existing facilities to allow the capture of CO<sub>2</sub> would be subject to the same PRC regulatory regime, as described in Section 5.3.1, that applies to the development and construction of new facilities.

### 5.3.3 Relevant pollution laws and policies

Carbon capture facilities, like other types of facilities and projects in the PRC, are subject to the requirements under the PRC's environmental protection regulatory regime.

The general framework on environmental protection is set forth in the *Law of the People's Republic of China Concerning Environmental Protection* (NPCSC, 26 December 1989, Standing Committee Gazette) under which various additional laws and regulations have been promulgated, with the aims of protecting the environment, protecting worker health safety, and reducing and monitoring the emission of pollutants.

As part of the approval required to undertake a construction project or the retrofit of an existing project, an environmental assessment must be undertaken in accordance with the *Law of the People's Republic of China on Environmental Impact Assessments* (NPCSC, 1 September 2003, Standing Committee Gazette, No. 77 (2003)) and related legislation. Depending on the scope, size and nature of the project, the relevant environmental impact assessment should be filed with, and/or approved by, the Ministry of Environmental Protection or its relevant local counterpart.

Depending on the nature of the project, various pollutant and waste-emission permits might be required before a facility can commence operations. Emissions permits may be required under a range of different PRC laws and regulations, including the following: *Law of the People's Republic of China for the Prevention and Treatment of Water Pollution* (NPCSC, 1 June 2008, Standing Committee Gazette, No. 87 (2008)), *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution Caused by Solid Waste* (NPCSC, 1 April 2005, Standing Committee Gazette, No. 31 (2004)), and *Law of the People's Republic of China on the Prevention and Treatment of Air Pollution* (NPCSC, 1 September 2000, Standing Committee Gazette).

It is worth noting that under the PRC's current environmental regulatory regime, CO<sub>2</sub> is not listed as a pollutant that is subject to emission standards for power or production activities<sup>11</sup>.

### 5.4 Liability for failure to capture

Current PRC laws, regulations or policies do not impose liability for a failure to capture CO<sub>2</sub> released during industrial or production processes.

### 5.5 Taxation of CO<sub>2</sub> capture

There currently are no PRC tax laws or regulations that specifically target the capture of CO<sub>2</sub>. This capture activity is subject to the generally applicable laws and regulations on taxation.

### 5.6 Evaluation

The absence of any integrated legislation regarding CCS could be a perceived weakness. However, existing laws and regulations are capable of governing the CO<sub>2</sub> capture process.

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<sup>11</sup> See Ambient Air Quality Standards (GB3095-1996) State Environmental Protection Bureau, January 18, 1996, and Emission Standard of Air Pollutants for Thermal Power Plants (GB 13223-2003) State Administration of Environmental Protection and the State Administration of Quality Supervision, Inspection and Quarantine, 23 December 2003.

## 6. Transport of CO<sub>2</sub>

### 6.1 Introduction

At present, the PRC does not have any CCS specific, integrated policies or laws governing licencing, planning, access and tenure or environmental and other risks.

### 6.2 General policy and legislation specific to transport of CO<sub>2</sub>

#### 6.2.1 Licencing of transportation activities

There is no licencing regime in the PRC that specifically governs the transportation of CO<sub>2</sub> by means of pipeline, road and rail, or ship.

#### PIPELINES

The PRC does not have an extensive regulatory regime governing pipelines. The applicable regulations, in large part, deal with safety issues related to transportation by pipeline of oil or gas, under a range of regulations, including the following: *Regulations for Protection of Petroleum and Natural Gas Pipelines* (State Council, 12 March 1989, State Council Gazette, No. 313 (1989)) and *Provisional Regulations for the Supervision and Administration of the Safety of Oil and Natural Gas Pipelines* (State Economic and Trade Commission, 24 April 2000, State Council Gazette, No. 17 (2000)). Moreover, it is worth noting that there is no access right under PRC law to the use of pipelines; the entity that owns and operates the pipeline has the sole discretion to grant access to its pipelines to third parties.

#### ROAD AND RAIL TRANSPORT

Road and rail transport is subject to general licencing and safety requirements under, respectively, the *Law of the People's Republic of China on Road Traffic Safety* (NPCSC, May 1, 2008, Standing Committee Gazette, No. 81 (2007)) and *Railway Law of People's Republic of China* (NPCSC, 1 May 1991, Standing Committee Gazette, No. 32 (1990)) and related regulations. Moreover, the use of high-pressure storage cylinders and related equipment that could be used to transport CO<sub>2</sub> most likely will require additional permits and licencing as stipulated by applicable laws and regulations.

#### TRANSPORTATION BY SHIP

Domestic shipping in the PRC is subject to the *Regulations of the Management of the Domestic Shipping* (Ministry of Transportation, July 1, 2009, State Council Gazette (2009)); pursuant to which, among other things, the provision of transportation services over water is made subject to a specific permit from the transportation authorities before such services can be provided.

#### 6.2.2 Planning

#### ZONING FOR TRANSPORT FACILITIES

The development and construction of pipelines is subject to the same regime, described in Section 5.3.1, that generally applies to facilities in the PRC.

## CONSTRUCTION AND BUILDING CODES

Various construction regulations and building codes apply to facilities for the transportation of CO<sub>2</sub>, depending on the mode of transportation and the nature of the relevant facilities. For instance, for pipelines, under the above-mentioned *Construction Law of the People's Republic of China*, the owner of a project must apply for the appropriate construction permit for the construction of pipelines from the applicable construction authorities before commencing construction. Moreover, the construction company undertaking the work must have appropriate licences under the above-mentioned *Provisional Regulations for the Supervision and Administration of the Safety of Oil and Natural Gas Pipelines* (State Economic and Trade Commission, 24 April 2000, State Council Gazette, No. 17 (2000)).

Various construction standards apply to pipelines. Such standards include, for example, the Environmental Protection Design Norm for Construction Projects for Oil and Gas Fields and Long-distance Pipelines (for Trial Implementation).<sup>12</sup>

## PIPELINE LICENCING REGIMES – NEW PIPELINES

Construction of pipelines is subject to, among other things, the project approval regime described in Section 5.3.1.

## PIPELINE LICENCING REGIMES – EXISTING PIPELINES

Construction of pipelines is subject to, among other things, the project approval regime described in Section 5.3.1.

## ENVIRONMENTAL IMPACT ASSESSMENT

As explained in Section 5.3.3, development and construction of facilities relating to transportation activities could require preparation, submission, record and/or approval of an appropriate environmental impact assessment study by the relevant environmental protection authorities.

## STAKEHOLDER ENGAGEMENT

Depending on the scope, nature, and location of a project, the preparation and/or approval of the project's environmental impact assessment study and/or applicable urban zoning plans could be subject to a public consultation process in the PRC.

### 6.2.3 Access / tenure

## NATURE OF PROPERTY INTERESTS CONFERRED

Section 5.3.1 provides a general overview of the PRC's land use regime.

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<sup>12</sup> These were approved by the Ministry of Petroleum Industry. Effective on a trial basis as from 1 May 1988.

## **ESTABLISHING PRIORITY BETWEEN TRANSPORT AND EXISTING USES AND RIGHTS (INCLUDING PETROLEUM EXTRACTION)**

Current PRC laws and regulations do not appear to address the issue of establishing priority between transport and existing uses and rights.

## **SUBSEQUENT USES**

Current PRC laws and regulations do not appear to deal with or address the issue of subsequent uses.

## **RIGHTS OF INDIGENOUS PEOPLES AND OTHER CUSTOMARY RIGHTS**

Current PRC laws and regulations do not appear to specifically address the issue of transportation as it relates to rights of indigenous people and other customary rights in the PRC.

## **COMPULSORY ACQUISITION AND COMPENSATION REGIMES**

Under *The Law of the People's Republic of China on Property Rights* (NPCSC, 1 October 2007, Standing Committee Gazette, No. 62 (2007)), the PRC Government may expropriate collectively-owned land use rights for public interest in accordance with applicable legal procedures. In such a case, compensation should be based on appropriate standards as determined by the state and, generally, is payable for the expropriated land, fixtures and crops, for relocation expenses, and for social security.

### **6.2.4 Environmental and other risks**

#### **LEAKAGE OF TRANSPORTED CO<sub>2</sub>**

Under applicable PRC laws and regulations, CO<sub>2</sub> is not listed as a pollutant. Hence, currently, there are no PRC laws and regulations governing the leakage of CO<sub>2</sub> during transportation.

#### **POLLUTION – NOISE, AIR AND WATER**

As set forth in Section 5.3.3, various laws and regulations, including appropriate emission standards, have been issued in the PRC governing noise, water and air pollution. These relevant standards should be observed in so far as applicable to the transportation activities involving CO<sub>2</sub>.

#### **WASTE**

Generally, the same regulatory regime discussed in Section 5.3.3 also applies to solid waste. Moreover, the PRC has a classification and related licencing regime governing dangerous waste under the *Measures for the Administration of Permits for Dealing in Hazardous Wastes* (State Council, 1 July 2004, State Council Gazette, No. 408 (2004)). These regulations do not explicitly apply to CO<sub>2</sub>, but they should be observed to the extent applicable to the actual transportation activities that are undertaken.

#### **OCCUPATIONAL HEALTH AND SAFETY**

The *Safe Production Law of the People's Republic of China* (NPCSC, 1 November 2002, Standing Committee Gazette, No. 70 (2002)) and related regulations implement a regulatory regime on work

safety. Under this regulatory regime, certain activities, such as construction or the operation of high-pressure boilers and related equipment, are subject to a separate licencing regime which, conceivably, might also apply to the relevant transportation activities involving CO<sub>2</sub>.

### **THREATENED/ENDANGERED SPECIES**

A construction activity creating a CO<sub>2</sub> transport network that could adversely affect wildlife might require additional examination and approvals during its Environmental Impact Assessment study. Depending on the particular circumstances of a project, its construction and other activities might be subject to the requirements set forth in the *Law of the People's Republic of China for the Protection of Wild Fauna* (NPCSC, 28 August 2004, Standing Committee Gazette, No. 24 (2004)).

### **MIGRATORY SPECIES**

Under current PRC laws and regulations, there do not appear to be specific laws or regulations which protect migratory species in relation to the transportation of CO<sub>2</sub>.

### **6.3 Taxation of CO<sub>2</sub> transport**

There are no specific regulations governing with the taxation of CO<sub>2</sub> transport. In general, under the *Provisional Regulations of the People's Republic of China on Business Tax* (State Council, 1 January 2009, State Council Gazette, No. 540 (2008)) and its implementing regulations, transportation services (including those provided by pipeline) are subject to a 3 percent business tax levy.

### **6.4 Evaluation**

Under current PRC laws and regulations, there is no specific policy or legislation that addresses the transportation of CO<sub>2</sub>.

## **7. Exploration of potential CO<sub>2</sub> storage sites**

### **7.1 Introduction**

Currently, there are no PRC policies or regulatory frameworks in place that specifically govern the exploration of potential CO<sub>2</sub> sequestration sites. As discussed in Section 4, PRC demonstration projects have so far focused on using CO<sub>2</sub> to enhance the recovery of CBM or oil. Consequently, those activities were conducted pursuant to the applicable PRC regulatory framework which governs the exploration and production activities involving oil and gas and CBM.

### **7.2 Integrated policy and legislation**

Currently, there is no PRC regulatory regime which specifically governs exploration, access, tenure, planning and construction activities for the identification of potential CO<sub>2</sub> sequestration sites.

### **7.3 General policy and legislation with application to exploration of potential CO<sub>2</sub> sequestration sites**

#### **7.3.1 Exploration licencing**

Currently, in the PRC, general legislation would not be likely to apply to the exploration of potential CO<sub>2</sub> sequestration sites. Current PRC laws and regulations only govern the exploration of mineral rights. Under the *Law of the People's Republic of China on Mineral Resources* (NPCSC, 1 January 1997, Standing Committee Gazette, (1996)) and applicable regulations, these activities are subject to a permit regime implemented by the Ministry of Land and Resources and its local counterparts. At present, CO<sub>2</sub> storage sites do not appear to fall within the definition of “mineral resources” which is typically understood as governed by this licencing regime.

#### **7.3.2 Access / tenure**

In the PRC, access to and tenure at sites for the exploration of potential CO<sub>2</sub> sequestration will depend, in significant part, on the specific ownership of the land use rights related to these sites.

It is worth noting that current PRC laws and regulations are silent on the issue of activities which relate to exploration of potential CO<sub>2</sub> sequestration. Therefore, as long as a party has legitimate access to the land use rights underlying those sites which are to be explored, then it is conceivable that such activities could be undertaken without running afoul of PRC laws or regulations and/or third-party rights to the site.

#### **7.3.3 Planning and construction regulation applicable to CO<sub>2</sub> sequestration facilities**

Carbon sequestration facilities will be subject to the planning and construction regulations as set forth in Section 5.3.1.

#### **7.4 Taxation of CO<sub>2</sub> sequestration exploration activities**

Currently, in the PRC, there are no laws or regulations that specifically address the taxation of CO<sub>2</sub> sequestration exploration activities. These activities would likely fall under the general tax regime which applies to businesses and related activities in the PRC and which is outlined in Section 4.6.

#### **7.5 Evaluation**

The current absence of any exploration policy or legislation for CO<sub>2</sub> sequestration in the PRC is not likely to be a major hindrance to the discovery and development of such storage facilities. This is due, in large part, to the fact that such storage facilities will most likely be identified by the PRC Government department in charge of water or mineral resources. The PRC Government is anticipated to play a major role in the identification of potential sites and would be likely to ensure that any regulatory barriers are removed.

## 8. Injection and pre-closure of CO<sub>2</sub> storage formations

### 8.1 Introduction

Currently, there are no PRC laws and regulations that specifically govern the injection of CO<sub>2</sub> and pre-closure of CO<sub>2</sub> sequestration formations. As discussed in Section 4, PRC demonstration projects, thus far, have focused on using CO<sub>2</sub> to enhance the recovery of CBM or oil. Such projects and activities, therefore, were conducted under the applicable PRC regulatory frameworks governing the exploration and production activities involving oil and gas and CBM including the above-mentioned *Law of the People's Republic of China on Mineral Resources* and related laws and regulations (including those on land use, production safety, etc.) (see also Section 7.3.1).

### 8.2 Integrated policy and legislation

Currently, in the PRC, there is no integrated policy or legislation that specifically governs injection and pre-closure processes for storage facilities.

### 8.3 General policy and legislation

#### 8.3.1 Injection licencing

Given that the current PRC regulatory regime is not well-developed in this area, it is unclear whether the PRC will prohibit or restrict such licencing.

Moreover, the only other licences or permits that potentially could be required for the injection of CO<sub>2</sub>, are those generally required for the exploration and production of the mineral resource for which the CO<sub>2</sub> is used to enhance recovery.

In general, an entity that injects CO<sub>2</sub> into sequestration formations may be liable in tort, under Article 106 of the *General Provisions of the Civil Code of the People's Republic of China* (NPC, January 1, 1987, adopted (1986)) ("PRC Civil Code"), if it injures a person or damages the property negligently or by wilful conduct. Furthermore, if the injection activity constitutes "work with a high degree of danger to the surroundings", then under Article 123 of the PRC Civil Code, the relevant entity may be liable for the damage caused, even if not acting negligently. While it is unclear whether any principle under PRC law would imply that the injection of CO<sub>2</sub> in any way would amount to "work with a high degree of danger to the surroundings", this is a fluid concept and potentially could be applied to the injection of CO<sub>2</sub> into sequestration formations once sufficient evidence is available to classify the injection of CO<sub>2</sub> into sequestration formations as such.

#### 8.3.2 Access / tenure

There are no specific regulations governing access / tenure for the injection of CO<sub>2</sub> into and subsequent pre-closure of sequestration formations. Access to and tenure at sites on which these activities will take place will fully depend on the specific ownership of the land use rights related to these sites. The main aspects of the land use rights regulatory regime is discussed in Section 5.3.1.

The PRC currently lacks a clear regulatory regime which addresses the use of sequestration formations. However, the PRC's regulatory framework concerning the production of oil might be

indicative. Under that framework, the specific licensee merely has the right to exploit the licenced area for oil. The licensee has no right to additional minerals found, nor does the licensee have any right to the use of the underground sequestration formations. That said, as indicated under Section 8.3.1, the manner in which the licensee conducts these production activities likely will impact what type of regulatory and permit requirements would apply.

While the PRC's land use regulatory regime likely governs issues involving access to the sequestration sites, there is yet no similar regulatory regime that addresses the use of underground spaces. Thus, it should be assumed that, in the absence of any specific regulation, those such spaces belong to the PRC State.

### **8.3.3 Planning and construction regulation applicable to CO<sub>2</sub> sequestration facilities**

Currently, in the PRC, there are no laws or regulations that specifically govern the planning and construction of CO<sub>2</sub> sequestration facilities. These activities are likely governed under the framework which governs planning and construction and which is summarized in Section 5.3.1.

### **8.3.4 Leakage liability**

Currently, in the PRC, there are no laws or regulations that specifically govern leakage liability after the injection of CO<sub>2</sub> into and subsequent pre-closure of sequestration formations.

## **8.4 Taxation of injection and pre-closure of CO<sub>2</sub> sequestration facilities**

Currently, in the PRC, there are no laws or regulations that specifically govern the taxation of injection and pre-closure of CO<sub>2</sub> sequestration facilities. Those activities, therefore, might be subject to the PRC's general tax regime described in Section 4.6.

## **9. Post-closure and long-term storage of CO<sub>2</sub>**

### **9.1 Introduction**

In the PRC, currently, there are no laws and regulations that specifically govern post-closure and long-term storage of CO<sub>2</sub>.

### **9.2 Integrated policy and legislation**

Currently, in the PRC, there is no integrated policy or legislation that specifically addresses post-closure and long-term storage of CO<sub>2</sub>.

### **9.3 General policy and legislation**

Currently, in the PRC, there is no general policy or legislation that specifically addresses post-closure and long-term storage of CO<sub>2</sub>.

### **9.4 Evaluation**

The absence of PRC policies or legislations that address post-closure and long term storage of CO<sub>2</sub> implies the reduction of potential incentives for developing CCS beyond deployment for EOR or ECBM. The lack of clarity on access to storage sites, on charges to store, and on liability for leakage, it seems, tends to discourage development of CCS beyond the current demonstration projects.

## 10. Summary

### 10.1 CCS policy and legislation 'best practice'

Currently, the PRC is in the early stages of considering and developing a regulatory infrastructure that addresses and applies to CCS technology. Except for general wording in aspirational policy documents under which the development of CCS technology is encouraged, there are no PRC official policies or regulations that specifically mention the capture or storage of CO<sub>2</sub>. At present, the regulatory focus seems to be the development of demonstration projects under international cooperation initiatives and the development of technical standards for the safe application of CCS technology.

Thus far, storage technology has been limited to use in the exploitation of oil and CBM reserves.,

The absence of policy and regulations that would stimulate the deployment of CCS technology in any material way indicates that CCS is currently not a significant priority for the PRC Government.

Overall, the PRC has followed international developments on CCS rather than promulgating original CCS policy or legislation that could be classified as a “best practice”.

### 10.2 Gaps in CCS policy and legislation

The PRC's CCS policy and legislation is substantially lacking. The absence of policies and legislation does not yet have any substantive legal consequences, largely because the PRC is under no international obligations to reduce its GHG emissions. Until the PRC Government establishes a CCS policy and legislative framework that have clear aims of promoting the development of CCS technology and related projects, a review of gaps in CCS policy and legislation is, at best, an analysis of hypotheticals.

### 10.3 Priority areas for future policy and legislative development

Under the PRC's current international pronouncements and cooperations, it is neither required nor compelled to set any priority for future policy and legislative development of CCS. Thus, as long as the financial and technological potential of CCS remains unproven (and not mandatory in potential export markets of the PRC), the PRC Government may not view the development and deployment of CCS technology as a priority.

Various IGCC projects under development aim to increase the efficient use of coal and reduce the PRC's reliance on foreign technology. Hence, IGCC development has the potential to provide financial benefits for the PRC thereby incentivising successful development of domestic technology and equipment.

### 10.4 Other lessons learned

Most of the CCS initiatives in the PRC are foreign-related, in one aspect or another. Accordingly, the PRC appears to have the following aims in relation to CCS initiatives and projects: (i) to receive access to and, perhaps, to copy best practices from abroad, preferably with international subsidies and support; and (ii) to be seen as cooperative on the international stage on these matters as part of its overall positioning in post-2012 Kyoto negotiations. Thus, the current CCS situation in the PRC

tends to indicate that CCS will be attractive to and become a priority of the PRC Government only to the extent that CCS projects and initiatives are determined to contribute to and/or enhance the PRC's overall strategic interests with respect to international cooperation on climate change and related matters.

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