Importance of Carbon Capture and Storage in De-carbonising the Chinese Economy

Hanming Liu1, Christopher P. Consoli1, Alex Zapantis1∗, Peter Grubnic1

1Global CCS Institute, Level 16, 360 Elizabeth Street, Melbourne VIC 3000 Australia
*Corresponding author. Email: Alex.Zapantis@globalccsinstitute.com

Abstract

While China ranks behind the United States (US) and European Union in terms of cumulative CO₂ emissions, its current high level of emissions of over 10 gigatonnes per annum means that China plays a pivotal role in meeting the objectives of the Paris Agreement. China is unique among the major global economies in that its power generation and industrial processes are predominantly based around coal combustion. Widespread deployment of carbon capture and storage (CCS) is essential if China is to combine economic prosperity with emissions reduction and energy security goals.

This report provides an overview of CCS in China. CCS facilities in China have developed in a low-key manner, mainly at demonstration-scale, and several have been of global significance. Currently as at the end of 2017, there is one large scale CCS facility (Yanchang Integrated CCS Demonstration) in construction, and seven at various development phases. The scale of coal-based infrastructure in China in both industry and power is vast. At present, operational CCS capacity in China is no more than 2 million tonnes per annum of CO₂ capture. This needs to increase by many magnitudes over the next 15 years. The Paris Agreement has refocused attention on emissions reduction and CCS is becoming a more prominent part of that conversation in China.

Salient features for CCS developments in China include:

- Enhanced oil recovery (EOR) is a strong enabler for CCS deployment. Over half of the listed CCS facilities identify EOR as the primary storage type. The use of CO₂ to stimulate oil production in China is viewed as increasingly important in declining oil fields that are not well suited to traditional water flooding techniques.

- Use of smaller scale demonstrations to de-risk large-scale deployment. Many of the listed large-scale facilities include operational facilities at lesser scale that generate knowledge that can be applied to larger scale developments.

- Increased emphasis on industrial CCS facilities, especially linked with CO₂-EOR systems.

- Reliance on road tankers for CO₂ transportation. Unlike the US, China does not yet have a major CO₂ pipeline network.
As in the rest of the world, for CCS to be widely deployed in China, a supportive business case must be made. At its heart, this involves three intertwined factors: the setting of national emission reduction targets consistent with the aims of the Paris Agreement, the inclusion of CCS in national climate Actions Plans, and that CCS is afforded policy parity – equitable consideration, recognition and support with other low-carbon technologies.

There is no CCS without the ‘S’ and development of CO₂ storage resources outside EOR in China must be prioritised; not to do so raises the risk of CCS deployment being slowed by uncertainty over available storage (at a time when CCS is most needed). An important component of storage ‘availability’ in China is progressing the establishment of CCS-specific legal and regulatory regimes that will support the many hundreds of projects (indeed thousands) that will emerge over the course of the next few decades.

Figure 1. Mapping key CCS and CCUS facilities in China, including large-scale facilities with annual CO₂ capture capacity of 400,000 tonnes or more and notable demonstration facilities with CO₂ capture capacity of ~5,000 to 400,000 tonnes.