华润海丰电厂一期扩建2×1000MW超超临界燃煤发电机组工程
CCUS示范计划情况简介

China Resources Haifeng Power Plant
2 x 1000MW USCPC Project
CCUS Demonstration Plan

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Presentation to the 8th Annual European Carbon Capture and Storage Conference, 18-19 Feb 2014, Brussels, Belgium
Guangdong Province (广东省概况)

- Pilot low-carbon province
- Largest ETS pilot
- 105 million population
- US$ 1 trillion GDP
- Approx. 90GW peak electricity demand
- Approx. 500TWh annual consumption
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四 广东CCUS示范计划 (Guangdong CCUS Demonstration Plan)
China Resources Group Introduction (华润集团简介)

- One of the 53 state-owned key enterprises, directly supervised by the State Council and highly related to the national economy and the People’s livelihood, headquarter set in Hong Kong.
- China Resources Enterprise Limited, China Resources Power Holdings Company Limited and China Resources Land Limited under the management of the Group are listed as Hang Seng Index constituent stocks.
- China Resources is ranked the 187th of the Global 500 by the latest Fortune ranking.
- Since 2005, China Resources has been continuously rated as an A grade Central Enterprise by the State Asset Regulatory Committee.
Introduction to China Resources Power (华润电力简介)

- Established 12 years ago, on 27 Aug 2001
- A Main Board Listed company under China Resources Group in HK and a member of HK Hang Seng Index constituent stocks (blue chip).
- Major business involves investment, development, operation and management of power plant, and investing in, operating, and managing power generating-related coal mine projects and logistics systems.
- By the end of 2012, company had HKD 177.7b total assets, in total 70 power plants, with total equity capacity 25.7GW, and controlled 33.5 million tonne coal production capacity.
- Located in Xiaomo Town, Haifeng County, Shanwei City, Guangdong Province
- planned total capacity are $4 \times 1GW + 4 \times 1GW$ USCPC units, with $2 \times 1GW$ in construction phase
- Will construct a 100,000 tons dedicated coal wharf for unloading
- Total investment for unit 1 and 2 is around 8.3 billion RMB
- First two units planned to be operating by Dec 2014 and April 2015
China Resources Haifeng Power Plant Location and Environment (华润海丰电厂厂址及环境)
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华润海丰电厂鸟瞰图
Montage view of China Resources Haifeng Power Plant
CCUS Demonstration Project in Extension Project: (1) Background

- On 27 June 2013, the Development and Reform Commission of Guangdong Province (Guangdong’s DRC) held the first CCUS Demo project coordination meeting, in which it set up a plan for CCUS demonstrations.

- Based on the experiences of China Resources Power and China Resources Group in Guangdong, China Resources Power to the Guangdong CCUS Project Team is chosen as the leading organization for Guangdong CCUS demonstration, with CRP Haifeng Unit 3 and Unit 4 (2×1000 MW expansion project as the first Guangdong CCUS Demo project, at the same time providing a full-scale CCS ready interface installation scheme for the feasibility study and design stages).
Signature of UK Guangdong CCUS Collaboration MoU
CCUS in Expansion Programs (2): As a Future Potential Million Tonne Integrated CCUS Project

Conceptual Diagram: A potential future million tonne integrated CCUS project
(3) Current Work

- Currently, the University of Edinburgh (UoE), the Clean Fossil Energy Development Institute (CFEDI) and Guangdong Electricity Power Design Institute (GEDI) are working on the CCUS ready interface design scheme, initially setting out conditions for land and water acquisition. They are also:
  - Preparing for the pre-feasibility study large-scale integrated CCUS project
  - Comparing advanced and economic carbon capture process technologies, and identifying potential technology suppliers
  - Acquiring financial and technical support for front end engineering design study (expected to start in March 2015)
Why Develop Demonstration Projects?
为什么开发示范项目？

- CCUS is the essential technology to decarbonise fossil fuel power plants, to satisfy Guangdong’s energy need and protect ecological environment and to demonstrate as a pilot low-carbon province. In addition it will…
- Demonstrate innovative low-carbon technologies for China, increasing international competitiveness and influence
- Encourage international collaboration, grant support and technology supply for the pre-feasibility study and later the detailed design
- Be essential to give the UK-China (GD) CCUS Centre world-class experience to be able to work on the next stage of CCS projects in Guangdong, the rest of China and abroad
Progress Review 进展回顾

- Full-scale CCS Ready Design for 2 x 1 GW unit (contract granted to UoE and GEDI) (scheduled to complete within 60 working days after the contract signature (in Feb), released on 15 May 2014)

- 1 million tonne post-combustion CO$_2$ capture demonstration pre-feasibility study (Apr 2014 to Mar 2015)

- UK-China Joint Testing Centre, a potential hub of pilots for testing/training (at the early development stage)
Pre-feasibility Study Works 预可研的工作

The large-scale integrated CCUS demonstration project includes CO\(_2\) capture, CO\(_2\) transportation, CO\(_2\) geological utilisation (TBC) and CO\(_2\) storage in saline aquifers. The study will include at least the following five reports:

Report 1: China Resources Power (Haifeng) CO\(_2\) Capture Pre-feasibility Study (Oct 2014)


Report 4: Huizhou-Haifeng CCUS Cluster Plan (Dec 2014)

Report 5: Cost, Financing Options and Financial Risk Management (Jan 2014)

- A synthesis final report (Mar 2014)
Pre-feasibility Study Works 预可研的工作

- Our Team (in proposal)
  
  UoE (Jia Li, Jon Gibbins, Stuart Haszeldine)
  E.ON CCS Technology Innovation Centre (Robin Irons)
  GEDI (Chen Lan, Yang Hui)
  South China Sea Institute of Oceanology (Zhou Di)
  Chinese Academy of Sciences Institute of Soil and Rock Mechanics (Wei Ning, Li Xiaochun)
  Clean Fossil Energy Development Institute (CFEDI) (Jia Li)

  **Project Owners:**
  China Resources Power (CRP)
  China National Offshore Oil Corporation (CNOOC)

  The project is still at early development stage, we are open to, and will welcome new members!
The Next Step 下一步计划

- Establish an Integrated Project Team for the CRP CCS Project (incl. linking with storage and transport colleagues at China National Offshore Oil Corporation (CNOOC), the 1st integrated project team assembles on 21 Feb 2014 in CNOOC HQ)

- Identify a pathway to engage with both local and national governments for further project development support;

- Formulate a plan for seeking financial support from China Resources Power Group and co-funding from other sources for demonstration development

- Develop a UK-China GD Joint Testing Centre, start construction of potential pilots, establish pilots in cement plants

- Learn from experiences and lessons in developing and demonstrating large-scale CCUS projects in other countries
Welcome to Visit China Resources Power Haifeng Project and Shanwei City!

欢迎访问华润海丰电厂和汕尾市！
Past CCS Studies in Guangdong

• Started to engage with stakeholders in 2006

• 2010-2013 GDCCSR Study implemented by UoE, Cambridge, Chinese Academy of Sciences Institutes and Linkschina, funded by UK FCO and GCCSI

• Identified storage capacity in South China Sea

• Suggested a roadmap

• Recommended a potential demonstration project