5th Oxyfuel Combustion Research Network Meeting

27th - 30th October 2015
Hongyi Hotel (弘毅大酒店)
Wuhan, China

An IEAGHG meeting in partnership with Huazhong University of Science and Technology

Preliminary Agenda
## Preliminary Agenda

### Oxyfuel Combustion Capacity Building Course

**Hongyi Hotel, China**  
**27th October 2015**  
**09.00 – 15.00**

**NOTE:** all titles provided in this agenda are preliminary and subject to change

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<th>Title</th>
<th>Speaker</th>
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| Lecture 1 | Introduction and Overview of Oxyfuel Combustion for Power Plant with CCS  | Joerg Maier  
IFK - Stuttgart University  
Germany |
| Lecture 2 | Overview to Oxy-PC Research in China                                | Prof. Zhaohui Liu  
Huazhong University of Technology  
China |
| Lecture 3 | Fundamentals in Pilot Plant R&D Activities – Operation, Testing & Analysis | Joerg Maier  
IFK – Stuttgart University  
Germany |
| Lecture 4 | Burner and Firing Systems for Oxyfuel Combustion                    | Gerry Hesselmann  
Doosan Babcock Energy Ltd.  
United Kingdom |
| Lecture 5 | Interaction of Oxyfuel Combustion Boiler and Flue Gas Management    | Frank Kluger  
ALSTOM Boiler Deutschland GmbH  
Germany |
| Lecture 6 | Overview to Oxy-CFB Research in China                               | Duan Lunbo  
Southeast University  
China |
| Lecture 7 | Oxygen Production for Oxyfuel Combustion Power Plants               | Alexander Alekseev  
Linde  
Germany |
| Lecture 8 | Overview of the CO₂ Processing Units                               | Stanley Santos  
IEA Greenhouse Gas R&D Programme  
United Kingdom |
| Lecture 9 | CO₂ Processing Units – Key Learnings from Large Scale Pilot Operation | Fred Lockwood  
Air Liquide  
France |

15.00 – 16.00  
Travel to Wuhan Boiler Company Manufacturing Site

16.00 – 18.00  
Visit to Wuhan Boiler Company

18.00 – 21.00  
Welcome Dinner (Hosted by Alstom Wuhan Boiler Company)
**Preliminary Agenda**

*5th Oxyfuel Combustion Research Network Meeting*  
Hongyi Hotel, China  
28th October 2015  
**08.30 – 17.50**

**08.30 – 10.00**  
Welcome and Keynote Address  
Speakers to be confirmed

**Session 01:**  
10:20 – 12.00 (20 minutes per presentation)

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<tr>
<th>Session 1A: RD&amp;D Efforts, Commercial Development, Techno-Economic Assessment of Oxyfuel Combustion</th>
<th>Session 1B: Flame Behaviour, Devolatilisation and Char Burnout</th>
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</table>
| Overview of Alstom’s Efforts to Commercialize Oxy-Combustion for Steam Power Plants  
John Marion, Andreas Bäcks, Rita Ison, Frank Kluger, Armand Levasseur, Magnus Moertberg, Thierry Proucho, Olaf Stallman  
Alstom Power (USA/France/Germany/Sweden/Switzerland) | Characteristic Temperatures of Coal Chars Combustion in O2/N2 and O2/CO2 Atmospheres  
B. Zhang, P. Fu, H. Zhou, C. Zheng  
Huazhong University of Science and Technology (China) |
| Research Progress of Key Technologies and System Integration for 200 MWe Oxy-fuel Combustion Plant  
Li Yanbing, Zhao Rui Liao Haiyan Chen Yinbiao  
Shenhua Guohua (China) | Coal Combustion in Oxygen-Enriched Environments  
Hookeyong Lee, Sangmin Choi  
Korea Advance Institute of Science and Technology (S. Korea) |
| The CLIMIT Program for Funding of Research, Development & Demonstration of CCS Technologies – Focus on Oxyfuel RD&D Projects  
Svein Boklen, Jarlild Svalastuen  
GASSNOVA (Norway) | Numerical Analysis of the Transient Combustion Characteristics of Single Char Particle in O2/CO2, O2/N2 and O2/Ar Environments  
Xudong Jin, Yuqai Zhou, Qyie Jin, Tingting Zheng  
Shanghai Jiao Tong University (China) |
| Techno-Economic Optimization of First Generation Oxy-Fired Pulverized-Coal Power Plant  
Hayato Hagi, Maroun Nemer, Yann Le Moullec, Chakib Bouallou, Mohamed Kanniche  
EDF R&D (France)  
MINES ParisTech, PSL – Research University (France) | Experiment Investigation on Char Nitrogen Evolution under Wet Oxy-Coal Combustion  
Xiaowei Hu, Wangchen Wu, Hui Wu, Xiaowei Liu, Hong Yao Huazhong University of Science and Technology (China) |
| Influence of Coal Quality Variation upon a 300MW Lignite Oxygen Combustion Boiler  
Jian-qiang Gao, Ning Wang  
North China Electric Power University (China) | Study on the Kinetic Effects of CO2 on the High Temperature CH4/O2/CO2 Flame  
Xing Li, Haoling Yang, Liqiao Jiang, Xiaohan Wang, Daqing Zhao  
Guangdong Institute of Energy Conversion – CAS (China) |
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<th>Poster Session</th>
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| **Experimental Study of O2/CO2 Swirled Burner of Pulverized Coal on Flow Field and Combustion**  
Jihua Qiu, Chun Zou, Jinghang Liu, Gang Li, Chuangang Zheng  
Huazhong University of Science and Technology (China) |
| **Sodium-related mineral transformation of Zhundong coal during oxyfuel combustion**  
Tai Zhang, Zhuhui Liu, Xiaohong Huang, Chao Liu, Qing Sun, Junjie Li, Biao Xiong, Chuangang Zheng  
Huazhong University of Science and Technology (China) |
| **Mode Switching and Dynamic Control of an Oxy-Combustion Pulverized-Coal-Fired Power Plant**  
Bo Jin, Haibo Zhao, Chuangang Zheng  
Huazhong University of Science and Technology (China) |
| **Photo-Catalytic Conversion of Oxyfuel Combustion Flue Gas into Fuels over TiO2 with Co-Exposed (101) and (001) Facets**  
Liu Yaming, Zhou Xiang, Yangchun Zhao, Junying Zhang, Chuangang Zheng  
EPRI – Guangdong Power Grid Company (China)  
Huazhong University of Science and Technology (China) |
| **Effect of Steam on CO2 Capture Performance of Carbide Slag under Hydrogen Production Condition**  
Zirui He, Yingjie Li, Changyun Chi, Xiaotong Ma  
Shandong University (China) |
| **Continuous Hydrogen Production in a Dual Fluidized Bed by Chemical Looping Redox Cycle**  
Zhou Liang, Shangjie Sun, Zhou Zhang, Rui Xiao  
Southeast University (China) |
| **CO2 Capture Performance of Synthetic Ca-Mg Sorbent Prepared from Carbide Slag and Magnesium Nitrate Hydrate by Combustion Synthesis**  
Lei Shi, Yingjie Li, Shiuimu Wu, Zirui He, Xiaotong Ma  
Shandong University (China) |
| **Characterisation of Oxy-Biomass Combustion in a 0.25 MWth Combustion Test Facility**  
J. Szuhanszki, M. Akram, K. Al-Qayim, S.S. Daood, K.N. Finney, L. Ma, W. Nimmo, M. Pourkashanian  
Sheffield University (UK) |
| **Investigation of NOx and SOx Control using a SCR System**  
Oghare Victor Ogidiama, Tariq Shamim  
Masdar Institute (United Arab Emirates) |
| **COP CO2 Quality Control in Oxy-Fuel Technology for CCS: SOx Removal by the Caustic Scrubber**  
Danyu Liu, Terry Wall, Rohari Stanger  
Newcastle University (Australia)  
University of Shanghai for Science and Technology (China) |
| **Three-Dimensional Full Loop Simulation of Solids Circulation in an Interconnected Fluidized Bed for Chemical Looping Combustion**  
Yanjun Guan, Jian Chang, Kai Zhang, Dingsheng Wen  
North China Electric Power University (China) |
| **Investigation into Performance of Iron-Containing Ore in Chemical Looping Combustion Experiments**  
E. Marsk, Y. Zheng, S. Scott  
Cambridge University (UK) |
| **Direct numerical simulation of vortical structures and turbulence properties of compressible spatially evolving axisymmetric jets**  
Li Delbo, Xu Qi Shen, Liu Yaming, Yin Libao  
EPRI – Guangdong Power Grid Company (China) |
| **Membrane Absorption Technology Application in CO2 capture**  
Z. Zhang  
Chongqing University (China) |
| **Experimental Study on the Effect of O2/CO2 Combustion Flue Gas on Homogeneous Mercury Oxidation**  
Wang Hui  
Southeast University (China) |
| **High Oxygen Concentration Oxy-fuel Combustion Technology in a 1 MW Pilot Scale Circulating Fluidized Bed**  
Qiangqiang Ren, Wei Li, Hanfu Li, Shiyuan Li, Qinggang Lu  
IET-Chinese Academy of Science (China) |
**Session 03:**
13.50 – 15.30  (20 minutes per presentation)

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<th>Session 3B: Chemical Looping Combustion (A)</th>
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Wu Haibo  
Shenhua Guohua (Beijing) Electric Power Research Institute Co. (China) | Overview of Alstom’s Chemical Looping Process  
Shin Kang, Ismail Abdulla, Herbert Audru, Armand Lavassour, Corinne Beale  
Alstom Power Inc. (USA/France) |
| Result of High-Flame Temperature Oxy-Combustion Tests at the 15MWth Test Facility and its Application to Refineries  
Mark Schoenfield, Bhupesh Dhungel, Bradley Adams  
Jupiter Oxygen Corp. (USA)  
Reaction Engineering Corp. (USA) | Research Introduction of Chemical Looping Combustion in Tsinghua University  
Ningsheng Cai, Zhenshan Li  
Tsinghua University (China) |
| Air and Oxy-Fuel Combustion of Anthracite with an Advanced Flexible Burner Concept  
Simon Grathwohl, Joerg Maier, Gunter Schaffknecht  
IFK – University of Stuttgart (Germany) | Thermodynamic Modelling and Characterisation of Canadian Ilmenite for Pressurised Chemical Looping Combustion  
Dennis Lu, Marc Duchesne, Robin Hughes  
CANNET Energy (Canada) |
| Predicting Heat Transfer Characteristics of a 1.5 MWth Oxy-Coal Flame  
Andrew Fry, Jennifer Spinti, Oscar Diaz, Ignacio Preciado, Eric Eddings  
Utah University (USA) | 300 Hours Continuous Operation of the Interconnected Fluidized Bed for Chemical Looping Combustion  
Shichen Ma, Haibo Zhao, Xin Tian, Yijie Wu, Mingzhe Su, Yongliang Zhang, Chuguang Zheng  
Huazhong University of Science and Technology (China) |
| Experimental Investigation and CFD Modelling of Oxy-Coal Combustion on UKCCSRC-Pilot Scale Advanced Capture Technology (PACT) Facility with Synthetic and Real Flue Gas Recycling  
S.Daood, J. Szuhanszki, L. Ma, C. Sun, C. Snape, W. Nimmo, H. Liu, M. Pourkashanian  
Sheffield University (UK)  
Nottingham University (UK) | Techno-economic Analyses of Oxy-fuel Retrofit Options Using Chemical Looping Air Separation Technology: An Australian Case Study  
Kalpit Shah, Cheng Zhou, Elham Doroody, Behdad Moghtaderi  
Newcastle University (Australia) |
**Session 04:**
15.50 – 17.50  (20 minutes per presentation)

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<th>Session 4B: Oxy-CFB &amp; Chemical Looping Combustion (B)</th>
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<td><strong>Design and Commissioning of a 1MWth Pilot-scale Oxy-fuel Circulating Fluidized Bed with High Oxygen Concentration</strong></td>
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<td>Hanyu Li, Shiyuan Li, Qiangbang Ren, Wei Li, Jingzhang Liu</td>
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<td>Harbin Institute of Technology (China)</td>
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<td><strong>Coal and Biomass Ignition under Oxy-fuel Mixtures for Pulverised Fuel Milling Safety</strong></td>
<td><strong>Experimental and Modelling of Oxyfuel Combustion in Fluidised Bed</strong></td>
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<td>Ignacio Trabadella, Juan Riaza, Hannah Chalmers, Jon Gibbins</td>
<td>Dasiyin Li, Yanming Zhuang, Changsheng Bu, Xiaoping Chen</td>
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<td>Edinburgh University (UK)</td>
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<td><strong>Ash Aerosols and Ash Deposits from Oxy-Coal Combustion of Powder River Basin, Illinois and Blended Coals</strong></td>
<td><strong>NOx and SOx Emission Behaviour during Oxy-fuel Coal Combustion in Lab-scale Fluidized Bed Reactor with Flue Gas Recirculation</strong></td>
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<td>Zhonghua Zhan, Andrew Fry, Jost Wendt</td>
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<td>L. Chen, X. Yang, X. Li, C. Snape</td>
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<td>Yuwei Bu, Xin Dai, Ping Lu, Wenjie Zhang, Jingdan Li</td>
<td>Mohammed Khan, Tariq Shamim</td>
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<td>Nanjing Normal University (China)</td>
<td>Masdar Institute (United Arab Emirates)</td>
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19.00 – 22.00  Meeting Dinner (Hosted by Huazhong University of Science and Technology)  
Venue to be confirmed
Preliminary Agenda

5th Oxyfuel Combustion Research Network Meeting
Hongyi Hotel, China
29th October 2015
08.30 – 17.50

Keynote Address
08.30 – 10.00

Announcement and Reminders (10 minutes)
Stanley Santos
IEA Greenhouse Gas R&D Programme

Development of Oxyfuel Combustion Technology – Chinese Programme (35 minutes)
Prof. Zheng Chuguang
Huazhong University of Science and Technology (China)

Callide Oxyfuel Project – Overview of Performance, Achievements and Lessons Learned (35 minutes)
Dr. Chris Spero
CS Energy & Callide Oxyfuel Project Ltd. (COSPL), Australia

Session 05 – Plenary:
10.20 – 11.30 (20 minutes per presentation)

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<td>Toshihiko Yamada, Takashi Kiga, Chris Spero</td>
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<td>CS Energy &amp; COSPL (Australia)</td>
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<td><strong>Callide CPU – Final results</strong></td>
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<td>Anne-Laure Lesort, Ludovic Granados, Mathieu Leclerc, Frederick Lockwood, Samuel Amy, Chris Spero</td>
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<td>Air Liquide (France)</td>
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<td><strong>Callide Oxyfuel Project – Safety and Hazardous Area Assessments</strong></td>
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<td>Chris Spero</td>
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<td><strong>Overview to ANLEC R&amp;D Funded Projects for Callide Oxyfuel Power Plant</strong></td>
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<td>Rohan Stanger</td>
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<tr>
<td>P. Smith, J. Thornock, Y. Wu, S. Smith, B. Isaac, D. Harris</td>
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<tr>
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<td>Dynamic Simulation and Exergy Analysis for Mode Switching Process in a 35MWth Oxyfuel Pilot Plant</td>
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<td>Wei Luo, Qiao Wang, Zhaohui Liu, Chenguang Zheng</td>
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<td>Huazhong University of Science and Technology (China)</td>
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<td>Dynamic Simulation and Controls for Oxy-Fired Boiler and Steam Power Plant with CO2 Capture System</td>
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<td>Xinzhong Lou, Francois Granier, Armand Javasseur, Carl Neuschaefer, Olaf Stallman</td>
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<td>Alstom Power Inc. (USA/France/Germany)</td>
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<td>Numerical Simulation and Optimization Design of 200MWe Tangentially Coal-Fired Boilers</td>
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<td>Junjun Guo, Zhaohui Liu, Xiaohong Huang, Chenguang Zheng</td>
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<td>Huazhong University of Science and Technology (China)</td>
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<tr>
<td>John Davison, Luca Manzi, Noemi Ferrari, Paolo Chiesa, Emanuele Martelli, Matteo Romano</td>
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<td>IEA Greenhouse Gas R&amp;D Programme (UK)</td>
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<td>Amec Foster Wheeler (Italy), Politecnico di Milano (Italy)</td>
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<td>Testing of a Gas Turbine Oxy-fuel Burner</td>
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<td>M. Dittranto, I. Sannum, P.E. Rekke, J. Janczewski</td>
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<td>SINTEF Energy Research (Norway)</td>
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<td>Impact of the oxygen supply on the downstream CO2 purification of the semi-closed oxyfuel combustion combined cycle (SCOC-CC)</td>
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<td>Jan Mietzko, Alfons Kather</td>
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<td>Hamburg University of Technology (Germany)</td>
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<td>Development of Advanced Oxy-Fuel Turbine Power Cycles</td>
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<td>Rebecca Hollis, Keith Prongske, Carl Hustad</td>
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<td>Reduced Mechanism for Interactions of Nitrogen and Sulphur Chemistry in Pressurized Flue Gas Systems</td>
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<td>Sima Ajdari, Fredrik Normann, Klas Andersson, Filip Johnson</td>
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<td>Chalmers University (Sweden)</td>
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<td>NOx Control in Oxy-firing Process</td>
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<td>Wuyin Wang, Olaf Stallmann</td>
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<td>Alstom Power (Sweden/Germany)</td>
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<td>Development of Staged Pressurized Oxy-Combustion</td>
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<td>Benjamim Kumfer, Zhewei Yang, Akifay Gopan, Edwadie Adeconou, Richard Axelbaum</td>
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<td>Washington University at St. Louis - WUSTL (USA)</td>
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### Session 08:
#### Session 08A: Flue Gas Processing and Cleaning
- **Acid Gas Control by Dry Sorbent Injection in Air and Oxy-Fuel Combustion**
  Reinhold Spörl, Stefan Pek, Siqiang Qin, Jörg Maier, Günter Scheffknecht
  IFK-University of Stuttgart (Germany)

- **COP CO2 Quality Control: CO2 Quality Control in Oxyfuel Technology for CCS: SOx Removal by the Caustic Scrubber**
  Dunyu Liu, Rohan Stanger, Terry Wall
  University of Shanghai for Science and Technology (China)
  Newcastle University (Australia)

- **COP CO2 Quality Control: Impact of Sulphur Oxides on Mercury Speciation and Capture by the Bag Filter during Oxyfuel PC Combustion**
  Lawrence Belo, Lisa Elliot, Rohan Stanger, Terry Wall
  Newcastle University (Australia)

- **Conceptual Design of a Packed Bed for the Removal of SO2 Prior to Compression**
  Dunyu Liu, Terry Wall, Rohan Stanger
  University of Shanghai for Science and Technology (China)
  Newcastle University (Australia)

- **Mercury Removal from Oxyfuel Combustion Flue Gas Over Cobalt Oxide loaded Magnetospheres Catalyst from Fly Ash**
  Xu Qisheng, Liu Yaming, Jianping Yang, Yongchun Zhao, Junying Zhang, Chuguang Zheng
  EPRI – Guangdong Power Grid Company (China)
  Huazhong University of Science and Technology (China)

#### Session 08B: NOx and SOx Emissions during Oxyfuel Combustion / Biomass Co-Firing
- **NOx Reduction during Oxy-coal Combustion: A Study of Applying Synthetic Model Coals with Pyrrolic or Pyridinic Nitrogen**
  Chang'an Wang, Yongbo Du, Xin Zhu, Yinhe Liu, Defu Che
  Xi'an Jiaotong University (China)

- **The Impact of Co-combustion and Oxyfuel Combustion on Flue Gas Impurities**
  Siqiang Qin, Reinhold Spörl, Jörg Maier, and Günter Scheffknecht
  IFK – University of Stuttgart (Germany)

- **Alkali Sulphating in Flames**
  Thomas Ekvall, Klas Andersson
  Chalmers University (Sweden)

- **Effect of Co-firing on Alkali Sulphate Formation during Oxy-Combustion**
  N. Jurado, M. Darabkhani, E. Anthony, J. Oakey
  Cranfield University (UK)

- **Sulphur Evolution of Biomass Blending with Bituminous Coal during Oxy-fuel Combustion with High Oxygen Concentration**
  Wei Li, Shiyuan Li, Xin Wang, Qinggang Lu
  IET-Chinese Academy of Science (China)

### Session 09:
#### Session 09:
- **17.30 – 17.50**  Closing Remarks
Facility Visit – Preliminary Arrangement:
(Schedules Still Subject to Change)

Morning Activities:

- Bus A: Leaves Hongyi Hotel at 08.00 – going to HUST’s 35MWth Facility

- Bus B: Leaves Hongyi Hotel at 08.00 – going to Linde’s Oxygen Plant at WISCO.

Afternoon Activities:

- Bus A: Leaves Yingcheng City after lunch to Linde’s Oxygen Plant at WISCO

- Bus B: Leaves Yingcheng City after lunch to HUST’s 35MWth Facility
Meeting Registration Information

**Early Bird Registration Deadline:** 31st July 2015

**Registration Fees:**

- Early Bird Registration Fees: GB£ 250.00 (RMB 2350)
- Early Bird Registration Fees and Facility Tour: GB£ 275.00 (RMB 2575)
- Full Registration Fee (after 31st July): GB£ 390.00 (RMB 3650)
- Full Registration Fee and Facility Tour (after 31st July): GB£ 415.00 (RMB 3875)

To register for this meeting – please follow the link below.
https://ieaghg.eventsair.com/5th-oxyfuel-combustion-network-meeting/registration/Site/Register

All payments are charged in British Pounds (GBP). RMB price are indicative only and could subject to change due foreign currency exchange during transaction.

The Registration Fee covers your attendance to all the sessions of the 5th Oxyfuel Combustion Network Meeting, Capacity Building Course, lunches, coffees and meeting bag. Additional fees for the tour include the buses, lunch and drinks.

The dinner on the 27th October is hosted by Alstom Wuhan Boiler Company and the dinner on the 28th October is hosted by Huazhong University of Science and Technology (HUST) and partners. We would like to thank our host for their generous support and contribution.

All meeting materials will be uploaded to the IEAGHG website after the meeting.
Travel Information

5th Oxyfuel Combustion Research Network Meeting
27th - 30th October 2015

Hongyi Hotel 弘毅大酒店
No. 136 Donghu Road, Wuchang District, Wuhan, Hubei, 430071, China
武汉市武昌区，东湖路 136 號，湖北省，430071 中国

The hotel is located at the shore of beautiful East Lake and is close to Wuhan Hongshan Square—scientific, educational, cultural and commercial center, and the back garden of Provincial Government --- Fangying Square and beautiful Shuanghu Bridge leans close to it. The natural scenery and environment create a cozy and elegant atmosphere for everyone to appreciate. It is also within walking distance to the Wuhan Central Cultural Zone Phase I “Chu River & Han Street”. You can also take a walk around the East Lake easily. The hotel is also about 3 km away from Wuhan University.

Transportations:
From Wuhan Airport to the Hongyi Hotel (A to B): about 40 km via 2nd ring.
Taxi Fare: approx. RMB100.00 - 140.00 (depending on the type of taxi).
From Wuhan Railway Station (High Speed Train Station) to the hotel (A to B): about 12 km. Taxi Fare: approx. RMB30.00-40.00 by taxi (depending on the type of taxi).

Nearby Commercial District – for restaurants and others:
Walking from Wongyi Hotel to Chu River & Han Street, A to B (about 1 km)