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## **Global Energy Security and Climate Change Challenges: The Future of Coal and Chances for Clean Coal**

*5.-6. May 2016*

### **Workshop Report**

The European Centre for Energy and Resource Security (EUCERS) at King's College London organized a two-day workshop on the topic of **'The Future of Coal'** together with the Energy Security and Climate Change Asia-Pacific (recap) of the Konrad-Adenauer-Stiftung e.V., the Atlantic Council of the U.S. (ACUS), and the Energy Studies Institute (ESI) at the National University of Singapore. As the second workshop in our series, the workshop was organized from 5<sup>th</sup> to 6<sup>th</sup> of May 2016, to discuss the future of coal and chances for clean coal.

Although inexpensive and supply is secure in the long-term (proven global coal reserves in 2013 were sufficient to meet 113 years of global production), coal is viewed controversially due to high CO<sub>2</sub> emissions produced. However, due to rising global energy demand, coal is still an important player in today's global energy mix. Technologies that allow for carbon capture and storage (CCS) and carbon capture use and storage (CCUS) are key for achieving climate goals while meeting energy demand. Globally, 22 large-scale CCS projects are currently in operation or being constructed - twice as many as a decade ago. What is the future of coal? Will new technologies such as CCS and CCUS make coal a clean energy source? These key issues were discussed during the workshop.

### **DAY I: Thursday, 5<sup>th</sup> May, 2016**

In the afternoon of 5<sup>th</sup> of May 2016, the first welcome address was made by Dr Peter Hefele, Director of the regional project on energy security and climate change at Konrad Adenauer Stiftung (Hong Kong). After the introduction, Professor Dr Friedbert Pflüger, Director of EUCERS at King's College London, chaired the meeting. Professor Pflüger mentioned the Paris climate agreement and its influence on coal. He concluded that coal is controversial but will continue to play a major part in the global energy mix. Instead of fighting against coal and trying to phase coal out, it is more important to develop clean coal technologies to make coal more sustainable. Afterwards, Professor Dr Gerhard Sabathil, Ambassador of the European Union to the Republic of Korea made his welcome address to participants. **Following Professor Sabathil's remarks, Dr Frank Umbach, Research Director at EUCERS,**



presented the EUCERS strategy paper on 'the future of coal'. Dr Umbach gave an overview on present dilemmas of global energy and climate policies. On one hand, the use of coal for energy generation is subject to growing criticism in light of international climate protection efforts, particularly after the Paris climate summit. On the other, coal is inexpensive and available long-term. He set forth his research objectives, including analyzing the strategic implications of different restrictions on export credit finance for coal power stations and clean coal technologies, and the overall question of whether coal has a future in the German and European energy mix in the medium-term. Then Dr Umbach concentrated on global dimensions and introduced the current energy situation worldwide, including the world's energy reserves, increase of world primary energy demand, attributes of coal from many aspects and growth of new coal power capacity, laying a good basis for further discussion. He also mentioned CCS-projects worldwide and potential uses of captured CO<sub>2</sub> as well as cost perspectives of CCS. Finally, Dr Umbach concluded that while promoting global climate and environment protection policies we need to be realistic and balance our analysis by taking into account energy security and economic issues. After intense discussion, Professor Pflüger made closing remarks and the seminar was followed by a dinner with participants.

## **DAY II: Friday, 6<sup>th</sup> of May, 2016**

### **Session 1: Asia-Pacific's Coal Power Industry- Opportunities and Challenges**

**Dr Peter Hefele** chaired the first session of the day. The first presentation was made by **Dr Xunpeng Shi, Senior Fellow and Deputy Head of Energy Economics Division at the Energy Security Institute (ESI), National University Singapore (NUS)**. Dr Shi analyzed ASEAN's future energy mix and the role of coal. He introduced the current energy paradox of ASEAN. On one hand ASEAN has aspirations to develop a sustainable growth agenda that promotes the use of clean energy and related technologies. On the other hand it is estimated that coal consumption keeps rising in the next three decades, due to its low cost and abundant reserves. Based on a SWOT analysis, Dr Shi listed opportunities and threats of strategies for a greener ASEAN energy mix. He also summarized the characteristics of coal in ASEAN, including 1) coal is cheap and affordable, 2) use of coal is expected to increase, 3) coal's share in power generation will increase, 4) global restrictions make coal more cost competitive (in some developed countries such as the U.S., where domestic consumption of coal is limited by exporting it to other regions and therefore causing the increase of coal supply in other markets). **Then Professor Younkyoo Kim, Director of the Center for Energy Governance & Security, Division of In-**



ternational Studies at Hanyang University, Seoul, South Korea gave the second presentation. He talked about why coal consumption is rising and what it means from a South Korean government's perspective. Professor Kim pointed out that facing global energy challenges, we expected energy source like LNG and natural gas to play a much more important role in the short term. But what we have seen is that due to infrastructure problems and pricing mechanisms, natural gas cannot currently play a key role as a bridge fuel. South Korea has finalized its 2030 target of reducing greenhouse gas emissions by 37 percent. As a result, it is crucial for Korean government to improve its energy mix under climate change pressures. In 2014, the Korean government came out with the Second National Energy Plan to cut its future reliance on nuclear power to 29 percent of total power supply by 2035. Down from a planned 41 percent by 2030. Meanwhile, coal production is increasing. According to the IEA, 75% of the annual new generating capacity being added in Southeast Asia is expected to be coal-fired. Therefore, Professor Kim concluded that the only option we have, is to make coal cleaner by adopting technologies such as CCS. **The third speech was given by Dr Frank Umbach, Research Director at EUCERS, King's College London, who presented the recent EUCERS' strategy paper on 'China's expanding overseas coal power industry'.** Dr Umbach compared the world's CO<sub>2</sub> emissions in 2005 with emissions in 2012 and pointed out that there is a significant increase of CO<sub>2</sub> emissions, a large part of which can be attributed to China. He suggested China's percentage of coal consumption in its energy mix is going down, although the volumes of coal consumption may still increase and its peak consumption has not yet been achieved. However, in terms of China's future energy policy, he believed that there is a structural change underway, which leads to a decrease of coal demand and as a result the current situation of over-supply may last longer. On the other hand, China's increasing investments on coal mining and coal power projects in other countries is of great concern. Dr Umbach pointed out that the Chinese global coal expansion investments are taking place not just in Asia itself but also in Africa and even in Europe. If China's domestic consumption of coal decreases on one hand, while the coal power industry expands by increasing its investments abroad on the other hand, it means for climate policies that it will decrease China's domestic CO<sub>2</sub> emissions but increase the emissions globally.

## **Session 2: The Future of Coal, CCS and Clean Coal Technologies after Paris**

**This section was introduced and chaired by Professor Dr Friedbert Pflüger. The first presentation was made by Miyeon Oh, Non-resident Senior Fellow of Atlantic Council Global Energy Center**



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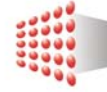
and Visiting Scholar at Johns Hopkins' School of Advanced International Studies (SAIS). Ms Oh discussed the future of coal, CCS and clean coal technologies after Paris. She gave an overview on world energy consumption as well as the IEA projections on world energy consumption by fuel. She stated that coal would still play an important role in global energy mix in the future. Installed coal-fueled generation capacity keeps rising, especially in developing countries such as China and India. Ms Oh summarized that potential emission reductions can be realized through improving end-use energy efficiency, switching end-use fuel and promoting the use of renewables and nuclear. CCS is the only technology for climate mitigation and therefore is the key to increasing ambition for low-emissions pathway. Globally there are 22 large-scale CCS projects in operation or under construction. However, due to the currently low oil and gas prices, demand for electricity may decrease and therefore may slow down the CCS development process. She also emphasized that since 90 percent of growth in primary energy demand till 2035 will come from non-OECD countries (according to IEA projections), promoting CCS technology in those developing countries is of great importance. **Dr Hwansoo Chong, Leader in the Policy Team at Korea CCS R&D Center (KCRC), gave the following presentation.** Dr Chong's presentation focused on Korea's CCS core R&D programme. He showed the current energy status, indicating coal is the largest energy source in Korea. In addition, around 49 KRW/kWh is the average cost of electricity generated from the coal-fired power stations, showing coal is a cheap energy source. The safety issue related to nuclear energy and the high cost of renewable energy have to be made clear. As a result, CCS can act as a bridge technology for continually using coal-generated electricity to meet Korea's energy demand while taking into account its 2030 target of reducing greenhouse gas emissions by 37 percent. Dr Chong introduced Korea's CCS 2020 project in detail, including capture technology (31 projects), storage technology (7 projects), conversion technology (19 projects), and the building of infrastructure. He also introduced Korea's CCS R&D Center at the end. Based on the above-mentioned points, Dr Pet Techarat made a comment and introduced the global status of CCS from a technological perspective.

### **Session 3: Global Trends in Energy and the Role of Coal in the World's Energy Mix**

**This session was chaired by Dr Xunpeng Shi of ESI. The first presentation was made by Carlos Fernandez Alvarez, Senior Coal Analyst, International Energy Agency (IEA).** Mr Alvarez mentioned the current debate on global climate change and also the fossil fuel divestment campaign. The campaign aims at the removal of investment assets from companies involved in extracting fossil fuels, in



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an attempt to reduce climate change by tackling its causes. He then explained the global trends of coal in detail. Today, 80 percent of coal consumption occurs in four regions: the European Union, the U.S., China and India: 1) In the European Union, coal consumption peaked in 1987, almost 30 years ago. As many countries in the EU have announced their energy plan of reducing the use of coal, there is a declining trend on future coal consumption. 2) In the U.S., where coal consumption peaked in 2006 or 2007, it is pretty clear that the country is phasing coal out. 3) In China, the peak of coal consumption will arrive in 2020 or as late as 2030. China is on its way of reducing coal consumption, but the total amount of coal consumption is still large. 4) In India, the peak of coal consumption is hard to predict as India needs coal to secure its electricity supply. **The second presentation was given by Dr Joachim Lang, Head of Public Affair Office in Berlin, E.ON SE.** Dr Lang summarized four major global trends in energy as follows: 1) Worldwide energy demands will continue to grow, as the world's population and economy expands. But at the same time the growth of energy consumption is slowing down, which is caused by faster growths in energy efficiency. 2) The energy mix continues to shift worldwide: new energy supplies like renewables emerge, but fossil fuels remain the dominant source of energy powering the world economy until 2050. Among which, gas seems to become the fastest growing fossil fuel with its share in primary energy gradually increasing; while oil grows steadily and remains the most important fossil fuel for the next 20 years. 3) More investments and more innovation will drive change on energy markets. Due to global investments and falling costs, no fuel is projected to grow as fast as renewables. Innovation reduces the costs of low-carbon technologies and energy efficiency, but for oil & gas, the gains are offset by the move to more complex fields. 4) Future development of global energy systems depends on further policy action and regulation. **The third speech was made by Dr D. Suba Chandran, Professor at International Strategic & Security Studies, National Institute of Advanced Studies (NIAS), Bangalore.** Professor Chandran emphasized India's coal conundrum. Coal is a relatively abundant and affordable fuel in India, however the quality is low and faces environmental constraints. Professor Chandran summarized India's coal conundrum as: 1) High ash content of Indian coal is a major source of local air pollution. In addition, nearly 40 percent of identified coal resources are in heavily forested areas and in human settlements. 2) Increasing demand will have to be met largely through imports. However, India faces infrastructure difficulties in handling larger volumes of coal imports, as large parts of ports and railroads need to be upgraded. 3) Imported coal is likely to be more expensive and would raise power bills by over 25%. Based on the above points, he also presented some policy recommendations. These recommendations are 1) To address the polit-



ical and strategic communities at the national level and help creating a national dialogue with the center, states, institutions and media. 2) To continue the existing approach in addressing the technical issues at the global level. 3) To create a 'Asian Regional Dialogue' sub-regional. **The last speech was made by Zorigt Dashdorj, former Minister of Mineral Resources and Energy of Mongolia.** He gave a Mongolian perspective on the future of clean coal and global energy security and climate change challenges. After a brief introduction on the importance of coal and current situation in Mongolia, Mr Dashdorj suggested that the CCS technologies have huge potential. However, for coal producers like Mongolia, it is 'disconnected' with the country's reality for two reasons: 1) The Paris agreement does not provide clear incentive neither for the transfer of technology to developing countries like Mongolia nor does it encourage to continue the use of clean coal; 2) Coal is critical for developing countries, not only for energy supply but also for economic development and poverty reduction. As a result, developing countries need coal to be as cheap as possible to support their economic growth. Finally, he shared his political viewpoint on how to connect the CCS technologies with reality. We have to understand the issue from a perspective of political realism, renewable energy and clean coal solutions under climate change. The public also has to be persuaded that there is still possibility for coal to have a future, even though CCS technology is not mature. It is essential to promote global and regional technology transfer through commercial mechanism.

During the workshops some main conclusions were drawn, including – but not limited to – the following points:

- 1) Coal is (after oil) still the second most important energy resource in the world for energy consumption, which has longer availability than conventional gas and oil resources, is cost-competitive, widespread, and plentiful;
- 2) Coal remains a viable option to enable economic growth and meet growing demand for energy in the near future, as a result, instead of fighting against coal and trying to phase out coal immediately, it is more important to develop clean coal technologies and make coal more sustainable.
- 3) In developing countries, having access to cheap energy to support economic growth and secure energy supplies are regarded as top priorities, rather than reducing CO<sub>2</sub> emissions;
- 4) In order to develop clean coal technologies like CCS, financing has to be available or otherwise poor technologies will be used in coal power plants;
- 5) Currently, there is no realistic alternative technology other than CCS/CCUS, which should be pro-



moted as worldwide climate mitigation technology;

6) CCS projects have regularly been faced by public resistance, as some believe these technologies are means to extend the lifetime of coal power plants and blocking the development of renewable energy;

7) CCS/CCUS is considered as a key and cost-effective technology both for achieving larger emission reductions from fossil-fuel usage (not just coal, but also oil and gas) and enhancing energy efficiency.