

## EXPERT GROUP ON CLEAN FOSSIL ENERGY (EGCFE) PROGRESS REPORT TO THE 53<sup>rd</sup> MEETING OF THE APEC ENERGY WORKING GROUP (EWG 53)

A summary of administrative and project activities undertaken by the EGCFE since the 52<sup>nd</sup> EWG Meeting is provided by the EGCFE Chair, Mr. Scott Smouse (USA).

### ADMINISTRATIVE

The EGCFE's web site has been completely revamped web site<sup>1</sup> and a functional website is now operational. Maintenance of the site has been difficult over the past few years, owing to contractor support limitations. It is now being managed much more cost effectively and timely by a contractor for the U.S. Department Energy in headquarters. We welcome any comments from EWG members on the website.

### EGCFE Secretariat

The EGCFE Secretariat is housed in the Japan Coal Energy Center (JCOAL). Ms. Toshiko Fujita of JCOAL-JAPAC provides the EGCFE Secretariat.

### Support Contractor

Technical support to the EGCFE Chair is provided by Dr. Ian Torrens (USA) through a USDOE support contract, for preparation of APEC project concept notes, full project proposals, project monitoring and completion reports, EGCFE progress reports to the EWG, development of technical programs for EGCFE seminars and workshops, and other ad hoc tasks related to EGCFE and EWG activities as required.

### Terms of Reference

The EGCFE's Terms of Reference (TOR) has been rewritten to reflect current EWG and EGCFE priorities, including the Oil & Gas Security Initiative, and to significantly streamline the overall text. The TOR was approved by EWG members out of session.

### Planning Activities

EGCFE business meetings are typically held in conjunction with the annual Clean Fossil Energy Technology and Policy Seminar. The last meeting was held on 21 February 2012 in Gold Coast, Australia. However, owing to travel limitations by the EGCFE Chair and his relocation from USDOE's National Energy Technology Laboratory to Headquarters, the annual EGCFE seminar and associated business meeting have not been held recently. In 2013 and 2014. The next business/planning meeting will be held in conjunction with the next annual Seminar, which is being discussed with Chinese Taipei. Alternatively, discussions have been held with Japan about holding a business meeting following their Clean Coal Day conference in early September 2017.

## PROJECT STATUS

### Coal-Based Power Generation and Conversion - Saving Water (EWG 08 2014A)

Most energy production and conversion methods need large amounts of water, and most methods of producing fresh water require energy. Policy-makers need to understand the links and trade-offs between water and energy, termed the nexus. An APEC project covering these issues, **Water-Energy Nexus: Coal-Based Power Generation and Conversion - Saving Water** (EWG 08 2014A) was completed in February 2017. It collected and shared information on developments to make coal-based energy generation more efficient and less water-intensive, on recovery and reuse of water from coal-based energy production, and on policy and regulatory developments in APEC member economies related to the water-energy nexus for coal-based energy production.

The project was carried out by Det Norske Veritas (DNV-GL), which was competitively selected from six contractor proposals received in response to an APEC RFP.

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<sup>1</sup> <http://www.egcfe.ewg.apec.org>

The end product of the project is a report containing information on the latest developments to make coal-based energy systems, including power generation and production of SNG and chemicals, more efficient and less water-intensive. The report includes a number of case studies describing how specific power generating plants in arid regions manage their water needs. It synthesizes information from these case studies and other recent sources, to summarize the latest developments for recovery and reuse of water from coal-based energy production and conversion, including use of alternative sources of water and coproduction of water with carbon capture, utilization and storage. Relevant policy and regulatory developments were included. The report (reference APEC#217-RE-01.1) may be downloaded from the APEC website<sup>2</sup>

This was the first APEC-funded EGCFE project on the water-energy nexus topic. As such, the end product distinguishes itself from previous work elsewhere in the field by setting the water-energy nexus issues in the APEC context. The project outputs include substantive suggestions regarding possible future work on the water-energy nexus related to coal that the EGCFE can propose to APEC for funding. The first such follow-up is the EGCFE workshop EWG 07 2015A to share the results of this project with APEC member economies (see below). Also, a new study on some of the technical or policy aspects of this project could be suggested.

### **APEC Water-Energy Nexus Expert Workshop (EWG 07 2015A)**

This expert workshop builds on information generated and lessons learned in the EWG 08 2014A water-energy nexus project described above. The objectives are:

- To discuss and evaluate the priorities identified in EWG 08 2014A project findings, and to share up-to-date knowledge and experience.
- To discuss future work in this area and develop recommendations, including capacity building needed on technologies, on the economics of measures addressing water-energy nexus issues, and on needed policy/regulatory structures.

The target speakers and audience are expected to include:

- Key government officials at the policy level, with relevant technical and economic expertise, which are involved in decision-making on freshwater resources management (production, transportation, and distribution), particularly with regard to the use of water for fossil energy-based industry; and on the environmental and regulatory issues specific to the water-energy nexus.
- Institutes and academia involved in economic and policy analysis in this area, such as the World Resources Institute, the World Policy Institute, the Pacific Institute, and the Woodrow Wilson China Environment Forum.
- Representatives of relevant industry sectors with interests in this topic.
- Other international fora active in this topic area (e.g., IEA/OECD, UNESCO).

The workshop structure, content and selection of speakers will reflect a special focus on the needs of developing economies.

The project will be conducted by a consultant, who will be responsible for suggesting an appropriate APEC host economy and workshop location, developing the workshop program, organizing the event, and preparing the proceedings and a synthesis report on the workshop for publication by APEC. The report will summarize the workshop, including presentations, briefing papers, and other relevant information. It will contain suggestions for follow-on work by APEC on water-energy nexus issues, formulated with input from the workshop participants.

Close coordination between this project and the above water-energy nexus project will aid in identifying invited speakers who are not only knowledgeable in this field of activity, but also capable of identifying critical future directions of research and analyses needed within the APEC region on the water-energy nexus field of activities from technology through policy to regulations.

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<sup>2</sup> [http://publications.apec.org/publication-detail.php?pub\\_id=1813](http://publications.apec.org/publication-detail.php?pub_id=1813)

The first step in the implementation of this project is submission of an RFP to the APEC Secretariat for posting on the APEC website. This is expected to be issued by April 14, 2017. The following is the timeline foreseen leading to the workshop in September and publication of the proceedings and synthesis report by the end of November:

### **Roadmap to Promote Transfer and Dissemination of Clean Coal Technologies in APEC Region (EWG 08 2015A)**

Fossil fuels, especially coal, will continue to play significant roles in the energy mix of Asia-Pacific region in long term. This project responds to APEC Energy Ministers' instruction for the EWG (through their 2014 Beijing Declaration) to promote clean coal technologies (CCTs), so as to enhance cooperation in developing and applying CCTs and to ensure sustainable energy development in APEC region.

The project focuses on transfer and dissemination of CCTs, including clean and efficient coal-fired power, CO<sub>2</sub> capture, conversion and storage, and clean and efficient coal utilization such as coal gasification and liquefaction. In a more broad sense, it also includes the efficient and clean coal-based technological advances (e.g., utilization of coal-based syngas, water saving and recycling) in chemical industry.

The objectives are:

- To create a platform for all APEC economies to participate in the activities of CCTs, and to build a CCTs database providing a technology category list and priority technical review.
- To develop and provide recommendations on promoting technology transfer and dissemination of CCTs.
- To emphasize to selected partner beneficiaries clear the significance and prospects of CCTs and to enhance common understanding among APEC economies on development of Low Carbon Technology.

It includes a CCTs database, built through information collection and field survey work, providing a technology category list and priority technical review. Periodical seminars enable experts to share their up-to-date information and best practices on CCTs, and provide recommendations on promoting technology transfer and dissemination.

A clean coal technologies website (<http://www.apec-cct.com>) has been built, consisting of the following:

- "CCTs" - a brief introduction of clean coal technologies, such as IGCC, USC, CCUS and utilization of syngas, along with the latest developments in this field;
- "EVENTS" - a platform for news or notices of some relevant upcoming events and past events;
- "REPORT" - a collection of workshop documents;
- "DATABASE" - CO<sub>2</sub> emissions per year, coal consumption per year, CO and CO<sub>2</sub> utilization technologies, and emission standards of many APEC economies;
- "ABOUT US" - introduction, objectives, work plan and project overseers;
- "CONTACT US" - ways for experts, designers, policy-makers, entrepreneurs and the public to obtain information on the project development, including brochures, media release channels, newsletters.

A seminar organized on August 5-7, 2016, included 50 invited experts on clean coal technologies from China, one-third of whom were women. Prof. Xinbin Ma gave a presentation on how to transfer and disseminate clean coal technologies of China to the APEC region, and encouraged close cooperation. A third video conference is scheduled for October 25, 2016, and a final workshop will be held in November 3-5, 2016. Relevant experts, policy-makers, the public, potential investors and applicants will be invited to participate in the workshop.

The CCTs database is built via information collection and field survey work, providing a technology category list and priority technical review. It is updated using Information from the events held during the project. The database will be helpful to policymakers seeking to deploy advanced efficient energy technologies, and will promote the transfer and dissemination of CCTs, providing both general and specific information and data.

The final project report will summarize capture from the website content and workshop results aimed at encouraging development and deployment of CCTs in APEC member economies and non-member economies.

Professor Ma Xinbin, Dean of the School of Chemical Engineering & Technology at Tianjin University □ the largest Chemical Engineering School in China □ is managing the project, as an APSEC work element. APSEC will provide a more detailed report at the EWG53 Meeting on the project.

## **FUTURE WORK**

### **APEC Clean Fossil Energy Technical and Policy Seminar**

The EWG Strategic Plan 2014-2018 includes the following elements:

- Increase understanding of the relevant clean fossil energy technologies including carbon capture, use and storage (CCUS), promoting their efficient use, and facilitating access to these technologies by encouraging information exchange.
- Facilitate joint research and development on clean fossil energy technologies that are adapted to the needs of APEC Member Economies, as well as demonstrate and disseminate appropriate clean fossil energy technologies.

The EGCFE Clean Fossil Energy Technical and Policy Seminars are valuable in encouraging information exchange and accelerating progress towards timely realization of EWG Strategic Plan objectives.

The EGCFE's Clean Fossil Energy Technical and Policy Seminars have provided a valuable forum for exchange of information, discussion and contacts involving high-level government research officials, private sector experts and consultants. The next EGCFE Seminar is being discussed with Chinese Taipei.

The objectives of the Seminar will be:

- To share outlooks for coal demand and supply within the region among producers and consumers, and related issues, including coal industry restructuring and globalization, pricing, and supply reliability.
- New coal preparation and coal conversion technologies
- To consider issues associated with the use of a variety of clean power generation and conversion technologies, and their impact on the cost of electricity while addressing local and global environmental concerns.
- To promote cooperation among APEC economies to fulfil their development and investment objectives.

The Seminar program will follow the structure of past CFE events, with a strong policy and technical program. Speakers and delegates will be invited to attend from the entire APEC region. A Project Steering Committee, consisting of the United States, Japan, and possibly the host economy, will finalize details after decision on the funding request is made.

### **Concept Notes**

The following concept note was submitted for funding consideration during the second round of 2016.

#### **High Efficiency Coal-Fired Power Generation (Total: \$160,000; APEC: \$135,000)**

Fossil fuels, including coal, will continue to play a major role in meeting the growing electricity demand in the Asia-Pacific region for many years to come. More-efficient state-of-the-art coal power plant designs and operations are available than have been historically deployed in many APEC economies. Such plants represent a cost-effective means to reliably supply electricity (to support energy security and economic growth) while lowering greenhouse gas emissions (carbon dioxide, CO<sub>2</sub>) relative to older, less-efficient technologies.

The global status of state-of-the-art technologies and best practices for efficient coal-power power generation will be assessed through case studies of existing and planned power plants. Earlier EGCFE work in this area will be reviewed and recent advances in technologies and best practices for efficient coal generation that can reduce coal consumption and emissions of SO<sub>2</sub>, NO<sub>x</sub>, mercury, and particulates, along with CO<sub>2</sub> emissions, will be highlighted. Efforts will be made to showcase plants in operation or planned in the APEC region. These case studies will include information on plant design, coal types, emissions control technologies, along with summaries of management best practices to assure optimum reliable power plant performance. Attention will be given to explaining what makes a coal power design and

operating practice technically and economically viable in the region, including providing basis to deploy carbon capture, utilization, and storage options.

The following concept note was submitted for funding consideration during the first round of 2017.

*PREP – Peer Review on Efficient Power (Total: \$175,000; APEC: \$150,000)*

Coal will continue to meet much of the APEC region’s electricity demand for many years. Maintaining efficient operations is often difficult for developing economies as their coal-fired power plants age, owing to a lack of knowledge and resources – resulting in increased fuel consumption and emissions and higher operating costs. A PREP – Peer Review on Efficient Power initiative for coal power generation is proposed wherein experts will review current coal power generation practices in APEC developing economies. Modelled after the APEC PREE initiative, PREP Peer Review Teams from developed member economies will visit two volunteer economies in this first phase to collect information from government ministries and regulators, power utilities, industry associations, and other relevant stakeholders. A report on findings, including summaries of current coal power plant management practices to assure optimum reliable performance will be prepared for each volunteer economy and recommendations made to improve plant performance.

**Possible Future Directions for APEC EGCFE Projects**

- Further work on the water-energy nexus issue:
  - Reliability and synergies of energy and water systems
  - How stakeholders approach the water-energy nexus issues in energy planning
  - Efficiency of water use in fossil-based energy production and electricity generation
- Further developments in High-Efficiency Low-Emission (HELE) coal-based electric power generation plants
- Developing the content of an APEC unconventional gas census
- Furthering APEC members’ expertise in CCS