

EXPERT GROUP ON CLEAN FOSSIL ENERGY (EGCFE) PROGRESS REPORT TO THE 52nd MEETING OF THE APEC ENERGY WORKING GROUP (EWG 52)

A summary of administrative and project activities undertaken by the EGCFE since the EWG 51st Meeting is provided by the EGCFE Chair, Mr. Scott Smouse (USA).

ADMINISTRATIVE

The EGCFE's web site <www.egcfe.ewg.apec.org> has been maintained by USDOE's National Energy Technology Laboratory (NETL). A major review of the website was completed in mid-2015 with the aim to revamp the site by year's end. However, following relocation of the EGCFE Chair from NETL to DOE HQ, the update has been delayed pending securing adequate resources.

EGCFE Secretariat

Ms. Toshiko Fujita of JCOAL-JAPAC is the EGCFE Secretariat.

Support Contractor

Technical support to the EGCFE Chair is provided by Dr. Ian Torrens (USA) through a USDOE site-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.

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, the annual EGCFE seminar and associated business meeting were not held in 2013 and 2014. The next business/planning meeting will be held in conjunction with the next annual Seminar, which is has been proposed for ???? 2016 in Kuala Lumpur, pending approval of the Malaysian government.

PROJECT STATUS

(1) 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) is now underway. It will collect and share 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 objectives of this project were to collect and share information on:

- Developments to make coal-based power generation and conversion to synthetic natural gas and chemicals more efficient and less-water intensive;
- Recovery and reuse of water from coal-based energy production, including use of alternative sources of water and coproduction of water with carbon capture, utilization, and storage (CCUS);
- Policy and regulatory developments in APEC member economies related to the water-energy nexus for coal-based energy production.

The project is being carried out by Det Norske Veritas (DNV-GL), which was competitively selected from six contractor proposals received in response to an APEC RFP. A significant delay occurred in getting the project started, due to a number of factors. Several of the proposals were considered to be of similar high quality, so detailed evaluations needed to be carefully carried out and monitored. Delays also occurred

due to difficulties in obtaining evaluators for the proposals from three APEC economies. Three reviewers were eventually selected to carry out the evaluations, from China, Japan and the United States. Some issues arose regarding the comparability of the results provided by the reviewers, which required some discussion among the parties. All evaluations used the contractor bid evaluation process that had been developed by the EWG's Expert Group on Clean Fossil Energy. The final result was selection of DNV GL Clean Technology Centre Singapore as contractor for the project.

The end product of the project will be 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 will describe the nature and magnitude of the water-energy nexus, drawing from practical examples in regions where water is scarce, and highlight the technical, economic and institutional issues faced by power generation in such regions. A number of case studies will describe how specific power generating plants in such arid regions manage their water needs. The report will synthesize 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, including use of alternative sources of water and coproduction of water with carbon capture, utilization and storage. Policy and regulatory developments related to the water-energy nexus will be highlighted.

The project's long-term intended impacts are to put developing APEC economies with rapidly growing use of coal for electricity generation and production of SNG and chemicals in a position to deploy more efficient clean coal technologies as effectively and economically as possible, and to build professional capabilities and capacity for achieving this. Long-term sustainability is a key objective of the EWG forum. The results of the project are likely to identify more clearly the barriers to CCT deployment due to the water-energy nexus in the situations different APEC economies find themselves, and further APEC work may be necessary to resolve the issues and find the most efficient way forward. The next step will take the form of an APEC Water-Energy Nexus Expert Workshop (EWG 07 2015A), the proposal for which was approved by APEC on July 22, 2015.

DNV-GL submitted a preliminary version of a draft final report dated March 16, 2016. The text had serious problems of content, clarity and style. It appeared to have been written by more than one person, and parts of the document were better than others in terms of style and content. Some paragraphs were quite difficult to understand. The quality of the writing clearly needed attention by the author(s) to bring it up to the standard of an APEC published report.

A detailed review was necessary, which involved a substantial amount of work. Detailed changes were indicated to DNV-GL in the edit mode. Our general suggestion regarding the quality was that DNV-GL should have a substantial editing job done on the report before submitting a final draft for review.

A revised version of the final draft report was submitted it on June 24, 2016. Comments on the revised version were provided to to DNV-GL on July 14. However, the June 30 end-date of the contract was too short to complete the review and other steps involved in wrapping up the project by that date.

A request was therefore submitted to APEC to grant a further contract extension for the project, with a new end-date of November 30, 2016. Continuing contact is being maintained between the Project Overseer and the selected contractor to ensure that the revised schedule is being followed, and any unanticipated developments are being managed appropriately.

This is the first APEC-funded EGCFE project on the water-energy nexus. As such, the end product will distinguish itself from previous work elsewhere in the field by setting the water-energy nexus issues in the APEC context. The project outputs are expected to include substantive suggestions regarding possible future work on the water-energy nexus related to coal that the EGCFE can propose to APEC for funding. A follow-on EGCFE workshop to share the results of this study with APEC member economies has recently been accepted for funding by APEC. Also, a new study on some of the technical or policy aspects of this project could be suggested.

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

This expert workshop will build 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 Schlumberger [SBC Energy Institute](#)
- 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 a 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.

The first step in the implementation of this project has been submission of an RFP to the APEC Secretariat on August 5, 2016, for posting on the APEC website.

The project implementation timeline is currently:

- September 2016: RFP Issuance
- October 2016: Selection of contractor to organize the Expert Workshop
- November 2016: Contractor submits an organizational plan, consisting of proposed workshop program, suggested names of expert speakers from the public and private sector, and proposed timetable for the workshop and other program activities, for consideration by the project steering committee.
- December 2016: APEC representatives invited to nominate experts to attend the Workshop.
- January 2017: Contractor submits a final proposed program and list of speakers and active participants for the Workshop for approval.
- April 2017: Workshop held.
- June 2017: Proceedings and synthesis report for the Workshop, including presentations, speakers' documents, briefing papers, and other relevant information, prepared and submitted to APEC for publication. The report will contain suggestions, formed with input from the workshop participants, for follow-on work on water-energy nexus issues.

(3) 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, CO₂ 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" - CO₂ emissions per year, coal consumption per year, CO and CO₂ 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 Xinbin Ma, dean of the School of Chemical Engineering & Technology of Tianjin University – the largest Chemical Engineering School in China, is managing the project.

(4) 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 Malaysia's Ministry of Energy, Green Technology and Water for convening in Kuala Lumpur. An EGCFE Business Meeting will be held at the conclusion of the Seminar. A concept note will be submitted to support this Seminar.

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.

Chinese Taipei has expressed interest in hosting the following Seminar.

(4) Possible Future Directions for APEC EGCFE Projects

- Further work on the water-energy nexus issue:
 - Reliability and synergies of energy and water systems
 - How the various stakeholders approach the water-energy nexus issues
 - Efficiency of water use in energy production and electricity generation
- Recent developments in very high efficiency fossil fuel electric power generation plants
- Developing the content of an APEC unconventional gas census
- Furthering the APEC expertise in CCS capacity building