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Group of Experts on Cleaner Electricity Production from Fossil Fuels

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Geneva, 30 October 2015

Item 8 of the provisional agenda

Work Plan for 2016–2017

Draft Work Plan of the Group of Experts on Cleaner Electricity Production from Fossil Fuels for 2016–2017

I. Mandate

1. In its decision on matters relating to the Committee on Sustainable Energy of 25 March 2014 (ECE/EX/7, Annex II, Chapter III), the Executive Committee of the United Nations Economic Commission for Europe (ECE) mandated the Group of Experts on Cleaner Electricity Production from Fossil Fuels until December 2015, with a possibility of extension, to carry out concrete, result-oriented activities that significantly reduce greenhouse gas (GHG) emissions from electricity production from fossil fuels. These activities are to be developed and implemented with the active participation of ECE member States, representatives from the energy and financial sectors and civil society, independent experts and academia.

2. The Group of Experts has delivered on the concrete activities of the mandate and work plan for 2014–2015.

3. The Group of Experts recommends that the mandate be extended to December 2017.

II. Areas of work

4. According to its Terms of Reference, the Group of Experts will concentrate on the following areas of work:

(a) Regulatory and policy dialogue;

(b) Sharing best practices on cleaner electricity production from fossil fuels in the ECE region;

(c) Carbon capture and storage (CCS), as well as carbon utilization;

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- (d) Enhanced oil recovery with CO₂;
- (e) Advanced fossil fuel technologies for power generation;
- (f) Evaluation of efficiency enhancing measures for coal-fired power plants including steam generators, air and flue gas systems, steam turbines, generators.

III. Concrete activities in 2016–2017

5. The Group of Experts has explored a range of possible activities in the field of cleaner electricity production for it to pursue in the future and prepared detailed descriptions for consideration and recommendation by members through an open, transparent, and inclusive electronic process.

6. At its tenth session held in Geneva, 21 October 2014, the Group of Experts reviewed proposals for future activities in the field of cleaner electricity production and established several Task Forces to propose concrete and results-oriented activities for the Group of Experts, including:

(a) A Task Force to further explore activities that might be carried out in relation to work undertaken by other organizations, including the European Bank for Reconstruction and Development (EBRD) and the World Bank Group, in the area of cleaner electricity production;

(b) A Task Force, led by Swift Global Results with support from the International Energy Agency (IEA) Clean Coal Centre (CCC), to explore what work is currently being undertaken on goals, targets and indicators on efficiency of fossil fuel-fired power plants and the impact on GHG emissions with a view to developing best practice guidance. The Task Force was to undertake exploratory work and provide a report on its findings and any recommendations on potential future work to the Group of Experts;

(c) A small Task Force, including representatives from the United Kingdom and the United States of America, to determine if further work could be undertaken on the transfer of Carbon Capture Use and Storage (CCUS) technology;

(d) A Task Force to assess what the Carbon Sequestration Leadership Forum (CSLF) has already undertaken in relation to capture readiness. A representative from the United Kingdom agreed to lead this activity, with the support of Swift Global Results. Based on its initial research, the Task Force will submit a proposal on any future work for consideration by the Group of Experts.

7. The Bureau of the Group of Experts and the Task Forces, on the basis of the outcomes during the implementation of the Work Plan for 2014–2015 and consultations through an inclusive electronic process, are proposing that the Group of Experts undertakes the following activities under an agreed and self-imposed deadline of the next two years (2016–2017):

(a) Assess a future role for thermal power plants in sustainable electricity systems

Description: Electricity generation currently contributes to 40 per cent of annual global energy related CO₂ emissions. Nearly 70 per cent of all electricity is produced using fossil fuels and electricity demand is growing at a faster rate than other energy vectors (such as the direct use of oil, gas and coal) which makes decarbonizing power production an urgent imperative. Additionally, in 2012 for the first time the growth of renewables in new generation outpaced fossil fuels, increasing variability in electricity systems.

In the ECE region, 60 per cent of electricity is produced from fossil fuels, but national shares range from zero to 100 per cent and vary significantly across input fuels of coal, natural gas and oil. Large shares of natural resources of coal and natural gas in the region provide a ready resource for centralized electricity production, but in parts of the region there is also growth in the deployment of renewable generation and other distributed generation sources. The drivers for coal use across the countries will vary – with different weightings applied to energy security, energy affordability, electricity access and environmental sustainability.

It is expected that fossil fuels will remain an important and cost-effective fuel for electricity production on a global and regional basis, especially in the medium term, but the changing dynamics of electricity systems (such as the inclusion of energy storage and smart grid technologies) contribute to uncertainty on the role fossil fuels will play.

There are two main aspects to consider for fossil fuel generation to remain a viable part of future sustainable electricity systems: decreasing the carbon intensity of electricity production and increasing the flexibility of fossil generation to support deployment of variable renewable power generation. These aspects will be assessed under a systems context under this task. Targeted aspects such as flexible generation, efficiency of fossil based power generation and CCUS will be addressed specifically in separate activities.

Work to be undertaken:

- (i) Initial review of several relevant existing electricity systems and future development plans (including relevant indicators) based on both renewable energy and fossil fuel outlooks to evaluate a range of current approaches to develop sustainable electricity systems. This review will include consideration of drivers, technologies, policies and legal and market aspects that are needed to support development (first bibliography and short report by 1 May 2016);
- (ii) The secretariat and the Bureau of the Group of Experts identify and contact principal stakeholders from government and non-governmental sectors, academia and international organizations;
- (iii) The secretariat and Bureau draft a report for consideration by the Group of Experts by December 2016.

Deliverables: A draft of best practices in sustainable electricity system development relevant for the ECE region and suggestion of new targeted activities as identified.

Timeline: Final report by December 2017.

(b) Increasing flexibility in coal power generation

Description: Increasing the flexibility of existing and new coal power plants could allow for deeper renewable energy penetration and thus reduce the carbon intensity of system wide electricity generation. However, coal is mostly used as a baseload resource due to historical electricity system development and limited flexibility in design and operation procedures. Operating this capacity under a different operating regime could reduce efficiencies substantially (to the detriment of the carbon intensity reduction objective) and lead to non-compliance with other environmental limits (sulphur oxides (SO_x), nitrogen oxides (NO_x), and particulates, for example). However, with proper design and operating procedures, it seems possible to support larger renewable energy integration using coal as a flexible balancing resource where coal-fired power plants and fuel resources are abundant (the role of natural gas power generation for such purposes is being considered by the ECE Group of Experts on Gas).

Work to be undertaken:

- (i) The secretariat and a Task Force of dedicated members of the Group of Experts conduct an initial review of actors and existing information to avoid duplication of efforts;
- (ii) The secretariat and the Task Force identify gaps in information on interactions, complementarities and tensions at the nexus of coal power plants and renewable power generation;
- (iii) The secretariat and the Task Force prepare a background document on the nexus of coal power plants and renewable energy for consideration at the twelfth session of the Group of Experts;
- (iv) The secretariat and the Task Force present the findings at the twelfth session of the Group of Experts;
- (v) The Group of Experts considers possible next steps, including collaboration with qualified partners (international organizations, private sector, academia) in assessing an integration of coal power plants into future electricity systems with a larger proportion of variable renewable energy. Key aspects would be technology, policy and markets that can support flexible operation of plants.

Deliverables: A report assessing the opportunity for coordinated operation of wind- and/or photovoltaic-coal power plants.

Timeline: Final report by December 2017.

(c) Decreasing emissions and increasing efficiency from new and existing coal power generation using best practices across the ECE region and globally

Description: Both existing and new coal power generation will play an important role in global electricity systems in the short and medium term. It can be assumed that for each 1 per cent increase in efficiency of a coal burning power plant there is a 2–3 per cent reduction of CO₂ emissions and other air pollutants. Improving energy efficiency has been a focus of intensive energy research over the past two decades. As a result, there has been steady technological innovation towards increasing efficiency and reducing emissions from the power generation of fossil fuels, most notably from coal (where most of the research has been focused).

For existing plants, increasing the energy efficiency can offer both economic benefits while reducing GHG emissions. Over the past few years, some countries have recognized concerns with their increasing energy demand and ageing power plants. For example, Mongolia, Kazakhstan and Uzbekistan have recently begun programmes of modernization or of constructing new power plants. However, the average energy intensities in countries with economies in transition are generally still significantly higher than most other countries. Building on the efforts to implement the Work Plan for 2014–2015, as well as the scoping effort undertaken in preparing and developing this Work Plan, a number of best practices guidance documents for improving plant efficiencies were identified as well as an opportunity to disseminate best practice guidance. Collaborative opportunities have been identified with a number of partners that could support this effort in the region.

For new construction of coal-fired power plants, there are a number of High Efficiency – Low Emissions (HELE) coal power generation technologies that could increase efficiencies significantly and decrease power generation emissions in the region. Coal gasification, for example, is a promising technology that offers a versatile and clean way to convert coal into electricity, hydrogen, and other valuable energy products. Introduction of HELE technologies that enhance efficiency, environmental performance, and reliability is critical

for countries in which electricity generation is based on coal. Activities under this topic will be developed with a view to developing best practice guidance in the deployment of HELE technologies across the ECE region and globally. It will provide member States the opportunity to adjust policy and regulation in a way that could find the right answer to ongoing coal utilization and a pathway towards CCS retrofits.

Work to be undertaken:

Elaborate best practices for operation and maintenance of existing fossil fuel power plants

- (i) The secretariat and a Task Force of dedicated members of the Group of Experts will finalize the review of existing best practice approaches and formalize collaborative opportunities with organizations to disseminate this information and contribute to capacity building;
- (ii) Hold a number of capacity building events in the region and at ECE headquarters.

Deliverables: A summary of events carried out with an assessment of effectiveness based on agreed indicators.

Timeline: Final summary by September 2017.

Prepare a survey of High Efficiency-Low Emissions coal power generation

- (i) Initial review of existing literature on HELE technology developments and policy frameworks (first bibliography and short report by 1 May 2016), targeting specific technologies, such as coal gasification;
- (ii) Secretariat and the Bureau of the Group of Experts identify and contact principal stakeholders from government and non-governmental sectors, academia and international organizations;
- (iii) The secretariat and the Bureau draft a report for consideration by the Group of Experts by December 2016.

Deliverables: A survey of HELE technology best practices across the ECE region and globally.

Timeline: Final report by September 2017.

(d) Assess means for development and deployment of carbon capture, use and storage (CCUS) technology and know-how

Description: CCUS is starting to be demonstrated or deployed at scale for a broader range of applications with government support in a number of ECE member States. This is an essential first stage in bringing these technologies to the point where they can be regarded as a routine extension to the emission control equipment already fitted to fossil-fuelled power plants and large energy-intensive industrial processes. However, differences in CCUS knowledge, capacity for deployment, energy infrastructure and operating practices exist across the ECE region. There is also natural variation in the type and availability of deep geological CO₂ storage sites, as well as a lack of detailed storage assessments in many parts of the region. Whilst existing storage mapping initiatives are very active globally, in some parts of the ECE region such initiatives are extremely limited.

Know-how for CCUS development and deployment is an important way to support progress in developing countries. This will allow such countries to consider new technology options in the development of sustainable electricity and energy systems, especially as many countries have economies based on fossil fuels. Since it is likely that the majority of

CCUS capacity will be deployed in developing countries over the long term, such knowledge sharing has potential advantages for both the technology developer and user.

Work to be undertaken:

- (i) The secretariat and a Task Force of dedicated members of the Group of Experts will explore the range of specific requirements for CCUS technologies across member States that are developing or may need to develop CCUS capability in their energy mix (country-specific requirements for CCUS technologies). Through the utilization of questionnaires and the use of published data the secretariat, in cooperation with the Bureau, will establish what ECE member States are doing in the fields of CCUS development and deployment, or what role CCUS has in national plans for emission reductions. The questionnaires will also identify specific needs across various countries such as CO₂ storage mapping and CCS readiness and retrofit options;
- (ii) The secretariat and a Task Force of dedicated members of the Group of Experts will explore the possibility for CCUS readiness and retrofits. This will be carried out by leveraging previous work by the Group of Experts and in cooperation with the activities that focus on efficiency of thermal power plants;
- (iii) The secretariat and a Task Force of dedicated members of the Group of Experts will explore opportunities to engage with global CO₂ storage mapping initiatives, focusing especially on the parts of the ECE region that are not well mapped. This activity will also coordinate with and support the development of standards/common approaches to storage mapping through the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009;
- (iv) The secretariat will assess enablers for CCUS technologies across the region, as well as barriers to uptake.

Deliverables: A draft survey of CCUS technologies and know-how that will be shared between ECE member States and best practice guidelines for CCUS capacity building. Secondly, a report that outlines engagement on storage activities with external CCS organizations and progress on storage mapping in the ECE region.

Timeline: Final report by December 2017.
