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**ECONOMIC COMMISSION FOR EUROPE**

**COMMITTEE ON SUSTAINABLE ENERGY**

Ad Hoc Group of Experts on Cleaner Electricity  
Production from Coal and other Fossil Fuels

Second session  
Geneva, 17-18 November 2008

**REPORT OF THE AD HOC GROUP OF EXPERTS ON CLEANER ELECTRICITY  
PRODUCTION FROM COAL AND OTHER FOSSIL FUELS  
ON ITS SECOND MEETING**

**I. ATTENDANCE**

1. The second session of the Ad Hoc Group of Experts on Cleaner Electricity Production from Coal and other Fossil Fuels was held on 17 and 18 November 2008. Additional background papers and detail on the items summarized in the report are available on the UNECE website at: [http://www.unece.org/energy/se/docs/clep\\_ahge2.html](http://www.unece.org/energy/se/docs/clep_ahge2.html).
2. The meeting was attended by representatives of Albania, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Czech Republic, France, Germany, Greece, Italy, Kazakhstan, Kyrgyzstan, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Representatives of Algeria, China, and Qatar attended the meeting under article II of the Commission's terms of reference.
3. The following United Nations bodies and specialised agencies were represented: United Nations Framework Convention on Climate Change (UNFCCC), United Nations Industrial Development Organization (UNIDO), International Atomic Energy Agency (IAEA), and International Labour Organisation (ILO).

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4. The following intergovernmental and non-governmental organizations were in attendance: European Organization for Nuclear Research (CERN), Euracom, European Environmental Agency (EEA), European Association for Coal and Lignite (EURACOAL), European Commission (EC), International Energy Agency (IEA), International Sustainable Energy Organisations (ISEO), International Centre for Research on Biofuels and Patents, International Chamber of Commerce (ICC), International Committee for Coal and Organic Petrology (ICCP), International Union for Conservation of Nature (IUCN), Organization for Security and Cooperation in Europe (OSCE), Regional Cooperation Council (RCC), World Coal Institute (WCI) and World Energy Council (WEC), World Trade Institute (WTI).

## **II. ADOPTION OF THE AGENDA (Agenda item 1)**

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5. The agenda was adopted without amendments.

## **III. ACTIVITIES AND PRIORITIES OF THE COMMITTEE ON SUSTAINABLE ENERGY AND ANY MATTERS FOR CONSIDERATION BY THE AD HOC GROUP OF EXPERTS (Agenda item 2)**

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6. The Director of the Sustainable Energy Division, Mr. Fred Romig, opened the meeting and welcomed the participants. He noted that much had changed since the first session of the Ad Hoc Group of Experts in November 2007.

7. The Director underlined particular aspects of emerging new technologies for Cleaner Electricity Production and how to foster related investments. He stressed that in the UNECE region, electricity demand was expected to grow 50 per cent by 2030. Sixty per cent of current electricity production was fossil fuel-based and this trend was expected to continue given that 40 per cent of the world's natural gas reserves and 60 per cent of the coal reserves were in the UNECE region. To continue on a sustainable path, however, carbon dioxide emissions from fossil fuel combustion must be reduced or eliminated. One option for large-scale CO<sub>2</sub> mitigation was the carbon capture and storage (CCS) approach. Since the 1990s, developed countries had put considerable resources towards research, development and deployment of CCS technologies at several test sites around the world. CCS was moving towards commercialization.

8. Attention in this key area was now shifting from technical feasibility to addressing investments, the market and regulatory challenges including costs, development of legal and regulatory frameworks, and public acceptance. Still the limitation of CCS for power stations needed to be considered: extra processes involved incurred an additional energy penalty; storing carbon was risky and expensive.

9. He encouraged the Group of Experts to continue its efforts to promote investments in cleaner electricity production from coal and other fossil fuels, and suggested that a request for a

renewed mandate from the Committee should be included in the conclusions and recommendations of the meeting

#### **IV. ELECTION OF OFFICERS (Agenda item 3)**

10. The Group of Experts elected a new bureau to serve for 2009-2010: Mr. B. Terzic (United States of America) as Chairman; Mr. R. Crisp (United Kingdom), Mr. V. Budinsky (Czech Republic), Ms. M. Ersoy (Turkey), Mr. S. Shumkov (Russian Federation) and Mr. B. Gryadushchyy (Ukraine) as Vice-Chairmen.

#### **V. OPENING REMARKS FROM THE CHAIR (Agenda item 4)**

11. The Chairman delivered his opening remarks to the meeting.

#### **VI. REVIEW OF THE PROGRAMME OF WORK FOR 2007/2008 (Agenda item 5)**

12. For the period 2007-2008, the Ad Hoc Group of Experts dealt with several activities within its programme of work such as: the prospects for cleaner electricity production from fossil fuels and the flow of investments in the industry; the regulatory prerequisites for the promotion of investment in cleaner electricity production from fossil fuels; the comparative advantages of investments in new capacities including CCS technologies; the creation of an ECE-wide consensus on enhancing investments in thermal generation and in transmission and related infrastructure, and the UNECE-wide guidelines for measuring capacity adequacy in generation and transmission as well as on enhancing transparency of cross-border transmission.

#### **VII. TRUST FUND FOR THE WORK OF THE AD HOC GROUP OF EXPERTS (Agenda item 6)**

13. The Ad Hoc Group of Experts had substantial activities during 2008 on raising extra budgetary resources to undertake a project on fostering investment in clean electricity production from fossil fuels. Selected major companies and Governments expressed a preliminary interest in supporting the initiative and in providing the funding. However, the secretariat had delayed the pledge of resources pending the outcome of the decision of the United Nations Development Account, on a project on clean energy technologies which would give a considerable boost to the Ad Hoc Group's activities in years to come.

14. In close cooperation with United Nations Department of Economic and Social Affairs (UNDESA) and United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the UNECE secretariat under the guidance of the Chairman of the Ad Hoc Group of Experts prepared a detailed project for the United Nations Development Account on enhancing investment in advanced fossil fuel technologies for climate change mitigation and sustainable development in countries with economies in transition for the amount of USD 632,000. The project was approved by the UNECE Executive Office in September 2008 and is currently being considered by the United Nations Headquarters for financing. The description of the project is based on the relevant decisions of the Economic Commission for Europe, Committee on

Sustainable Energy and the Ad Hoc Group of Experts. Member States and corporate donors will be informed of any decisions taken by United Nations Headquarters.

15. The meeting confirmed its decision to establish a trust fund on fostering investments in cleaner electricity production with the support of a number of major companies and Governments which agreed to take an active role in shaping its focus and assisting in raising required funds. The Chairman and Bureau will circulate detailed proposals for the trust fund for comments. In addition to the member countries represented in the Bureau, the Ad Hoc Group of Experts noted with the appreciation the interest of delegates from European Union, Siemens, ENEL, Vattenfall, CCII (China) and Kazakhstan to take an active part in the process.

16. The ad Hoc Group of Experts will consider organising one or two workshops on the issue in 2009-2010 focusing on delivering the project's outputs which would have a tangible impact on promotion of investments in cleaner electricity production.

### **VIII. STATUS OF THE CARBON MARKETS INCLUDING PREPARATIONS FOR POST 2012 (Agenda item 7)**

17. During the meeting it was emphasized that the European Union (EU) had large CO<sub>2</sub>-intensive industries: power generation, cement, refineries, iron, petrochemicals, etc. The target for CO<sub>2</sub> emission reduction of 50 per cent by 2050 will not be possible with energy efficiency and the use of renewable alone. About one-third of the existing EU coal-fired power capacity will be replaced within the next 10 years, according to the European Commission (EC). Kyoto Protocol and EU commitments envisage a target reduction of at least 20 per cent in greenhouse gases by 2020. The European Commission believes that the Emission Trading Scheme (ETS) target cannot be met without CCS, which is not yet technically and commercially viable. In this framework the objectives of the EC are to ensure that CCS is a safe and responsible mitigation option, to support up to 12 CCS demonstration projects which would be operating by 2015, and to ensure that 160 million tonnes of CO<sub>2</sub> are captured in 2030, which is approximately 15 per cent of the reduction required in Europe. Although CCS is not yet commercially or technically proven, the CCS Directive can promote CCS if it contains a clear, reasonable and flexible legal framework, envisages financial support and a favourable, flexible liability regime, which would allow risk transfer. With legal certainty and flexibility, the private sector, with public support, could develop vehicles to finance CCS projects.

18. At the meeting representative of China underlined that China was improving its strategies for controlling GHG emissions through: acceleration of the transformation of the economic development pattern; optimization of macro-economic structure; optimization of the energy consumption structure by developing renewable energy, whose proportion in primary energy consumption would increase to 10 per cent by 2010 and 15 per cent by 2020 respectively with huge investment; improvement of public awareness of climate change and strengthening of mechanisms to deal with climate change. China was establishing a mechanism to reduce GHG emissions, encourage CCS development and promote clean development mechanism carbon trade. He also explained that China actively participated in international activities for Climate Change mitigation.

19. The representative of ILO presented his organization's views and commitments on realizing a low-carbon world through the creation of jobs and increasing safety at work. Green Jobs initiative should create decent jobs which contribute to preserving or restoring environmental quality. In particular, Green Jobs address two major challenges: the environmental challenge and the decent work challenge. It was estimated that the renewable energy sector created about 2.5 million jobs in 2006. This figure is about half the current employment in the extraction sector. Biomass alone created about 1.2 million jobs, accounting for about 50 per cent of the overall employment in the sector. ILO adopted the 'Prevention of Major Industrial Accident Convention, No. 174' whose aim is to cope with the sudden occurrence of major industrial accidents by providing comprehensive national frameworks for major hazard control. It also facilitates a systematic national action for accident prevention and mitigation, as well as collaboration among government authorities and stakeholders. Convention No. 174 strongly suggests the inclusion of pipelines as a part of major hazard installations.

### **IX. CLEANER ELECTRICITY FORUM – CARBON CAPTURE AND STORAGE (Agenda item 8)**

20. A Forum on carbon capture and storage held during the session addressed the current state of CCS technology and market developments, the launch of the CCS Regulator's Network and ways of financing CCS projects. The Forum also discussed the deployment of CCS in Europe and North America as well as CCS awareness and readiness in the emerging economies of the ECE region, and the contribution of CCS to energy security and sustainable development.

21. The Forum confirmed that there was a vital need for the development of cleaner electricity production from coal and other fossil fuels to balance the expected demand and supply electricity scenarios.

22. The representative of UNFCCC underlined that the CCS may become more important as a cost-effective way to reduce CO<sub>2</sub> emissions. However a favourable business climate and a significant CO<sub>2</sub> infrastructure were required to achieve widespread deployment (e.g., the role of integrated regional CO<sub>2</sub> transport networks as well as the role of companies and governments to build and operate these networks need policy developments).

23. The presentations on new directives on CCS rules and regulations and CCS technology implementation, as well as on the CO<sub>2</sub> market formation and development, illustrated that numerous challenges remained to be resolved to make available CO<sub>2</sub>-free fossil fuels based electricity production. CCS is a viable technology option, but carbon capture is a critical technology issue, and carbon storage is a geological and monitoring issue. The increase of plants' efficiency is crucial to balance the efficiency losses provoked by CCS. Large-scale demonstration plants and further R&D are necessary to limit the risks and lower the overall costs. CCS could play a key role in combating climate change. An EU CCS demonstration programme is required to make CCS commercially viable by 2020. Industry is ready to bear the risks and base plant costs while requesting €7 to €12 billion in public funding.

24. The meeting reviewed the EU proposals to amend the EU ETS (Emission Trading Scheme) and adopt a CCS directive. EU Member States might in the future fund CCS projects through emission allowance revenues – proceeds to be earmarked for climate change. Also it was noted

that if Member States and industries did not develop CCS quickly enough, the EU might consider making it mandatory, but no funds would be directly provided by the EU before the 2014 budget.

25. Panellists mentioned that CCS in the United States of America was not economic and subsidies would be needed for construction first plants. Some regulation was in place, but legislation is needed to resolve uncertainties. Utility bond-holders required certainty on CCS liability with no indefinite long-term risk exposure. Private owners and insurance could manage first losses and states might want to share risks to encourage plant construction. With a heavy dependence on coal-based electricity in some US regions, CCS was vital for progress on carbon emissions. If risks related to CCS were addressed through a mix of policies and construction of demonstration projects, CCS would help to fight climate change: by 2020, all power plants could be forced to be carbon capture-ready, and there could be regulation on the average amount of CO<sub>2</sub> per kW/h that installations would be allowed to emit. Also it was stressed that there were some difficulties in design regulation because the real costs of CCS were still unknown.

26. In the session on deployment and development of CCS, the Forum expressed the conviction that CCS makes our ambitious climate goals achievable. To prove CCS economically viable by 2020 demonstration plants were needed. Electricity utilities would have to undertake massive investments in clean coal technologies for power generation taking into account the conditions in the carbon market. CCS development was essential to put EU industries and ECE at the forefront of the rapidly growing low carbon technology sector. The transition to a low carbon economy would have profound consequences for energy security, climate change, growth and jobs.

27. Experts expressed the belief that use of coal in power sector was only compatible with the climate challenge if highly-efficient plants predominated and CCS was widely available. Coal and other fossil fuels would remain an important part of the energy mix, but solutions addressing carbon footprints were needed that could deliver the above-mentioned EU climate target at the lowest cost. Demand for climate-friendly energy generation and the replacement of aging conventional generation facilities would complement each other.

28. The delegation from Italy underlined that Enel CCS projects were also based on the views expressed by the European Institutions and the Zero Emission Fossil Fuel Power Plants Technology Platform that fossil fuels would have a primary role for electricity generation in the decades to come. The contribution of coal to power generation is also essential for security of supply. Only the implementation of CCS technologies would allow the continued use of fossil fuels compatible with the objectives to reduce GHG emissions in the atmosphere. Italy had theoretically a significant potential for CO<sub>2</sub> geological storage in deep saline aquifers. In fact related studies were in progress to evaluate in detail the storage potential.

29. The meeting was also informed about the CCS situation in Poland. Research in Poland on CO<sub>2</sub> storage started in 2001. The Polish Ministry of Economy in cooperation with scientific and industrial partners was preparing a project on: clean coal in electrical power engineering which would determine the scope of the activities necessary to introduce CCS technology in demonstration projects on an industrial scales. Several proposals for demonstration projects had been prepared so far, but only two of them might be approved. In November 2008 official agreement was announced on the programme on recognition of the formations and structures

suitable for safe geological storage of CO<sub>2</sub>, together with a monitoring programme. Its total cost, estimated at US\$ 11 million, would be entirely covered from the National Environmental and Water Management Fund and managed by the State Geological Institute (PIG). It will analyse the characteristics of the formations and structures suitable for CO<sub>2</sub> storage, elaborate statistical models of geological formations and dynamic processes of injection, elaborate a monitoring programme for selected underground CO<sub>2</sub> storage sites and summarize geological sequestration of CO<sub>2</sub> research and works performed in Poland and in Europe so far.

30. The delegation of Turkey explained that coal was the most important energy resource in Turkey and that use of domestic coal, particularly for electricity generation, had to be increased. Its quality was quite low and clean coal technologies needed to be promoted. CCS studies are at

a very preliminary stage. One ongoing project on CCS Technologies in Turkey was an investigation of CO<sub>2</sub> storage at underground geological stratas. Other examples of initiatives which are linked and cover CCS Technologies were the CBM project and SOMALOX project. One of the objectives of the CBM Project was to investigate suitable underground stratas for CO<sub>2</sub> storage within the soma lignite basin in Turkey. Additionally, one of the expected outputs of the SOMALOX Project (retrofitting a pulverized lignite power plant for oxy-fuel combustion for FP7 ENERGY 2008) was to demonstrate the CO<sub>2</sub> capture potential of the retrofitted plant.

31. The energy policies and goals of Kazakhstan were presented. The main objectives of government policy in the energy sector were to ensure the fuel and electricity independence of the country, create fuel and electricity markets, create legislation to encourage the development of the energy sector, implement energy saving policy so to improve the ecological situation as well as involve renewable sources of energy in the energy balance of Kazakhstan.

32. It was also underlined that applications of CCS technologies did not conflict with the energy policy of Kazakhstan. In fact the availability and further development of coal-fired power plants, the significant number of oil and gas deposits – both continental and offshore and the possibility of other geological formations for CO<sub>2</sub> storage might favour CCS applications. The delegation also explained that the country was working on deployment of CCS technologies in Kazakhstan, examining possible measures to stimulate the construction and operation of sustainable fossil fuels technologies in commercial power generation, developing an enabling framework for CCS and promoting public acceptance of carbon capture and storage.

33. Presentations provided to the secretariat are available on the ECE website (<http://www.unece.org/energy/se/pp/clip/ahge2.htm>).

#### **X. PROGRAMME OF WORK FOR 2009-2010 (Agenda item 9)**

34. The Ad Hoc Group of Experts will continue or develop the following activities in 2009-2010:

- (a) Analysis: Review the prospects for cleaner electricity production from fossil fuels and the flow of investments in the industry with an emphasis on measures and incentives, which would promote investment in cleaner electricity production. The analysis would include the evaluation of reserve margins across the ECE region and a comparison of related policies and regulations.

- (b) Electricity trade assessment: Determine regulatory prerequisites for the promotion of investment in cleaner electricity production from fossil fuels through the exploration of long-distance east-west electricity trade opportunities and interconnection capacities.
- (c) Business strategies: Appraise the comparative advantages of investments in new capacities, plant and end-use efficiency, structural adjustment of fuel use and reliance on carbon capture and storage (CCS) technologies.
- (d) Innovation: Survey CCS awareness and readiness particularly in the emerging economies of the ECE region; assist in the development of compatible regulatory frameworks.
- (e) Policy guidelines: Foster the creation of an ECE-wide consensus on enhancing investments in thermal generation and in transmission and related infrastructure, in particular cross-border transfer capacities and procedures.
- (f) Norms: Begin work on developing UNECE-wide guidelines for measuring capacity adequacy in generation and transmission as well as on enhancing transparency of cross border transmission.

35. After discussion, the Ad Hoc Group of Experts:

Approved the programme of work for 2009-2010 with focus on fostering investments in cleaner electricity production from coal and other fossil fuels.

## **XI. OTHER BUSINESS (Agenda item 10)**

36. It was decided that the third session of the Ad Hoc Group of Experts would take place on 14-15 May 2009 and the fourth session on 16-17 November 2009.

## **XII. ADOPTION OF THE REPORT (Agenda item 11)**

37. Delegations accepted the proposed conclusions and recommendations and adopted the report of the meeting.

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