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Group of Experts on Cleaner Electricity Production from Fossil Fuels

Eleventh session

Geneva, 30 October 2015

Report of the Group of Experts on Cleaner Electricity Production from Fossil Fuels

I. Introduction

1. The eleventh session of the Group of Experts on Cleaner Electricity Production from Fossil Fuels was held on 30 October 2015.¹
2. This report summarizes the discussions on the work of the Group of Experts at its eleventh session. All the documents and presentations of the eleventh session are available on the United Nations Economic Commission for Europe (ECE) website.

II. Attendance

3. The meeting was attended by experts from the following ECE member countries: Czech Republic, Kazakhstan, Kyrgyzstan, Norway, Poland, Romania, Russian Federation, Serbia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America, and Uzbekistan.
4. A representative from the European Union participated.
5. An expert from Ethiopia participated under Article 11 of the Commission's Terms of Reference.
6. The following international organization was represented: the International Energy Agency (IEA).

¹ Official documents of the session are available at <http://documents.un.org/>. Unofficial room documents and presentations delivered at the meeting are available on the ECE website at: <http://www.unece.org/index.php?id=38533>.

7. Representatives of the following non-governmental organizations participated: Association des ONG de l'Environnement, The Association of Mining Towns in Donbass, European Association for Coal and Lignite (EURACOAL), Global Carbon Capture and Storage Institute, IEA Clean Coal Centre, Japan Coal Energy Center (JCOAL), World Business Council on Sustainable Development and the World Coal Association.

8. In addition, the private sector was represented by experts from over five companies. Academia was also represented by experts from three universities.

III. Adoption of the agenda (agenda item 1)

Documentation: ECE/ENERGY/GE.5/2015/1

9. The provisional agenda as contained in the document ECE/ENERGY/GE.5/2015/1 was adopted without amendment.

IV. Election of Officers (agenda item 2)

10. The Group of Experts elected a Bureau for a term of two years.

11. The Bureau comprises: Mr. Barry Worthington (United States) as Chair, Mr. Vladimir Budinsky (Czech Republic), Mr. Sergey Katyshev (Kazakhstan), Mr. Leon Kurczabinski (Poland), Mr. Sergey Shumkov (Russian Federation), Ms. Milena Djakonovic (Serbia), Ms. Mucella Ersoy (Turkey), Mr. Borys Griadushchyi (Ukraine), Mr. Jon Gibbins (United Kingdom) and Mr. Rasmus Valanko (World Business Council on Sustainable Development) as Vice-Chairs.

12. The delegation from the United States and the Russian Federation raised questions regarding the procedure for nomination of members of the Bureau, in particular the nominee from the World Business Council on Sustainable Development (WBCSD) who was not nominated by a member State. The Group of Experts and delegations agreed on the value of the involvement of the WBCSD in the work of the Group of Experts and further agreed that the nomination process for the WBCSD representative to the Bureau would not be considered as setting a precedent for other ECE expert groups, groups of specialists, or intergovernmental bodies.

V. Opening remarks (agenda item 3)

13. The session opened with an address by the Chair of the Group of Experts on Cleaner Electricity Production from Fossil Fuels. He highlighted the ongoing importance of this Group of Experts as the world transitions to a sustainable energy future. He emphasized that whilst there will increasingly be changes in how fossil fuels are used, they will continue to have an important role in global energy systems.

14. The Chair also welcomed the participants, noting a number of attendees were taking part for the first time. He noted that as the Group of Experts is discussing its future work plan, this is an excellent time to become engaged in the Group's activities.

15. The Chair thanked the Bureau members for their efforts and commitment since the tenth session. He also thanked the chairs and members of all the task forces.

16. The Chair drew attention to the draft set of conclusions and recommendations circulated prior to the meeting, noting that this was the method of working for the Group of Experts adopted at its tenth session and which is in line with the Guidelines on Procedures

and Practices for ECE Bodies that were adopted by ECE at its sixty-fifth session in April 2013. He emphasized that the draft conclusions and recommendations are not intended in any way to prejudice the discussions but rather to provide a draft text to facilitate discussions. The Group of Experts agreed to consider and approve conclusions as the agenda items were discussed rather than considering them *en bloc* at the end of the meeting.

17. The Executive Secretary of ECE welcomed the participants as key stakeholders in an industry that is critical for the world's future. He noted that the transition to a sustainable energy system requires energy efficiency from source to use, minimization of environmental impacts, reduction of energy and carbon intensities, and correction of energy market failures. Full integration of the energy markets of the ECE region under an efficient framework would significantly improve the essential technical, social, economic, and environmental contribution that energy must make. This scale of change requires increased emphasis on "systems thinking" where all technologies are included – no one technology will solve all the problems the world's energy sector is facing. He highlighted the importance of the twenty-first Conference of the Parties (COP 21) to the United Nations Framework Convention on Climate Change (UNFCCC) meeting in Paris, 30 November – 12 December 2015, emphasizing that it is **not** a "road to Paris" but rather **it is** a "road through Paris". This point was made to articulate that COP 21 will set the framework for the significant work that needs to happen over the years to come. He also highlighted the importance of the recently adopted Sustainable Development Goals.

18. Mr. Charles Soothill, Chief Technology Officer of Alstom Power delivered a keynote address to the Group of Experts, offering a picture of how electricity systems are evolving already today, and how Alstom Power sees this continuing in the future. Mr. Soothill encouraged all member countries to consider a very different electricity system in the future compared to recent past experiences. Additionally he emphasized the importance of improved efficiency of fossil-based generation as a pathway to low-carbon electricity production from fossil fuels using Carbon Capture and Storage (CCS). Mr. Soothill noted the current lack of support for uptake of CCS and highlighted the need for consistent and stable policy frameworks.

19. The Chair thanked ECE for the unique platform it offers in allowing such a diverse range of stakeholders and regions that can come together for the global good.

VI. Introduction of participants (agenda item 4)

20. A tour de table was conducted during which all participants introduced themselves.

VII. Activities and priorities of the Committee on Sustainable Energy and any matters for consideration by the Group of Experts on Cleaner Electricity Production from Fossil Fuels (agenda item 5)

21. The Director of the Sustainable Energy Division of ECE provided an update on the relevant outcomes of the twenty-third session of the Committee on Sustainable Energy, 19–21 November 2014.

22. The Director drew attention to the work of the other subsidiary bodies of the Committee of most relevance to the Group of Experts. In particular, he outlined the work of the four Task Forces on the Group of Experts on Gas which are focusing on development of Best Practice Guidance in Reducing Gas Leaks in the Gas Value Chain, Best Policy

Practices on the Role of Natural Gas in Significantly Increasing the Uptake of Renewable Energy in the ECE, Best Practice Policy Guidance for Liquefied Natural Gas (LNG) and Removing Barriers to the Use of Natural Gas as a Transportation Fuel. He also outlined the work on methane management from all extractive activities that is being carried out under the auspices of the Committee on Sustainable Energy.

23. The Director further highlighted that the Expert Group on Resource Classification continues to develop and broaden application of the United Nations Framework Classification for Fossil Energy and Mineral Resources 2009 (UNFC-2009). In particular, he drew attention to the current work to broaden application of UNFC-2009 to injection projects for the purpose of geological storage of CO₂.

24. In closing, the Director highlighted that ECE is an organization that develops standards, best practices and other normative instruments. By working across its broad membership and stakeholder base – in many cases, in concert with the other United Nations regional commissions – ECE can provide needed normative instruments that will allow others to act. By providing the standards, normative instruments and best practices, ECE is helping establish the stable investment framework conditions that are being requested by industry. He encouraged industry to engage with governments using the platform offered by ECE. ECE cannot deliver credible results without industry being at the table together with governments.

VIII. Report and recommendations from the workshop and stakeholder consultations on cleaner electricity production from fossil fuels (agenda item 6)

25. The Group of Experts noted with appreciation the collaboration with the Electric Power Research Institute (EPRI) in the development of and expert participation in the workshop. The Group of Experts recommended that cooperation with EPRI be strengthened.

26. The Group of Experts noted the conclusions of the workshop on the importance of improving power plant efficiency for economic and sustainability benefits, whilst observing that this is only an initial step on the pathway to low-carbon electricity production from coal. Low-carbon solutions such as carbon capture, use and storage and flexible operation of power plants in support of variable renewable generation technology are essential to decarbonize the electricity system whilst continuing to use fossil fuels.

27. The Group of Experts recommended that the conclusions and recommendations of the workshop and stakeholder consultations be considered in its 2016–2017 work plan.

28. The Group of Experts recommended that a one-day workshop and stakeholder consultations be organized immediately prior to the twelfth session.

IX. Report and recommendations from the work of the Task Forces (agenda item 7)

Documentation: CEP-11/2015/INF.4 – Unofficial room document: Baseline Efficiency Analysis of Fossil Power Plants *dated 9 October 2015*
CEP-11/2015/INF.3 - Unofficial room document: Exploration of Collaborative Opportunities with Regional Development Banks *dated 9 October 2015*

CEP-11/2015/INF.2 - Unofficial room document: Status of Global
Carbon Capture and Storage Readiness (CCSR) Discussion, *dated 9
October 2015*

29. An overview of the work and outcomes of the five task forces was provided².
30. The Group of Experts noted that it had delivered on the concrete activities of its Task Forces, as well as its mandate and work plan for 2014–2015. The Group of Experts will report on achievements and key milestones at the twenty-fourth session of the Committee on Sustainable Energy.
31. The Group of Experts expressed its appreciation for the work undertaken by the five Task Forces.

X. Work plan for 2016–2017 (agenda item 8)

Documentation: ECE/ENERGY/GE.5/2015/3 – Draft Work Plan of the Group of Experts on Cleaner Electricity Production from Fossil Fuels for 2016–2017 *dated 12 August 2015*

32. The Group of Experts reviewed and discussed its draft Work Plan for 2016–2017.
33. The Group of Experts recommended that its draft work plan for 2016–2017, as edited and attached as an annex to this document, be submitted to the Committee on Sustainable Energy for endorsement and then to the ECE Executive Committee for subsequent approval.
34. The Group of Experts recommended to the Committee on Sustainable Energy that its mandate be extended to 31 December 2017.

XI. Preparations for the twelfth session of the Group of Experts (agenda item 9)

35. The twelfth session of the Group of Experts will be held in October or November 2016 in Geneva or another location if appropriate.

XI. Other business (agenda item 10)

36. The Group of Experts noted the challenge to complete its work in one day and recommended that consideration be given to increasing the duration of future meetings of the Group of Experts to one and a half or two days.
37. The Group of Experts recommended to the Committee on Sustainable Energy that its annual sessions be supported by parliamentary documents and reports as needed in relation to the implementation of the work plan 2016–2017. The Group of Experts further recommended to the Committee on Sustainable Energy that the secretariat be invited to continue supporting its work by, inter alia, the following: organizing planned work plan activities, preparing formal documentation required for the development, approval,

² (a) Task Force on increasing efficiency of fossil fuel-fired power plants and potential normative instruments
(b) Task Force on collaboration with global and regional developments banks
(c) Task Force on goals, targets and indicators on efficiency of fossil fuel-fired power plants
(d) Task Force on carbon capture, use and storage technology transfer
(e) Task Force on carbon capture readiness.

implementation and reporting of work plan activities, including the translation of official documents in the three official ECE languages (English, French, Russian) to service the Group of Experts' meetings.

38. The Chair noted that the topic of smart grids could be addressed under the Committee on Sustainable Energy. By covering the topic under the Committee the broad role that smart grid technologies play in electricity systems could be better reflected rather than being placed in a given group of experts.

39. No other issues were raised.

XII. Adoption of conclusions and recommendations (agenda item 11)

Documentation: CEP-11-2015-INF.1 - Unofficial room document: Draft Conclusions and Recommendations arising from the Group of Experts on Cleaner Electricity Production from Fossil Fuels *dated 14 October 2015*

40. The conclusions and recommendations were adopted and are included under the relevant agenda items highlighted in this report.

XIII. Adoption of the report and close of the meeting (agenda item 12)

41. The report of the meeting was adopted, including the conclusions and recommendations, subject to any necessary editing and formatting.

Annex

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;
 - (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 system and future development plans and/or scenarios (including relevant indicators) based on both renewable energy and fossil fuel outlooks to evaluate a range of current approaches to develop sustainable electricity systems and possibly in the context of the broader energy system. 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 the twelfth session.

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 coal power plants with variable renewables (eg. wind and/or photovoltaic), seasonal variations and/or other stressors in the system.

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.
