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**Economic Commission for Europe****Committee on Sustainable Energy****Thirtieth session**

Geneva, 22-24 September 2021

Item 7(d) of the provisional agenda

**Future work of the Committee on Sustainable Energy:****Approval of documents****Work Plan of the Group of Experts on Cleaner Electricity Systems for 2022-2023****Prepared by the Group of Experts on Cleaner Electricity Systems****I. Introduction**

1. The Group of Experts on Cleaner Electricity Systems (Group of Experts) carries out concrete, result-oriented activities that contribute to transformation of energy systems and promote reduction of greenhouse gas (GHG) emissions from fossil fuel-fired electricity generation. These activities are developed and implemented with the active participation of the member States of the United Nations Economic Commission for Europe (ECE), energy companies, the financial sector, civil society, academia and independent experts.
2. The areas of work of the Group of Experts are regulatory and policy dialogue on modernization and decarbonization of electric power systems: sharing best practices in the field of cleaner electricity systems in the ECE region; effects of electrification of transport and commercial and buildings heating and cooling on current grid systems; interplay of technologies, including between flexible clean coal, natural gas and renewable energy; carbon capture, use and storage (CCUS); advanced fossil fuels technologies for power generation, including high-efficiency, low-emissions (HELE) technologies; nuclear power; hydrogen; financing clean energy projects; digitalization of electricity systems.<sup>1</sup>
3. Based on the outcomes of the implementation of the Group of Expert's Work Plan for 2020-2021 and the recommendations from the Group of Experts and its Bureau, the Group of Experts will undertake a number of activities, several of which represent a continuation with adjustments as needed from the Work Plan for 2020-2021. The Group of Experts requests the Committee on Sustainable Energy to renew its mandate until 31 December 2023, with the possibility of extension.

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<sup>1</sup> The areas of work are as per the following documents: Group of Experts on Cleaner Electricity Systems Work Plan for 2018-2019 (ECE/ENERGY/2017/6 and ECE/ENERGY/GE.5/2017/3), Group of Experts on Cleaner Electricity Systems Work Plan for 2020-2021 (ECE/ENERGY/2019/7) and Report of the sixteenth session of the Group of Experts on Cleaner Electricity Systems (ECE/ENERGY/GE.5/2020/2).

4. The activities proposed in this Work Plan ensure that the work of the Group of Experts contributes to efforts by countries to deliver on the objectives of the 2030 Agenda for Sustainable Development and attain carbon neutrality. In addition, following the request of the Committee on Sustainable Energy at its twenty-ninth session and the proposed Strategic Review of the sustainable energy subprogramme to explore opportunities for closer cooperation among its subsidiary bodies, all the proposed activities in this Work Plan are cross-cutting in nature and will be implemented in close cooperation with the other subsidiary bodies of the Committee depending on their scope and mandates.

5. The Group of Experts notes that under the current resource constraints the successful implementation of the 2022-2023 Work Plan requires the institution of dedicated Task Forces. When deciding on which activities to pursue, the Group of Experts therefore has considered the willingness of experts to take a leading, or at least an active role in the work of these Task Forces and other Groups of Experts between sessions as one of the key selection criteria.

6. The Group of Experts further particularly emphasises that its new activities necessitate expanding the expert base of the current Group of Experts, both geographically and substantively.

## **II. 2022-2023 Activities**

### **A. Electricity as a driver for achieving deep transformation of the energy system**

#### **Description:**

7. Electricity continues to be a pacing factor for energy systems' transformation. Power plants are becoming more flexible and low- and zero-carbon technologies are decarbonizing electricity generation. The traditional electricity supply and demand will need to evolve to reflect the increasing distribution of energy assets, benefiting from novel technologies that support individual energy risks and safeguard the environment. The power system will need to deliver greater demand flexibility and responsiveness.

8. Further integration of e-mobility and electric heating and cooling will add a significant load to the system, leading to potential congestion in conventional power networks, as these are not designed for shifts in electricity demand. At the same time, these assets are a source of flexibility and increased local self-sufficiency if managed adequately.

9. A well-planned integration of emerging electricity uses, such as electric vehicles or heat pumps, can significantly reduce the need for grid expansion. The deployment of community scale and household-wide renewable energy units can provide flexibility and grid resilience, especially if local energy trading is activated, as enabled by new legislation in the European Union and the Federal Energy Regulatory Commission Order No. 2222 in the United States of America. Such a systemic approach to new electricity applications in mobility and household heating and cooling would add value to grid beneficiaries and help reduce the carbon footprint of the energy sector across the ECE region.

#### **Work to be undertaken:**

(a) The Group of Experts will assess the impact and integration opportunities of e-mobility and electric heating devices (e.g. heat pumps) on power system design and operation;

(b) Provided needed extrabudgetary funds or in-kind contributions are identified, the Group of Experts will collect relevant case studies and lessons learnt from policies implemented by ECE member States over the past several years in the field of e-mobility and emerging electricity applications for household and commercial heating and cooling.

**Deliverables and Timeline:**

(a) Roundtable on the impact and integration opportunities of e-mobility and electric accumulation heating systems on power system design and operation, by November 2023;

(b) Background document on the impact and integration opportunities of e-mobility and electric accumulation heating systems on power system design and operation. First draft by November 2022, final draft by November 2023;

(c) Case studies from ECE member States on the results achieved through the implementation of policies supporting the development and system integration of e-mobility and the accumulation of electric heating, by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role).

**B. Technology interplay under a carbon neutral energy system****Description:**

10. Achieving the carbon neutrality of an energy system will require a holistic approach and an “all technology” strategy involving accelerated deployment of energy efficiency, renewable energy, CCUS, HELE, hydrogen, nuclear power, CO<sub>2</sub> removal or other approaches such as increasing forests’ absorptive capacity. Recognising that ECE member States take different views regarding the use of fossil fuels, CCUS, and nuclear power, technology portfolios can be adapted by member States and subregions to reflect their unique circumstances.<sup>2</sup>

11. The Group of Experts will continue building on the findings from the extrabudgetary project on “Enhancing the understanding of the implications and opportunities of moving to carbon neutrality in the ECE region across the power and energy intensive industries by 2050” (Carbon Neutrality project) that was implemented under the auspices of the Group of Experts from 2020-2021.

12. In cooperation with the Group of Experts on Renewable Energy, the Group of Experts on Gas and the Expert Group on Resource Management, the Group of Experts will look into technology interplay, including technical and societal nexus areas for a range of technologies including low carbon technologies (i.e. coal with CCUS, gas with CCUS), zero-carbon technologies (i.e. CCUS, nuclear power), negative carbon technologies (i.e. bioenergy with carbon capture and storage (BECCS), direct air capture with carbon storage (DACCS)), as well as innovative solutions (i.e. hydrogen). Further extrabudgetary resources are necessary to fund future technology deep dives.

**Work to be undertaken:**

(a) The Group of Experts in cooperation with the Group of Experts on Gas and the Expert Group on Resource Management will share recommendations with ECE member States and the wider stakeholder community on the role of CCUS to attain carbon neutrality, for those countries who choose to implement this technology, and will adapt them for different subregions as appropriate;

(b) The Group of Experts in cooperation with the Group of Experts on Renewable Energy and the Group of Experts on Gas will share recommendations with ECE member States and the wider stakeholder community on the role of hydrogen to attain carbon neutrality and will adapt it for different subregions as appropriate;

(c) The Group of Experts in cooperation with the Group of Experts on Energy Efficiency will share recommendations with ECE member States and the wider stakeholder community on carbon neutral energy intensive industries and will adapt the recommendations for different subregions as appropriate;

<sup>2</sup> As per the following documents: ECE/ENERGY/133 para 28; ECE/ENERGY/GE.5/2020/8 Rev.1 Carbon Neutrality Framework; and ECE/ENERGY/GE.5/2020/2 para 17.

(d) The Group of Experts in cooperation with the Expert Group on Resource Management will share recommendations with ECE member States and the wider stakeholder community on the role of nuclear power to attain carbon neutrality, for those countries who choose to implement this technology, and will adapt it for different subregions as appropriate;

(e) Provided needed extrabudgetary funds or in-kind contributions are identified, the Group of Experts in cooperation with the Group of Experts on Renewable Energy and the Group of Experts on Gas will conduct analysis on sustainable hydrogen production pathways across the ECE region;

(f) Provided needed extrabudgetary funds or in-kind contributions are identified, the Group of Experts in cooperation with the Group of Experts on Gas and the Expert Group on Resource Management will conduct an analysis of the potential of hydrogen hubs and carbon storage hubs across the ECE region and their role to decarbonize hard to abate sectors (i.e. energy intensive industries, long-haul transport etc.).

**Deliverables and timeline:**

(a) Roundtable on the role of CCUS and carbon storage hubs in the ECE region in cooperation with the Group of Experts on Gas and the Expert Group on Resource Management, by November 2022;

(b) Roundtable on sustainable hydrogen pathways and the role of hydrogen hubs in the ECE region in cooperation with the Group of Experts on Gas and the Group of Experts on Renewable Energy, by November 2022;

(c) Roundtable on the role of nuclear power in the ECE region in cooperation with the Expert Group on Resource Management, by November 2022;

(d) Roundtable on carbon neutral energy intensive industries in the ECE region in cooperation with the Group of Experts on Energy Efficiency, by November 2023;

(e) Analysis on sustainable hydrogen production pathways across the ECE region by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role);

(f) Analysis of the potential of hydrogen hubs and carbon storage hubs across the ECE region and their role to decarbonize hard to abate sectors (i.e. energy intensive industries, long-haul transport etc.), by November 2023 (subject to the identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role).

## **C. Modernization and decarbonization of electric power systems in ECE subregions**

**Description:**

13. Ambitious climate mitigation policies advocate for the development and implementation of zero- and negative-carbon technology options. Each country will make its decisions based on their level of economic development, natural endowments and legislative legacy. Ensuring secure, affordable and sustainable energy requires a diverse energy mix.

14. For many countries, especially in Eastern Europe and Central Asia, given the role that fossil fuels play in their energy mixes, it is necessary to move towards a more sustainable energy system based on diversified energy sources and to explore the role of all technologies that can help countries attain a carbon neutral electric power system.

15. Coal-fired power plants have undergone modernization over the past decade. While the trend of the coal phase-out is ongoing, in many countries across the ECE region, it is expected that coal-fired power plants will remain operational over the next decade. Actions should be taken to encourage the deployment of zero and low carbon technologies to further decrease GHG emissions associated with power generation.

16. As countries in Eastern Europe and Central Asia will remain dependent to a large extent on fossil fuels, technology transfer and investments are needed to allow the electricity

systems in these regions to decarbonize. The most advanced fossil fuel technologies, such as coal with HELE, coal with CCUS or gas with CCUS can be a viable and economic choice for many countries in the ECE region. In addition, further technological advances can have a positive spillover effect on energy intensive industries across the ECE region, namely production of cement, steel and iron or chemicals. Issues related to financing advanced fossil fuel-based electric power generation infrastructure remains controversial but a necessary topic that urgently needs to be resolved in order to avoid stranded assets, support further economic development in countries in transition and help countries to attain carbon neutrality.

17. Strengthened international cooperation is necessary to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, nuclear power and advanced and more environmental-friendly fossil-fuel technologies, and promote investments into modernization of energy infrastructure and clean energy technologies. Joint and well-balanced national power systems could be enhanced through strategic partnerships and cross-border energy cooperation, which would take into account the specificity of national power sectors.

**Work to be undertaken:**

(a) The Group of Experts will further build on the results and activities carried out in 2020-2021 and lessons learned in cooperation with the Group of Experts on Coal Mine Methane,<sup>3</sup> the Group of Experts on Renewable Energy, United Nations Special Programme for the Economies of Central Asia (SPECA), International Renewable Energy Agency (IRENA), International Energy Agency Clean Coal Centre, World Nuclear Association and Electric Power Council of the Commonwealth of Independent States;

(b) Based on findings and results achieved to date on best practices in HELE and CCUS technologies, the Group of Experts in cooperation with SPECA will organize a dialogue on the potential of advanced fossil fuels and investments in ECE subregions with the aim of contributing to the development of innovation-led, socially and environmentally responsible sustainable national energy strategies;

(c) Provided needed extrabudgetary funds or in-kind contributions are identified, the Group of Experts will organise a series of subregional dialogues on financing energy infrastructure and clean energy projects;

(d) Provided needed extrabudgetary funds or in-kind contributions are identified, the Group of Experts will conduct analysis on the modernization and decarbonization of electric power systems in a selected ECE subregion – with a focus on the use of novel technology solutions to improve the integration of distributed energy resources – and on strengthening cross-border power systems interconnections to develop the energy balance of national power systems to increase deployment of renewable energy sources into existing infrastructure.

**Deliverables and Timeline:**

(a) Roundtable on the potential of advanced fossil fuels and investments in ECE subregions, by November 2022;

(b) Roundtable on financing clean energy projects, by November 2023;

(c) Generic guidelines on financing more accessible, reliable and sustainable energy services across the ECE region, by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role);

(d) Background document on the modernization and decarbonization of electric power systems in a selected ECE subregion with a focus on the use of novel technology solutions to improve the integration of distributed energy resources and on strengthening cross-border power systems interconnections to develop the energy balance of national power

<sup>3</sup> A proposal to change the name of the Group of Experts on Coal Mine Methane to the Group of Experts on Coal Mine Methane and Just Transition will be presented to the Committee on Sustainable Energy at its thirtieth session.

systems, by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role).

#### **D. Digitalizing electricity systems**

18. Digitalization is making energy systems more connected, efficient, reliable and sustainable. The energy sector has been an early adopter of digital technologies. Digital innovations are offering new ways of looking at the existing energy efficiency challenges and finding exceptional ways to address them.

19. Policymakers increasingly face new and complex decisions. Incomplete or imperfect information may lead to flawed decisions. Digital innovations can not only make the technology smart but can also significantly improve the way in which policies are developed, coordinated and implemented by enhancing accessibility, improving accountability, and increasing transparency across the value chain.

20. Key value propositions of digital integration into energy landscape include increased system efficiency, innovative business models and effective policymaking and implementation. Digitalization of electricity systems brings many benefits, such as data accessibility and usability, automation and connectivity and empowered consumers and other stakeholders. Despite many advantages, digitalization is also raising new security and privacy risks.

##### **Work to be undertaken:**

The Group of Experts and the Task Force on Digitalization, run under the auspices of the Group of Experts on Energy Efficiency, will:

- (a) Conduct analysis on the opportunities and challenges provided by digitalizing electricity systems on grid management and operations and on markets, with a focus on the supply side;
- (b) Conduct analysis on critical security and privacy concerns and opportunities;
- (c) Analyse the opportunities of the availability of data for grid management and operation, for system planning and development and on new market opportunities including increased consumer choices and improved market access;
- (d) Analyse the role and the impact that policy decisions and the regulatory environment can play on digitalization of electricity systems.

##### **Deliverables and Timeline:**

- (a) Background document on opportunities, side-effects and concerns of digitalizing electricity systems on grid management and operations and on markets with a focus on increased system efficiency, innovative business models and effective policymaking and implementation, by November 2022 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role);
  - (b) Background document on critical security and privacy concerns provided by digitalizing electricity systems and on corrective and preventive measures including system security risks, individual cyber safety, proactive policies, by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role);
  - (c) Background document on opportunities provided by data and data analytics in grid management and operations, in energy efficiency, in market opportunities and in renewable energy, by November 2023 (subject to identification of extrabudgetary funds, in-kind contributions, or willingness of experts to take a leading role);
  - (d) Roundtable on digitalization of electricity systems, by November 2023.
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