CAN SUBMISSION ON TOPICS IN LINE WITH THE SCOPE OF THE WORK PROGRAMME AS REFERRED TO IN THE UNFCCC DECISION, CMA 4, MATTERS RELATING TO THE WORK PROGRAMME FOR URGENTLY SCALING UP MITIGATION AMBITION AND IMPLEMENTATION

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Climate Action Network

CAN submission on topics in line with the scope of the work programme as referred to in the UNFCCC decision, CMA 4[1], Matters relating to the work programme for urgently scaling up mitigation ambition and implementation

CAN welcomes the COP27 decision on the Work Programme on Mitigation (MWP) by parties as starting points for addressing the concerning pre-2030 emissions gap[2]. This will require enhancing deep emissions reductions in all countries in all sectors and addressing all greenhouse gases (GHG). CAN supports the science[3] showing that only immediate, far-reaching, ambitious, just and equitable emissions reductions will give the world a chance to stay within the 1.5°C survival limit.

CAN, however, endorses the necessity for strategic and sectoral deep dives and not deal with all issues in parallel. As a result, CAN is encouraging the MWP to take a targeted approach rather than a broad one in its planned workshops for 2023. All other energy (sub)sectors, including land use, can certainly be addressed later.

To do so, CAN strongly suggests focusing the MWP in 2023 on the decarbonisation of the power sector with the following sequencing:

We encourage the UNFCCC to expand the work to at least four dialogues/workshops and focus each one on specific sub-topics.

- ➔ **Workshop 1** - Broader scope in energy sector: Phase out of Fossil Fuels and Clean Alternatives in a just, macro-economic efficient, reliable, affordable and sustainable manner.
- ➔ **Workshop 2** - Scale up of Clean Energy/Legislation & Regulation: including lessons learned from countries on what has worked, and what has failed.
- ➔ **Workshop 3** - Target setting for clean energy nationally, regionally and locally: participatory and scientific, economic approaches from the regions, including options for electricity-based clean energy for heating and cooking that are the main types of energy consumption in many countries.
- ➔ **Workshop 4** - Financing: How to move the trillions from fossil fuels to clean energy investments and address the cost of capital barrier.

When CAN suggests 'clean energy', we refer always to the composite technology mix of clean renewables, particularly solar, wind, geothermal, energy efficiency as well as energy savings and the needed infrastructure like grids, storage etc. for the following reasons:

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[1] FCCC/PA/CMA/2022/L.17

[2] According to the latest UNFCCC NDC Synthesis report, the implementation of NDCs as of 31 Dec 2021 are projected to lead to total GHG emission levels that are 0.3% lower than in 2019. Further, the level of cumulative CO_2 emissions in 2020–2030 would use 86% of the remaining carbon budget aligned with 1.5°C warming

[3] Climate Change 2021: The Physical Science Basis - IPCC, 2021; AR6 Working Group III - IPCC, 2022; Global Carbon Budget - GCB, 2022; Emissions Gap Report 2022 - UNEP, 2022; Net Zero by 2050 – A Roadmap for the Global Energy Sector - IEA, 2021

Electricity sector relevance and emissions

- While the wider fossil energy sector is historically and presently globally the largest and growing GHG emitter (CO_2 and CH_4), responsible for about three quarters of all GHG emissions, the electricity sector is projected to grow significantly in almost all countries during the next decades with both, higher demand for 'conventional' electricity use and additional electrification of sectors so far powered by liquid or gaseous fossil fuels. While presently electricity demand is slowing in richer nations, it increases rapidly in many emerging and developing economies for industrial development, cooling/air conditioning and general household products. Although it presently contributes only about one quarter of all final energy demand, the power sector must grow generally. Electricity must dominate the share of all final energy consumption eventually to about 80% of all energy use in deep decarbonisation scenarios and implementation of net-zero targets by countries. CAN does not know of any reputed scientific institute or organisation that does not see large-scale electrification of presently fuel-based energy supply (transport, heating, industry) based primarily on renewables and energy efficiency as the main providers for a deep 1.5°C transformational pathway. The future renewable electricity demand therefore is far higher than today's electricity demand[4].

- The power sector is burning about 75% of all coal worldwide, the single largest sectoral emissions source with about 25% of all global GHG emissions when including coking coal for steel production. This is fortunately addressed by a range of countries and non-state actors like the Powering Past Coal Alliance for coal to be phased out by 2030, which should be a global yardstick for the power sector. Coal is also the main source of outside air pollution in many countries and regions from Poland and Turkey to India and China. WHO data show that almost all of the global population (99%) breathe air that exceeds WHO guideline limits and contains high levels of pollutants, with low- and middle-income countries suffering from the highest exposures[5]. Annual deaths due to air pollution alone from fossil fuel combustion, primarily coal and oil products like Diesel, are estimated to be 3.6 to 8.7 million people. Aside from combustion, fossil fuel extraction and processing also present a grave threat to human health. These deaths could be avoided by fossil fuel phase-out[6].

Electricity sector financing and expansion

- All is nothing without sufficient finance and investments. There is a consensus in the wider scientific community that for instance for rapid and successful decarbonisation in the energy sector and based on rapid electrification at least about a tripling of the joint and cumulative global investments towards about USD 4.5 trillion annually by 2030 is necessary compared to today. This encompasses renewables expansion, mainly solar and wind, energy efficiency in all energy consuming sectors of up to 4% annually, infrastructure development including power storage and grid development, both small scale distributed mini-grids as well as large scale international and regional high-voltage grids, and local smart grids for local match of production and use for efficient and reliable renewable electricity transport to the centers of consumption[7].

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[4] World Energy Outlook 2021 – Analysis and Key Findings - IEA, 2021; World Energy Outlook 2022 – Analysis and Key Findings - IEA, 2022

[5] Air pollution - who.int

[6] Effects of fossil fuel and total anthropogenic emission removal on public health and climate - Lelieveld, Pozzer & Ramanathan, 2019; Global mortality from outdoor fine particle pollution generated by fossil fuel combustion - Vohra., et al, 2021; Cradle to the Grave - GCHA, 2022

[7] World Energy Investment 2022 - Analysis and Key Findings - IEA, 2022

Nuclear power is dangerous

- The power sector is a key driver for nuclear energy. Which is being portrayed as a solution to climate change and growing again in several countries. While the technology is carbon-free when used, its many disadvantages for sustainable development, people and nature need to be highlighted. After about 70 years of civil use of nuclear power, there is not a single agreed independently, transparently and scientifically monitored safe geological depository in place in any country for the about 300,000 tons of highly radioactive nuclear waste across the world that need to be kept outside the biosphere for at least 100,000 years. Those are under construction in several countries, the nuclear lobby says since decades[8]. This adds to the other problems of nuclear power such as risks of mega accidents, high costs per unit electricity of up to four times that for renewables, high freshwater consumption, insufficient insurance against accidents and nuclear power is a source of proliferation of nuclear materials for military purposes. Which all stagnates its share of power supply to about 10% globally. In addition, inflexible nuclear power is hampering growing flexible, demand-led variable renewable energy supply like solar and wind. Renewable energy-based electrification and decarbonisation towards 100% renewables eventually will avoid sustaining the failures of the past[9].

Carbon capture and storage is expensive and unproven

- A number of countries consider the options of carbon capture, storage and use (CCUS) of CO_2 in the power sector as part of the essential solutions to combat climate change while maintaining the present infrastructure and working with the usual incumbents of the fossil fuel industry that had promoted these technologies around the power sector for more than 20 years. But it has not worked. The industry is admitting that costs are prohibitive today. And the overall implementation is very erratic. There are presently about 43 million tons of annual CO_2 CCS capacity operational, with another about 200 million tons for annual CO_2 capture under various phases of development globally. These represent about 0.1% and 0.4%, respectively of all energy-related CO_2 emissions worldwide[10]. And most of these technologies are made for Enhanced Oil Recovery (EOR). Which is a technology to insert CO_2 into the oil mine to push more oil out. None of the CO2 CCUS infrastructures in use, mostly in North America, are independently regularly monitored and checked for potential CO_2 leakage. And for comparison, solar and wind power rose their share in global electricity in the last 10 years from close to zero to about 12% jointly in 2022 - and without the giant money available from the fossil fuel industries for CCS[11].

The key solutions to energy decarbonisation and a 1.5 C pathway

- The power sector is home to the key technologies in renewables and the globally needed energy transition and transformation like solar, wind, electricity storage, grid development etc., with steeply declining costs in many countries and regions. Large scale decarbonisation of sectors presently based on liquid or gaseous fossil fuels is most economically and technically feasible with electrification. And electrification makes sense only if based on renewables. Also, for 'sector coupling', development of solar thermal heating of water, electric heat pump-based household heating

[8] Global Overview of Radioactive Waste and Spent Fuel Management - IAEA, 2022
[9] World Nuclear Industry Status Report - worldnuclearreport.org, 2023
[10] Global Status of CCS - Global CCS Institute, 2022
[11] Renewables Global Status Report - REN21, 2022

will complement energy efficiency for entire buildings towards low/zero energy housing with enhanced rates of building envelope's retrofit.

- Large scale renewable-based electrification holds the key for development of renewable gasses, for instance solar and wind-based hydrogen (H_2) by electrolysis, for 'hard-to-decarbonize sectors' like heavy industry such as chemicals, steel, fertilizers. Also, renewable H_2 is fundamentally important to provide large scale seasonal and long-term storage from abundant production of clean renewables like solar power in spring and summer or wind in winter and autumn in countries and regions with a not-tropical climate but also in many Southern developing countries. Renewable H_2 storage will prevent curtailing renewable electricity production in times of overproduction and make H_2 available in times of reduced production.

- For electricity storage, the same is true for sustainable hydropower and pumped hydro as a more or less short-term storage provider of electricity. Molten Salt technologies provide significant options for high-heat storage, particularly from Concentrated Solar Power (CSP) that however need to be better integrated and increasingly applied in sunny and hot regions.

- The IEA had assessed the large-scale potentials for energy efficiency developments in the electricity-consuming sectors and products, from LED-lighting to super-efficient electronic ICT[12]. Compared to buildings, city infrastructures or power plants, most energy consuming devices in households and offices have a comparably fast turnover time and an exchange rate of about a decade or shorter. So, innovation can work rapidly. Similarly with cars, in many countries the car fleet is exchanged in about a decade. Moving from the internal combustion engine to electric vehicles is therefore possible in comparably short time spans. In addition, sustainable transport policies can reduce the need for cars and speed up the transformation of the transport sector. With higher carbon prices in electricity, industry will also move faster to more efficient electric motors in manufacturing.

- There are about 750 million people mainly in South Asia and Sub-Saharan Africa without any electricity access, which impedes their development aspirations and social living conditions substantially. To avoid that electrification for the poorest will be in the hands of fossil fuel companies, most sustainable concepts point to mini-grids and off-grid solutions for electrification based on decentralized renewables. The IEA had suggested that more than 80% of all power generated to those who have not presently, should be coming from decentralized clean renewables because this is also economically most effective by 2030. According to the IPCC, successful climate mitigation must work in tandem with achieving fundamental development goals - including overcoming energy poverty in developing countries by 2030 what is an agreed objective within the wider framework of the Sustainable Development Goals (SDG)[13].

- Electricity grid development progress, both in the South and the North is a driver for efficient, cost-effective and affordable renewable energy. This is particularly true for the larger industrial centers and cities where localized renewable electricity should contribute to demand but is unlikely to provide all the power needed. Hence, new developments like large scale offshore wind and utility scale solar power are needed outside the centers of energy consumption and be grid-connected with densely populated and industrialised areas. In parallel, development of local low-voltage smart grid

[12] Net Zero by 2050 – A Roadmap for the Global Energy Sector - IEA, 2021; An Updated Roadmap to Net Zero Emissions by 2050 – World Energy Outlook 2022 - IEA, 2022
[13] An Updated Roadmap to Net Zero Emissions by 2050 – World Energy Outlook 2022 - IEA, 2022

solutions that match production and demand is necessary to minimize the costs of expensive, large-scale high-voltage grid development[14].

One cross-cutting crucial barrier - the cost of capital

- Recognising the key role of renewable electricity in meeting Paris goals and recognising that this is a prerequisite for unlocking GHG emission reduction potential and energy savings in other sectors via electrification, it is a suitable task for the MWP to identify and suggest solutions to overcome any barriers to do so. Particularly in the private finance sector and with bilateral and multi-lateral finance flows.

- The challenge is both to replace existing fossil power generation with renewable electricity rather quickly and ensure that renewable power in all countries becomes an economic and feasible choice when new electricity supply is being implemented.

- *"One of the key barriers hampering clean energy investment in emerging market and developing economies is the high cost of capital"*[15]. Most Levelized Cost of Energy (LCoE) calculations find renewable power as a cheaper alternative than fuel based power generation. However, as the IEA concludes this is not necessarily the case in countries with high cost of capital which occurs from a variety of reasons such as concerns on national governance, lack of legislated targets, an inadequate national financial accounting and monitoring system, political tensions in the country etc. Generally, renewable electricity requires a larger upfront investment compared to fossil fuels like coal or gas, but over the lifetime of the project produces significantly cheaper power. The business case for renewable electricity is therefore strong in countries with low cost of capital, but weak in countries with high cost of capital. Countries with high cost of capital might be economically forced to opt for fuel based power, simply because it requires a smaller up-front investment.

- To meet the Paris targets the capital cost barrier for renewables needs to be addressed and lowered. The task of the MWP is to identify and recommend urgently financial and other policies to rapidly scale up mitigation ambition and implementation. The IEA identified the high capital cost barrier as a key barrier to the deployment of RE-power. CAN welcomes the recent release of the IEA-led continued assessment on cost of capital in developing and emerging economies[16]. It shows that a solar power plant for instance has a 2 to 3 times higher cost of capital in developing countries than in OECD or China. The new IEA-led analysis demonstrates that reducing financing costs for renewable power by only two percentage points would bring down the investment needed to reach net zero emissions in emerging and developing economies by a cumulative USD 16 trillion over the period to 2050.CAN encourages the MWP to suggest possible solutions to overcome the capital cost barrier. Undoubtedly different innovative financial arrangements/solutions/measures will be required for different countries.

- Generally in the power sector in particular in developing countries, with all private and public funding and lending, there must be one universal goal to ensure that renewable electricity in all countries will become the economically rational choice when planning and building new power-supply. And it

[14] Renewables Grid Initiative
[15] An Updated Roadmap to Net Zero Emissions by 2050 – World Energy Outlook 2022 - IEA, 2022 (p.200)
[16] Cost of Capital Observatory - IEA, 2023

should be the financial *ultima ratio* to encourage early retirements of existing fossil fuel and nuclear assets. For all climate, environmental, sustainability *and* financial reasons.

- Many challenges exist for a fully decarbonised renewable power sector. Some interventions, policies and actions require strong bilateral and international cooperation, particularly with global investment flows. Other policies can only be implemented nationally, regionally and even locally. CAN is very much aware that besides fixing the capital cost the unfolding of these potentials in all countries also require tailor-made and nationally accepted legislation and regulation in a participatory way. They do not happen automatically. The market for renewables only works if there is a strong boundary with clear rules and what includes phase out of fossil fuels and nuclear power as well. CAN therefore urges the MWP and its experts to discuss, elaborate and review the following larger areas of policies, legislations and regulations to recommend appropriate action by parties who should ideally agree and implement domestically, regionally and locally as appropriate. Not all of these policies might work in all nations. Yet, these policies had been shown to work cost-effectively compared to a BAU pathway, environmentally ambitious, socially responsible and speedily across a number of countries in the world to rapidly increase renewable energy development and carbon emissions reductions from the power sector.

- The following is a list of these policies and energy politics, some more granular than others, certainly not addressing all issues in the sector. But those describe roughly the areas where countries need to get active domestically. These policies and interventions had been shown over the last decade to work in all those countries, in some countries much more than others, that started to implement renewable technology, particularly solar and wind and related infrastructure.[17]

    1. Countries need to engage on a **deep power sector reform** that includes better regulation, liberalization of the supply side, more and better access of innovative and accountable newcomers on the electricity market, & foremost legal unbundling to break the vertically integrated power sector monopolies while creating a legal divide between electricity production, transmission and distribution. The reform should also enable and support local power production, owned and controlled by the local population with for instance energy communities.

    2. **Binding Renewable Energy Source (RES) targets for energy (sub) sectors** are crucial as starting points. It does not make sense to agree on economy-wide RES targets while there is no differentiation between heat, power, industry, transport targets and all their subsectors. For instance, in industry, we have to differentiate between low-heat and high-heat demand and between process and manufacturing energy sources. Same in transport. Light duty vehicle road transport requires other interventions and technologies as heavy-duty vehicles or shipping or aircraft. In addition, reduction of emission in transport is not just a question of vehicle technologies, but just as much a question of sustainable transport policies with emphasize on more sustainable public transport modes than cars and trucks such as railways.

    3. **A differentiation of RES targets into sub-targets** allows for broadening implementation responsibility in the society, specific monitoring and verification, and tailor-made support schemes and technology development.

[17] Renewables Global Status Report - REN21, 2020, 2021, 2022

4. In addition and beyond any RES targets, societies need legislation beyond precise RES targets to prepare all communities and business for changes in the future and agree on **'secondary' legislation** to boost and support any agreed targets. Those would include primarily
    - Steps, targets and commitments for enhanced electrification of energy consuming sectors presently based on fossil fuels to grow the share of renewable power in energy use subsectors
    - Objectives for Green/RES-based, renewable gases and H_2 development
    - Planning for electricity storage of variable and renewable energy power supply and including where possible storage of pumped hydro and/or molten salt in the case of Concentrated Solar Power (CSP)
    - Pushing and supporting more effective regional and national grid and interconnector planning procedures
    - Guaranteeing preferred grid access for RES compared to other power sources
    - Securing fair net-metering accounting for own-producers of RES
    - Better and fair/flexible electricity price tariffing for energy consumers, both captive consumers (households, offices) and industry, based on the timings of electricity consumption over the day to guarantee most fair cost coverage of timings when production costs and demand is high compared to when these are low.
    - Policies to reduce the drivers of energy consumption, with for instance sustainable transport policies, and transition to a more circular material economy

5. **Skill building, training and education curricula for RES technical implementation** staff both for utility scale and distributed applications in universities, technical education and in businesses.

6. **Empower and support legally and politically the grid companies/system operators** (Transmissions System Operators (TSO) & Distribution System Operators (DSO)) in a legally unbundled power sector to unfold their capacity for enhanced, speedy, cost-effective integration of renewable power into the grid system. That would include for instance
    - Local, regional, national and international cooperation for faster and high-capacity electricity interconnectivity, locally and internationally
    - Better and faster domestic RES and infrastructure, like grids, and particularly permitting procedures
    - Early planning procedures by governments with stakeholders locally, regionally, nationally, and internationally

7. **Significantly increase the funding** for new technologies and RES research, deployment and development programs (R&D&D) nationally and in international cooperation, including moving from fossil fuel subsidies to RES subsidies.

8. **Promote innovative, distributed RES** alongside utility scale development

9. Pro-actively **engage on emerging bottlenecks of enhanced electrification with RES and batteries**
    - Ensure human rights, reduce water use etc. and other issues with critical minerals
    - Define criteria, scope and enforce implementation for a Circular Economy
    - Exclude any limits to RES distribution sharing among customers, for instance do encourage solar-exposed private rooftop owners or other public buildings to produce more than their own consumption is and be allowed to share with neighbors and/or via the grid

- Expand PV and onshore wind alongside railway lines and larger streets/highways to safe agricultural land or natural areas.

10. **Enact strong energy efficiency legislation/regulation** for all power-consuming products and processes, industry, (public and private) transport, and residential/office consumption alike. Orient towards the suggested 4% annual efficiency improvement by the IEA in its net zero report.

11. **Combined international and national processes to overcome the Capital Cost Barrier for renewable electricity in developing countries, promote public and private financial sector and investment reforms to upscale RES**, efficiency, infrastructure and product development investments *and* reduce incumbent fossil fuel and nuclear energy financing; such as free trade of and no VAT on certified clean products, green electricity

12. **Internationally enhanced co-operation for implementing clean energy solutions in developing countries** including overcoming energy poverty for both the 750 million people with no access to power and for the particularly small scale commercial and social sector like farms, shops, schools, hospitals

13. **Stop all fossil fuel/nuclear subsidies, direct and indirect ones**

14. Last but not the least, **engage in domestic campaigns to show that good grid management will benefit renewables, affordable and reliable power supply, and significantly reduce or avoid black outs** from variable weather-dependent energy sources like solar and wind. This will counter the myth that renewables always need conventional back up or/and cannot supply 100% renewable energy.

Electrification based on renewables and the Just Transition

A Just Transition, which is primarily a social, democratic and participatory process, is important and necessary for successful renewable-energy based electrification (REE) which is primarily an industrial, technological and financial process. Both processes have to work hand-in-hand and mutually reinforce each other and thus can help to address many of the social and environmental challenges that we currently face. Some of the key reasons why REE is important for a just transition and vice versa include:

Reducing import and export dependence on fossil fuels: REE can significantly reduce import dependence on costly fossil fuels for most nations and save domestic income and state budgets. This will also encourage domestic technological development and create jobs. Fossil fuel exporting countries can diversify their economies toward a much better balanced resource policy, minimise the risk of stranded assets, and will not suffer as client countries phase out of fossil fuels eventually.

Improving energy efficiency on the demand and supply side: More energy efficient appliances, buildings, cars and industrial processes as well as highly efficient REE grid distribution systems will reduce the need for more power supply, save costs for consumers and resources, whilst also reducing the need for more power transmission and potential distribution losses.

Promoting equity and access: REE can help to promote equity and access to energy by making it possible to deliver energy services to and in remote and underserved communities.

Creating jobs: The transition to REE can create jobs in a variety of fields, such as manufacturing, installation, and maintenance of electric vehicles and a variety of clean energy supply, demand and infrastructural support systems.

In summary, REE can help to create a more sustainable, equitable, and resilient energy system, which is a critical aspect of a just transition.