PLATFORM FOR ACTION ON RENEWABLE ENERGY (PoA)

BRIEFING PAPER

RENEWABLES FOR CLIMATE CHANGE MITIGATION, CLEAN AIR AND ENERGY EQUITY

Introduction

Greenhouse gas (GHG) emissions resulting from the burning of fossil fuels, in particular CO_2, have contributed significantly to the increase in atmospheric GHG concentrations. Most, if not all, of the observed increase in the global average temperature since the middle of the 20th century has been a result of the increase in anthropogenic GHG concentrations, and the increased consumption of fossil fuels has had a direct impact on this. The atmospheric CO_2 concentration, at about 419 ppm as of May 2021[1] is the highest since several million years, long before *Homo sapiens* started to roam the planet. The global CO_2 emissions from fossil fuels by humankind in 2019 were the highest ever. Industrialised countries, with a much smaller share of population, historically had since the onset of the industrial revolution the lion share of both absolute and per capita CO_2 emissions. This is important to remind, in the context of global responsibility, capacity to act, and financial capability to invest and support poorer countries in deep decarbonisation efforts, and that about 40% of CO_2 remains in the atmosphere for longer than 1,000 years. In parallel, about 760 million people mostly in Sub-Saharan Africa and developing Asia have no or only erratic access to clean electricity and about 2.6 billion people rely on the unsustainable use of biomass for indoor-cooking, a challenge that kills up to 3 million people annually from in-door air pollution[2]. Worse, overall air pollution, particularly in developing countries with high coal and diesel consumption, kills almost 7 million people each year[3].

Multiple options that have been put forward for lowering GHG emissions from energy systems include energy conservation and efficiency, renewable energy, fossil fuel switching, nuclear power, and carbon capture and storage. However, it is evident that renewable energy (RE), complemented by energy efficiency measures, is the most sustainable and feasible option for replacing fossil fuels in global energy systems, while still satisfying the increasing demand for energy services particularly in the Global South. Renewables will play the most significant role in the energy transformation required to cut global emissions by 50% by 2030, reduce air pollution, provide energy access for the poor and to reach the net-zero goal by 2050, thereby limiting global warming to 1.5°C.

[1] https://www.co2.earth/earths-co2-main-page
[2] IEA (2021), Tracking SDG7: The Energy Progress Report, 2021, IEA, Paris https://www.iea.org/reports/tracking-sdg7-the-energy-progress-report-2021
[3] https://www.who.int/data/gho/data/themes/air-pollution

We need to keep in mind, that energy efficiency and conservation is the crucial other side of the coin of deep decarbonisation. The more countries invest in energy efficiency in all economic sectors, the lesser is the investment required in supply options for a 1.5°C pathway, and more the money that can be saved by households and companies. Presently, global annual investments in renewables and efficiency amount to $340 billion and $250 billion, respectively, and about $300 billion in electricity networks.[4] This is less than 50% of the total of almost $2 trillion invested in energy – most of that in fossil fuel infrastructure. The IEA had shown in its 2021 net zero report[5] that an annual 4% improvement of economic energy efficiency will provide tremendous support to deep decarbonisation in this decade. Still, deployment and investment in renewables, particularly solar and wind, have to grow by about four times globally until 2030 to meet the decarbonisation challenge.

Renewable energy, in addition to having a large potential to mitigate climate change, can also contribute to social and economic development, reduce impacts on the environment, and ensure energy justice when implemented properly.

Renewable Energy for Combating global warming

With electricity generation being a large source of emissions, and with energy services demand in the power sector forecasted to increase steadily and significantly in a global decarbonisation trajectory, it is imperative that renewable sources take over the electricity supply sector. At the global level, renewable energy technologies are key to reducing emissions from electricity supply. In 2020, about 29% of the world's electricity generation was from renewable technologies, while a large part of it, about 61%, came from burning fossil fuels[6]. However, the share of modern renewables is only about 11.2% of the total final energy consumption (TFEC), with renewable electricity at 6% of TFEC; renewable heat, 4.2% of TFEC, and transport biofuels at 1% of TFEC[7]. About 7% of global energy use is still derived from unsustainable biomass use for cooking by mainly poor communities in developing countries[8].

With electrification of presently fuel-dominated sectors like heating, road and rail transport, complemented by energy efficiency measures being the backbone of the strategy to limit global warming, it is imperative that this trend be reversed with renewable energy's share in generation increasing to around 40% to 50% by 2030 and 100% by 2050. In addition, 'hard-to-abate' sectors like energy-intensive industries of chemical and steel production will increasingly use renewable hydrogen as feedstock. Historically, hydropower has been the leading source of low-emission energy. However, as per the current trends, it is mainly the expansion in wind and solar power that will help bring about the rapid expansion required in global renewables generation to help to address successfully the 1.5°C survival objective, and

[4] IEA (2020), pp. 412 & 413, World Energy Outlook 2020
[5] IEA (2021), Net Zero by 2050, IEA, Paris https://www.iea.org/reports/net-zero-by-2050
[6] Ember, Global Electricity Review 2021 (London: 2021), https://ember-climate.org/project/global-electricity-review-2021.
[7] https://www.ren21.net/wp-content/uploads/2019/05/GSR2021_Full_Report.pdf
[8] REN21 (2021), p. 90, Renewables 2021 - Global Status Report

overcome air pollution and energy poverty. In addition, without a full RE-based decarbonisation in the energy sector, any long-term net-zero GHG scenario cannot be met.

Teske, S.; et. al, in their article[9] have clearly outlined pathways that regions across the globe can adopt to reach the goal of 100% renewables by 2050, thereby achieving the goal of limiting global warming to 1.5 °C and net-zero emissions. While the technology pathways suggested are clearly ambitious, it outlines the steps that would be required, with defined five-year milestones, to achieve the target of decarbonization of global energy systems through 100% renewables and improvements in efficiency, without having to resort to the use of nuclear power, and fossil-fuel based power combined with CCS and BECCS. As per their modelling, the share of RE in electricity generation will have to move from the current level 21% in 2020 to 56% in 2030, and 100% by 2050, and all energy use that is presently still fossil fuel-dominated (oil and gas) is run by renewables, including synthetic fuels and hydrogen as energy carriers.

Renewable Energy for energy equity and justice

Despite significant progress in ensuring energy access, with the number of people without access to electricity declining from 1.2 billion in 2010 to less than 760 million in 2019, about 660 million people might still lack access to reliable electricity in 2030 in the absence of early action and adequate financing. In the clean cooking sector about one third of the global population, about 2.6 billion people, do not have access to modern fuels. Without urgent action, the world will fall short of the SDG 7.1 target of universal energy access about 30% in 2030[10].

Energy equity is also a major challenge with poor populations, especially those living in rural areas who lack access not only to primary energy services, but also to other essential services such as access to modern health facilities, potable water, quality education, and livelihood opportunities due to the lack of energy services. The poor also spend more money on energy compared to the rich since the fuels and equipment they use are less efficient and harder to access. In addition, poorer countries and communities also need reliable and affordable energy for their manufacturing and business processes to remain competitive on the markets and aim at higher value products for sales rather than just marketing raw commodities. With lack to energy access, this development is impeded.

Renewable energy, can ensure access to modern energy services, and ensure energy equity and justice when implemented properly. Some RE technologies, such as solar PV and modern bioenergy solutions, can be deployed at the point of use, and at the scale that is required and makes economic sense. Such decentralised renewable energy (DRE) options will play a significant role in scaling access to electricity and clean cooking so that the SDG7 goal for 2030 can be met. DRE will also play a catalysing role in achieving other sustainable

[9] *"It Is Still Possible to Achieve the Paris Climate Agreement: Regional, Sectoral, and Land-Use Pathways. Energies 2021, 14, 2103"*

[10] https://trackingsdg7.esmap.org/data/files/download-documents/2021_tracking_sdg7_report.pdf

development goals such as SDG 3: Good Health and Well-being, SDG 4: Quality Education, SDG 6: Clean Water and Sanitation, and SDG 8: Decent Work and Economic Growth, all of which cannot be achieved without the availability of a reliable source of energy.

Renewable energy also has the potential for job creation with jobs in the RE sector reaching 11.5 million globally in 2019 according to the IRENA Annual Review 2020[11]. The potential of DRE to increase the productivity and profitability of small livelihoods and businesses thereby improving local incomes is also well documented by numerous studies and can result in reducing many other detrimental impacts in poorer countries such as uncontrolled urban migration and declining rural incomes leading to agrarian debt and farmer suicides, a regular and sad occurrence observed in particular in rural India

Shortcoming of Renewable Energy Options

Numerous studies have shown that the total global technical potential of renewables far outstrips the global demand for energy. While the potential varies from region to region, even in regions with low technical potential for one renewable energy source, the technical potential of other RE sources will be able to compensate for it. Further, even in regions with low technical potential for a particular RE source, there are still significant opportunities for increased deployment thus making the continued growth in RE globally a reality. However, a final 100% shift in global energy systems to renewables has significant challenges now that need to be overcome. Some of the significant issues are –

- The levelized cost of energy for many RE technologies is currently still higher in many countries than existing energy prices, though RE sources like solar and wind have proven to be more economical than fossil fuels in most settings. This is the result of perverse incentives in certain countries like subsidies, as well as the lack of domestic renewable production capacities, high import taxes for "foreign" technologies, and/or shortcomings in trained personnel for installation and maintenance.
- The availability of energy from many RE sources, especially the predominant ones like solar and wind, is seasonal and weather-dependent, and is not available 'on-demand' like energy generated from fossil fuels. To maintain grid stability and reliability this demands in particular smart grid and load management across regions and borders, where possible, and additional investment in energy storage once variable renewables like solar and wind take a high share of overall electricity production. However, it may also be noted that some European countries and utilities, with support from progressive grid operators, run shares of 30% to 50% or even more from variable renewables, without any grid supply and reliability problems.
- Some of the renewable energy technologies like large scale hydropower, bioenergy, etc. also come with social and ecological challenges when scaled beyond a certain level thereby restricting public acceptance, and posing challenges to the environment, human rights, and energy justice.

[11] https://www.irena.org/publications/2020/Sep/Renewable-Energy-and-Jobs-Annual-Review-2020

- Shifting to renewables would require significant investments in research and development, and new infrastructure regarding storage, energy efficiency, synthetic fuels and integration mechanisms, without which hard to decarbonize sectors such as industrial processes, aviation, shipping, etc. will still be reliant on fossil fuels.
- Getting the world to about 50% clean renewables by 2030 requires bold legislative actions; leveraging of finances; halting and overcoming all new and existing fossil fuel investments and subsidies; and preparing a modern infrastructure for the change that accommodates large utility scale and decentralised community or individual solutions; while electrifying the difficult to decarbonise sectors, which are presently predominantly fossil-fuel based.
- A longer-term shift to 100% renewables requires significant investment, which will be a large challenge for the poor and developing nations for whom immediate political priorities might be very diverse. Long-term, and soft financing options will be required to convince both state players as well as private consumers to make the move to early, short term actions and longer-term 100% renewables. Highly important is also a significantly strengthened climate finance support by rich countries and International Finance Institutions (IFIs) to move well beyond the agreed – but so far never reached - annual $100 billion support in grants, where a certain share should be earmarked for renewables. While no one knows in detail what the required investments will be in each country, it is a fair estimate to assume that annual investments in renewables and underlying infrastructure need to grow by a factor of 3 – 5 in this decade to stay on the 1.5°C trajectory[12]. However, this is still well below the assessed external costs of fossil fuels, both carbon and air pollution, of about 6.5% annual GDP[13].

[12] IEA (2021), Net Zero by 2050, IEA, Paris https://www.iea.org/reports/net-zero-by-2050
[13] Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates (imf.org)