Discussing the availability of the resources needed for the transition to all-green energy

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Introduction

Prompted by the colossal threat of climate change and global warming, as climate indicators such as the height of sea level, atmospheric greenhouse gas concentrations, surface ocean temperatures, ocean acidification and biodiversity continue to deteriorate, exposing the considerable ramifications of human activity. Experts and politicians have spent countless hours deliberating, debating, and drafting policy, over the course of countless international conferences from Kyoto in 1997 to Cairo in 2022. Finally, setting in motion a united global objective to reduce greenhouse gas emissions, through a transition from a dependency and reliance on fossil fuels to all green energy. As highlighted above coming to such an agreement has required extensive scientific, public, and political pressure, ranging from passionate youth activists such as Greta Thunberg to public figures such as David Attenborough. Yet support is not universal, some still doubt the urgency of the climate crisis rather than prioritizing the short-term economic benefits of the fossil fuel industry. However, these sceptics are not the biggest obstacle facing a transition to all-green energy. Some states such as Iceland have been able to triumphantly transition, effectively utilising the potential of renewable energy to meet all the demands of a modern economy. However, practical issues ranging from electronic infrastructure, and land use, to technology, inhibit the majority of the international community's current ability to successfully transition to renewable sources of energy and reduce the greenhouse gas emissions corrupting the planet. Hence, effective measures are required to eliminate said obstacles and ensure effective and swift implementation of the policies set out by treaties, such as the Paris Agreement. If successful, such measures would stand as an achievement and example of what the international community is truly capable of doing when cooperating for humanities collective benefit.

Definition of Key Terms

Decarbonization

The process of the reduction or omission of carbon emissions into the atmosphere from the manufacturing and industrial sector, with the ultimate goal of achieving net-neutrality. This includes strategies such as carbon capture and storage, electrification (powered by fossil fuels) and biomass.

Renewable Energy (Green Energy)

Renewable energy is energy that is infinite, as it is derived from natural resources that are able to be replenished. It includes natural resources, such as wind, movement of water, geothermal heat, sunlight, and organic material.

Fossil Fuels

Fossil fuels are materials containing hydrocarbon molecules that naturally form in the earth's crust over the course of millions of years from the decomposition of organic matter. They are extracted and combusted for energy but are the globe's leading source of pollution and are a finite resource. Fossil energy sources include natural gas, crude oil, and coal.

Paris Agreement

A legally binding international treaty on the subject of climate change, mandating global cooperation. 196 signatories agreed to a global framework covering mitigation, adaptation, and finance, seeking to limit global temperature increase in this century below 2°C and possibly below 1.5°C, marking the first global effort to net-zero emissions.

Electrical Power Transmission

The movement of energy from generation sites to consumption sites, typically using transmission lines and high voltage to ensure efficiency, through the electrical grid.

Electrical Grid

The interconnected network of electrical infrastructure ensures the distribution of electricity across a state from producers to consumers. It is composed of transmission and distribution power lines operated by control centers.

General Overview

Given all of the current conflicts in the decision-making regarding the transition to all-green energy, the path to absolute sustainability becomes increasingly unattainable. However, this must change to accommodate the impending issue of climate change. The International Energy Agency (IEA) predicts that wind and solar energy, two potential green forms of energy, “could account for 70% of power generation by 2050” if the world continues to strive to become carbon-neutral by 2050, as called for by the Paris Agreement. In order to stay on track, the following aspects regarding energy sources must all be addressed.

Infrastructure

Currently, the infrastructure for energy consumption and distribution is designed for fossil fuels and non-renewable resources. The potential for using renewable sources is high, however, is not being utilized to the maximum efficiency. The transmission of energy is inhibited by the lack of infrastructure, and factors such as high voltage in regions with the potential for renewable energy, long inefficient distance power lines that carry electricity from power facilities and into communities, absence of centralized organization or long-term planning. An example of this is the United States, which lacks the transmission infrastructure to provide renewable energy to the entire country, in this case, states such as Vermont, Nebraska, Kansas and more have the potential to develop and exploit renewable energy sources, however, the current electrical grid doesn’t have the necessary capacity or reach to transport electricity to consumers. Therefore, the United States government must invest in its electrical grid infrastructure to eventually eliminate the usage of fossil fuels. This process can take up to a decade as the construction of power lines is an extremely bureaucratic process, requiring the permission of local landowners to construct on their land. Any refusal or postponement in negotiations can lead to long delays. Hence, the expansion of the power grid is a measure that needs to be undertaken desperately ahead of time facilitates the transition to renewables. Renewable sources could provide 65 per cent of the world's total electricity supply by 2030, and once the appropriate infrastructure is in place, this value can be reached. Moreover, the lack of necessary infrastructure in less developed nations to accommodate increased renewable energy resources must also be addressed. The successful construction of a solar or wind farm is utterly defunct if the state's electrical grid cannot handle increased supply or successfully transmit the power to civilian households, businesses and industries.

Distribution of land

The difference in energy access for urban areas compared to rural areas is evident. The areas of land required to facilitate renewable energy sources will be vast solar, wind and biofuels require more land to harness their potential than fossil fuels, and therefore will occupy great amounts of rural land. Moreover, much of the land with the necessary geographic or climatic requirements (such as vast quantities of wind) is mainly present in the countryside, outside metropolitan areas. This makes it easier for rural areas to access renewable energy with proximity to wind or solar farms, as opposed to crowded urban areas which lack the space to accommodate this. Yet, the construction of wind farms for example in rural areas near human settlements is an unpopular venture, as homeowners claim the loud noises generated by farms and their poor appearance decrease the land value of the surrounding area. Hence, rural folk are increasingly more hostile to wind farms, lobbying governments to prioritize the construction of offshore wind farms, where they can't interfere with real estate. However, a contradictory issue is that urban areas have more access to renewable energy due to the increased energy transmission in densely populated areas. This is a cause of the proximity of individual living, which allows for less transmission loss compared to rural areas. So overall, problems are occurring in both rural and urban areas, and sufficient planning is required to find space for the generation of all green energy and to provide it to all areas of land.

Power storage

Another important element to consider is the storage of energy when shifting to green energy sources. Efficient storage of energy generated by renewable sources would eliminate the need for fossil fuels, allowing for a potential reduction of 1 million tons of CO_2 annually for every gigawatt of energy. However due to the inconsistency of energy types such as solar and wind, due to their weather dependency and the high costs of battery storage for these resources, diesel, a non-environmentally friendly alternative, is frequently used instead, as renewables are not able to change their supply of energy per the everchanging demand of electricity. Therefore, the inability of the power grid to encompass sufficient renewable energy throughout countries causes a reliance on non-renewable storage, especially when replacing diesel with wind and solar power.

Decarbonization of the industry

With the constant growth of the population, the demand for energy will only increase as will the consumption, with expectations of lower prices. Industry is responsible for 28% of the world's greenhouse gases, and to remain in accordance with the Paris Agreement, decarbonization of the industrial sector will need to take place. Decarbonization involves the reduction or complete elimination of carbon dioxide emissions from manufacturing or the production of energy. However,

decarbonization will be difficult as it will require a complete restructuring of production processes, as well as an increase in costs to eliminate carbon usage, through the implementation of processes such as carbon capture, or utilization of renewables, putting the industry at an economic disadvantage. Overall, these are unappealing to the industry, making it difficult to enforce decarbonization.

Environmental Considerations

While overall renewable energy is more environmentally friendly and sustainable than fossil fuel due to its ability to be a net-zero carbon emitter green energy does not have a faultless environmental record. Wind farms have a significant impact on bird populations. In the United States alone wind farms kill approximately 100,000 to 300,000 birds per year due to collisions with their rotating turbines. Wind farms also interrupt bird migratory patterns and habitats, as the loud noises farm produce disturb local bird populations, which then actively avoid the area in which they are located. Moreover, as previously stated renewables utilize vast quantities of land, and the environmental consequences of this characteristic renewable energy have been indicated in the amazon rainforest. Brazil is a leading producer and exporter of biofuels which compose the vast majority of its renewable energy sources. However, exploiting biofuels requires land to grow vegetation. This requirement has contributed to the deforestation of the amazon rainforest, contributing to the habitat loss of thousands of species many of which are critically endangered and endemic to the amazon. This greatly reduces the biodiversity of the rainforest leading to the possible loss of the medicinal properties of undiscovered plant species and the destabilization of local ecosystems. The loss of forest cover also contributes to soil erosion as the soil is no longer protected from precipitation by vegetation cover, resulting in surface and nutrient runoff which also reduces soil fertility. Overall, biofuels have a significant environmental impact, however, their replacement with fossil fuels may compensate for their environmental destruction. Moreover, most of the components used in batteries for the storage of renewables and renewable energy sources themselves use valuable minerals such as lithium. The extraction of these raw materials and their later manufacturing are both processes which release carbon emissions and damage their environment. Hence, the notion that renewable energy has a perfect environmental record is false and incorrect.

Geopolitical Considerations

The transition from fossil fuels to green energy will have substantial geopolitical consequences, in particular the shifting of power and influence from petrostates towards states with vast reserves of raw materials used in the components of renewables. States, particularly in the Middle East such as the gulf states and Saudi Arabia will experience a dramatic loss in global influence, wealth, and power. As the globe will no longer rely on fossil fuels, these states operating through the Organization of

Petroleum Exporting Countries (OPEC) will no longer be able to exercise their control on energy to impose their will on foreign states, such as during the 1973 oil crisis. Instead, their global influence will be supplanted and replaced by states, such as the Democratic Republic of the Congo (DRC) which controls great reserves of valuable minerals such as cobalt, an essential mineral in the components of wind turbines. The international community will develop a reliance on said states to provide these raw materials to international markets, in doing so granting them the ability to influence global events by manipulating the supply of these commodities. However, the DRC is extremely politically unstable often harboring

rebel groups and warlords in its vast territory. Said groups often take control of mines producing valuable minerals, allowing these groups to exercise global influence and enrich themselves, as states and private companies are forced to barter with them. Thus, the international community will need to find a method to not empower groups, which often have vast human rights violations.

Timeline of Key Events

Date	Event
5th June 1972	United Nations Conference on the Human Environment identifies the need for states to cooperate to solve global environmental issues.
12th February 1979	World Climate Conference, the first international forum regarding climate change.
27th June 1989	Toronto Conference on the Changing Atmosphere, early objectives for cuts to carbon dioxide emissions were discussed.
11th December 1997	Kyoto Protocols, first commitment to the reduction of greenhouse gas emissions.
12th December 2015	Paris Agreement, mandates states to reach net-zero emissions by 2050.
14th July 2021	European Green Deal adopted by the European Union, creating an action plan to reach net-neutrality by 2050.

Major Parties Involved

International Energy Agency

The International Energy Agency (IEA) is an intergovernmental organization supporting the international community's transition to accessible, cost-effective, sustainable energy for all states, coordinating the global response on how to respond to the obstacles preventing said transition.

United States of America

The United States of America are one of the preeminent global actors in the transition to green energy. Recently, having collaborated with the Rockefeller Foundation and the Bezos Earth Fund to create an Energy Transition Accelerator. A partnership hoping to galvanize private enterprises to invest capital into renewables in less developed countries.

European Union (EU)

The European Union have created a set of proposals and policy initiatives effective in all member states to make the EU carbon-neutral by 2050. The European Green Deal ensures all member states net-zero emitters of greenhouse gasses and complete a transition to renewable energy.

Democratic Republic of the Congo (DRC)

The Democratic Republic of the Congo is an important stakeholder in the transition to green energy, due to its abundant reserves of valuable minerals essential in the manufacturing of renewables. The DRC singlehandedly controls 60% of the earth's cobalt reserves, a mineral essential in batteries, wind power, and other green technologies. However, its instability particularly reflected by warlords' control of much of the state's mining infrastructure, harms its ability to efficiently export primary products to the world economy.

Iceland

Iceland is a global leader and poster child for the transition to renewable energy, thanks to its position as the world's largest green energy producer per capita. 100% of Iceland's domestic electrical production derives from renewable energy, particularly geothermal energy, which it has exploited to its maximum capacity due to its advantageous position on the Mid-Atlantic ridge. The facts above have credited Iceland as a steadfast global advocate of renewable energy, notably sharing geothermal expertise with less developed states.

Possible Solutions

A first step to facilitating the transition to green energy is making renewable energy technology accessible universally. Hence, both the lower and upper strata of society, just as more and less economically developed countries should all have equal access to said technology. Steps to achieve such a goal could be to promote technological cooperation and sharing in both the public and private sector possibly through relevant United Nations committees and organs. Such a body could create a fund to pool investment into technology and infrastructure to ensure progress is made globally. A mandate could be made stapling all nations to improve a certain aspect of their renewable energy framework such as infrastructure and to dedicate resources to energy ventures. However, member states should consider steps to ensure investment isn't intercepted or diverted and is effectively spent to the benefit of the populace in the designated field.

Moreover, an improvement in global supply lines for components and raw materials necessary in the manufacturing of renewable technology is crucial to improve access to said resources. These could take the shape of expanding and spreading the manufacturing capacity of key components or ensuring the stability of states who control large reserves of key raw materials, ensuring they are accessible to the international community. Guaranteeing the protection and control of mines producing these raw materials by faithful and legitimate actors may be necessary, considering hostile actors such as rebel warlords have fallen in control of mines before. Hence, mechanisms may need to be adopted to ensure such an event isn't repeated.

Governments need to also adopt policies in a manner similar to the European green deal indicating a clear framework for reaching net-zero emissions and climate neutrality in the near future. The incentivization of private investment into renewable energy is a key aspect of this ensuring projects have the necessary capital to commence. The breakdown of roadblocks such as redlining and streamlining of bureaucracy is also an essential step to facilitate and streamline renewable energy projects to ensure they are not perpetually postponed and delayed in the quagmire of government bureaucracy.

Furthermore, the prioritization of renewable energy over fossil fuels is crucial, encompassing the redistribution of funds previously subsidizing the fossil fuel industry to renewables. Legislation

capping the number of capital spent on fossil fuel projects, limiting the scope and scale of ventures, or restricting the number of sites exploiting non-renewable sources of energy could force the hand of investors to turn their focus to green energy.

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