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SERVICES FOR SCIENCE AND EDUCATION

The Fate of Energy Arising from Renewable Sources

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ABSTRACT

Using the wind energy as example, this notice sheds some more light on the effects of conversion of natural energy on the Earth's climate. This energy is mostly converted into electric energy that may strongly affect the climate. Its final mode is heat that is disposed as waste in the environment.

INTRODUCTION

The term "renewable energy" has become synonymous with sustainable energy conversion and climate protection, encompassing various forms of energy deemed to be environmentally friendly. However, a closer examination reveals a nuanced reality; while energy can undergo transformation through certain processes, it is not inherently "renewed." Take, for instance, the heat generated by the sun's rays on the Earth's surface: the energy is not renewed but rather produced. This nuance prompts a critical evaluation of the terminology itself, suggesting that the label "renewable energy" might be somewhat misleading.

If a process of energy transformation leads to irreversible changes of the energy carrier, with persistent environmental outcomes – such as the combustion of the energy carrier – it challenges the applicability of the term "renewable energy." In the context of Earth's climate, **Nikola Tesla** (1857 – 1943) regarded all energy processes, involving the consumption of matter, like the burning of coal, as barbaric. This underscores the need for a critical evaluation of energy practices, highlighting the importance of sustainable and environmentally conscious approaches to energy production and consumption. Tesla's viewpoint invites us to reconsider our reliance on processes that contribute to irreversible environmental consequences.

POLITICAL DECISION

In a historic move, the Earth's climate underwent regulation through a ground-breaking political decision, paving the way for the management, purchase, or sale of climate pollution among nations. This decision marked a significant milestone by seeking to legitimize the storage of carbon dioxide (CO2) in the environment. However, in this context it is crucial to emphasize that the atmospheric composition is not solely shaped by CO2; other substances, including water vapour (H2O), also contribute to its dynamics. Acknowledging the multifaceted nature of atmospheric constituents is imperative for a comprehensive understanding of the complexities involved in climate regulation and underscores the need for inclusive and informed environmental policies.

CLOUDS OF WATER VAPOUR

Clouds of water vapour could cover certain areas of the Earth’s surface and diminish the radiant heat emitted into the space. This would correspondingly increase the temperature of the

Earth's surface and of the adjacent layer of the atmospheric gas, allowing the Earth to release more vapour that would be absorbed by the atmosphere. The interaction could be viewed as an autocatalytic process, ultimately terminated by the supersaturation of moist air with vapour and its strong condensation.

MATERIAL AND ENERGY FLOWS

Such processes are of central importance for an analysis of climatic conditions that includes the material and energy flows in the Earth's atmosphere. These flows are influenced by the depth of our penetration into the atmosphere. The latter is closely tied to the production of goods which requires certain conversion of energy. The processes occur within our surroundings, imposing a significant strain on it. As an example, I mention the generation of high-quality electrical energy by wind turbines.

CONVERSION OF WIND ENERGY

In this example, electrical energy is derived by converting the mechanical wind energy; it is then transmitted to consumers, where it is commonly converted into work and heat. The work is mostly dissipated as heat (see e.g., **Robert Boyle** (1627 – 1691) experiments 1675). Taking into account also the transport resistances, the wind energy is completely converted in heat, which is released into the environment.

By this example several questions arise, including: How can we reduce the temperature increase of the environment when the production of goods drives energy demand and subsequently the temperature rise? The simplest answer is straightforward: the energy flows must be limited.

As long as we are unwilling to restrict the production of goods, the demand for energy will continue to rise, leading to a higher environmental temperature. This example illustrates that wind energy, in its original form, is largely climate-friendly. However, once converted into electrical energy at the wind turbines, it can have a significant impact on the climate.

OTHER ENERGIES

Similar conditions are also observed with other energy sources, such as hydro energy. Both hydro and aero energies originate from natural sources and have a low impact on the environment without human intervention. The conversion of nuclear energy also generates heat, which is released into the environment. The only exception in this context is the **solar energy**. Solar radiation, that is not reflected into the space, is partially absorbed at the Earth's surface without human assistance and converted directly or indirectly into heat. Therefore, whether the solar radiation is first converted into electrical energy and then dissipated as heat and absorbed by the environment is irrelevant.

CONCLUSION

Addressing the environmental impact of goods production and its associated energy demand requires a multifaceted approach that involves technological, policy, and behavioural changes. Limiting energy flows by adopting energy-efficient practices and transitioning to cleaner energy sources is one possibility in mitigating the temperature increase associated with human’s activities. Most probably this possibility alone cannot provide a satisfying solution

against the increase of the environment temperature. The conclusion is obvious, because the energy emitted by various sources is transformed into heat as its final form that has our environment as its mutual sink.

Offshore wind energy:
https://www.google.com/search?q=Windenergie+Nordsee&&tbm=isch&ved=2ahUKEwjev

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