

Importance of Material Selection in Renewable Energy Generation

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Short Communication

The energy problem is the biggest problem in the world and this problem continues to grow day by day. Increasing population and developing technology constantly demand more energy. Today, in many countries, mainly coal, oil and natural gas are used for energy. It is possible that these resources will be limited and will run out in the future. These resources, called fossil fuels, are not renewable. Humanity meets the energy it needs by converting various natural resources into energy. Today, the use of renewable energy sources

among energy sources is constantly increasing. Renewable energy is generally defined as energy sources that can be supplied mostly above ground and continuously renewed without the need for any production process. It is a type of energy obtained from the energy flow that exists in natural periods. Unlike conventional energy sources, renewable energy sources provide many environmental benefits. In Table 1, renewable energy and conventional energy are compared.

Table 1: Comparison of Renewable and Conventional Energy.

Renewable energy	Conventional Energy
It has little or no harm to the environment and human health.	It has been proven to be quite harmful to the environment and human health.
It is obtained economically easily and cheaply.	It is a highly effective driver of economic progress and is expensive.
It reduces carbon dioxide emissions and helps protect the environment.	It increases carbon dioxide emission. It does not help protect the environment.
Being a domestic resource reduces foreign dependency and contributes to increasing employment.	External dependency is high and does not contribute to increasing employment.
It is continuously and sustainably sourced. It is of great importance as an energy source.	It has no continuity and there is a decrease in the resource over a certain period of time.

It would be useful to briefly mention renewable energy sources. Renewable energy sources do not run out because they renew themselves. Most of the renewable energies are directly or indirectly sourced from the sun. It is directly used in residences and other buildings to heat and illuminate from solar energy. It is used for various factors such as indirectly generating electricity, heating water and cooling in commercial and industrial buildings. As a result of the sun's heating of the earth, it creates winds and wind energy is captured with the help of turbines and turned into wind energy. As the sun increases the amount of heat on the earth, it causes evap-

oration of water from oceans, lakes, streams and water resources. When the water vapor turns into hail, snow or rain and reaches the rivers or streams again, hydro energy can be captured by hydroelectric power plants. Sun heat and light, along with hail, snow and rain, cause plants to grow. The organic substances that make up these plants are called biomass. It is possible to produce electricity by using this organic material and by using it, biomass energy is obtained. Hydrogen is found in all known organic compounds. It is one of the most abundant elements on Earth and is not found as a natural gas. For methane, it is always combined with other ele-

ments, as it combines with carbon. When separated from the combined hydrogen energy can be converted into electricity or used as fuel. Brief definitions of renewable energy types can be made as follows. Solar energy, which can be obtained quite economically, is one of the renewable energy sources that does not have a negative impact on the environment. Wind energy offers the opportunity to be used in every corner of the world as a clean and sustainable type of energy that almost does not harm the nature. Hydroelectric power plants are among the efficient systems in energy production. Hot water and steam in the lower layers of the earth's crust are convert-

ed into energy using steam turbines. Geothermal energy with high efficiency can also be used for heating purposes. Biomass power plants can be installed anywhere. Hydrogen energy refers to the energy obtained by converting and processing hydrogen gas. It has an important place among renewable and clean energy sources. Wave energy, which is one of the renewable energy sources, is defined as obtaining energy from the wave motion and pressure created by the waves. Renewable energy sources are shown schematically in Figures 1a & 1b.

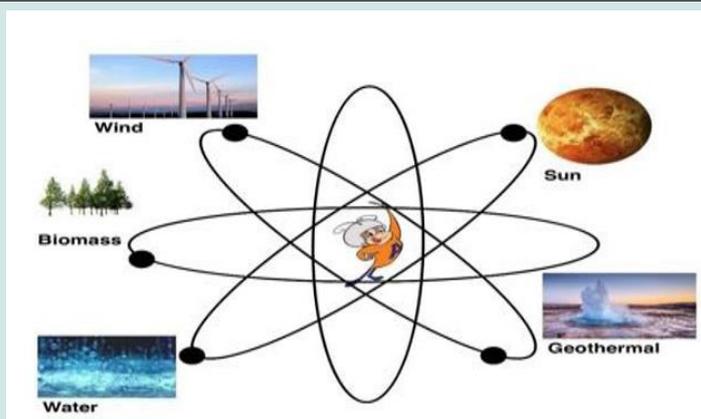


Figure 1a: Schematic representation of renewable energy sources.



Figure 1b: Renewable energy sources images.

UK-based price comparison company Compare the Market has published a 2019 study examining 21 countries' investments in renewable energy sources such as wind, solar, hydropower and bio-energy. According to the research, Germany has invested heavily in renewable energy as part of its efforts to meet the European Un-

ion's renewable energy and climate action targets and has become the first country with the highest use of clean energy. is located. Again, according to this research, Turkey ranks eighth among the countries that use renewable energy the most. The top 10 countries in the ranking are listed in Table 2.

Table 2: Renewable Energy Usage Rates.

Rank	Country	Percentage of Renewable Energy (%)
1	Germany	12.74
2	UK	11.95
3	Sweden	10.96
4	Spain	10.17
5	Italy	8.8
6	Brazil	7.35
7	Japan	5.3
8	Turkey	5.25
9	Australia	4.72
10	USA	4.32

Source: Compare the Market.

Nanoscience and nanotechnology began with two major developments in the early 1980s. The first of these is the increase in computational power. The second is advances in material modeling. Nanomaterials form the basis of nanoscience and nanotechnology. Nanostructured science and technology have become interdisciplinary research in recent years [1]. Especially with the increasing interest in renewable energies, the importance of these materials has increased and will continue to increase day by day. Nanomaterials exhibit strong shape and size effects that cannot be explained by typical theories [2]. It is useful to examine these effects in two different situations. The first is the calculation of the thermal conductivity of some nanomaterials based on the size-dependent atomic structure based on surface effects. The second is to calculate the temperature-dependent changes of the nanomaterial volume ratios. These calculations have been made on nanosolids, nanowires and nanofilms [3]. In addition, the selection of nanomaterials with different structures such as body-centered cubic (BCC), face-centered cubic (FCC), and hexagonal closed package (HCP) differs. The material properties of nanostructures differ from bulk structures due to the high surface area to volume ratio and the emergence of

possible quantum effects at the nanoscale. These materials exhibit strong shape and size effects that cannot be explained by typical theories. The study of the effects of size and shape on material properties has received great attention due to their scientific and industrial importance [4]. As a result, the use of nanomaterials in renewable energy production is very important. Turning to renewable energy sources is of great importance for the future of the world and for humanity. According to the International Renewable Energy Agency (IRENA), by 2050, renewable energy sources will meet 86% of global energy needs.

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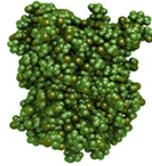


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