

Do the benefits of renewable energy sources stack up?

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Do the overall efficiencies of renewable energy sources, such as wind, solar, and geothermal add up in terms of their complete life cycle from materials sourcing, manufacture, running, and decommissioning? Researchers in Greece have carried out a life cycle assessment to find the answer.

Increasing energy consumption and a growing world population implies shrinking reserves of fossil fuels. While the use of fossil fuels brings with it the problem of carbon dioxide emissions and climate change. Our continued dependence on fossil fuels coupled with the pressing global issue of climate change has pushed the concept of renewable energy sources to the top of the agenda.

In looking for alternative energy supplies, there is more to simply adding up the outputs, according to Christopher Koroneos and Yanni Koroneos of the Laboratory of Heat Transfer and Environmental Engineering, at the Aristotle University of Thessaloniki, Greece. They argue that a whole life cycle assessment of any environmentally friendly energy supply must be carried out to ensure its green credentials are valid.

Writing in *Inderscience's International Journal of Global Energy Issues*, the researchers point out that land use and materials employed are just two aspects of renewable energy development that can have an adverse impact on the otherwise positive environmental picture.

There are three viable renewable energy resources, say the researchers -

solar energy, wind power and geothermal energy. They have applied the techniques of life cycle assessment (LCA) to each in order to determine the total environmental impact and to compare this with the effects of equivalent energy release from fossil fuels.

The LCA approach allows an assessment to be made of the flow of material and energy used in the construction, operation and ultimate decommissioning of a renewable energy supply. It also takes into account the manufacturing of components, the possible extraction and supply of fuels as well as waste generated in these processes.

The researchers demonstrate that some renewable energy systems based on wind power and geothermal energy do have valid green credentials in electricity production. The efficiency of these systems is comparable over the complete life cycle than the equivalent fossil fuel system. However, the conversion of solar energy to electricity using photovoltaic solar cells is less efficient in terms of materials production, running, and recycling than non-renewable energy. However, economies of scale come into play with solar power and a large enough area of solar cells would outstrip the fossil fuel system. The team also points out that the life cycle pollution of solar systems is much, much lower than any conventional system although thermodynamic efficiency is lower.

"A significant advantage of the use of renewable energy systems," say the researchers, "is that they are environmentally friendly because overall they result in lower dangerous pollutant emissions, this and one other major factor, they are essentially inexhaustible."

Source: Inderscience Publishers

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