

What's the best way to use solar energy?

Opinion

Solar energy in its various forms supplies most of the energy we use. Harvesting this energy can be accomplished in several ways, ranging from photovoltaic's (PV) for the production of electricity to biomass (through photosynthesis) and ultimately fossil fuels.

The choice among such energy sources was determined in the past by availability and cost. More recently, however other dimensions were added to such choices the most important being sustainability and an important quality index which is the continuity of supply.

Sustainability imposes severe limitation on fossil fuels use. Green House Gas emissions mitigation requires that available fossil resources will never be used in its totality as technological development with potential to transform known reserves in further resources loses interest.¹ As an alternative developed and developing countries alike have encouraged the development and use of solar energies through mandates and subsidies.

The result has been decreasing costs through impressive "learning curves" and today most solar energies are competitive in comparison with traditional fossil fuel sources of energy.

As a consequence, the contribution of renewable energy sources such as wind and photovoltaic's is increasing significantly but suffers from a fundamental problem, which is intermittence and require backup from fossil fuels with the consequent emission of Green House Gas. Hydroelectricity based on hydro reservoirs as backup is an attractive possibility but is region and seasonally specific.²

A very attractive solution, particularly for tropical countries, is electricity produced from biomass. Some types of biomass such as sugarcane are able to provide simultaneously liquid fuels and electricity, and such co-production explains their high quality energy at fulfilling sustainability requirements.³ Biomass residues can be stored for months and used when electricity demand requires. It is worth mentioning that carbon capture and storage (CCS) has been considered as one of the important technologies to guarantee the accomplishment of world compromises assumed in the Paris agreement. CCS, initially devised as a technology to improve sustainability of fossil fuels, has been seen more recently as more effective for biomass based energy sources because the net effect can result in negative Green House Gas's emissions. Thus, instead of just another mitigation technology, negative emissions means that as more energy is used, more CO₂ will be removed from atmosphere.⁴

It has been argued however⁵ that "the productions of biofuels constitute an extremely inefficient land use. Michel based his point in the comparison of the low efficiency of photosynthesis in converting solar energy (below 6%) with the efficiency of photovoltaic cells (about 15%) and states that the combination of photovoltaic cell/electric battery/electric engine uses the available land 600 times better than the combination biomass/fuel/combustion engine".

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Such claims have been critically analyzed by⁶ and proved to be highly exaggerated. Furthermore, the combination of biofuel production and electricity production, which is feasible when using sugarcane as the feedstock plus CCS, provides a powerful alternative for the capture and storage of solar energy providing thus a negative carbon route with continuity of supply.

Conclusion

In conclusion, what one can say is that solar energy capture in some of its forms, particularly bioenergy, can meet the criteria of sustainability as well as energy quality.

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Conflicts of interest

There is no conflicts of interest.

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