

Sustainability of renewable energy

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Abstract

The talk will start with an introduction on what the International Energy Agency's 2 degree scenario (2DS) means with respect to the energy sector. If we want to meet this 2DS scenario, we must reduce our CO₂ emissions with over 70 % by 2050 and power generation activities are expected to contribute the most to this reduction with a share of 40 % (industry and transport both 12 % and building improvements 5 %). Moreover, shortly after 2050, the power generation sector needs to become carbon negative. The largest reduction should come from structural shifts in the production and use of energy with a shift from carbon based energy to renewable energy accounting for 40 % of the total effort needed, increased efficiency also 40 % and Carbon Capture and Storage for 14 %. The presentation will focus on these renewable energy production technologies and present some of ENGIE's R&D work in this area.

Apart from some technological improvements in the field of the mature solar and wind power generation technologies, a selection of emerging renewable energy production technologies will be presented: Airborne High Altitude Wind energy, CO₂ to hydrocarbons, emerging PV technologies, artificial photosynthesis, ... The presentation will discuss the maturity of the technologies and the technical improvements needed. A particular focus on how renewable hydrocarbons will be needed for applications where high energy density is needed will be highlighted (eg. marine transport, aviation, ...).

Apart from the technological issues, the challenge related to the assessment of the sustainability of some of these emerging renewable energy technologies will be presented. It is a fact that environmental impact is not equal to low carbon and in many cases, a trade-off exists between low carbon and other environmental impacts (eg. mineral depletion, water footprint, particulate matter formation, ...). Some case studies encountered in ENGIE's R&D program on renewable technologies and their Life Cycle Assessments will illustrate this trade-off in more detail. On top of possible trade-offs, we must ensure that low carbon technologies implemented in Europe but manufactured elsewhere do not lead to a displacement of their environmental impact from one location to another. The importance of this possible pollution displacement issue will be demonstrated for the PV supply chain.

To conclude, the megatrend of how sustainability moves away from emissions to resources will be presented. The quest for alternative, cheap and earth abundant materials and the efforts needed with respect to recycling will be highlighted.