Hydrogen from renewable sources

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Renewable energy sources have the greatest potential for the sustainable production of hydrogen. Usually, hydrogen is made from biomass or generated by means of electrolysis, with electricity and heat produced from renewable sources. If the electricity market is developed extensively for renewables (share >50 %), the availability of low-cost electricity could mean that the use of electrolysis for the energy industry will become economically viable. Then, electrolysis could be inexpensive and solar-compatible.

Concentrator solar power systems are also increasingly becoming interesting. They directly covert sunlight thermochemically into combustible fuels with very high conversion efficiencies. The reformation of methane from synthesis gas is the most advanced concept of such solar chemical processes.

Today, hydrogen is mainly made from natural gas, with large quantities of hydrogen also being created in the chemicals industry. The generation technologies used to serve as intrigue technologies towards a hydrogen energy system based on renewable sources. Advanced synthesis gas methods that already provide a very high level of hydrogen content at little process temperatures in a single gasification stage represent a new entry point for the production of hydrogen from biomass, and hence decentralized production for mid-size power generators.

Research and development requirements

- Development of synthesis gas production with high hydrogen content
- Solar-chemical procedures to reform methane in concentrator solar power units
- Direct water-splitting by means of thermo-chemical circulation processes for the production of solar hydrogen
- Solar heat to support high-temperature electrolysis for the production of hydrogen
- Highly efficient pressure electrolysis with small-scale units
- Development of inexpensive materials, such as catalysers' electrolysis units, membranes, gas distribution layers