

Call for cooperation

Dear colleagues,

We want to draw your attention to the project which is described in the following and ask your cooperation. This project is a significant step to explore one of the most important problems of our time and, at the same time, presents the interdisciplinary collaboration of the faculties. If you are interested, please contact the authors. This appeal refers equally to persons who are not member of the university.

Carbon dioxide hydrogen projects for the energy production

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The aim of the supply system of electrical energy is to provide electrical energy matching the demand while keeping to the same quality level of voltage and frequency. The supply of electrical energy coming from photovoltaic or wind energy systems cannot be guaranteed without storage of these energies. Feeding these energies directly into the mains has the effect that the power plants which feed into the mains, have to take charge of the mains control and to provide reserve power.

The aim of this project is to examine if solar or wind

energy can be supplied in a controlled and calculated manner if it is stored in an efficient manner.

1 Technological principle

The electrical energy produced by solar or wind energy is used to produce hydrogen [1]. To avoid the storage of big quantities of gaseous hydrogen, you let the hydrogen react with carbon dioxide to methanol. Methanol is an energy carrier and better suited for storage than hydrogen. The methanol

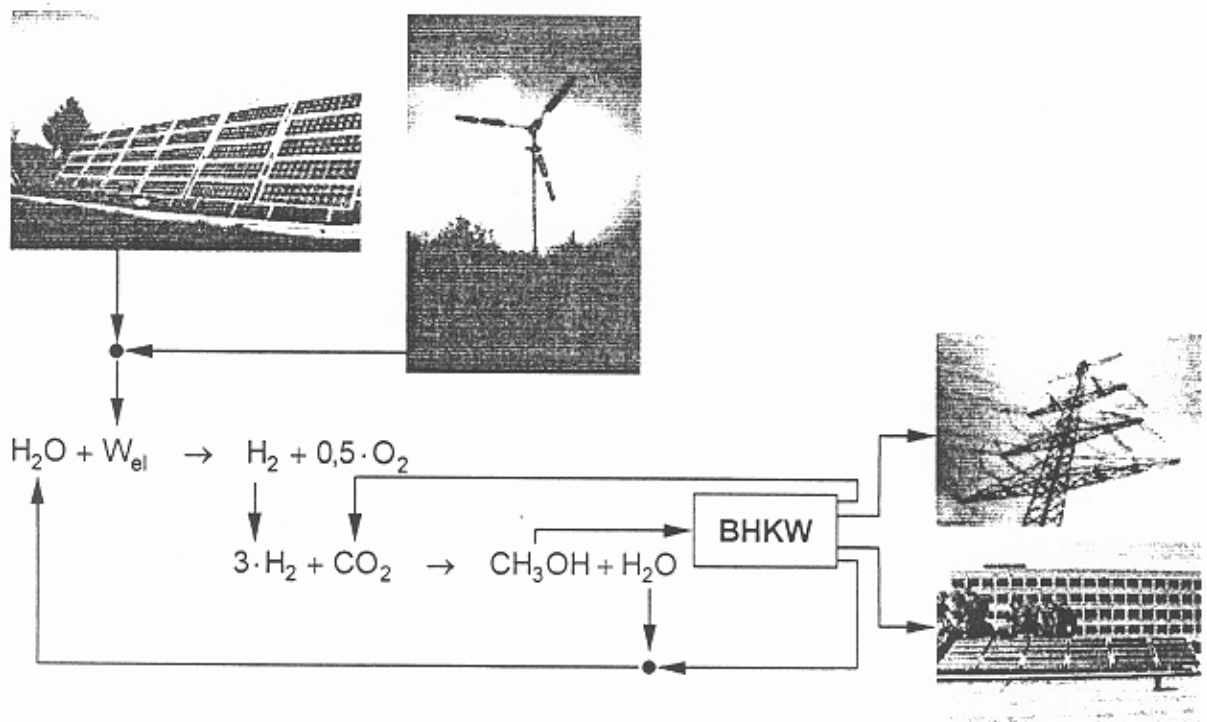


Fig. 1 Technological principle of the energy production

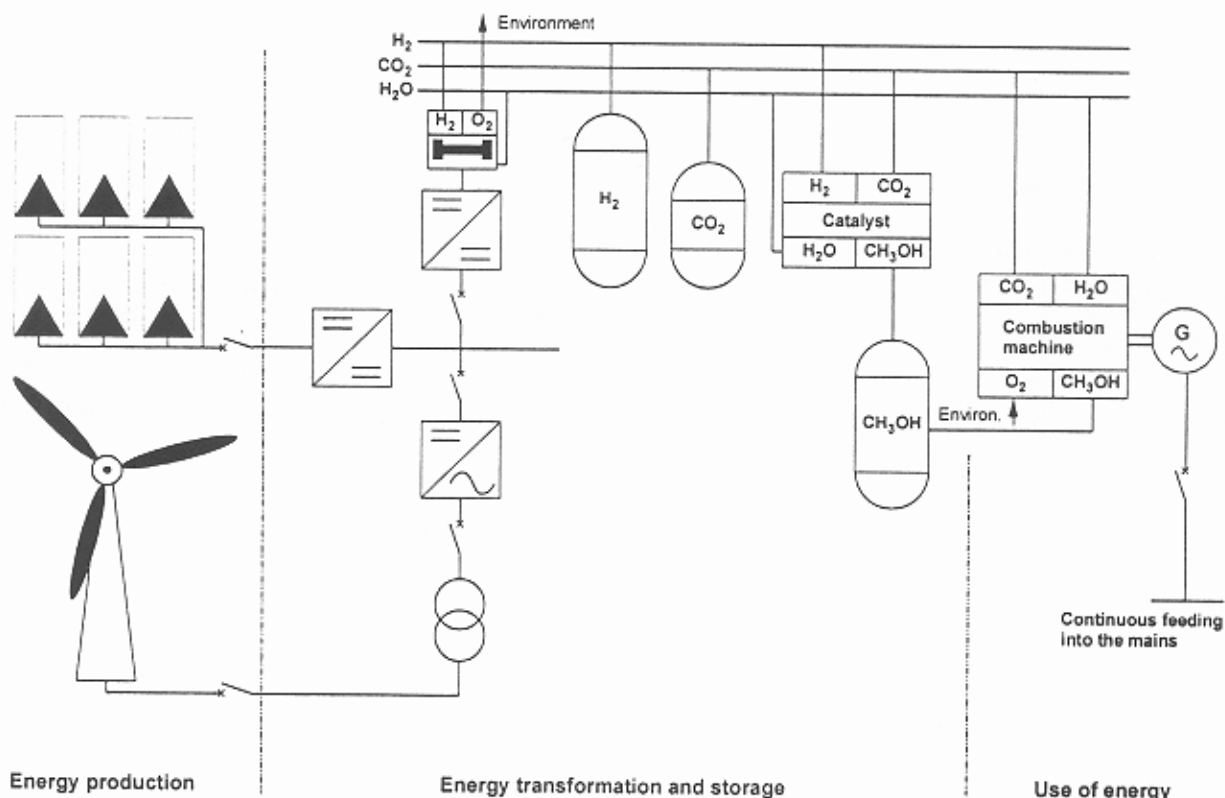


Fig. 2 Technological process of the energy production

drives a cogenerator (here BHKW), which produces thermal and electrical energy.

The combustion gases, water and carbon dioxide, are fed back into the process. This way, the carbon dioxide is not released to the environment: it serves to produce methanol. Fig.1 shows the technological principle of the described process of energy production. The aim of the project is to supply electrical and thermal energy in a calculable manner. The following questions still have to be answered:

- How big will the storage tank for methanol have to be to supply a certain demand.
- Which size of solar (wind) power system will be needed.

2 Realisation of the technological principle

The realisation of the principle should tend to a specific object, for instance the energy supply of a part of the university of applied science in Rüsselsheim. Fig.2 shows the technological process of the principle mentioned above. The entire energy produced in the wind or solar system is fed into the water electrolysis to produce hydrogen and oxygen. In a reactor, the hydrogen reacts with carbon dioxide to methanol. The energy for this process and the gas purification comes from other sources. The storage tanks for

hydrogen and carbon dioxide serve as buffer for the process control. The produced methanol is stored in another tank. Electrical and thermal energy are produced by burning the methanol in a cogenerator. The combustion gases - carbon dioxide and water – are fed into the process. Further carbon-dioxide will be produced by other combustion processes if necessary. The environment is not charged with carbon dioxide in this process.

3 Tasks for the project

In various studies, the following topics will have to be investigated:

- Profile of energy demand for electrical and thermal energy as basis for the energy supply system.
- Analysis of methanol consumption as basis for the methanol production and tank.
- Choice of adequate process for methanol-production, determination of storage tanks for hydrogen and carbon dioxide.
- Choice of adequate process for water electrolysis with consideration to discontinuous energy supply from the fotovoltaic system.
- Determination of fotovoltaic area.

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- Conception of a process control system.
- Cost assessment of the plant.

As a result of these investigations, a concept of the energy supply system and its economic efficiency has to be developed. Should the decision be positive, a pilot plant should be built.

References

- [1] Schulien, S...;
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