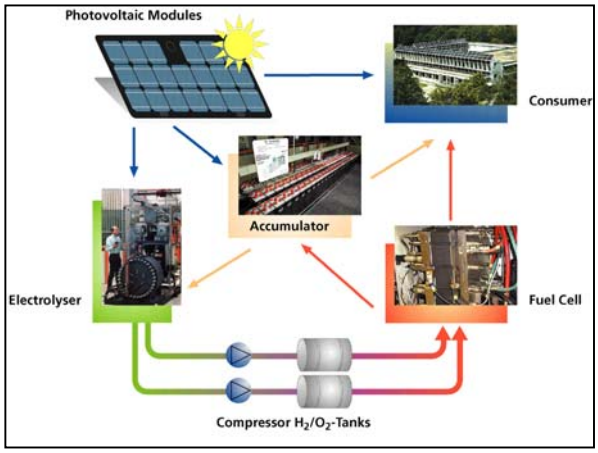
Project Information

Subject: **PHOEBUS Juelich**



Applicant: Forschungszentrum Jülich GmbH
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Project Duration: 1999 - 2000

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Project description:

The increasing use of renewable energy sources such as solar radiation and wind power requires an innovative buffer technology between producer and consumer or grid especially with respect to optimum utilization. This buffer takes on the function of energy conversion as well as energy storage with equipment and components specially developed and designed for this purpose. Scientists and technicians at the Institute for Materials and Processes in Energy Technology (IWV-3) of Research Centre Jülich are working on future-oriented solutions for the appropriate storage of renewable energy. The most impressive result is the PHOEBUS demonstration facility which supplies the Central Library of Research Centre Jülich with solar electricity. This takes place day and night under all weather conditions without any release of gaseous effluents.

PHOEBUS stands for photovoltaics, electrolysis, fuel cell and system engineering as the most important components of the facility. A total of 220 photovoltaic modules with more than 30,000 monocrystalline silicon solar cells capture sunlight on a surface area of 312 m² and supply electric power of up to 30 kW. If on sunny days the solar cells produce more electricity than immediately needed, the excess electricity serves to recharge the battery, which has a capacity of 500 car batteries, and furthermore to decompose water into hydrogen and oxygen by means of an electrolyser. Both gases are stored in pressure tanks and serve as a reserve for the winter half-year with less sunshine. The supply deficiency from the solar panels during this time is compensated by the conversion of hydrogen and oxygen in a fuel cell supplying electricity.

In order to continuously and fully automatically satisfy the annual energy requirements of such a demanding consumer as the Central Library, amounting to about 16 MWh, throughout the year, which corresponds to the annual electricity consumption of five average German households, computer-based control is necessary, so-called “energy management”. This independently determines the battery’s respective charge state, starts the electrolysis when e.g. there is intense solar radiation over a prolonged period or puts the fuel cell into operation when e.g. the energy required at a particular time exceeds the solar energy available. The safety concept developed in Jülich is also implemented by the system control of energy management. For example, a leak in a hydrogen pipe would be immediately detected by the system and the facility would be run automatically into a safe state. It is possible to demonstrate with the system described that a grid-independent electricity supply is feasible under our weather and consumption conditions.

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