Harnessing Microorganisms for Natural Gas Production

New results have proven that certain microorganisms are capable of producing natural gas under industrial conditions. The method, based on microorganisms known as Archaea, converts climate-damaging CO2 and hydrogen into storable methane (natural gas). A recently completed pilot study has demonstrated how quickly microorganisms can respond to sudden peaks in power generation and produce high quality natural gas to be fed into the grid.

Considering rising power generation from renewable sources, there is an increasingly urgent need for a practical, commercial solution to large-scale power storage. While oil and gas can be converted into electricity in line with demand, wind, water and sun cannot be adapted as readily to fluctuations in power consumption. Efficient power storage solutions must satisfy two criteria: Their own consumption of resources must be as low as possible, and surplus power must be stored within seconds. A microorganism-based process developed by Krajete GmbH is can satisfy both of these criteria.

The process benefits from life characteristics of microorganisms known as Archaea, which have inhabited Earth's extreme environments since the origin of life. These single-celled organisms are capable of converting CO2 and hydrogen into methane, i.e. natural gas. Commercial use of this ability has long been thwarted by the harsh living conditions under which the microorganisms feel truly at home.

Now it possible to run the process at moderate temperatures of around 40-60 degrees Celsius and at atmospheric pressure. The extreme heat or elevated pressure that prevails in the natural habitat of the Archaea is no longer necessary, saving resources and satisfying the criterion for efficient power storage. Moreover, Archaea only need CO2 and hydrogen to produce natural gas. Production takes place with a surprisingly short response time once these nutrients have been supplied, thereby satisfying the second criterion for efficient power storage.

The study process can be ramped up to full load and even shut down again within one minute and can deliver this performance repeatedly and stable over a period of months. As a result, sudden peaks in power generation can be immediately captured and stored in the form of natural gas. The hydrogen required can be quickly and efficiently produced simply by electrolyzing water. In the waiting time between power peaks, it does not consume any power and, on arrival of surplus power, gas production begins within seconds, and natural gas ready to be fed into the grid is available after one minute.

While the process is suitable for intermittent power storage in a "power to gas" system, it can also directly enrich biogas and waste gas into natural gas. In fact, the process can convert gasoline and diesel combustion gases, syngas-type gases from

the steel making industry or transform incineration and crude biogas into natural gas with a purity of > 95 volume percent methane. Intermittent power storage with ultra-short response times and direct utilization of genuine industrial CO2 gases demonstrate the efficiency and versatility of natural processes which are ideally suited for a sustainable energy concept.