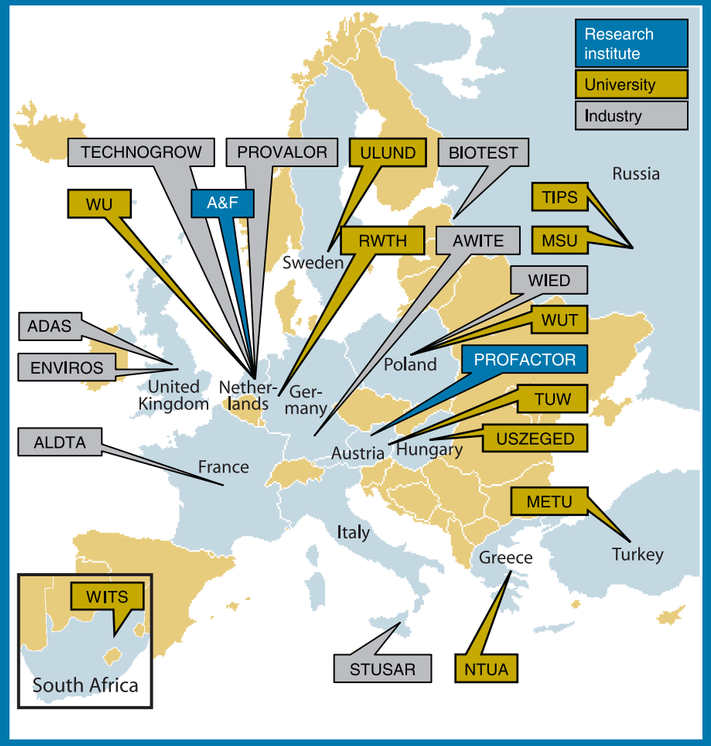
More information

Visit the HYVOLUTION website for more information: www.hyvolution.nl

Or contact the project coordinator:
Pieternel Claassen
pieternel.claassen@wur.nl
+31 317 480221

The HYVOLUTION participants

A&F	Agrotechnology and Food Innovations (project coordinator), The Netherlands
ADAS	ADAS, United Kingdom
ALDTA	Air Liquide, Division des Techniques Avancées, France
AWITE	Awite Bioenergie, Germany
BIOTEST	Bioreactors and membrane systems, Russia
ENVIROS	ENVIROS Ltd, United Kingdom
METU	Middle East Technical University, Turkey
MSU	Moscow Lomonosov State University, Russia
NTUA	National Technical University of Athens, Bioresource Technology Unit, Greece
PROFACTOR	Profactor GmbH, Austria
PROVALOR	Provalor b.v., The Netherlands
RWTH	Rheinisch-Westfälische Technische Hochschule Aachen, Germany
STUSAR	Studio Sardo, Italy
TECHNOGROW	Technogrow b.v., The Netherlands
TIPS	A.V. Topchiev Institute of Petrochemical Synthesis, Russia
TUW	Vienna University of Technology. Austria
ULUND	Lunds Universitet, Sweden
USZEGED	University of Szeged, Department of Biotechnology, Hungary
WIED	Wiedemann Polska. Poland
WITS	University of the Witwatersrand, South Africa
WU	Wageningen University, The Netherlands
WUT	Warsaw University of Technology, Poland



Non-thermal production of pure hydrogen from biomass

"Hydrogen is a clean fuel and the fuel of choice for fuel cells, which, I think, will replace today's combustion engine," says Pieternel Claassen, HYVOLUTION project coordinator. *"Fuel cells have high efficiency, low noise and low emissions – and we'll need hydrogen to power them, but hydrogen from a renewable resource, not from fossil fuels."*

www.hyvolution.nl

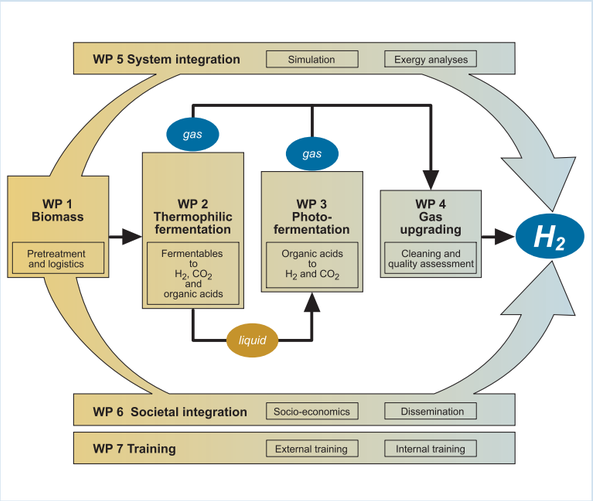
The aim of HYVOLUTION

The aim of HYVOLUTION is to deliver prototypes of process modules which are needed to produce hydrogen of high quality in a bioprocess which is fed by multiple biomass feedstocks. To achieve this aim, a coherent set of scientific and technological activities is required which are interdependent and flanked by system and societal integration for optimal economics and societal implementation.

What is HYVOLUTION?

HYVOLUTION is an EC-funded Integrated Project aimed to develop a blue-print for an industrial bioprocess for de-central hydrogen production from biomass. HYVOLUTION started in January 2006 and will end at December 2010. The work is organized in different work packages (WP). HYVOLUTION's non-thermal bioprocess enables the small scale conversion of a broad range of locally produced biomass. This biomass can be crops, primary and secondary agro-industrial by-products.

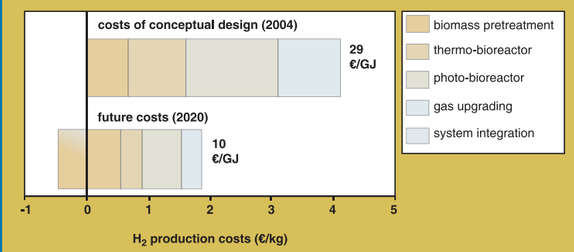
The process starts with the conversion of biomass to make a suitable feedstock for the bioprocess (addressed in WP 1). The ensuing bioprocess is optimized in terms of yield and rate of hydrogen production through integrating fundamental and technological approaches, addressed in WP 2 and 3. Dedicated gas upgrading is developed for high efficiency at small-scale production units dealing with fluctuating gas streams (addressed in WP 4). Production costs will be reduced by system integration combining mass and energy balances (addressed in WP 5). The impact of small-scale hydrogen production plants is addressed in socio-economic analyses performed in WP 6.



The HYVOLUTION approach

The HYVOLUTION process turns biomass into fermentable sugars which are fermented in two bioreactors and hydrogen is produced. The hydrogen is then cleaned for usage as a biofuel. This process will be improved in many ways, by testing various feedstock and strains of bacteria. The biggest challenge for the HYVOLUTION team will be reducing the cost of the process. The aim is to make the hydrogen production costs in 2020 competitive with similar costs for biofuels in terms of Euro per GJ. After the prototypes for each stage have been developed, expected in 2011, an integrated pilot plant can be built in collaboration with industry partners.

The price target will be achieved by reducing costs in the biomass pretreatment, by optimising the efficiency and rate of the fermentations enabling low cost thermo- and photo-bioreactors, by developing dedicated, low cost gas upgrading procedures and optimum system integration for making economic balances with respect to energy and heat utilization.



System integration and societal integration

Besides scientific and technological objectives, also socio-economic activities are included to increase public awareness and societal acceptance, and for identification of future opportunities, stakeholders and legal consequences of this specific bioprocess for decentral hydrogen production.

System integration and societal integration form a basis to secure the scientific and technical objectives. These issues are fundamental to develop this new process for small-scale hydrogen production and to make it viable in terms of process-economics and socio-economics, including environmental impact. Both disciplines are integrated in HYVOLUTION to enable identified adjustments right from the start. This is necessary to avoid routes which will have no economic future or do not adhere to sustainability, and to make optimal use of the integrated approach.

Prototype of a 100 L photobioreactor for production of H2 by Rhodobacter capsulatus from acetate and light.