



# Non-thermal production of pure hydrogen from biomass

## Reporting

### Project Information

HYVOLUTION

Grant agreement ID: 19825

[Project website](#) 

Start date

1 January 2006

End date

31 December 2010

Funded under  
FP6-SUSTDEV

Overall budget  
€ 14 216 992

EU contribution  
€ 9 894 082

Coordinated by  
**STICHTING DIENST  
LANDBOUWKUNDIG  
ONDERZOEK**  
 Netherlands

## Final Report Summary - HYVOLUTION (Non-thermal production of pure hydrogen from biomass)

HYVOLUTION (please see <http://www.hyvolution.nl> online) had been granted in the Sixth Framework Program (FP6) on Research, Technological Development and Demonstration (RTDD) , Priority 6.1 Sustainable Energy Systems. The integrated project has started on 1 January 2006 and ended on 31 December 2010. Its aim: 'development of a blue-print for an industrial bioprocess for decentral hydrogen production from locally produced biomass' added to the number and diversity of hydrogen production routes giving greater security of supply at the local and regional level. The final target of this future biohydrogen industry would be to deliver 10-25 % coverage of the European Union (EU) demand for hydrogen, for use in power or bio-fuel production, at 10 Euro/gigajoule (GJ).

The novel approach adopted in the project was based on a combined bioprocess employing thermophilic and phototrophic bacteria, to provide the highest hydrogen production efficiency in small-scale, cost effective industries. In HYVOLUTION, 10 EU countries, Turkey, Russia and South Africa were

represented providing the critical mass for realizing a breakthrough in cost-effectiveness of hydrogen production.

Hydrogen is regarded as an important energy carrier in the future according to several reports in prominent journals as e.g. Science and Scientific American. However, to make the hydrogen economy fully sustainable, renewable resources instead of fossil fuels have to be employed for hydrogen production. In HYVOLUTION, bacteria were exploited, which freely and efficiently produced pure hydrogen as a by-product during growth on biomass. This approach, which started in the Fifth Framework Programme (FP5) project BIOHYDROGEN, allowed a great reduction in CO<sub>2</sub> emission and provided independence of fossil imports. Both topics are dominant in all global agreements on climate protection and urgent in mitigating the greenhouse effect.

HYVOLUTION was structured around in seven technical work packages (WPs). The process started with the conversion of biomass to make a suitable feedstock for the bioprocess (WP 1). In WP 2 and 3 the fermentations were optimized in terms of yield and rate of hydrogen production. Dedicated gas upgrading was developed for high efficiency at small-scale production units dealing with fluctuating gas streams (WP

4). Production costs would be reduced by system integration combining mass and energy balances (WP 5). The impact of small-scale hydrogen production plants was addressed in socio-economic analyses performed in WP 6. WP 7 addressed external as well as internal training.

The overall objective of HYVOLUTION was the development of a two-stage bioprocess and construction of prototype modules. Several sub-objectives could be distinguished as follows:

1. Pretreatment technologies for optimal degradation of energy crops and bioresidues.
2. Equipment for mobilisation of fermentable feedstock.
3. Maximum efficiency in conversion of biomass to hydrogen.
4. Reactors for thermophilic and photo-heterotrophic hydrogen production.
5. Assessment of installations for optimal gas cleaning.
6. Devices for monitoring and control.
7. Equipment for optimal gas cleaning.
8. Minimum energy demand and maximum product output.
9. Increase of public awareness and societal acceptance.
10. Identification of market opportunities and future stakeholders.

## Related documents

 [132122841-8\\_en.zip](#)

**Last update:** 19 February 2012

**Record number:** 53029

