GA No. 691911

# Research Coordination for a Low-Cost Biomethane Production at Small and Medium Scale Applications

## Deliverable No. D3.3

## R&D Needs

| Dissemination Level | | |
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| **PU** | Public | x |
| **CO** | Confidential, only for members of the consortium (including the Commission Services) | |

| Nature | | |
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| **R** | Report | x |
| **O** | Website | |

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# 1 Introduction

The following tables lists a number of research needs that have been identified at Record Biomap workshops and by developers of small scale biomethane technologies. In the first table some general areas that would benefit from further research have been collected as potential input for potential inclusion in future calls. The second table focuses on specific R&D needs to move respective innovation the next step towards market introduction.

# 2 General R&D needs

In the following table, general R&D needs are listed.

**Table 1: General R&D needs**

| Research need | Notes |
|---|---|
| **Develop crop and straw harvesting technology and manure management that prevents stones, gravel and other hard impurities to enter the biogas production line with the substrates.** | Stones, gravel and other hard impurities in substrates is perhaps the most important reason for high maintenance costs at biogas production plants. It is also a limiting factor for many pretreatment technologies that could have otherwise been used to increase digestability of substrates. |
| **Development and market introduction (24/7 industrial demo) of small scale liquefaction technology for decentralized LBG production.** | Further development to reduce cost of production of existing market ready version. Development of competing concepts for LBG. Important to reduce cost of distribution of biomethane produced at rural locations some distance away from biomethane users. |
| **Improvement of durability and impermeability of gas dome roofs to prevent leakage of methane from storage over time.** | Methane slip is the Achilles heel of the biomethane industry. If no dealt with through R&D, product development and smart design it can erode the environmental arguments for biomethane production and use. |
| **Quantification of enviro-socio-economic benefits unique to small- scale and decentralized biomethane production.** | Little researched area as most studies and assumptions around these benefits are extrapolated down from studies that have been done on large-scale centralized systems. |
| **Development and testing of biomethane fuel-cells for farm machinery application (field tractors, etc).** | Heavy duty farm machinery will eventually also have to be weaned off fossil fuels. The problem is to be able to carry enough energy in the vehicle for a full day of heavy duty work to enable rational conditions for operation. A combination of biomethane (especially LBG) as a dense renewable energy carrier and the efficiency of an electrified drivetrain could be realized through the key technology of efficient on-board methane fuel-cells. |

# 3 Specific R&D needs to move small scale biomethane innovations forward

The specific R&D needs were collected with the Technology Descriptions in the Record Biomap Project (Task 1.2) and are summarised in Table 2.

**Table 2 Specific R&D needs to move small scale biomethane innovations forward**

| Company/organization (innovation) | Research need |
|---|---|
| **UWM (Change-pressure disintegrator), ED Biogas International AB (MR Methane Reactor), NeoZeo (Vacuum Pressure Swing Adsorption - VPSA), University of Valladolid (Algal Bacterial System for biogas upgrading), CentraleSupélec (G-PUR)** | Scale-up test to prove technology in a 24/7 industrial setting, with the goal of improving the model for efficient delivery of complete system. |
| **UWM (Ultrasound disintegrator, Hydrodynamic disintegrator, Device for mechanical grinding of plants substrates, innovative digester mixing system), Latvia University (Methane production in 4 sections module anaerobic digester), Czestochowa University of Technology (Micro batch reactor), University of Applied Sciences Landshut (Cryogenic treatment of biogas)** | Technical scale (pilot) proof of concept and run-time experience to assess and reduce operational costs as well as optimize operations. |
| **Ventury (Pressure Swing Conditioning), Bialystok University of Technology (Micro-biogas plant with heating system combined with mixing system)** | Further product development to increase operational stability of system components (valves etc.) and reduce material costs. |
| **Hyperthermophilic (Hyperthermophilic Fermentation), PRV (HDP),** | Needs to be proved out for more substrates to increase the markets scope of the innovation |
| **Waterment AS (High rate AD for dilute substrates)** | Optimize design of feeding system. Development of simple and cost-efficient system for use of gas. |
| **RISE (In-situ methane enrichment)** | Reduce heat loss during operation |
| **RISE (Ash-filter)** | Planning and implementation of an efficient ash management system (logistics) |
| **Apex (Membrane technology)** | Certification and development/expansion of existing standards |
| **Electrochaea GmbH (Biological methanation)** | Needs differentiated rates for surplus electricity. R&D and policy development for Utility companies to actually implement differentiated electricity rates. |

# 4 Conclusion

From the specific company/organization research needs specified in the table above it can be concluded that scale-up, either from laboratory to pilot-scale or from pilot-scale to the first full-scale industrial installation is of the highest priority. It is therefore recommended that scale-up should be the focus for more R&D-calls in the future.