



HFR ROTTENBURG - HFT STUTTGART - HS ULM  
M.SC. SUSTAINABLE ENERGY COMPETENCE (SENCE)

## Report of the Second Project Phase

# Introduction of the UDR-Technology to the North-American Market and Prospects for the System

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## Abstract

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### **What was the task?**

The energy transition in the United States from fossil and nuclear fuels to an energy portfolio dominated by renewable energy is making only slow progress. Most notably the number of biogas plants in North America is almost negligible.

One objective of this report is to give insight into the current situation of the renewable energy market and especially the biogas market in the United States. Furthermore it presents a promising system for biogas plants – the UDR-Technology – describes the introduction and analysis the opportunities of this technology to the North-American market. Special attention is given to the development of the operation matrix for a facility, which is using this technology.

### **What was the approach?**

The first step was, to analyze the current U.S. renewable energy market and to find the reasons why the energy transition in the U.S. makes slow progress. By comparing the U.S.

biogas market to the German market, the potential for future biogas plants in the U.S. was investigated.

To estimate the future prospects of the UDR-Technology on the North-American market, the advantages of the UDR-Technology against its competitors were determined. The subsequent presentation of the market introduction of the UDR-Technology will provide the reader with more detailed information about the technology and the modular design of the UDR-System.

### **What is the result?**

The review of the energy transition in the U.S. shows, that even if the current share of renewable energies in electricity generation is only 13 %, gradually however the general public and politics in the U.S. are rethinking their approach on renewable energies. In many states renewable energy incentive programs were recently introduced, which will push the further expansion of renewable energies. Most notably are the Renewable Portfolio Standards, which require electricity providers to generate or acquire a certain portion of their power supplies from renewable sources.

Nevertheless the biogas market in the U.S. is still very small and the number of existing biogas plants is overshadowed by the sheer quantity of potential applications. With the rise of new environmental regulations in the farming and food processing sector, many operators of such facilities have to react now and biogas plants present a promising solution for many of their problems.

Especially the UDR-Technology could offer many benefits. This patented technology uses the fixed-bed and recirculation principal to achieve high level performance regarding biogas yield and biological robustness. It combines a pair of fixed-bed digesters (Upflow- and Downflow-Tank) with a conventional complete mixed digester (Reflow- Tank). The fixed-bed principal provides micro-organisms with a surface to settle on; this stabilizes the process biology and increases the level of degradation of the organic input material, when compared to the same retention-time in standard digesters, which are using wet fermentation. The recirculation brings active substrate back in to the process and prevents that still viable and thus important micro-organism gets washed out with the digestate.

The LEAD project (Lowell Energy Anaerobic Digester) is the first biogas plant in the U.S., which utilizes the UDR-Technology. For the development of this project and the introduction of the UDR-Technology to the North-American market, enCO<sub>2</sub> – the developer of the project and engineering company of the plant – has formed a network of several

business partners, which will be used for further development of the market. The design of the 800 kW LEAD facility is characterized by the modular UDR design and by cost-effective technical solutions.

On the basis of the LEAD design, a modular system for UDR biogas plants was developed, which allows a fast and modular layout of industry sized biogas plants. The system is composed out of a 1 MW standard UDR facility, which can then be combined into a group of three facilities. For large-scale plants, this group is multiplied until the demanded size is reached.

### **What are the perspectives?**

The know-how attained in the LEAD project and the thinking in modules, will be very useful for future projects in the North-American market. The new environmental regulations in the U.S. will force many operators of the food and farm industry to upgrade their facilities with technology, which can reduce the environmental impact. Both business fields have considerable production sizes in the U.S. and waste showing a high variety of organics. With its biological robustness and scalability the UDR-Technology has the potential to provide solutions for many challenging applications and thus develop into a strong brand for high efficient biogas plants.