TECHNISCHE UNIVERSITÄT DRESDEN

PROCESS CONTROL SYSTEMS PROCESS SYSTEMS ENGINEERING

**Bereich Ingenieurwissenschaften** Professur für Prozessleittechnik & Arbeitsgruppe Systemverfahrenstechnik

**Project task description for the specialized internship**
for
**Robin Götzelt, Matr.Nr. 4766152, Study program VNT-AVT**

# Scheduling optimization of green hydrogen production from renewable energy sources

## Background:

With the rise in importance of green hydrogen, the fluctuating nature of renewable energy sources such as wind power, solar energy and hydro power has to be considered. To take advantage of the energy fluctuation, electrolysis can be used to transform excess power into an easily storable product. To optimize the production of hydrogen and effectively use the excess energy from renewable energy for these different demand scenarios, load dependent degradation of the electrolyzer modules and the energy consumption have to be considered to propose optimal production schedules. Considering these aspects, an optimization of this scheduled hydrogen production following state of the art operation strategies for a known hydrogen demand and energy forecast is to be proposed in this research project. During the development of such an optimization, the following scientific questions need to be answered:

## Scientific research questions:

- Which electrolyzer types and operating conditions are relevant for the described scenario? Which operating strategies (stack module and plant level) for the specific electrolyzer technologies exist in literature and are feasible?
- Which fitness function can be used to evaluate the overall optimization on both stack module level and plant level? How do existing best practice operation strategies compare to this fitness function?
- Which different aspects of the hydrogen production have the largest impact on the Levelized Cost of Hydrogen (LCOH)? How can additional technologies help to optimize the minimization of these costs?

## Requirements specification:

1. Literature research, expert interviews, and reasonable choice of the research methodology for the solution of the research questions. The written deliverable of this work package serves as a milestone.
2. Target-oriented answering of the research question by systematic application of the selected research methodology
3. Critical final evaluation of the chosen working method and the research results

The work is to be carried out according to the guidelines of the Institute of Automation. Suitability and quality of the created software are to be proven by automated component, integration and system tests.

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| **Supervisor:** | Dipl.-Ing. Isabell Viedt<br>Dr.-Ing. Volker Göke (ITM Linde Electrolysis GmbH) |
| **Start date:** | 01.11.2021 |
| **Submission date:** | 02.05.2022 |

Prof. Dr.-Ing. habil. Leon Urbas
Reviewer

Robin Götzelt
Student