# Scaling a 2-10kW methanation reactor for a 10-30kW power-to-methane system

**General Information:**

Type of project: Master thesis in engineering

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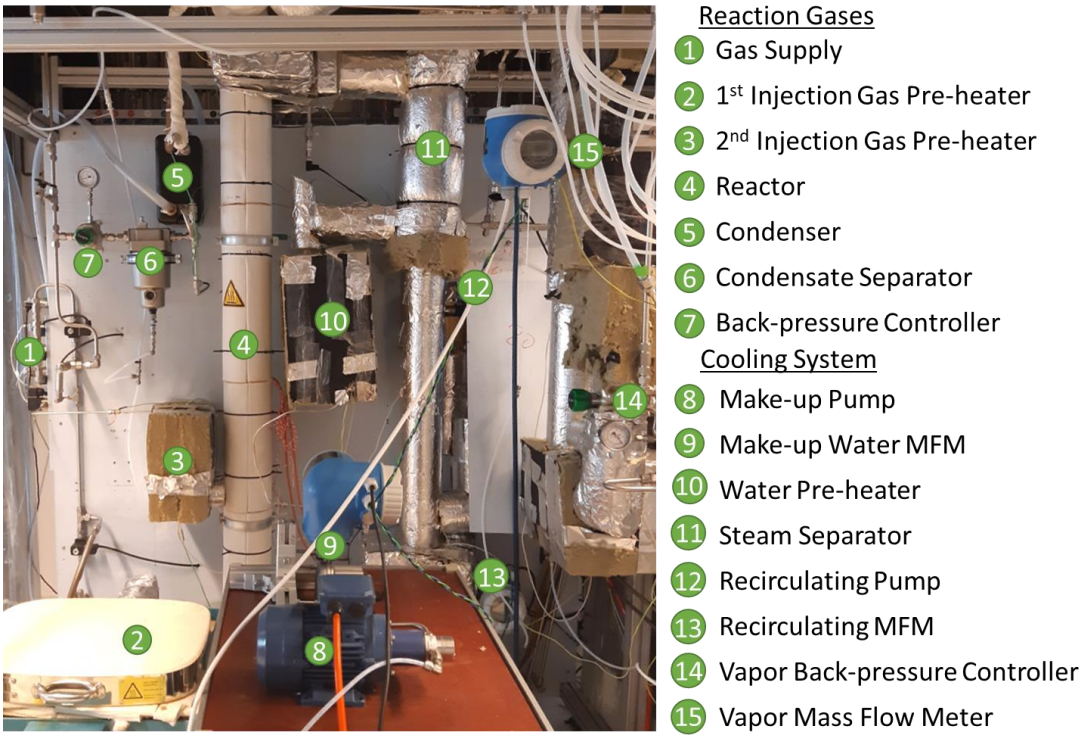


*Figure 1: 5kW reactor with BoP, from [1].*

Description:

Chemical energy storage via power-to-methane technology has become one of the most promising options to store redundant renewable energy on a large scale, due to the existing infrastructure of methane storage (the natural gas grid). The power-to-methane technology is expected to be coupled directly with renewable electricity sources without an electrical battery as a buffer.

The current version of the reactor was designed to be operated with a 5-kW solid-oxide electrolyser (SOE). In addition, the reactor is cooled directly with evaporating water to produce the steam required by the SOE. However, a new version of the reactor is to be built for a 30-kW solid-oxide electrolyser. From the current geometry of the reactor, there are a few already identified pathways for the scaling of the reactor (multiplication of reactive beds, add a second stage with intermediate water extraction and consider separation unit).

Possible actions:

- Complete additional test on the current reactor to improve conversion and range on the current reactor. At the same time, this should help select the path towards scaling.
- Use current reactor simulation code (and possible improved version) to estimate dimensions of the scale-up version of the reactor.
- Design the BoP of the 30kW methanation unit.
- Design the cooling water manifold: CAD and CFD simulations.

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