DC backbone with power-to-gas coupling
**DESCRIPTION**

The DC backbone with power-to-gas coupling offers a complete solution for the efficient integration of short-term and long-term energy storages within local microgrids. This comprises the optimized combination of highly efficient lithium-ion batteries for compensation of short-term fluctuations and a hydrogen storage system for the long-term storage of energy. The generated hydrogen is stored under ambient conditions by loading a liquid organic hydrogen carrier (LOHC) within a chemical reactor. One main advantage of that storage technology is the very high energy density, which allows the compact prototype setup of the chemical energy storage system within a 20 ft-Container.

To couple the storage systems and PV-arrays with the DC micro grid, intelligent control systems and highly efficient DC/DC-converters as well as a reliable communication network are needed.

**FEATURES**

- High energy and power density due to coupling of batteries and hydrogen storage
- Efficient DC-coupling through newly developed DC/DC-converters
- Safe storage of hydrogen within a liquid under ambient conditions
- Fast reactor behavior and compact system setup through innovative one-reactor concept
- Low communication effort for voltage regulation through implemented Droop Control
- Reliable and secure communication network
- Intelligent energy management systems

**TECHNICAL DATA**

<table>
<thead>
<tr>
<th>DC backbone</th>
<th>Hydrogen storage system</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-Bus voltage</td>
<td>+/- 380 V</td>
</tr>
<tr>
<td>Efficiency of DC/DC-converters</td>
<td>&gt;96%</td>
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<tr>
<td>Electrical Storage capacity*</td>
<td>1 MWh</td>
</tr>
<tr>
<td>Self-discharge (per month)</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Maximum Charging and Discharging Power</td>
<td>30 kW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Battery storage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Charging and Discharging Power</td>
<td>100 kW</td>
</tr>
<tr>
<td>Electrical storage capacity</td>
<td>20 kW</td>
</tr>
</tbody>
</table>

* expandable by 15 MWh per additional container

**SYSTEM SETUP**

**PROJECT PARTNERS**

- Fraunhofer Institute for Integrated Systems and Device Technology IISB
- Fraunhofer Institute for Integrated Circuits IIS
- Chair of Electron Devices (LEB), FAU
- Institute of Chemical Reaction Engineering (CRT), FAU

**CONTACT US**

We develop and realise new approaches for the storage of electrical energy, featuring innovative power electronics within intelligent DC microgrids and advanced hydrogen technologies. This also covers the development of specific simulation models and control strategies for grid stability and energy flows.

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