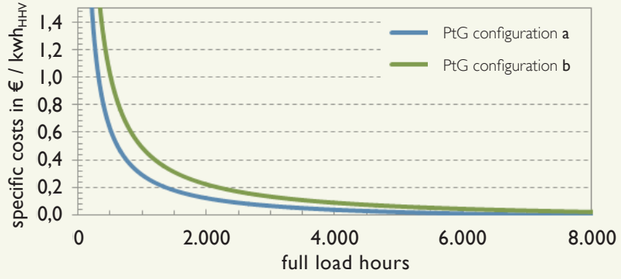
The Energy Institute is a lead a partner in most of the Austrian power-to-gas research projects and organizes power-to-gas platform meetings to enable vital information exchange. The Institute cooperates with 26 partner organizations and companies from all over Europe in the STORE&GO project that is funded by the EU's Horizon 2020 research and innovation programme, to integrate power-to-gas technology into the European energy system of the future. The Energy Institute collaborates with the technical universities of Vienna and Graz, the Montanuniversität Leoben (Austrian University for mining and metallurgy), and with several industrial partners such as OMV AG, RAG, and Verbund AG. The Institute's experts also conducted research assignments at the request of public authorities like the Austrian Federal Ministry for Transport, Innovation, and Technology (bmvit) or the Austrian Federal Ministry of Science, Research, and Economy.



An example of power-to-gas (PtG) product cost estimate for different configurations.

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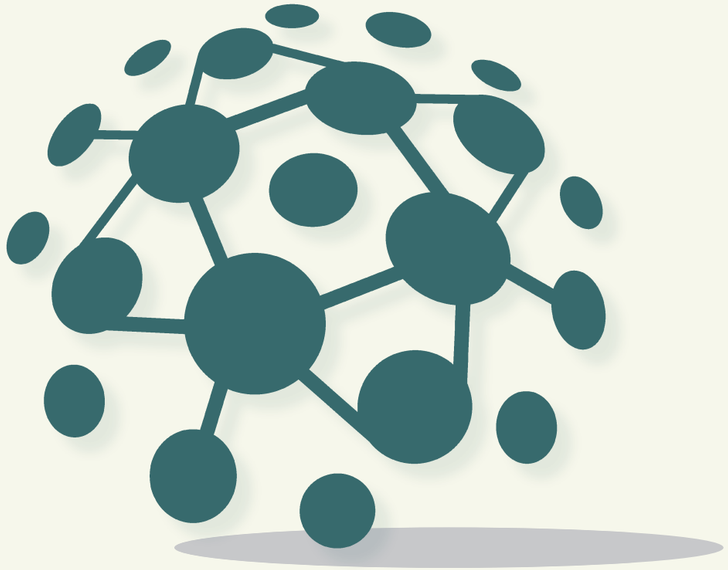
POWER-TO-GAS
the innovative system approach



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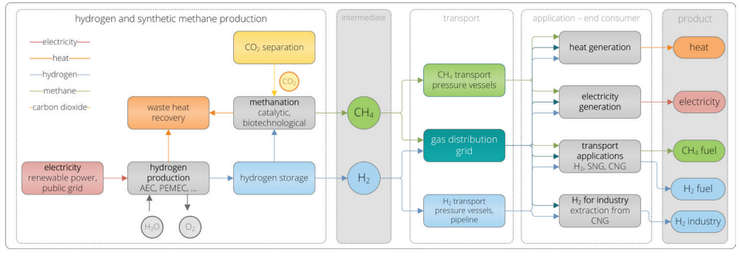
The coupling of the power grid and the natural gas grid by power-to-gas, enables an increased implementation of fluctuating renewable power sources (e.g., wind power and photovoltaics) by providing long-term energy storage and transport possibilities. With the potential application of the produced H_2 and CH_4 for transportation purposes or industrial processes, power-to-gas enables hybridization of the energy system and provides increased flexibility.



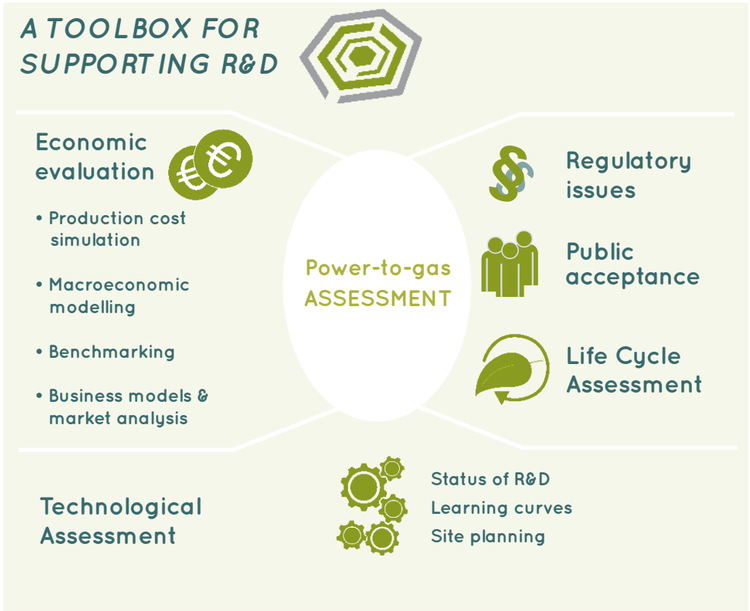
A flowchart of the process stages in the power-to-gas assessment tool – PResTiGE.

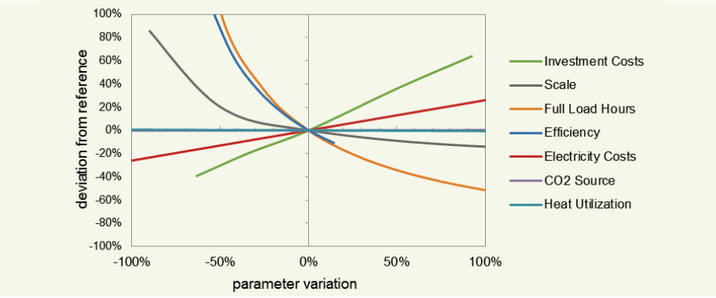
A sustainable implementation of the power-to-gas technology should bring benefits to the environment and to society in terms of reducing global warming, increasing or maintaining the security of energy supply, and providing an affordable renewable energy system. Different dimensions of the process assessment, including economic evaluations, life cycle assessment, public acceptance, and regulatory issues are essential for successful system integration besides technical issues of components. The various kinds of expertise of the Energy Institute fully represent these different dimensions.

A toolbox for actual and prospective benchmarking of power-to-gas systems

Numerous research and development activities by the Energy Institute in the past years characterized economic viability, the demand for energy storage, the demand for the renewable products H_2 and CH_4 in the transportation and industry sectors, and the environmental performance as the predominant influencing parameters on the implementation of power-to-gas. Based on these activities, **a toolbox for actual and prospective techno-economic and environmental benchmarking of power-to-gas systems** was developed by the Energy Institute's interdisciplinary research team.

The PoweR To Gas assEssment tool, **PResTiGE**, comprises data from demo sites and benchmark systems as other options for electricity storage or application of the gaseous products H_2 or CH_4 in the transportation sector at different scales, regionally adaptable over all process steps of the power-to-gas system and product application. The techno-economic optimization of the power-to-gas system focuses on reducing the investment costs through experience curves, learning effects, and economies of scale. The assessment tool, PResTiGE, is capable of evaluating future investment cost reductions based on those effects. Assessment results reveal the optimal (minimal cost and maximal system benefits) power-to-gas system configuration and implementation. Sensitivities can be systematically analyzed to explore the robustness of the results.





An example of sensitivity analysis of impacts on power-to-gas production costs.

Services and expertise for supporting technological development and rollout

Besides quantitative calculations of the previously designed indices for technical, economic, and environmental impacts with the PResTiGE tool, we offer profound expertise concerning a broader economic perspective and regulatory/legislative aspects. Power-to-gas not only requires further technological development and real life large-scale implementation and deployment, but also a comprehensive assessment of the economic and business aspects, its societal impact and acceptance, and an analysis of the large-scale storage and market-uptake potential in the short and long term.

The Energy Institute's experts identify potential barriers, e.g., safety, public acceptance, IP, regulatory, and legal issues and assist in their mitigation. Policy issues determining incentives such as subsidies, taxation, or command-and-control measures are crucial to investigate as these technologies are still at the start of the learning curve.

Additionally, we assist in site planning via identification of infrastructure prerequisites (i.e., electricity, gas, heat grids, and CO_2-source) and synergies for by-product utilization (oxygen and heat), to provide insights into the overall EU-wide scope of this technology as a base of a future large-scale energy storage.