Project Outline – Using Hydrogen as energy storage

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# Current Situation

Each year the electricity generated through using renewable energies like solar and wind makes up a bigger part in the energy-mix of Germany. But the amount varies because of seasonal or just daily differences in wind and sun time. In general, the renewables part in the mix is around 40%.[[1]](#footnote-1)

# Need

The need for a complete energy storage solution is becoming more acute because of the significant mismatch in grid power demand. It’s a well-established problem for the industry, and there are a number of energy management and storage systems in the pipeline today, but few offer a complete solution allowing wind and solar energy to be plugged into the grid seamlessly.

# Problem Description

Today, the importance of transitioning into a sustainable and cost-effective energy sector is more important than ever. Fossil fuels won’t last for ever and are straining the environment too much. The state will on the long-term ban or at least heavily restrict the usage to meet its own agendas therefore the solution for efficiently storing renewables is of utmost importance.

Hydrogen production by wind power is intermittent and fluctuant, and it presents a huge challenge to wind power hydrogen production. Currently one of the main challenges is the adaptability of hydrogen production under the condition of wide power fluctuation of wind power. The life of equipment and the effect on the purity of the product gas are two main aspects that result from the power output fluctuation. The innovation and development of high adaptability wind turbines are very important for this technology. Furthermore, the production of pure gas is essential for the safe operation of the system. Hydrogen production with low power will lead to impure gas and may cause an explosion in the electrolysis device by the mixture of hydrogen and oxygen.

# Testing and Criteria

The new energy storage method must be more efficient in the long-term than using large batteries or using pumped hydroelectric energy storage systems. It has to be lower in cost than the current technology and be able to be integrated into the current grid of wind turbines. The combination of new advancements in PEMs and the compressing and storage of hydrogen is vital. The factors to rate hydrogen as an energy storing method therefore include:

* Cost-effectiveness
* Maximum duration of storage
* Means of storage and compression
* Energy per kilogram
* Integration in current wind turbine grid
* Efficiency of the location at which the storage solution is integrated into the grid
* Possible new advancements in technology

# References

[Energy-Mix] Der deutsche Strommix: Stromerzeugung in Deutschland. https://strom-report.de/strom/. Last accessed 21.11.19

1. Energy-Mix [↑](#footnote-ref-1)