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Development and Interpretation of a Merit Order of Energy Storage

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Abstract

Inspired by the concept of the Merit Order of conventional power plants we investigate how to create a Merit Order of Energy Storage and how to interpret it. In contrary to other studies we look at the value of energy storage both from welfare and business perspective. This allows not only for the identification of discrepancies in political decisions, but also to identify solutions to support an efficient transition of the energy system. The development of the approach is rooted in the difficulty of determining the absolute value of different energy storage systems as the value depends on a large number of parameters both on the technology and the application side as well as the respective point of view. Thus, our approach contributes to a better understanding of the complex interrelations and offers the possibility to create a relative ranking of different functional energy storage technologies.

Furthermore, the introduction of the concept of the "Functional Energy Storage" allows for the interpretation of flexibility options as storage systems. Thus, not only classical storage systems, such as Pumped Storage or Batteries, are investigated, but also Demand Side Management and Power2Heat etc. In order to be able to estimate the value of each of these functional storage technologies their techno-economical characteristics are identified and compared to the technical and regulatory requirements of different applications for energy storage (e.g. load-levelling, control reserve etc.).

Figure 1 shows an example of how a Merit Order of Energy Storage could look like. The x-axis denotes the welfare perspective as "Added Value for the Economy", whereas the y-axis denotes the business perspective as "Profitability for Stakeholders". For the German and Austrian power system, which is well embedded in the European Electricity Market, we find that the convergence of the two sectors electricity and heat offers not only a large potential for flexibility, but is on top also a valid option from both the welfare and the business perspective. In this context Power2Heat constitutes a more efficient technology as opposed to Power2Gas. Another major potential can be seen in large flexibility options, such as CHP and Load Shifting in Industry.

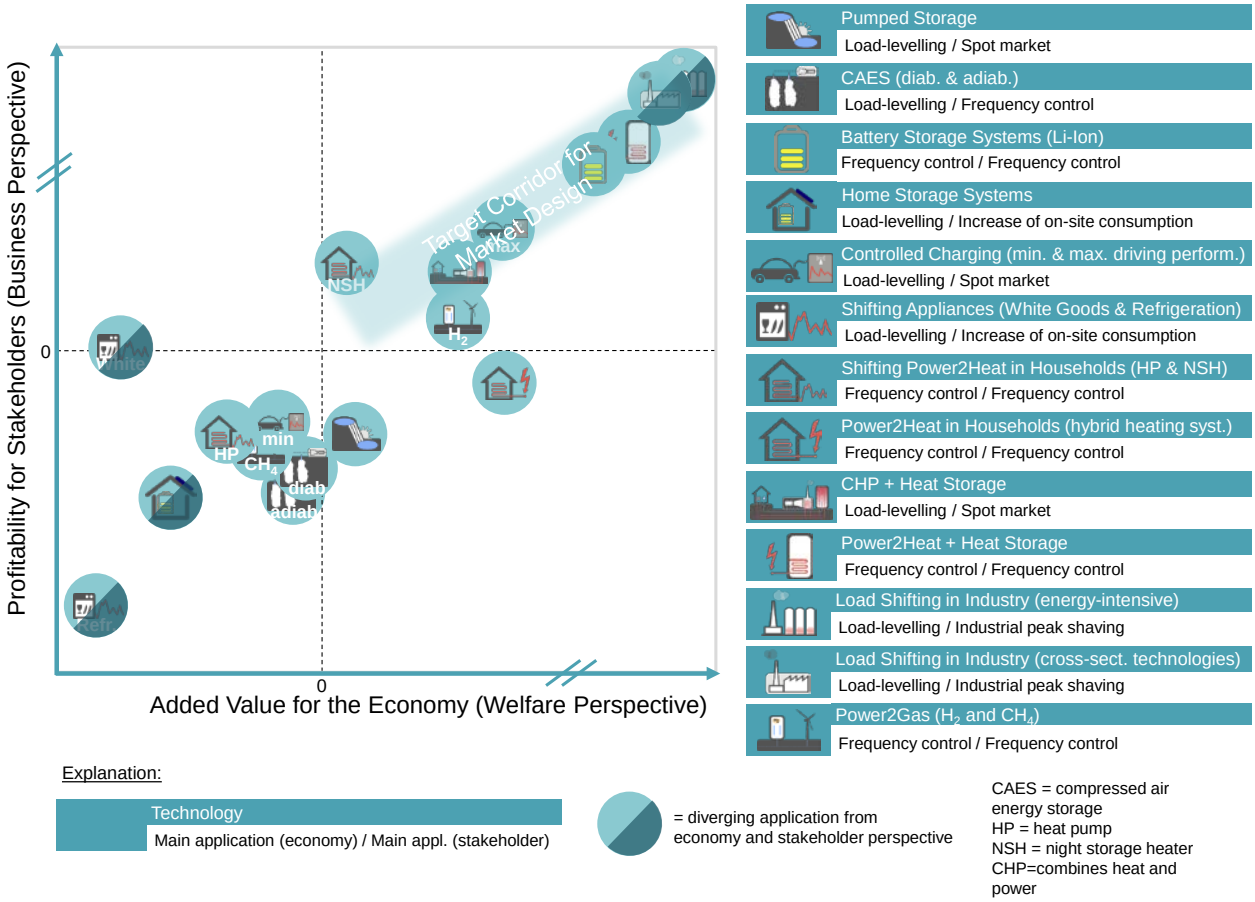

Figure 1: Example of a Merit Order of Energy Storage (preliminary results)

As the project is supported by 13 companies – reaching from large and small electricity suppliers to TSOs and even to car manufacturers – it will deliver a better integration of practical solutions beyond theoretical results.