Executive Summary

The integration of mini and micro Combines heat and power plants (CHP) in a virtual small power plant (VKK) offers a variety of economic, smart grids and climate protection potentials to support the "Wärmewende". However, an integration of such systems is usually associated with high costs, wherefore usually only plants in higher power classes (> 500 kW_{el}) can reasonably be implemented. Within the framework of the mikroVKK project, the goal therefore was to demonstrate and prove that also CHP plants below 100 kW_{el} can be economically integrated into a virtual small power plant (VKK).

For this purpose GridSystronic Energy (GSE) has developed a special VKK system (gs.system), which was tested, further developed and brought to market readiness under real conditions as part of the project. By configuring the system – which means the installation of simple control boxes (gs.box) as gateway for on-site communication to the system and meter connection, whereas the calculations, simulations and optimization of the control signals is done on the central gs.server - a cost-effective and scalable solution can be realized.

In cooperation with ten municipal utilities as practice partners, different CHP locations were identified and analyzed for their technical suitability and the feasibility of new business models based on intelligent control. For selected objects, such as Schools, district heating networks, multi dweller buildings, GSE realized an implementation of the devices and meters necessary for controlling the system.

The set of rules for the system control, such as "Follow load profile", as the basis for new business models have been developed and adjusted with the practice partners. Based on the possible effects of an intelligent control (e.g. the use of possible flexibilities, stability of the system, postponement of operating times, changes in delivery quotas, etc.), new business models were analyzed in detail. Yet, a prototypical implementation of the business model requirements was omitted within the project due to various reasons, wherefore the evaluation of the smart grid (flexibility, grid-compatible feed-in, etc.) and climate protection potentials (CO_2 reduction) were based on simulated values.

Within the project, the technical feasibility for implementing CHP with an electrical output of up to 100 kW_{el} could be demonstrated. The preparation of a standardized and cost-effective connection solution was, much more time-consuming than originally planned, wherefore a delay of the implementation was caused or to some extend CHP could not be implemented at all. Because of the low data base, the fundamental economic potential of a VKK control could therefore only be evaluated on a theoretical basis. The connection and integration costs depend mainly on the local conditions, wherefore a blanket statement about the general cost-effectiveness is not possible. Through the gained experience and learning processes, however, a considerable cost reduction could already be achieved in the course of the project. New built sites, where the VKK system and its requirements can be planned in advance, the costs of the connection can be reduced. In a next step, it would therefore be necessary to analyze whether the effects determined also occur under real conditions.