UNIversity Campus Operating as a self-Regulated Network

Publieke samenvatting / Public summary

Aanleiding

As a special consideration in the recent EU Winter Package, local energy communities (LECs) open up a possibility to tackle complexity of energy system integration (ESI) across multiple pathways and geographical scales to deliver reliable, cost-effective energy services. In order to adapt with appearance of LECs, the smart energy infrastructure needs to evolve by developing self-management schemes for exploiting completely their flexibility potential to decrease peak-load consumption while improving energy efficiency and resiliency. On the one hand, flexibility values from LECs have been investigated and tried out in several research and pilot demand response (DR) oriented projects. Those projects, however, address normally a single dimension of energy vector, i.e. electricity, thus lacking an ESI design view at the LEC level to explore completely flexibility value in which the thermal energy flexibility plays a predominant role.

Doelstelling

UNICORN aims to strengthen positions of local energy communities, particularly the TU/e campus network as a self-regulated microgrid. This project focuses on improving monitoring of such campus microgrid by an end-to-end modular sensor solution with high sampling rate for (real-time) control purposes embedded together with topology identification and state estimation features. Based on such advanced monitoring platform, UNICORN will develop data-driven models with deep and reinforcement learning for self-management and

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Publicaties en materialen / Publications and attachments

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optimisation processes. This will lay a foundation to explore completely flexibility potential to improve resilience and efficiency of the campus microgrid as well as the whole integrated system. Tangible achievements for energy saving target up to 40% and peak-load reduction up to 20% are expected from UNICORN.

Korte omschrijving

The UNICORN project will be coordinated by TU/e with active contributions from the consultancy company (DNV GL) and a start-up (digiEMS) partner. Besides the management and dissemination WP led by TU/e, three main WPs are dedicated for each partners. digiEMS will take charge of WP2 (Data acquisition and analysis) to develop a monitoring solution including affordable modular sensors and I/O interfaces suitable for not only data analytic but also “real-time” control functionalities. TU/e will lead WP3 on efficient and resilient operation of self-regulated campus network in which a set of control algorithm for resource scheduling and real-time dispatching will be developed and validated. Last but not least, DNV GL will provide an insight in viable business models to exploit flexibility values for LECs, especially for the case study of the campus microgrid.

Resultaat

- Real-time measurement solutions applicable for the low voltage (LV) network that can integrate end-users' (IoT based) data in a reliable and secure manner; - Distributed energy management systems based on (deep) learning techniques to improve self-regulated capability of LECs; - Exploring flexibility values from LECs, not only in demand response with controllable units, but only in direct control techniques for distributed energy resources including solar PVs and (stationary and mobile) storages.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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