(Ir) Responsible Operational Strategies of Smart Multi-Commodity Energy Hubs (SMCEH)

Client	Entrance
Related project	LEVE Energiehubs!
Start date	Flexible
Suitable for training course(s)	EMRE, SESyM, SSE, Operations Research, Physics, Mathematics, EES or similar
Learning Community	System Integration

Assignment context

The LEVE Energiehubs! Project aims to develop a theoretical framework to judge the viability of SMCEH within the existing and developing regulatory environment. The framework will identify the goals, barriers, risks and the effect of these factors on the viability of different types of SMCEH. KPI's will be defined per type of hub to determine if a hub is achieving its intended goal within the determined constraints and serve as output for numerical models. With different type of hubs different types of assets could be needed which could lead to differing system configurations and differing operational strategies. This assignment encompasses the identification of these operational strategies and determination of the strategy being (in)complementary to energy system goals as a whole.

Assignment

A SMCEH is a complex system that can consist of different energy generation, demand, storage and conversion sources. Depending on the goal of the system, different operational strategies using these various components are possible to achieve system goals. Some goals can be dependent only on local factors/signals and in the most cases will not affect the upstream system in a noteworthy way (e.g. maximizing decentralized self-consumption within infrastructure constraints). However some strategies could be dependent on non-local signals (e.g. prices on different (national) energy markets) and could affect the upstream system in a positive/negative manner. The crux of this assignment is identifying the operational strategies that are possible using the assets available in different system configurations when they react to possible coordination signals/constraints. These strategies can be divided into responsible behaviour (beneficial) to the energy system as a whole and irresponsible behaviour (detrimental) to the energy system as a whole. As it is desirable to promote responsible behaviour and avoid irresponsible behaviour, the analysis can look into how specific behaviour is possible within the current regulatory framework, how they are rewarded/punished and how regulations can be

changed to achieve the desired behaviour and a more robust energy system. One specific issue which has been getting more attention recently is increasing instability in the balancing markets due to aggregated (algorithmic) real time operation of flexible assets. As SMCEH will be operated using energy management systems which could also be used for aggregation via aggregators, it could be possible that the aggregations of SMCEH operation can contribute to certain developments in the markets that are not desired. Part of this assignment is building a quantitative model using software tools such as oemof/Pyomo to analyze the behaviour of SMCEH to different market signals and determine whether the behaviour is desirable and if not, how it can be influenced by other mechanism designs.

General information

Final Product	Theoretical paper on what types of operational strategies SMCEH can pursue within the existing and the developing regulatory framework and the categorization of these strategies as responsible and irresponsible for the energy system as a whole. Quantification of the effects of these strategies with quantitative models is done using software tools such as oemof and Pyomo.
Location	Entrance
Parties involved	Hanze, RUG, HvA, Windesheim
Contact person	Edrick Tromp (e.o.v.tromp@pl.hanze.nl)
Supervision	Rosa Kappert and Edrick Tromp

Who are we and where can you find us?

ENTRANCE is a learning community, where students and professors from various programmes cooperate with researchers, companies, governments and civil society organisations to accelerate the energy transition. We do this at the following locations:

- Location Proeftuin, Zernikelaan 17, Groningen

- Location Energy Academy Europe, Nijenborgh 6, Groningen

What do we offer?

ENTRANCE offers a multidisciplinary and inspiring learning, working and research environment where you can develop the competencies needed to shape and accelerate the energy transition. There is room for collaboration with professors, researchers, lecturers and the professional field.

In addition, you will be supervised by professionals who are part of the ENTRANCE learning community.

Contact us

Are you interested in the vacancy? Do you have questions or would you like to apply immediately?

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