AMSTERDAM INSTITUTE FOR
ADVANCED METROPOLITAN SOLUTIONS

Draft

Description research assignment AMS Institute (AMS) & TU Delft Powerweb in collaboration with Liander and Municipality of Amsterdam

Research title:	**Congestion relief analysis Buiksloterham**
Contact AMS :	[redacted] Urban Energy
Keywords:	Grid, consumption and production profiles analysis, storage integration scenarios, flexibility criteria for grid relief, development of congestion protocol for Amsterdam
Period:	maximum 4 months
Starting date:	As soon as possible
Level:	Minimal Medior+ researcher, 1 senior & 1 junior
Research group:	Powerweb Institute

Short term research project @ Buiksloterham (BSH)

Recently (June 24th) grid operator Liander published the code red regarding structural congestion in the area of Buiksloterham. This means that besides new housing, the area will not be able to host new grid consumers that ask for a large connection than 3x80A (BSH has environmental zoning max. 3 except older industry locations). The 4 medium voltage cables from substation Papaverweg to the area are at maximum capacity.

Key reason for this is the complexity of grid expansion (complex drilling) and further details regarding the electricity connection of urban development in the area (more electricity than anticipated). The grid enforcement is expected to be finalized Q1 2023. Considering the fact that Liander did not find any > 1 MVA consumers in the area, the congestion management analysis showed no temporal solution.

Currently, the grid operator and Liander are forming a case-team to identify solutions for both Buiksloterham and the larger Westhaven area which is also a congested area.

Goal of the project

Investigate the opportunity to provide alternative solutions for the area of BSH:

- In order to identify what the existing remaining capacity is, including energy flexibility at existing and future consumers (i.e. perform a more granular search than Liander recently did)
- For what type of new consumers the identified grid capacity can be used for (typical user profiles that can be integrated) or define the energy flexibility of new consumers)
- Identify how strategically placed (community and behind the meter) storage can alleviate the congestion in this area regarding the expected grid expansion.

The solution need to be cost-effective and technically feasible. Examples for potential solution categories are:

- load side efficiency improvement
- local (temporal) supply and storage
- using the grid more to its (dynamic) limits
- scheduling demand and supply smarter
- temporary infrastructure reinforcement

Data Requirements

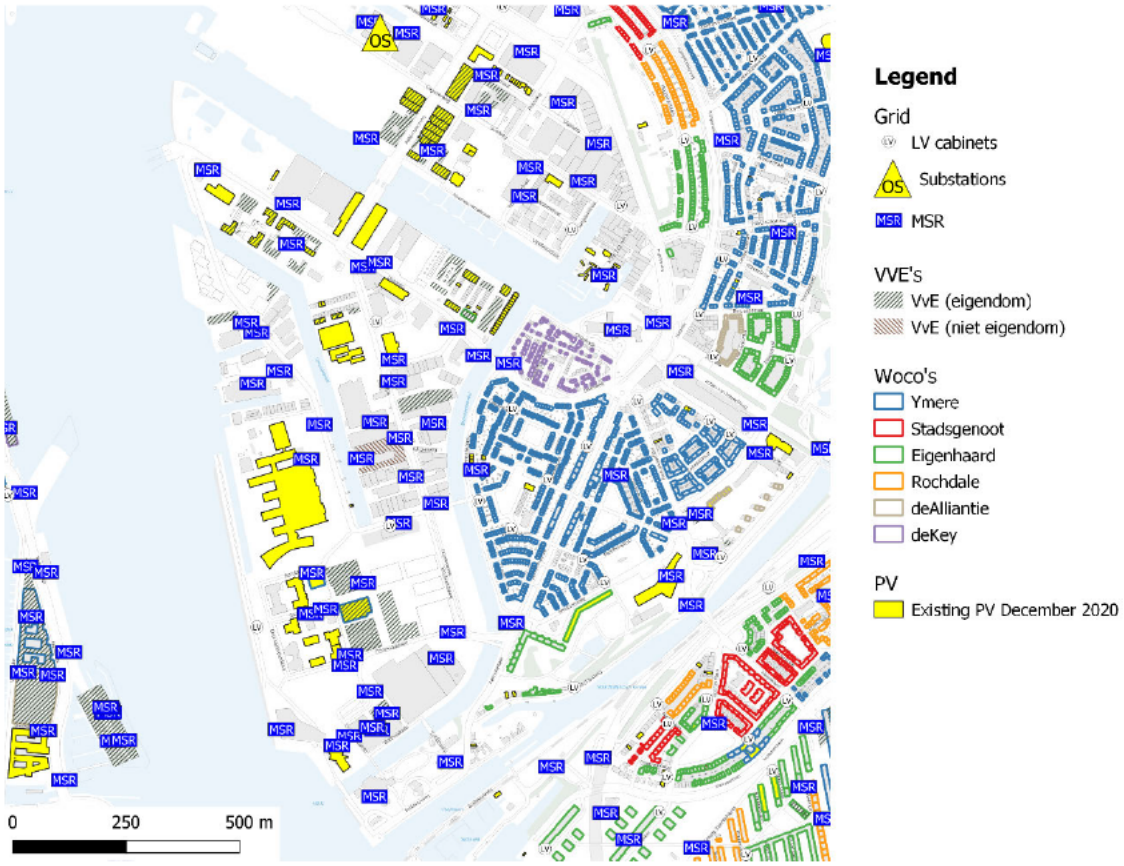
In order to execute, data acquisition is crucial. AMS Institute will work together with the Municipal of Amsterdam and Liander to obtain:

- Consumption data of consumers (mainly >3x80A), including variations over the day and year (e.g., 15min values)
- Expected changes in load (e.g., new customers/housing)
- Expected changes in generation (e.g. new local PV).
- Powerflow model of the area (i.e. impedance matrices, grid topology)

Note: assumed is that only for larger consumers in the area data acquisition is needed, other data is assumed to be available at the Municpality/Liander.

Area description
BSH is a former industry area under redevelopment. Still hosting for e.g. the Shell Technology Center and construction companies, but more and more innovative startups (e.g. VR and 3D printing) and housing development find its way. It is also hosting the creative area of De Ceuvel and neighbouring SchoonSchip, Republica and Poppies. All four locations are part of the H2020 ATELIER project, aiming for energy exchange among these 4 locations (link ATELIER: https://smartcity-atelier.eu/about/lighthouse-cities/amsterdam/general-information/)

Next to these developments, more and more locations integrate solar panels on rooftops. *NB. Most of the indicated housing corporations in the image below actually lie outside of the indicated congestion area.*



Location of MV lines to be integrated. (image by [redacted], AMS [redacted] on solar panels)

Description of work

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Congestion and grid adequacy analysis typically requires load flow analysis. Such an analysis is a snapshot of a certain grid under a certain load with a certain feed-in or generation. Since all that can change over time, a series of such snapshots needs to be investigated.

Therefore, the listed data will need to be integrated in Powerflow model, which we can use to show the load profile of the 4 MV cables in BSH and do the variety of studies to come to a solution, including:

- What is the sensitivity analysis (i.e. which parts dominate the problem, or are there), and
- scenarios development (in close collabaoration with partners)

Why AMS Institute in the challenge

- Independent local partner to process confidential consumption data.
- Supported by insights of multi-year innovation projects and executed by leading authority in the respected fields of intelligent power grids, AMS PI Peter Palensky and the Powerweb Institute.
- Not restricted in the way Liander is in the development and definition of solutions. I.e. based on the executed analysis, AMS Institute and the Municipality can approach and discuss with the existing consumer a temporal load reduction.
- Capacity for more detailed congestion management analysis. Perform a study of existing and new consumers' flexibility in the area. Identify solutions outside of business as usual and outside of the (current) regulatory framework.

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