Smart Storage Unit

A Network Integrated Solution

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ENEXIS

NL Energy Market Charactheristics

- 7,6 mio households that use 3000 kwh electricity and 1400 m3 gas
- 1,5 mio companies that use 1874 PJ energy (70% by industry)

- More than 50 energy suppliers for retail
- Annual switching rate up to 17%
- Average household yearly bill 1600 euros

- 7 DSOs,1 TSO electricity,1 TSO natural gas.
- DSO legal ownership unbundling

- NWE market coupling
- Interconnectivity with DE, BE, UK, NO

DSO facilitates energy transition

- Off shore wind until 2023: 4458 MW
- Reducing natural gas production
- No hydro
- Steep increase rooftop PV-systems. 2,5 mio households in 2023?

Scenario's for electricity defined by:
- Electric Vehicles (currently 100,000)
- PV / Wind
- Heatpumps

Enexis Smart Storage Unit (SSU)

In the neighbourhood “De Keen” in Etten-Leur

SSU Project Objective

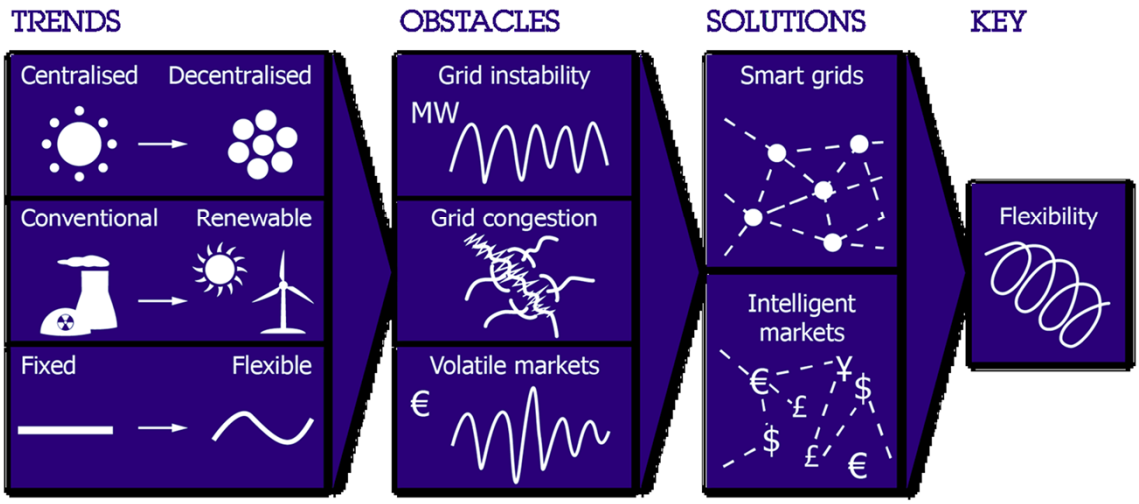
The main objective is to **demonstrate**

- a smart **electricity storage** unit
- that **increases to the amount of DRES** that can be integrated in the distribution network
- in such a way that **both** the **integration** of this electricity and the usage of the network **capacity** is **optimal**.

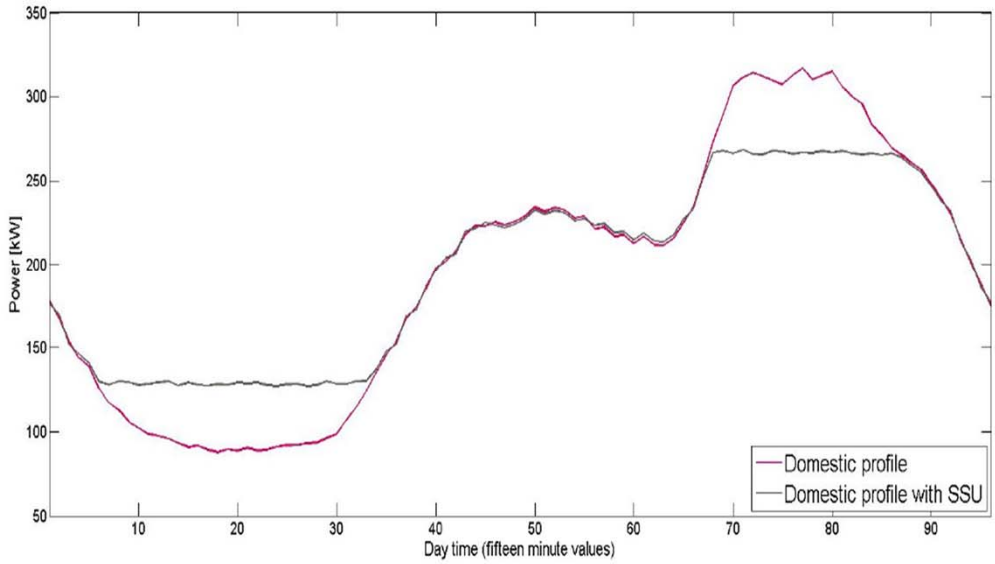
Because we want to facilitate and stimulate the energy transition.

5

Because: Flexibility is Key

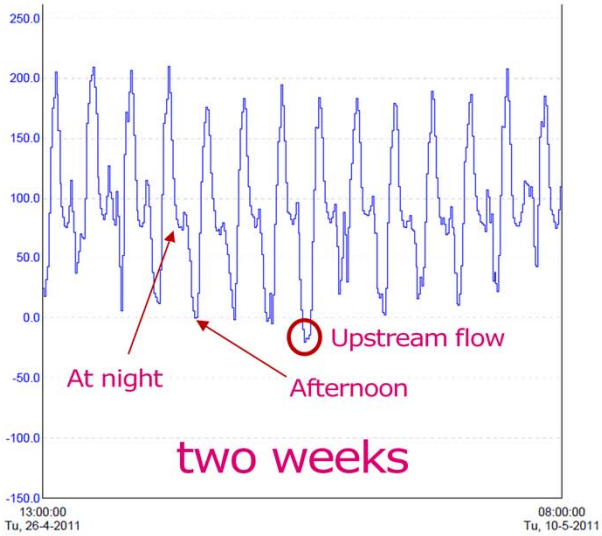


Peak Shaving



Grid load effect with some solar panels

Figuur 2 – Lokatie Smart Storage systeem de Keen, Etten-Leur



8

Load MS/LS transformer, without SSU

This is not an extreme situation, not at all. Minus 50 kW in very common.

Expected SSU Contributions

The SSU project contributes to the following targets:

- Maintain the local power balance as DRES is increasing.
  Charging and discharging is based on the expected renewables production.
- Use today's network in an optimal way, even when load and variability increase.
  Charging and discharging is also based on measured frequency and voltage.
- Ensure the reliability of the network and the quality of service (voltage).
  The smart storage facility even offers functionality for autonomous energy supply (islanding/microgrid).
- Prevent energy transportation and distribution losses as much as possible.
  Energy flows upstream on sunny days and downstream later that day cause unnecessary losses and can cause voltage problems.

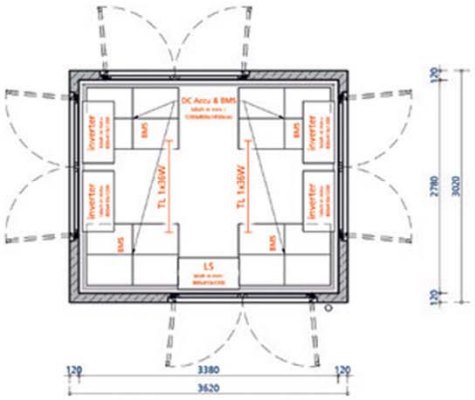
9

These targets are general targets, not specially smart storage targets.

1-2. With SSU we can postpone the classical expansion of the network.

3. An average MV failure takes about 2 hours. SSU's dimensions are based on this figure. In 75% of the failures, it will do.

Technical Data



Smart Storage Unit

- Partly underground
- Dimensions:
- Height = 1.80 m
- Length = 3.00 m
- Width = 2.80 m
- Underground depth = 1.87 m

- Li-Ion Battery capacity: 232 kWh
- Charging capacity: 100 kW
- Discharge capacity: 400 kW

Results of the SSU as Distribution Battery

- It is possible to join different technologies in an intelligent storage unit, and to integrate this in a LV network.
- Islanding/microgrid operation has been tested successfully.
- Peak-shaving: 15% peak reduction has been realized.
- Energy losses can be minimised with an SSU.

Conclusions:
- Battery based storage can offer the DSO flexibility needed
- DRES integration problems increase while battery prices decrease
- SSU not first in line, just one of the solutions, other flex-solutions can even be better.

11

Peak reduction: so peak loads of transformers have been decreased and expansion of the network can be postponed.

SSU as Neighbourhood Battery

A neighbourhood battery can be used to offer storage services to (individual) customers.

- To store and use your self generated solar energy.
- While sharing storage capacity with others, economies of scale.
- Without any (presumed) risk of a battery in your own garage.
- Etc.

But: is this a realistic proposition, and how to realise this, e.g. how to share and split the risks and the costs?

To find out: pilots with neighbourhood batteries.
Not to develop our own proposition, because in the end we leave this to the market.

12

Peak reduction: so peak loads of transformers have been decreased and expansion of the network can be postponed.

Roles in the market. What's happening today?

"Op het erf van aardappelteler Jan Reinier de Jong start binnenkort een proef waarbij een slimme batterij van 290 kWh binnenkort kan bepalen of de elektriciteit van de 310 kWp aan zonnepanelen moet worden opgeslagen in de batterij, gebruikt om de aardappels te koelen of moet worden verhandeld op de energiemarkt."

Energeia, september 2015

A potato farmer (with solar panels, 310 kWp) is going to start an experiment with smart batteries (capacity: 290 kWh). He wants to be able to use his solar power for cooling potatoes, for storage in the batteries, or for trading on the energy market.

Storage, objectives and DSO roles (1/2)

With storage a lot is possible, it can be an instrument to make money.
From cooling potatoes to speculating on the market.
All this is for commercial market parties, not for DSOs.

But: DSOs must be able to use storage to prevent (or solve) network management problems. Then the value of storage is determined by the price of the best alternative solution for society.

Storage, objectives and DSO roles (2/2)

DSOs should be able to buy flexibility services such as storage services on the market.

Because:

- such a service can serve two different and separate objectives: an instrument to make money versus a solution for society;
- the DSO is responsible for Security of Supply and Quality of Service;

DSOs should also be able to own and operate (O&O) battery based storage themselves.

We highly encourage the market to develop attractive solutions and offer them to DSOs.

Netbeheer Nederland (NBNL)

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