atelier
Positive Energy Districts

PROJECT RESULT

Software in the Loop (SIL) Lab

PARTNERS

DNV

DNV GL NETHERLANDS B.V.

www.dnv.com

PROJECT

EU Programme:
Horizon 2020 Innovation Action

Coordination:
City of Amsterdam

Partners:
29 partners, 10 countries

European grant:
19.6 M€

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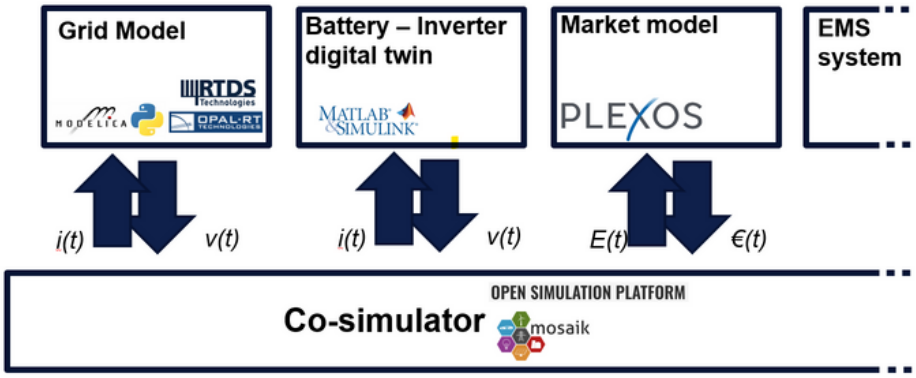
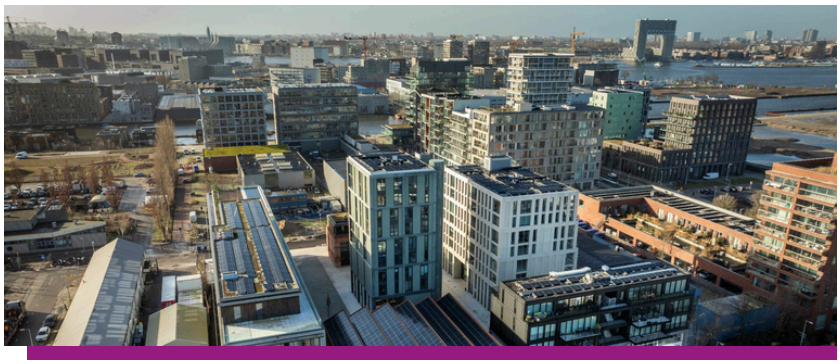
Result in a nutshell



- Control hardware and software in the loop, validating whether the behavior of controllers comply to standards, regulation and (performance) claims.
- Validation of digital twins of energy control and management systems, that precisely mimic the behavior of their physical originals, so they can be used in simulations and studies.
- Validating the performance and associated risks of energy management systems, for example for smart charging of fleets of electric vehicles.

Demonstration site



- In Atelier the developed “Software in the Loop (SIL) Lab” has been applied to assess the impact of electro-mobility on the electricity grid.

Detail on result

Technical aspects:

- Study of complex interaction phenomena between several power electronic converters'control. The heart of the SIL Lab is DNV's validation laboratory which is part of a larger laboratory in which experts in different competence areas and capabilities work synergetically.
- (Real time) digital simulation capabilities:
  - OPAL RT (OP 5700, OP 8660, OP 7000, Hypersim, Matlab/Simulink, RT-LAB, Analog/digital I/Os, Communication protocols)
  - RTDS (NovaCor, RSCAD software, GTDI card, GTDO card, GTAI card, GTAO card, GTNET x2, GTSYNC, GTNET-SKT, GTNET-MODBUS, GTNET-GSE)

Advantages:

- Our solution tackles the new needs of our customers originated by the increasing dependency on control to manage the power system, as this new scenario encompasses a higher dependency on the software that controls the energy management systems and controllers.
- Some of the most important use cases of the SIL Lab involve "original equipment manufacturers", "network operators" and "investors developing energy projects".
- Original equipment manufacturers find the SIL Lab useful to proof if their product complies to regulations and standards or even it can be adapted to answer self-made claims of this customer segment.
- Thanks to the SIL Lab, network operators can get an insight of the risks related to multiple and different controllers and even how they interfere with each other's behaviour.
- Investors can learn more about the performance and the risks involved in the operation of energy management systems, allowing them to optimize their combined renewable generation and battery plants under different circumstances.

Our mission:

- As an assurance company with a strong foothold in the energy and electricity sector, DNV has the goal of continue developing services that provide assurance to the application and implementation of digital energy control and energy management in an increasingly dynamic electricity system.

The challenges ahead:

- For the SIL Lab to be market ready, the market size for Energy Management Systems needs to grow as well as the awareness among our different customer segments of the importance of mitigating the risks associated to their application.

Further development

Potential for further development:

- In the next 2 to 3 years, the focus will be in demonstrating the capabilities and reliability of EMS in supporting the integrity of the network, as well as demonstrating the performance and safety of EMS for commercial applications (i.e. EMS operating batteries for ancillary services and trading).
- Investors experience increased risks in developing energy projects, such as grid connected battery systems and electric vehicle charging stations, as their performance is increasingly being determined by EMS.

Potential areas of applicability:

- EMS for larger applications, such as for grid connected batteries or batteries co-located with wind and/or solar electricity generation.
- Control hardware in the loop of advanced inverter functions, such as grid forming wind turbines and solar plants providing inertia and ancillary services to support the grid. These grid supporting functions might eventually become mandatory also for large demand, such as e-boilers and electrolysers with the increasing replacement of synchronous generators (i.e. thermal power plants) by inverter based generators (i.e. wind and solar).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864374.