EnergyVille
Smart Grid Infrastructure Laboratory

The EnergyVille Smart Grid Infrastructure Lab is a platform for testing smart grid products and systems.

In the Smart Grid Infrastructure Lab, our highly experienced team executes tests and validates:

- power line communication systems in distorted grids.
- long-term automated cycling of Li-ion batteries and reference performance tests.
- research on low voltage distribution grids with a high amount of renewable energy sources:
  - development & test of VITO Intelligator®: an agent based control algorithm to match supply and demand of energy.
  - power quality: voltage dips, phase unbalance, harmonic distortions.
  - voltage droop control: taking grid constraints into account by power adjustments.
  - inverter control algorithms for unbalanced grid conditions.
- data analysis:
  - different energy flows (V, I, cosφ,..) are logged in a dedicated SCADA system.
  - accurate high speed PQ measurements according to EN 50160.

Interoperational platform addressed to developers, system integrators and grid affected parties.

The EnergyVille Smart Grid Infrastructure Lab consists of:

- a **150 kVA low voltage AC-grid**, connected to:
  - the EnergyVille Home Lab with test facilities for energy management systems and smart domestic appliances.
  - EnergyVille's Thermo Technical Lab with test facilities for heat pumps, μCHP and thermal storage.
  - extra cable loops.
  - a PV installation.
- EnergyVille's Battery Testing Lab.
- **PHEV and BEV charging infrastructure**
- a **programmable inverter**
- a 700 V **low-voltage DC-grid** connected to:
  - a DC-DC converter with battery storage and/or supercapacitor storage.
  - DC-sources such as fuel-cells and PV.
- **a 150kW bidirectional DC module,** useful to simulate batteries or PV installations as source or batteries or other DC devices as load.

Technical Notes

The EnergyVille Smart Grid Infrastructure enables multidisciplinary research, integrating different smart-grid topics in an interconnected low voltage AC and DC grid, using flexible facilities & laboratories.

Equipment

- dedicated **programmable inverter and converter equipment:**
  - 70 kVA inverter as three-phase grid connected inverter, with or without neutral line.
  - inverter as grid independent voltage source that reproduces voltage/frequency.
  - deviations and harmonic distortions.
  - two dedicated 100 A DC-DC converters.
- reconfigurable **programmable inverter and converter equipment.**
- possible configurations:
  - two 11 kW grid-connected inverters with neutral line
  - three three-phase 11 kW grid-connected inverters
  - one 11 kW grid-connected inverter with three 32 A DC-DC converters
- **battery test facility** with dedicated battery room and safety equipment
- **charging station** for plug-in hybrids, electric vehicles & electric scooters
- **PV systems & simulation equipment**
- 10 kW **programmable AC load**
- **SCADA system**

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*EnergyVille is an association of the Flemish research institutes KU Leuven, VITO and imec in the field of **sustainable energy and intelligent energy systems**. Our researchers provide expertise to industry and public authorities on energy-efficient buildings and intelligent networks in an urban environment. This includes, for example, smart grids and advanced district heating and cooling.*

The EnergyVille labs function according to the international quality, environment and safety standards: ISO 9001, ISO 14001 and OHSAS 18001.

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