GROW-DERS

Grid Reliability and Operability with Distributed Generation using Transportable Storage

Petra de Boer, KEMA, 23 April 2008

GROW-DERS project

- Funded by EU under 6th framework program
- 9 partners
- September 2007 – September 2010
- Focus on distribution grid

IBERDROLA

Electricity Authority of Cyprus

MVV Energie

JEN

cea ines

saft

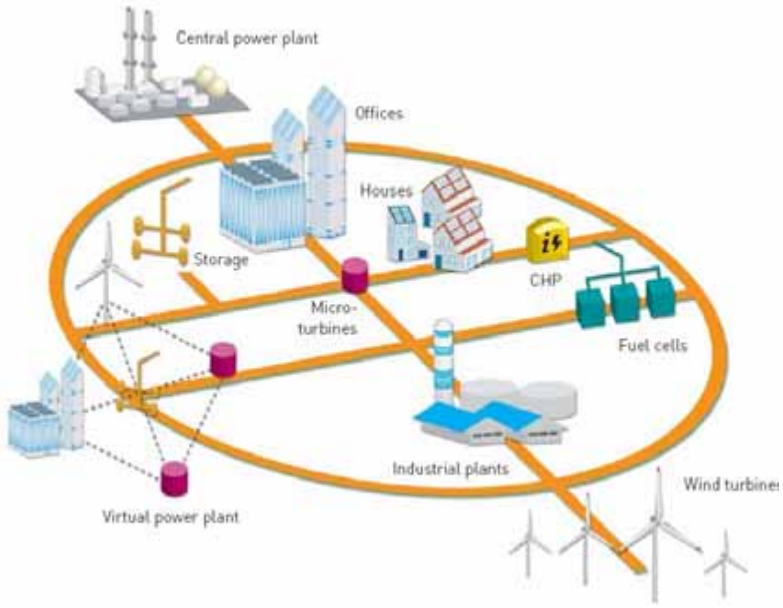
EXENDIS

Continuon Netbeheer

KEMA

GROWDERS objectives

To demonstrate the technical and economical possibilities of existing electricity storage technologies

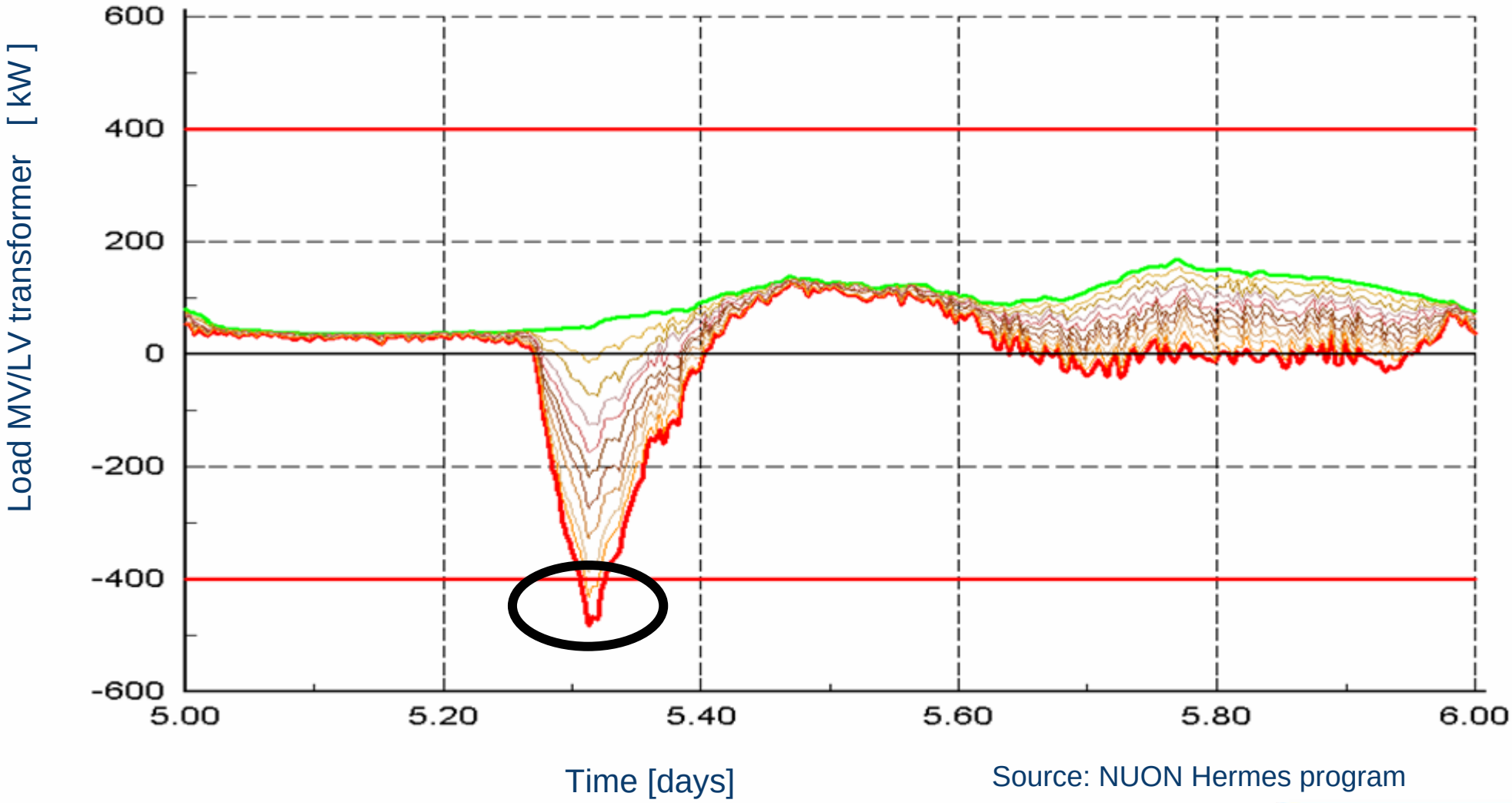


- Realization and demonstration of transportable grid connected storage systems
- Development of an assessment tool for optimal distributed network management (to determine optimal storage applications)

Why storage in the distribution grid? Several applications:

- Integration renewable sources
- Reduction of peak loads (e.g. deferral of investments)
- Load shifting (e.g. for trading)
- Reliability
- Voltage control
- Reactive power
- Power quality (harmonics, flicker, voltage dips etc.)

An example of an application

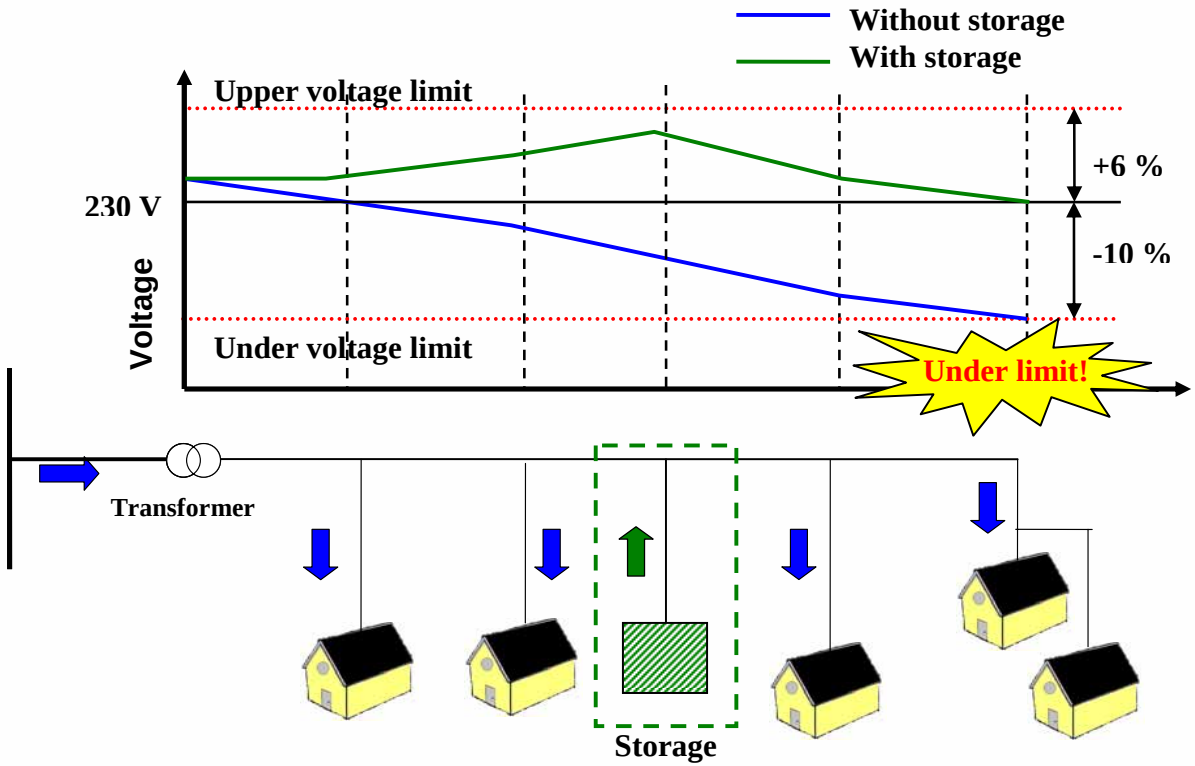


Source: NUON Hermes program

First rough business case analysis

- Investment deferral
- Trading
- Power Quality

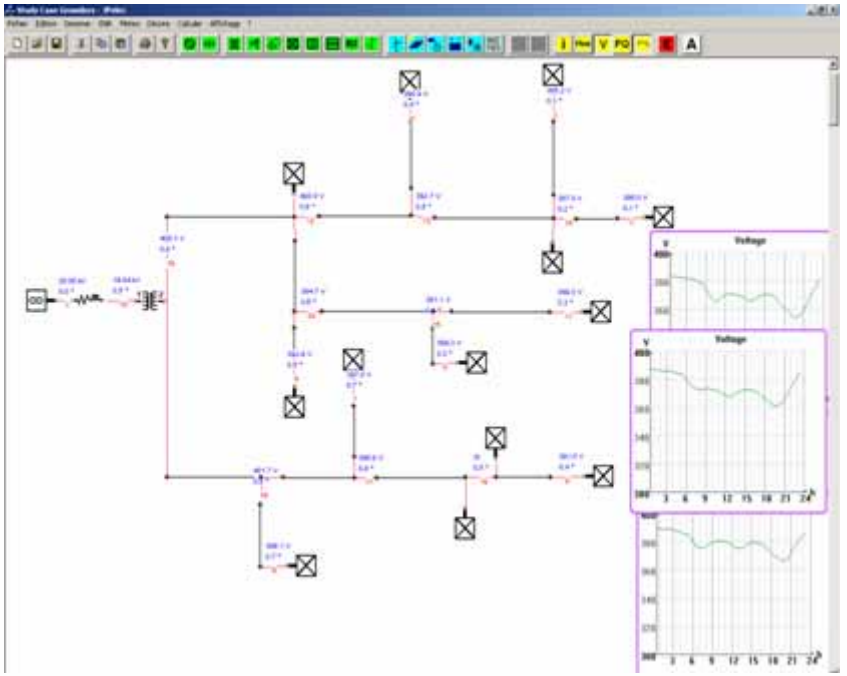
Study Case: Investment deferral



Source:

Study Case: Investment deferral

- Storage size: 33 kWh
- With expected prices for storage (150 €/kWh for Li-ion)) this is cheaper than a network upgrade



Source: cea ines

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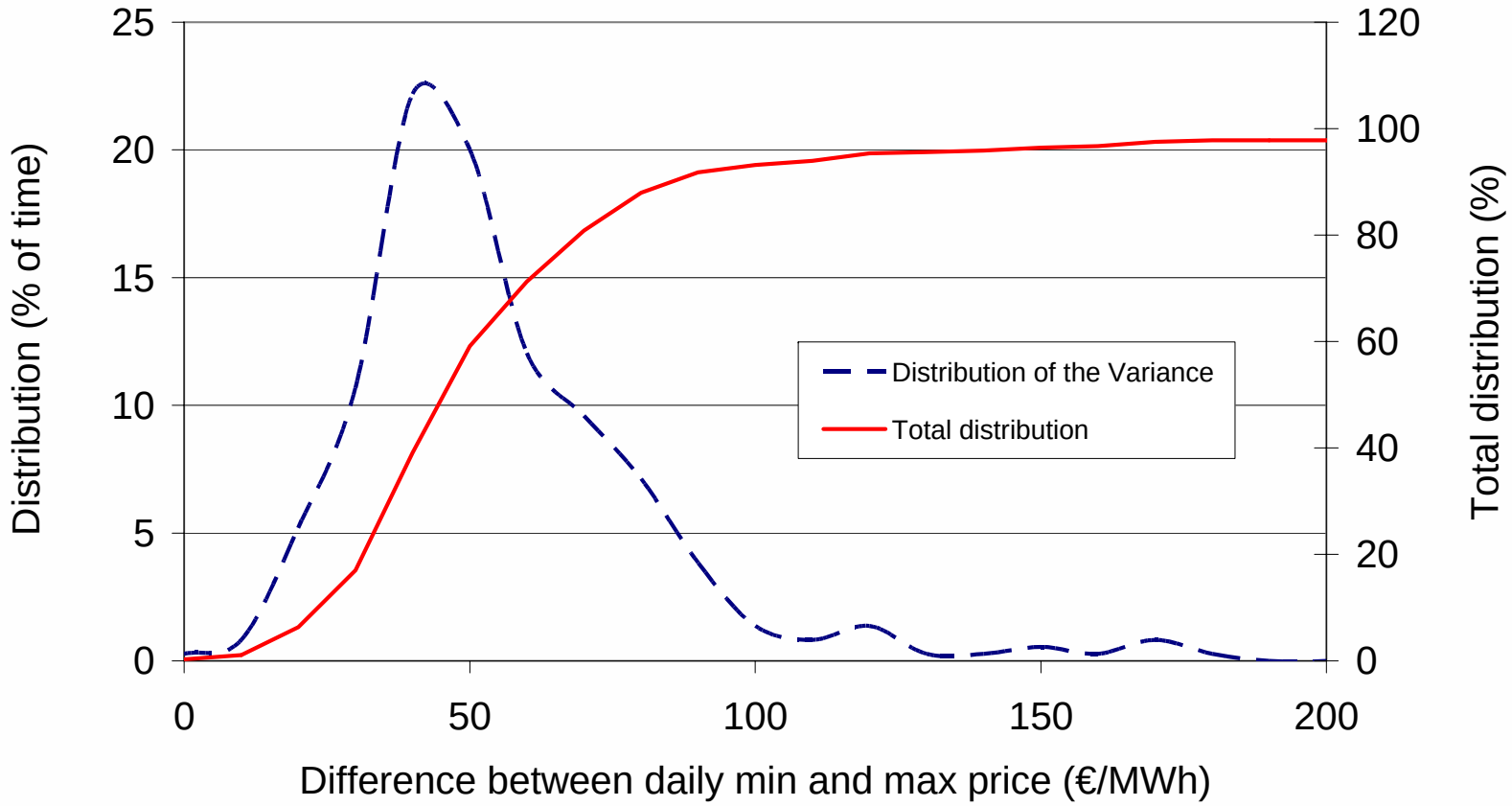
Study Case: Trading in France

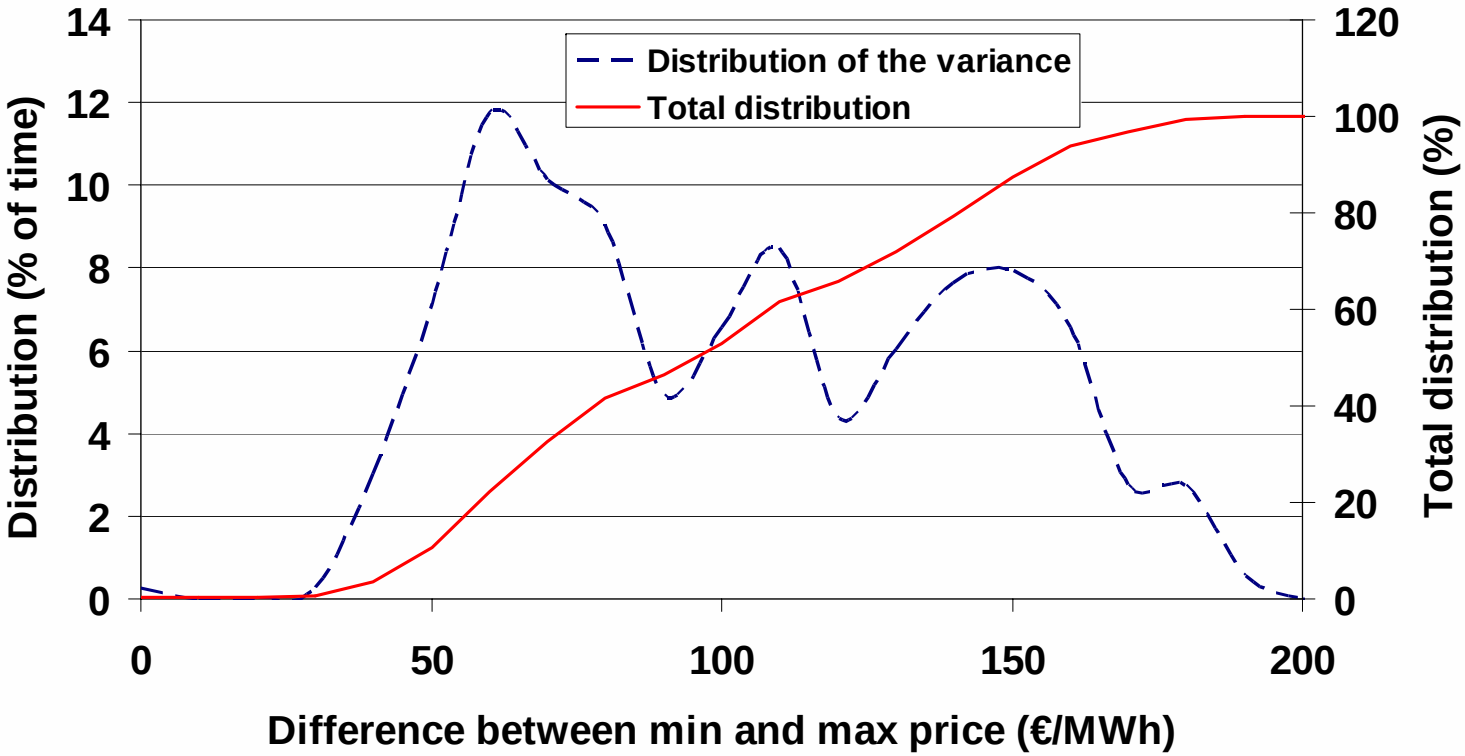


⇨average value of the difference is 64€/MWh.

⇨Li-ion battery price < 200€ / kWh (4000 cycles)

Source:

Study Case: Trading in Italy



⇨**average value of the difference is 103€/MWh.**

⇨**Li-ion battery price < 330€ / kWh (4000 cycles)**

Source:

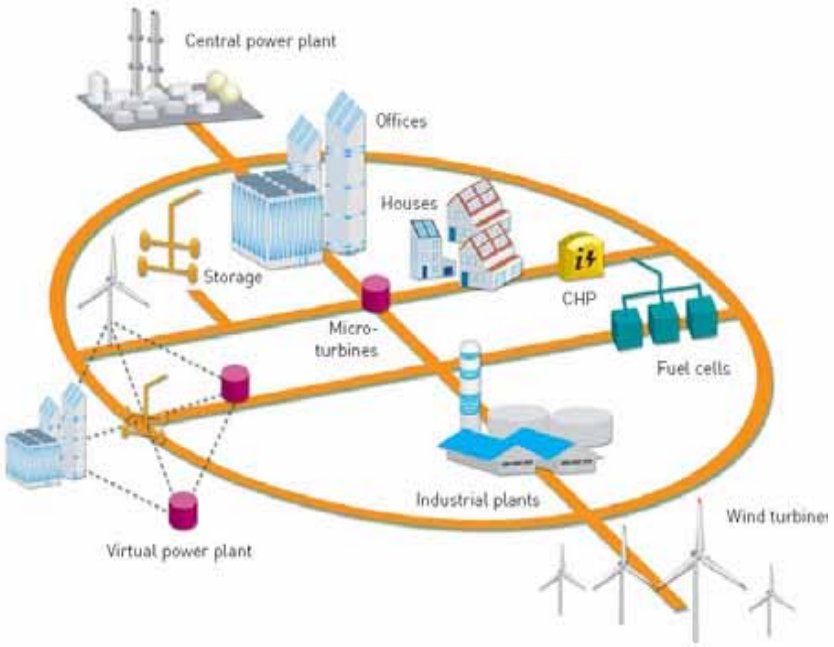
Study Case: Power quality

PQ improvement (harmonics, flicker, voltage dips etc.):

- A specific system for this application, e.g. a flywheel
- A storage system used for another application can also be used for PQ improvement

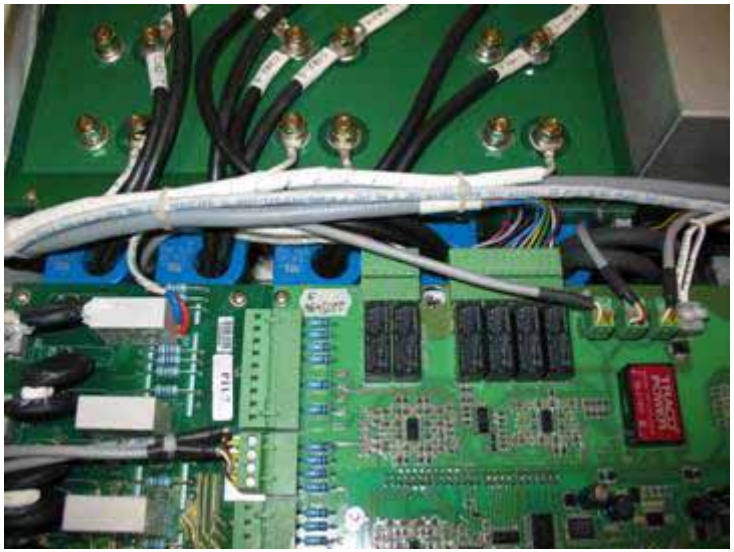
- The business case is more complex:
  - The problem will increase in the future (more distributed generators)
  - Who is the owner of the problem?

Test sites



- 4 test sites with distributed generation (France, The Netherlands, Spain, Germany)
- 3 transportable storage systems (2 Li-ion batteries and a flywheel)
- Demonstration of the technology
- Input for validation of the assessment tool

Production components battery demonstration



Assessment tool (software tool)

Objective = to optimize net management

Prediction

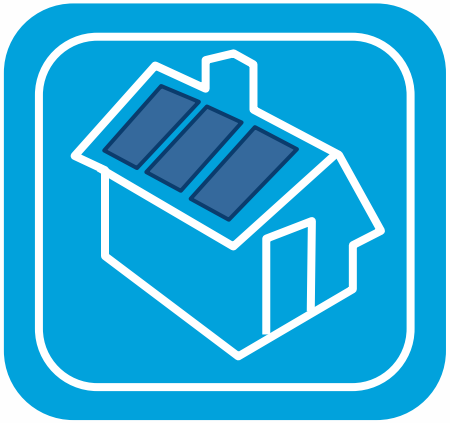
- Prediction of electricity demand
- Prediction of electricity production

Optimization

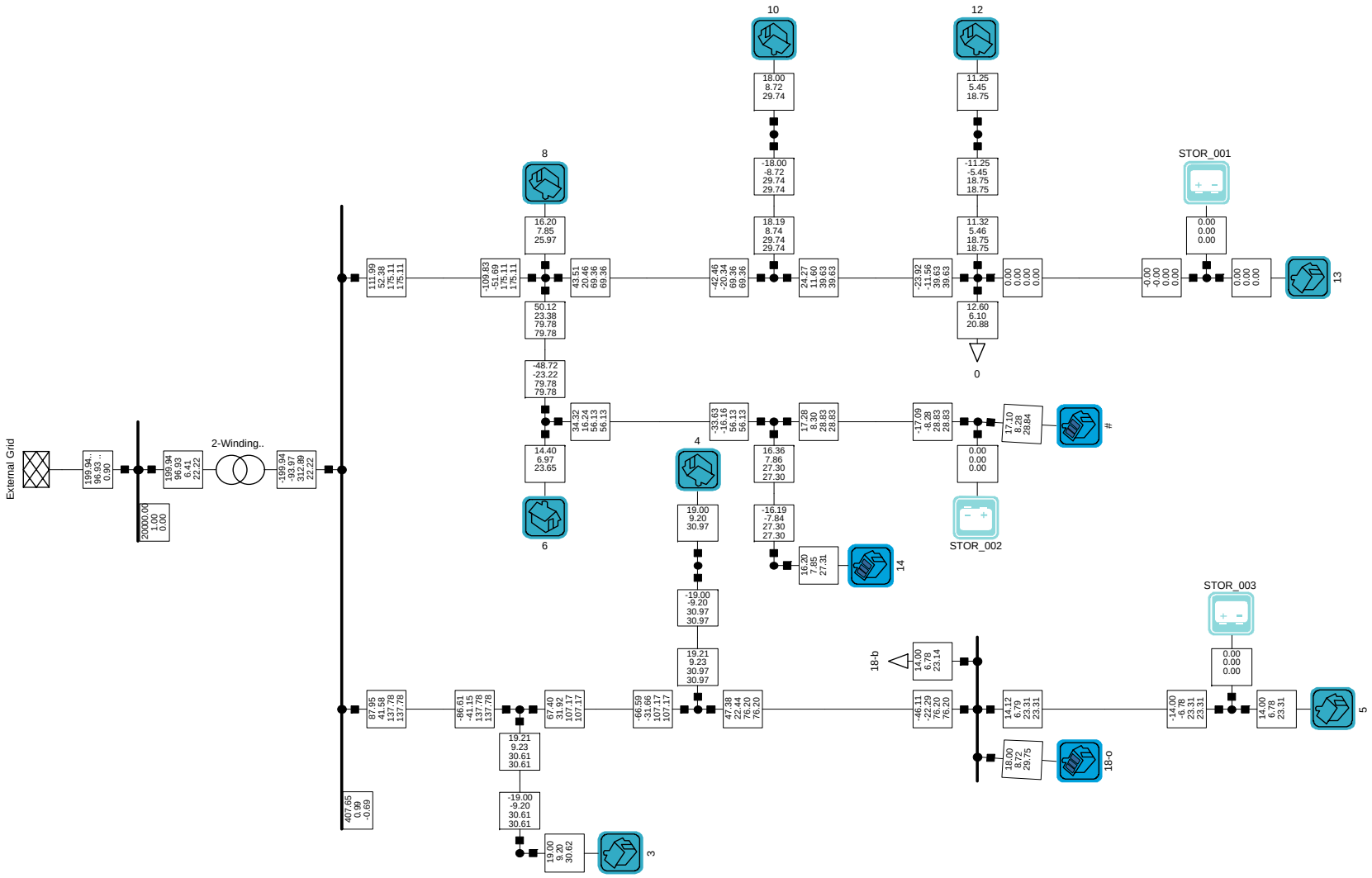
- Type of storage system
- Specifications of storage system
- Location of storage system
- Validation of the tool

Example Grid Model

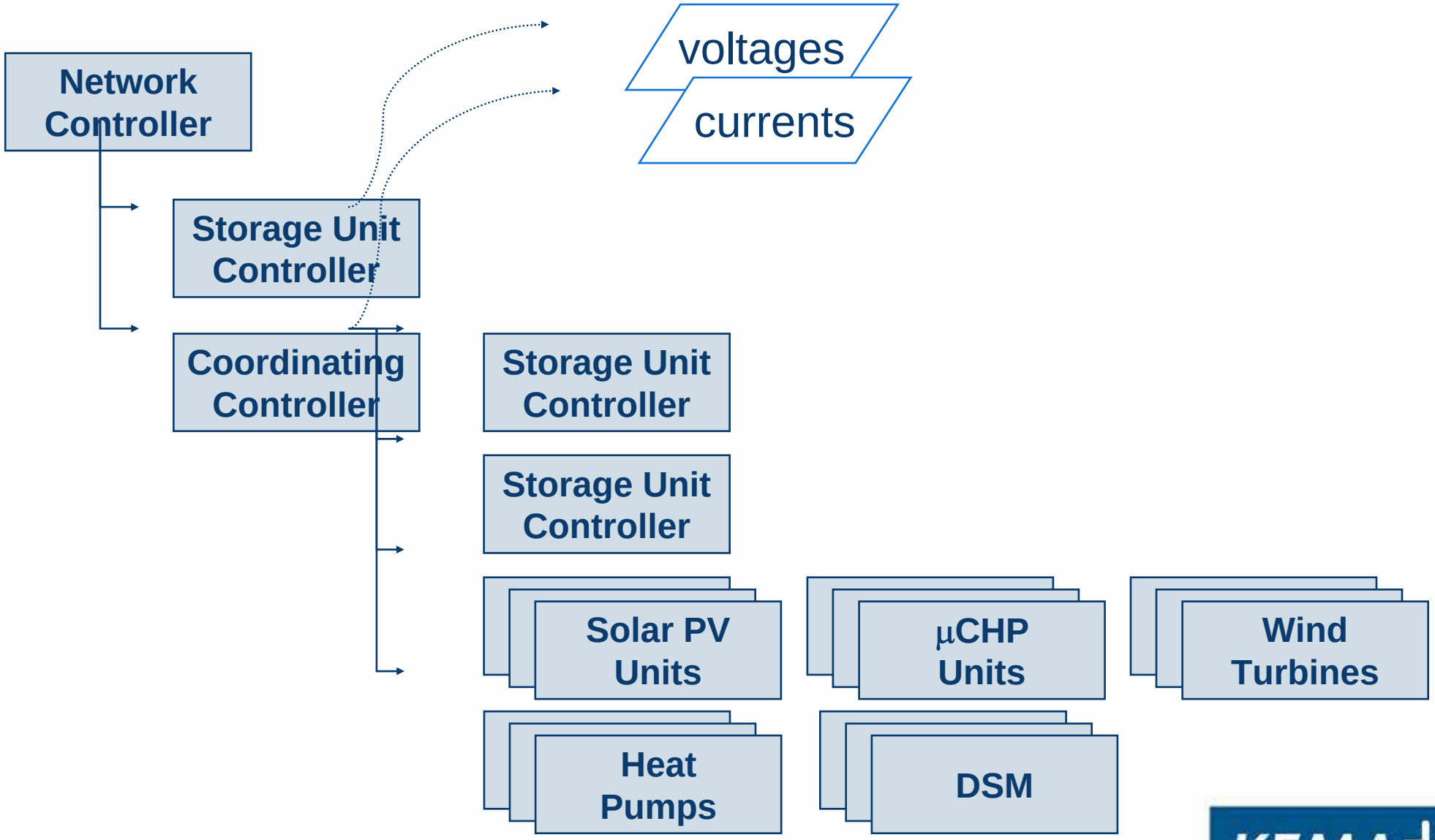
- Detailed model of a Distribution Network
- House models with Demand Profiles
- Models for solar Panels, Wind Turbines, (micro-)CHP are being developed
- Intelligent Storage Units with network/market interface and loading/unloading logic



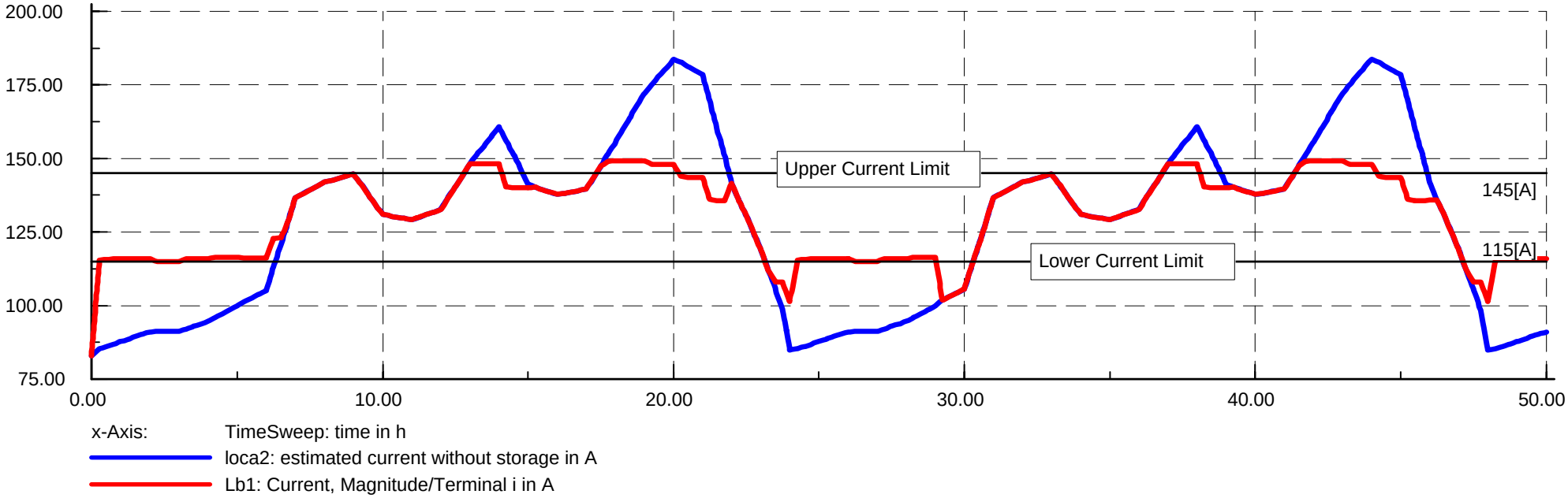
Example Network Model

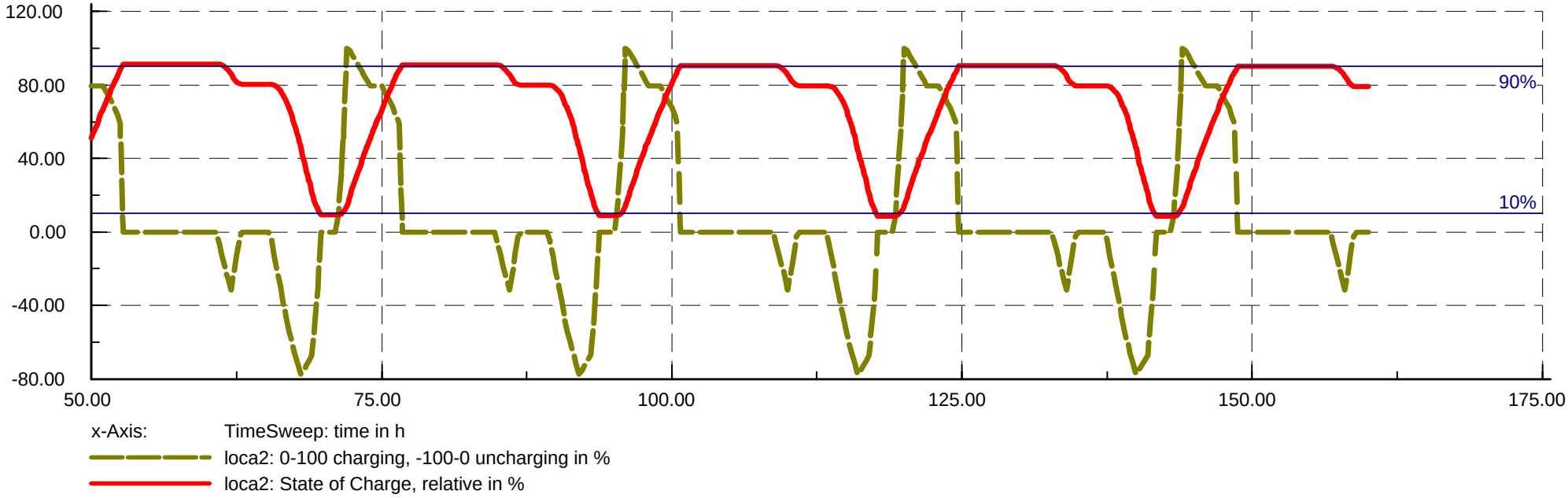


Hierarchy of controllers



Example of the first results





Current situation GROWDERS

- 1 September 2007 - 1 September 2010
- WP 1 (determine network properties) almost finished
- WP 2 (production battery system) started
- WP 7 (design assessment tool) started

Planning

2008

- Commissioning storage systems
- First prototype assessment tool

2009

- Field tests including data acquisition
- Validation assessment tool

2010

- Transportation storage to last field test site
- Field test with all storage systems together
- Workshops / training on assessment tool

End sheet

Thank you for your attention.

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