Energy Management Systems (EMS)

Knowledge Centre for Energy

KHK
KATHOLIEKE
HOGESCHOOL
KEMPEN

Content

- KCE: Knowledge center for energy
- Demand side management
- Lab of Energy Control
- Storage management
- Requirements
- Energy management systems
  - Possibilities
  - Demands
  - Examples
  - Results
- conclusion

KCE

- Integration of energy systems in buildings
- Research
  - Monitoring and control
  - Communication
  - Simulation and optimization
  - Integration and demonstration
- Energy audits
- Transfer of knowledge
  - Seminars
  - Study days
  - Postgraduat Energycoordinator
  - …

KCE

GLASREG Technological advice on energy saving technics and alternative energy production in glass gardening

BOUWREG Energy measurements in buildings

CV-IMPROVE Development of a model that allows a central heating in not-residential buildings waterside controllable en energetic optimization. The model calculates the savings.

REMOTE Tele management with wireless and power line technics for energy-efficient lightning.

TRNSYS is a flexible program that makes simulations of the performance of thermal energy systems

IVAN Thermodynamic model for an alkaline fuel cell

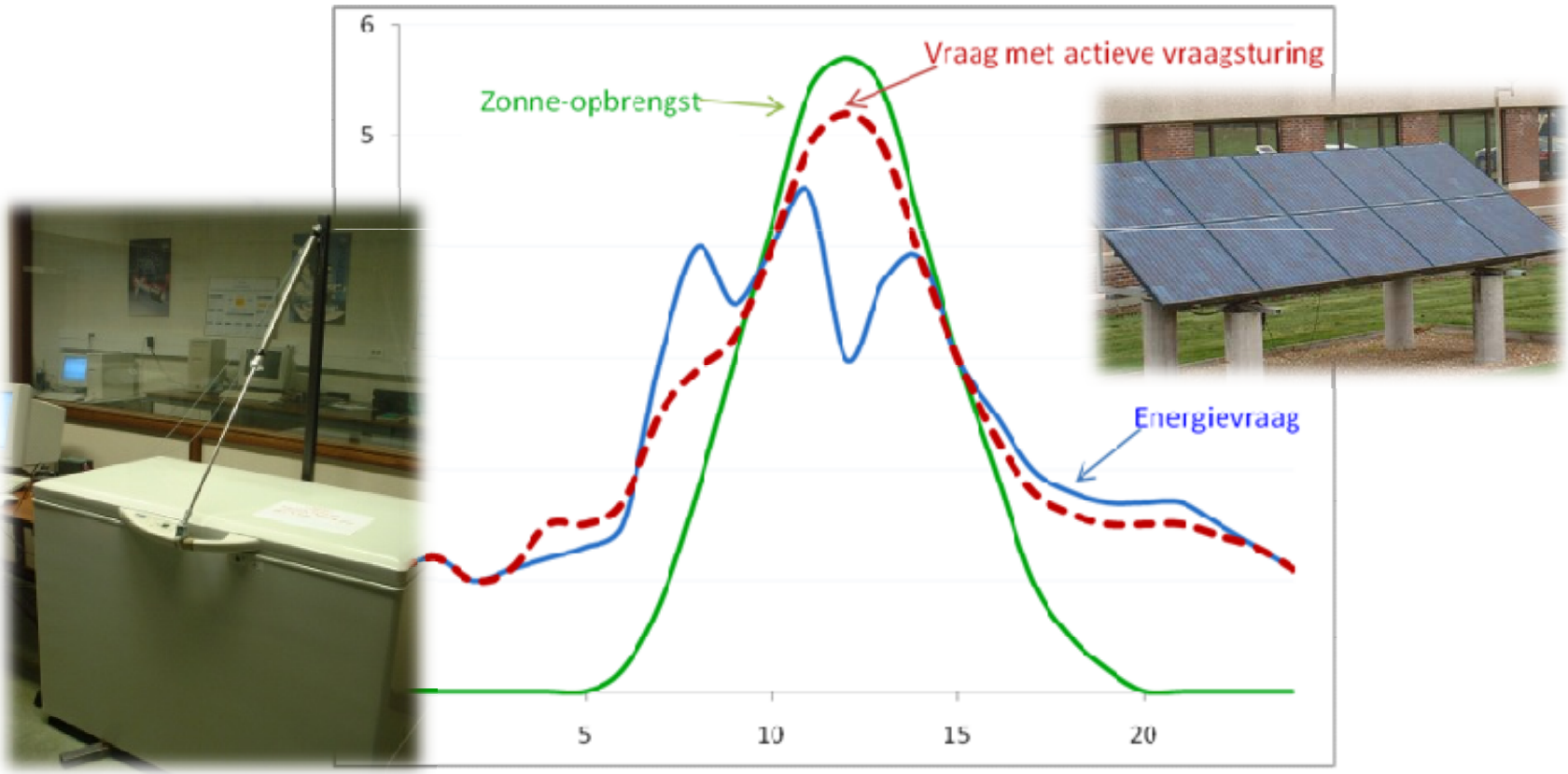
REDEEM European cooperation with Croatia. Biomass.

PROJECT Improving PV-panels

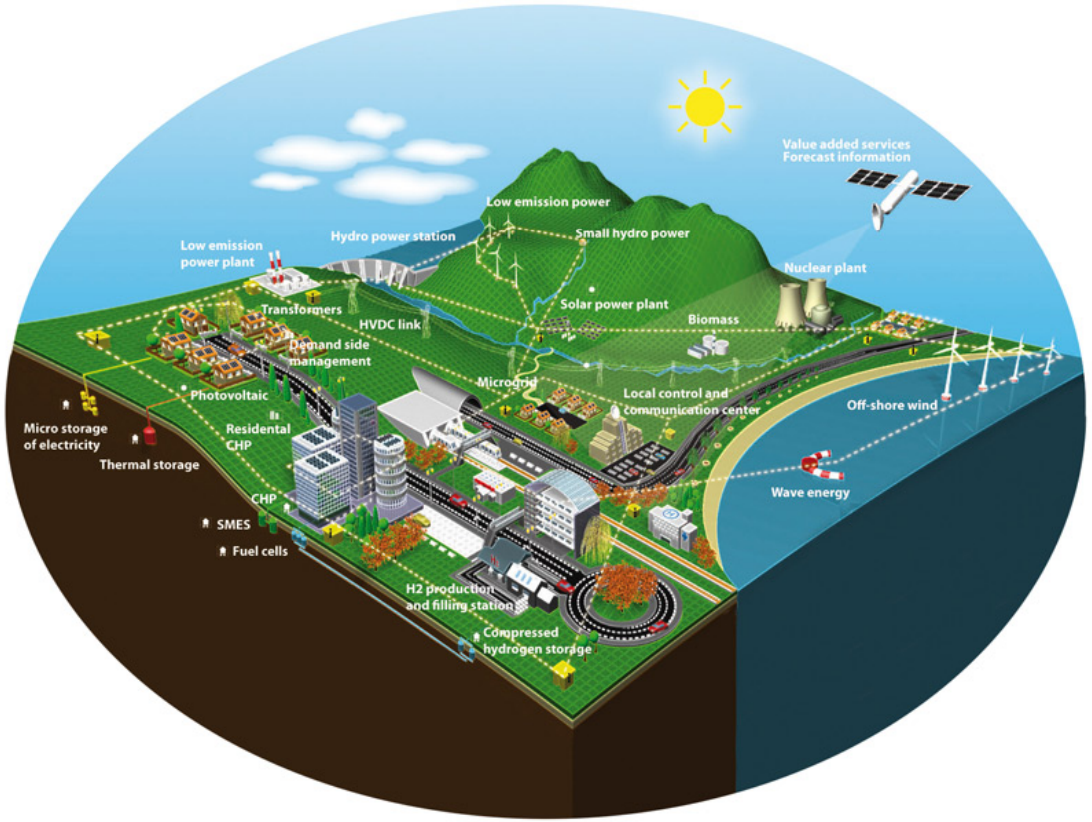
PCM Investigation about Phase change materials as heat saving medium

SMARTKAS Eco fysiologic-energetic gardening in an intelligent controlled greenhouse environment.

Demand Side Management

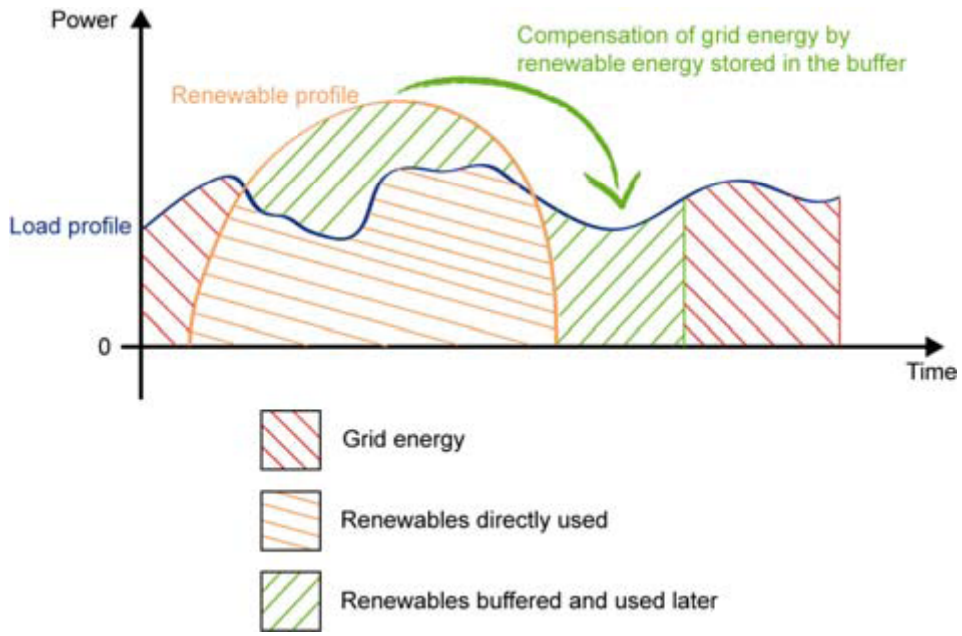


Smart Grid

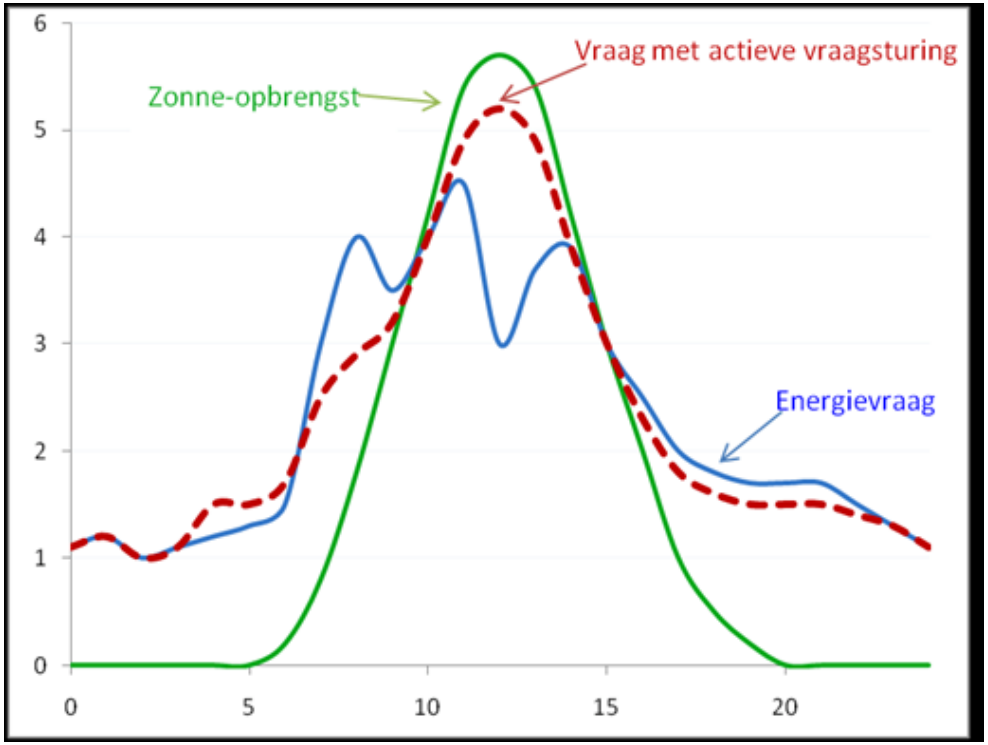

Value added services
Forecast information
Low emission power
Small hydro power
Hydro power station
Low emission power plant
Nuclear plant
Solar power plant
Biomass
Transformers
HVDC link
Demand side management
Microgrid
Local control and communication center
Off-shore wind
Photovoltaic
Micro storage of electricity
Residental CHP
Thermal storage
Wave energy
CHP
SMES
Fuel cells
H2 production and filling station
Compressed hydrogen storage

Lab of Energy Control

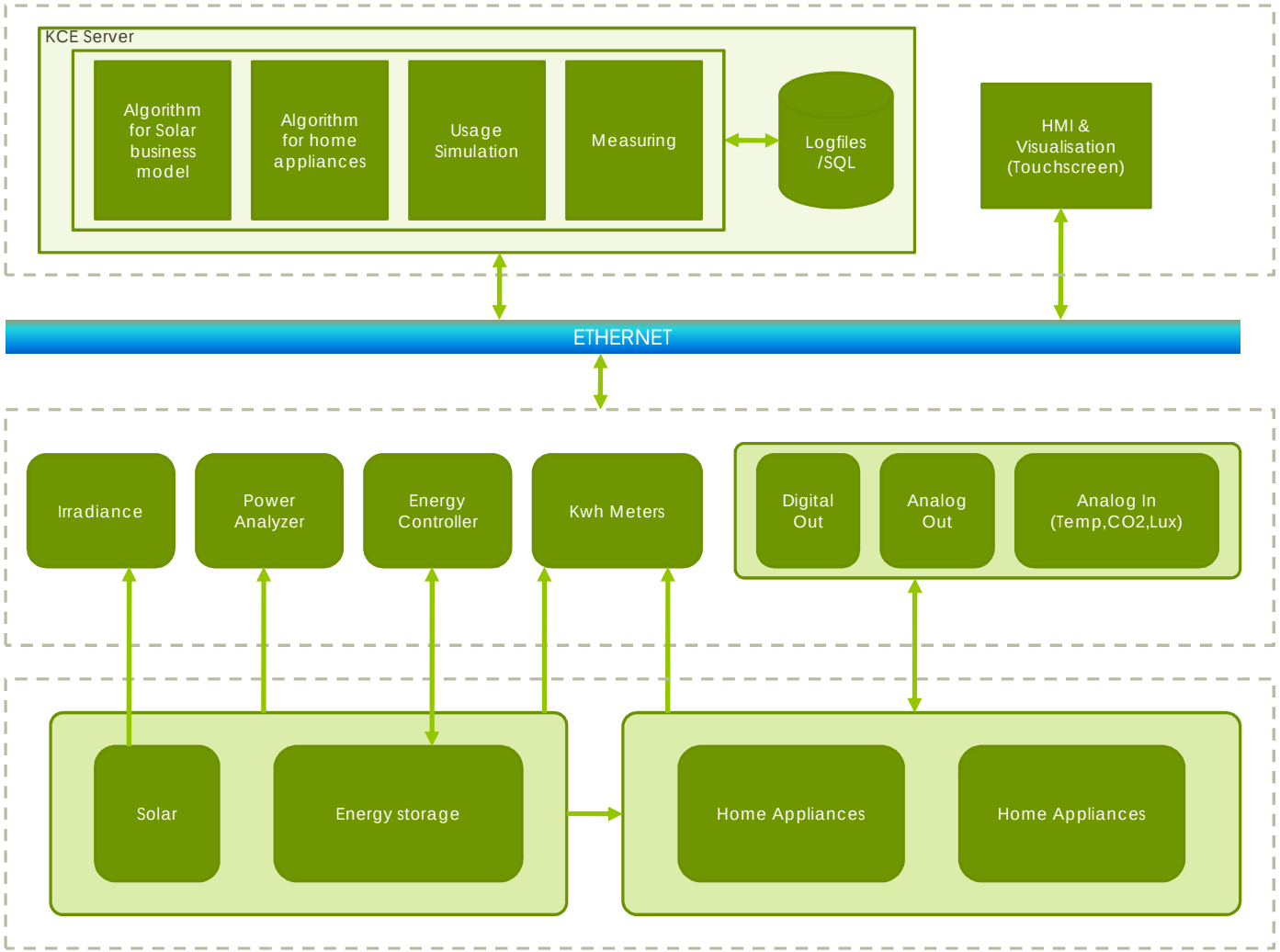
Storage management



Demand side management



Lab of Energy Control



		Control device		Touch screen	IO for Usage simulation
	Setting parameter	Input	Output	GUI for settings	
Dishwasher	Time	None	1 DO	x	None (IT)
Washing machine	Time	None	1 DO	x	None (IT)
Dry cleaner	Time	None	1 DO	x	None (IT)
Fridge	Temperature	Internal Temp (1 AI)	1 DO		1 DO (Heater)
Freezer	Temperature	Internal Temp (1 AI)	1 DO	x	2 DO / 2 DI (Hydrolic cylinder)
Boiler	Time & Temp	Water Temp (1 AI)	1 DO	x	1 AO (kitchen faucet)
Airco	Time & Temp & Envirem. Temp (1AI)	Room Temp (1 AI)	1 DO	x	None
Ventilation	Time & CO2 (& Humidity) & Presence	CO2 (1 AI)	1 DO	x	None (IT)
Circulation pumps	None (Instant)	None	None	None	None (IT)
Microwave	None (Instant)	None	None	None	1 DO
Water heater	None (Instant)	None	None	None	1 DO
Hot plate	None (Instant)	None	None	None	1 DO
Lighting	Lux & Presence	Lux (1 AI / Dali)	AO / Dali	x	None (IT)
Water pump	None (Instant)	None	None	None	None
SOHO appliances	None (Instant)	None	None	None	1 DO
PC	None (Instant)	None	None	None	Wake up on LAN
TV	None (Instant)	None	None	None	1 DO
HIFI	None (Instant)	None	None	None	1 DO
Laptop	Time & Battery status	Battery status	1 DO	x	Wake up on LAN
(Mobile Phone)	None (Instant)	None	None	None	

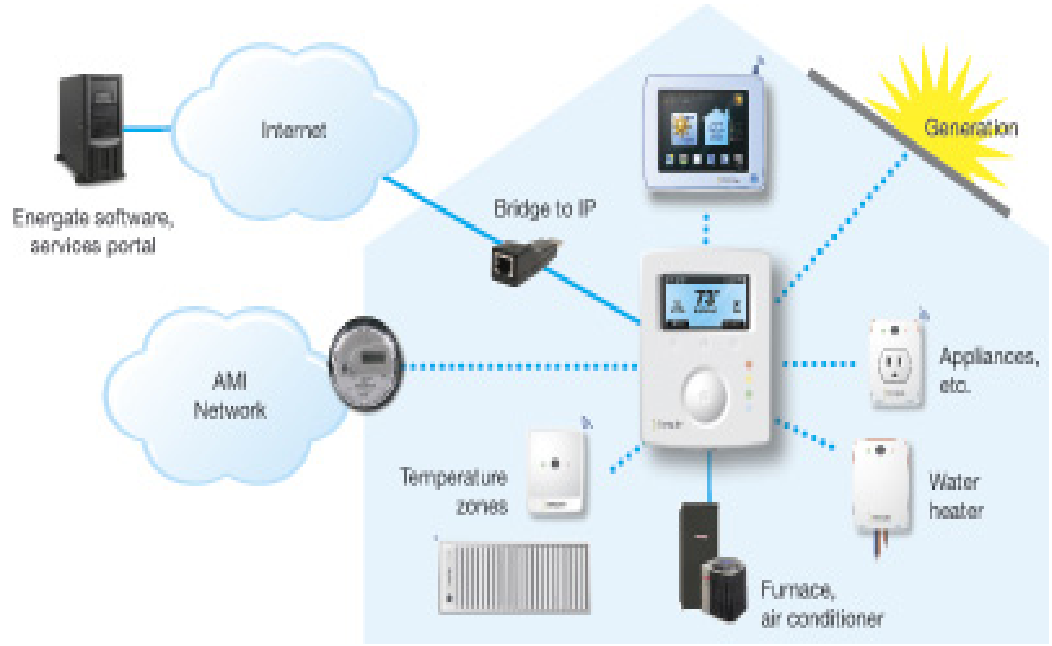
What do we want?

Home appliances that can communicate with a central unit (software).

Energy, status, extra features, extra sensors,...

Not on the market

Energy management systems



Requirements for the EMS

- Measure energy or power
- Measure temperature or status or …
- Good and reliable communication
- Preferable Ethernet
- No extra cables
- The software (management unit) should respect the privacy and must be adaptable to our needs.
- Switch on/off
- Change settings

Types of EMS

- Residential solutions
  - Plugs
  - Domotic systems
- Industrial solutions
  - PLC

Plugs

Example. Plugwise

Domotics

Example. Teletask

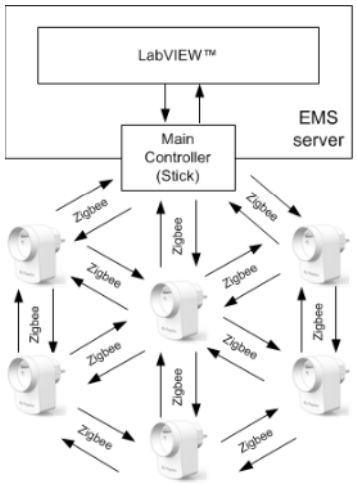
PLC

Example. Beckhoff PLC

Conclusions

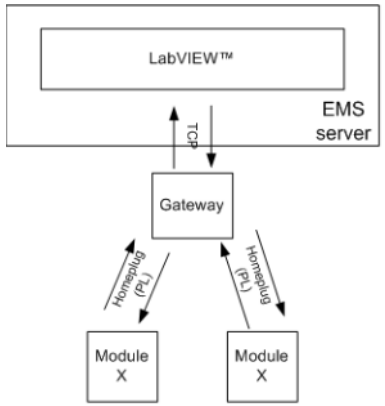
Not available on European market
With different power grid/ different plugs
Too expensive
Non-adaptable software
No privacy of data
Modules do not have extra sensors
Mostly measurements, no switching
Need to use software of the company
Bad data-communication

Plugwise (ZigBee)



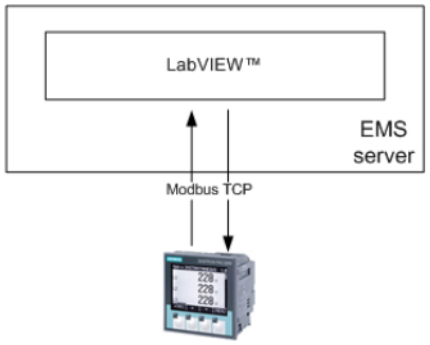
Strengths	Weaknesses
- Compact - Accurate - Large product range - Energy consumption - Easy installation	- Range - Speed - Price - Possible configurations - Synchronization: sequential readout - Stick as only connection
Opportunities	**Threats**
- Advanced time switch - Zigbee + Homeplug - Expanding the product range	- Not suitable for EMS - Protocol is shielded

Module x (Powerline)



Strengths	Weaknesses
- Synchronization: fast communication - Use of existing electrical wiring - Accurate - Individual IP address - Minimal **configuration** required - Easy installation - Suitable as EMS - Fast switching - Simple protocol	- Dimensions - Energy consumption - Bugs
Opportunities	**Threats**
- Homeplug GreenPhy - Both Powerline and Ethernet - Protocol to the public - Price - Reading sensors - Integration into existing hardware - Consumption in power (W) - IPv6 Integration - DHCP Integration	- Sticking to Homeplug Turbo - Unresolved bugs - Shielding protocol - Price - Interference from other devices - Single IP address

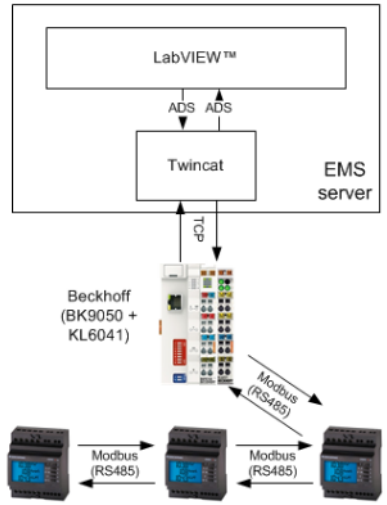
Siemens Sentron PAC32000 (ethernet)



Siemens Sentron Pac 3200

Strengths	Weaknesses
- Energy and power readout - Extensive measurements - Separate readout of measured values - Central programming - Simple readout - Simple **configuration**	- Seperate IP address
Opportunities	**Threats**
- One digital input - One digital output - Failover	- Integration into the Power Grid - Installation by professional - IP address shortage

Socomec Diris A10 with BECKHOFF PLC



Socomec Diris A10

Strengths	Weaknesses
- Energy and power readout - extensive measurements - Simple modules - Central programming - Simple readout - One IP address	- Delays - All values in one time - Large buffer needed
Opportunities	**Threats**
- Expansion with other modules - Easy to install additional meters - Additional functions	- Integration into the Power Grid - Installation by professional - Synchronization: to many meters on one serial line - Fail-over

Conclusion

Miele@home

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