A street in 2020....
Challenges

Supply & demand Management

Power Quality

Congestion Management

Reliability
What does the prosumer/consumer wants?

She

• wants to minimize the costs for electricity
• wants to reduce her carbon-footprint
• has flexibility to offer
• but does not want to be bothered with it
• .... and decide for herself

I do not want anyone to fumble with my household!
-18°C or -24°C?
Everything has a price...
Everything has a price....
Electronic markets

Supply/Demand equilibrium

CHP
Coal/Biomass
Solar energy
Wind-energy

Industrial demand
Charging
HVAC
Cleaning
PowerMatcher: ICT solution for clustering of devices

Scalability:
- Large numbers of devices (supply & demand)
- Distributed over a large area
- ‘Centralized control’ has limitations

Open system:
- Devices can connect and disconnect
- All (future) devices must be able to join
- Integration of renewables

Multi-actor interaction:
- Optimization of different processes (locally and globally)
- Coordination exceeds ownership

In accordance with existing energy markets
Field experiment I: CRISP

Central CRISP-Node

Local CRISP-Node

Local CRISP-Node

Local CRISP-Node

Local CRISP-Node

Data Communications Network

Wind Turbine Park I

Residential Heat Production (CHP)

Wind Turbine Park II

Emergency Generator

Cold Store

ECN Test Dwelling
Wind imbalance
Cluster imbalance

44% imbalance reduction
Field experiment III: First Trial

- 10 Households with micro-CHPs
- Peak reduction of local substation
- No infringement of user comfort
VPP node
• “Fit and Forget” did not reduce substation peak load.

• PowerMatcher:
  - 50% peak reduction (winter)
  - 30% peak reduction (summer)
Field experiment IV : PHEV
Field experiment V: PowerMatching city

Constrained network
Local market operated within network capacity

No network constrain
Energy management using market price

Compare to local marginal pricing (LMP)
CHP buffer fill level