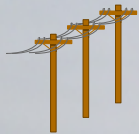


"Use of Load Management and Energy Efficiency as an alternative to Grid reinforcement"



Pilot 1: Implementation of DSM in Oslo (IDO)



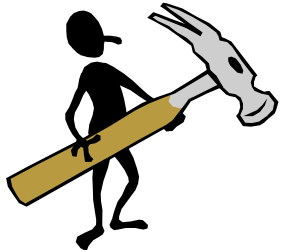
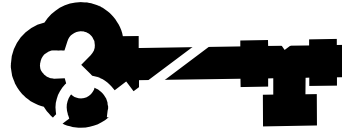
Pilot 2: Control of power loads in Oslo (CPO)

Håvard Nordvik, E-CO Tech

Sponsor: Hafslund Nett

EFFLOCOM workshop 10.June 2004 Trondheim

The network company wishes the customer to invest in Demand Side Management!

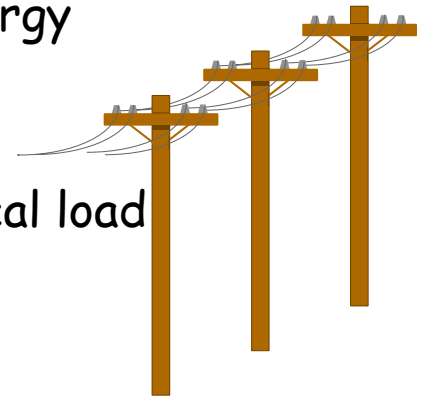
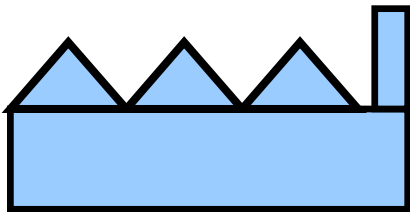


Pilot 1: DSM actions that *do not require involvement by the network company*

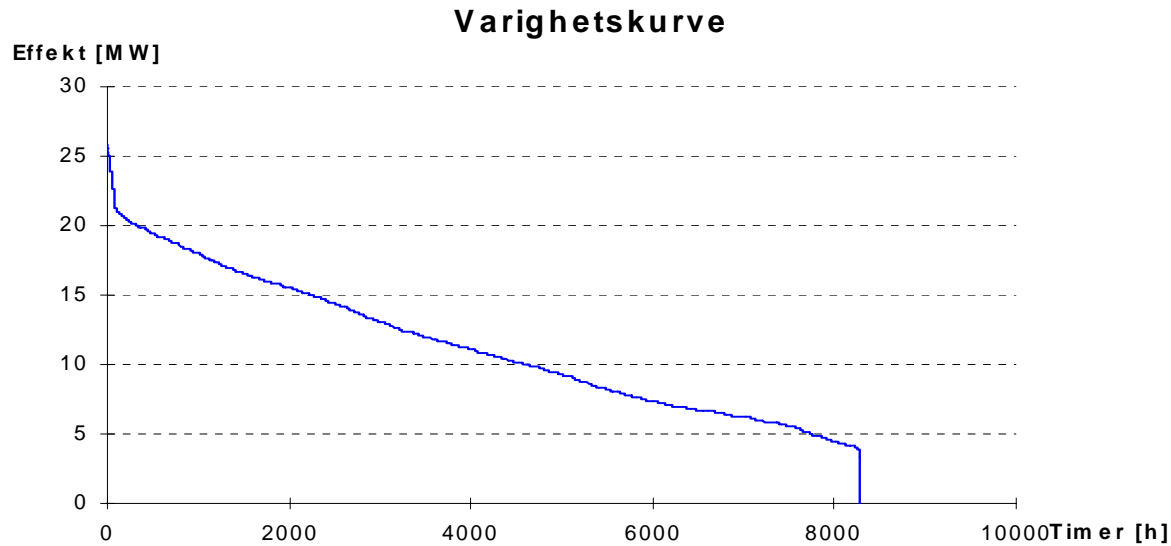
- a) "Energy alteration" - alternative energy carrier to electricity
- b) Reduction of energy consumption
- c) Reduction of maximum peak load (local load control)

Pilot 2: DSM actions that *do require involvement by the network company*:

- d) Remote control of the customers power load.



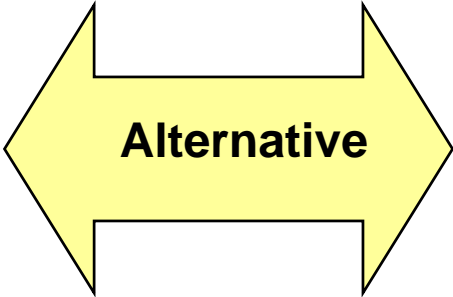
"DSM balance principle"



Load prognosis is determined

↓

Adaptation of the grid



The grid is determined

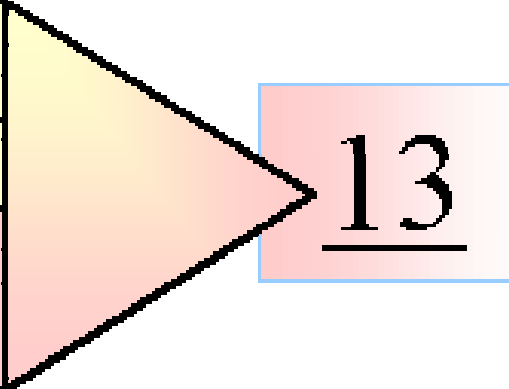
↓

Adaptation of the end user

Pilot 1: Implementation of Demand Side Management in Oslo (IDO)

Testgroup - commercial customers

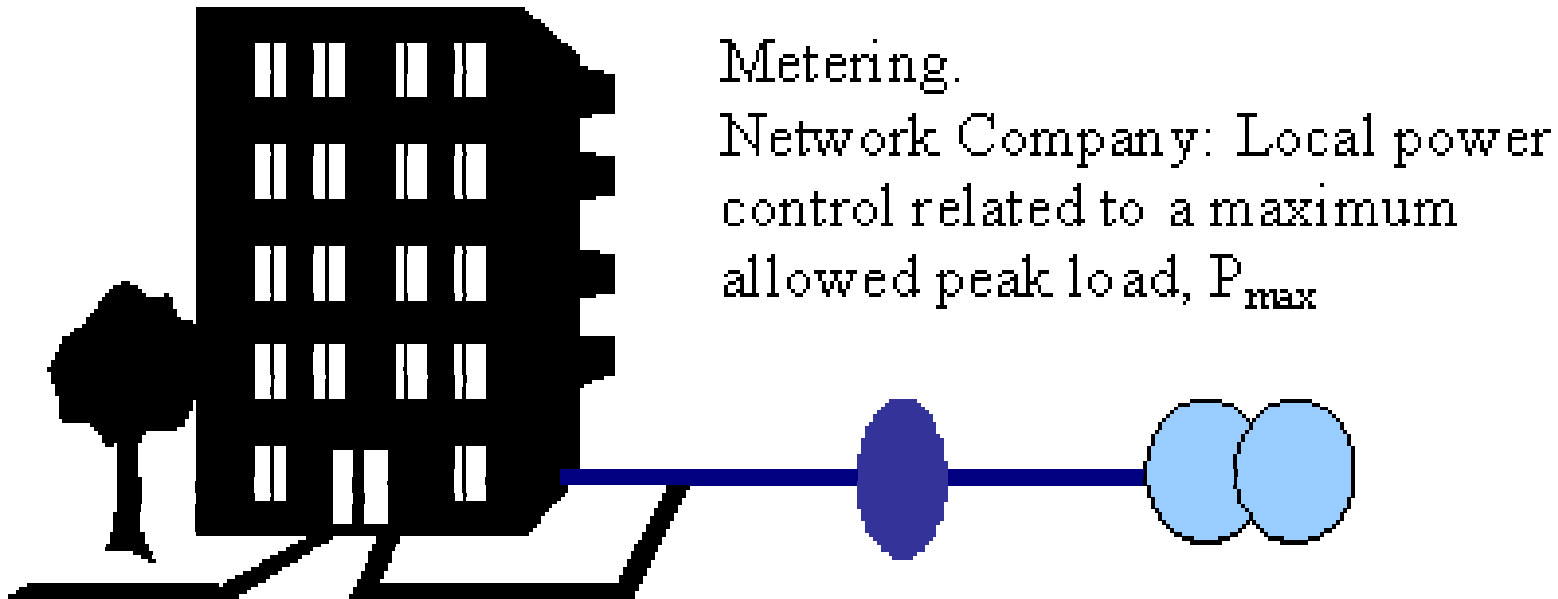
Preliminary analysis	Energy auditing	Network analysis	Implementation	
Year 1999	Year 2000		Year 2001	
65...40	34	20	15	13



- Almost cost free energy auditing was offered to 40 commercial customers → recommended energy efficiency actions
- Minor subsidy (10-15%) from the City of Oslo and Hafslund Nett.
- 13 customers implemented or started implement recommended actions within the project period
- Most actions were related to building maintenance
- Total investments by the 13 customers: 7,5 Million €(or about 65 Mill.NOK)

Testgroup: residential customers

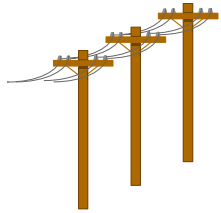
- Load control of water heaters in 8 blocks of flats (156 flats)



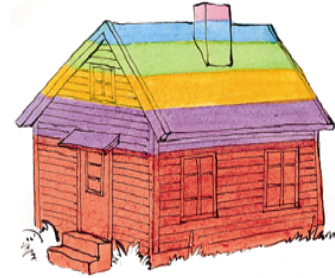
- Load control of electrical heaters in 17 semi detached houses

Key Motivation factors!

Residential customers



Motivation



- Cost allocation - the end user have to pay for the potential grid reinforcement himself
- Electricity costs
 - ✓ Why shall I reduce the peak load when I do not pay for it?
- Contact persons and decision-making process
 - ✓ Jointly decision - if my neighbour does I will
- Human factors and knowledge
 - ✓ Confidence in the projects spokesman

Conclusions from IDO pilotstudy



- ❑ DSM actions can be proved to be profitable compared to conventional grid reinforcements
- ❑ One methodology for implementing DSM actions has been developed - a motivation model.
- ❑ A general potential for energy saving and peak load reduction of 10-15%. This potential is related to a wide type of energy efficiency actions.
- ❑ We believe this knowledge should lead the way for network owners, local authorities and district heating suppliers in Norway and other countries.

Pilot 2: Control of power loads in Oslo (CPO)

Pilot 2: CPO - Remote control of power loads in Oslo

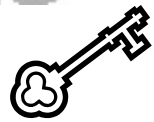
Ongoing activity

- EFFLOCOM pilot:
 - ✓ identifying new controllable load groups
 - ✓ designing new tariffs
 - ✓ testing load control during limited time periods.

MAIN OBJECTIVES

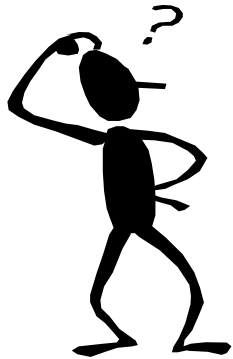
- Postpone distribution network reinforcements
- Achieve network tariffs that gives the customer incentives for investment in load control.

Use the project results to achieve participation in the
Regulating Capacity Option Market



The tariff is the main instrument of the Network Company!

My electricity costs?

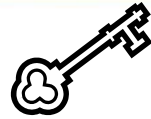


□ An enduser in Norway will most likely have its electricity costs as follows:

- Power Company: 40-45%
- Taxes: 25%
- Network company: 30-40%

Commercial (Average):
60% Maximum peak load
38% Energy consumption
2% Fixed Cost

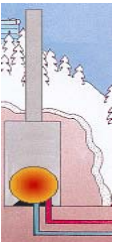
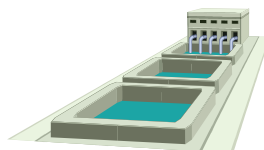
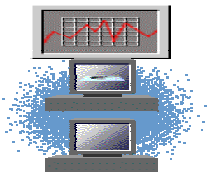
Residential (Average):
0% Maximum peak load
75% Energy consumption
25% Fixed Cost



What makes it interesting for the customer to invest in load control?

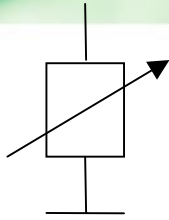


- Switching off the water heater, electric boiler, heat pump providing your basic needs
- Stop the high-pressure pumps supplying the city of Oslo with drinking water.
- Stop the air-conditioning plant which serves a store with thousands customers every day
- Stop the cooling compressors supplying a skating rink with international Championship every year

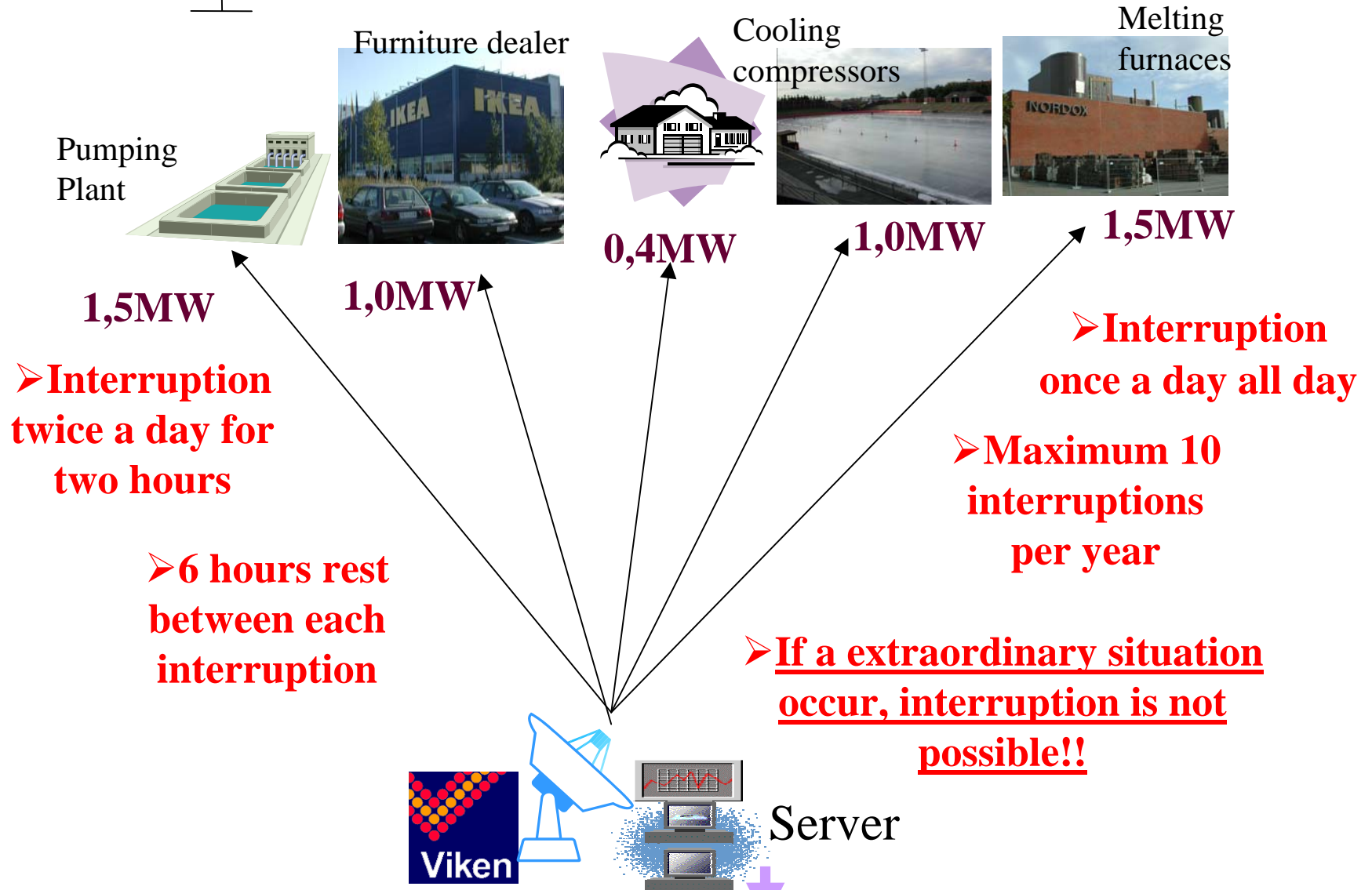


The approach in this project

- 14 commercial with peak load above 800kW have been analysed
 - ✓ potential for load control in limited time periods
 - ✓ possible technical solutions
- 7 out of 14 customers have been offered a new pilot tariff with 50% reduced power part
- Two of the customers have made an agreement of the new pilot tariff, five customers have rejected the offer.
- The new pilot tariff will be revised according to project experiences

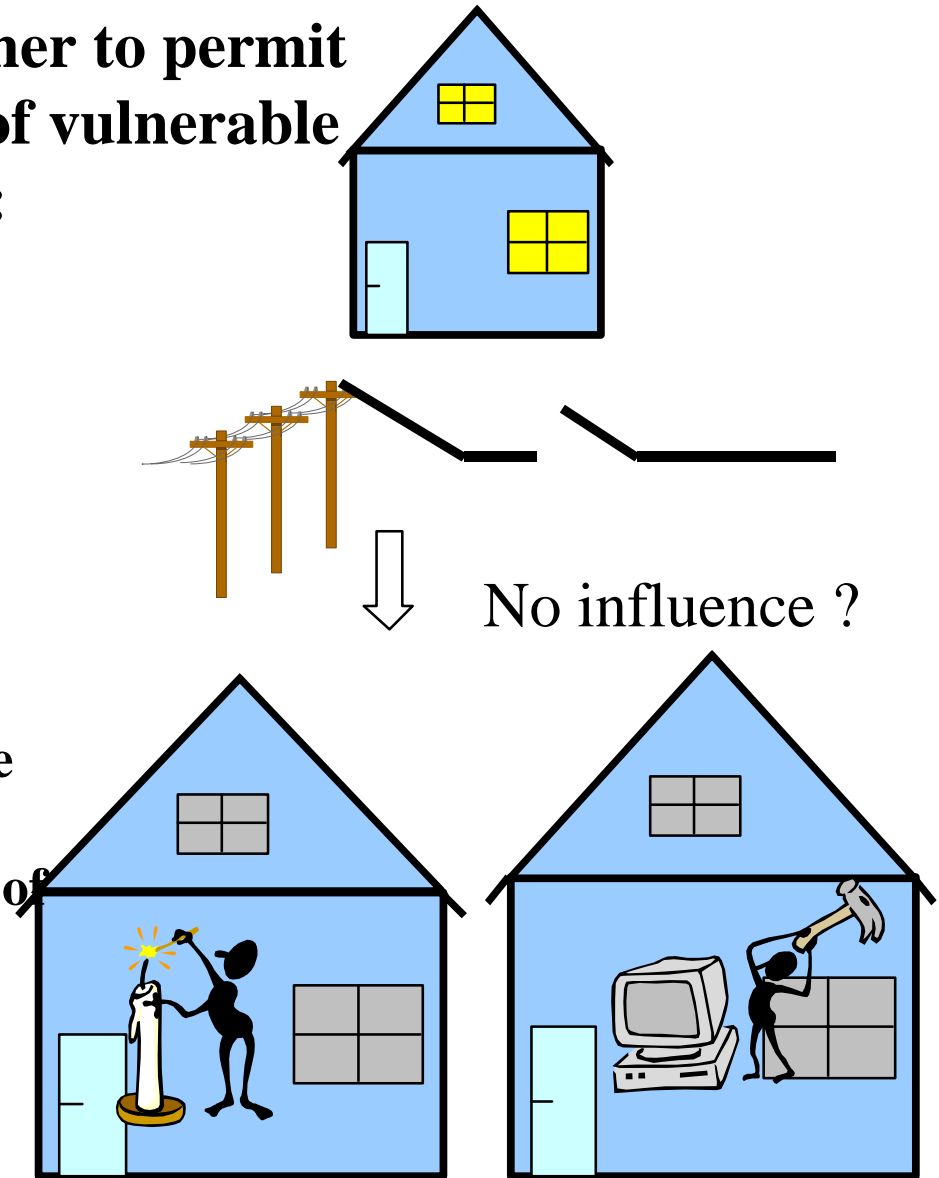


Results from the pilot project



When convincing the customer to permit remote interruption/control of vulnerable loads, several barriers arise:

- ✓ **Duration of interruption/control**
- ✓ **Time of rest between interruption/control**
- ✓ **Number of interruption/control**
- ✓ **Alert before interruption/control**
- ✓ **Technical solution for interruption/control**
- ✓ **Sufficient cost-benefit through the Network tariff**
- ✓ **Consequence of a possible failure of interruption/control (reliability of direct communication)**



Conclusions from CPO pilotstudy



- ❑ Among a random group of commercial customers, 49% of peak power load can be controlled or interruptible for a limited period of time
- ❑ Several barriers related to type of flexibility, technical solution, economy, as well as psychological barriers and methodology for introductory sale of the Network tariff.
- ❑ A new network tariff for remote control of loads in limited time period will be included in the standard tariffs of Hafslund Nett.