EFFLOCOM Workshop 13-06-2003

How to achieve energy efficiency actions as an alternative to grid reinforcement!

Håvard Nordvik
Per Edvard Lund

Picture: Oslo January 2003
IDO - Based on the “DSM balance principle”

Load prognosis is determined

Adaptation of the grid

Alternative

The grid is determined

Adaptation of the end user
Identifying bottle-necks

\( C_{\text{Grid-reinforcement}} \)
- Identify all cost for conventional grid-reinforcement

\( C_{\text{DSM}} \)
- DSM actions per customer
- Simulate bottle-neck profile after proposed DSM actions

Analysis and Motivation

Evaluation

Is \( C_{\text{DSM}} \) less or equal to \( C_{\text{Grid-reinforcement}} \)?

- NO: Grid-reinforcement
- YES: DSM
What makes it interesting for the end-user to invest in DSM?

- Switching off the water heater, electric boiler, heat pump, heater cables, outdoor electric installations
- Reducing the room temperature with 1-2 °C
- Using the emergency power aggregate in the peak period
- Rehabilitation of building such as insulation, replacing windows, heat recuperator in ventilation plant etc..
- Implementing building automation system for controlling energy consumption and peak load reduction
- Choosing another energy carrier than electricity, e.g. district heating
The network company wishes the end-user to invest in Demand Side Management!

Pilot 1: Long-term DSM actions (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: Short-term DSM actions (do require involvement by the network company):

d) Remote control of the end users power load.
“How to understand the end-user? Everyone is so different?
Among the majority of end-users in Norway energy consumption is based on electricity!

An average resident:

- Heating 58%
- Hot water 14%
- Lighting 11%
- Kitchen 11%
- Bathroom 4%
- Sundry 2%
Key Motivation factors!
Residential end users

- Cost allocation - the end user have to pay for the potential grid reinforcement himself
  - What can I afford compared to other costs in the household?

- 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
Incentives and goals!

Commercial end users

Owner of premises
- High profitability of his investments
- Strengthening of his position on the real estate market
- Low operation and maintenance costs

Network company
- A tariff agreement which makes the end user implement DSM actions
- Maintained or increased incomes from transmission

Leaseholders (renters)
- Low rent fees
- A secure solution for remote control
- Similar to residential (selfowner)
## Key Motivation Factors!

- Ownership versus rent of premises
  - Affects the decision-making process
- Contact persons and decision-making process
- Cost allocation
- Financing of DSM and recovering of investments
- Electricity costs
- Human factors and knowledge
An enduser in Norway will most likely have its electricity costs as follows:

- Power Company: 50%
- Taxes: 20%
- **Network company: 30%**

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

**Residential (Average):**
- 0% Maximum peak load
- 75% Energy consumption
- 25% Fixed Cost
Conclusions from pilot studies in Oslo

- 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.
- Among a random group of commercial end users, 49% of peak power load can be controlled or interruptible for a limited period of time (short-term DSM).
- A general potential for energy saving and peak load reduction (long-term DSM), of 10-15%. This potential is related to a wide type of energy efficiency actions.
- We believe this knowledge will lead the way for network owners, local authorities and district heating suppliers in Norway and other countries.