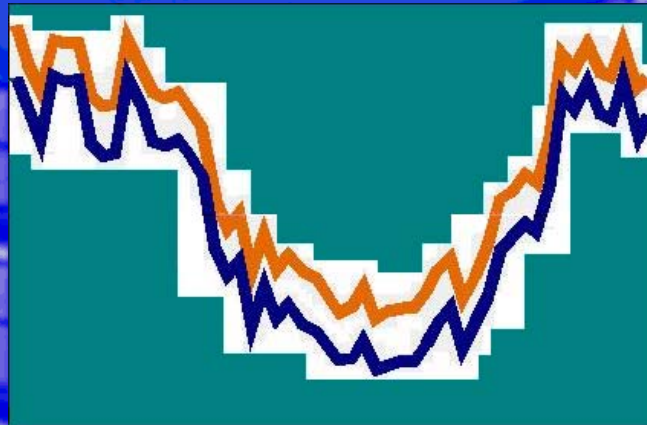


EFFLOCOM

Energy **EFF**iciency and **LO**ad curve impacts of **COM**mmercial development in competitive markets program



Presentation 10-06-2004



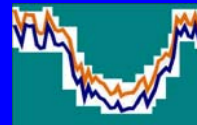
Casper Kofod +45 4045 9876



A EU SAVE
programme

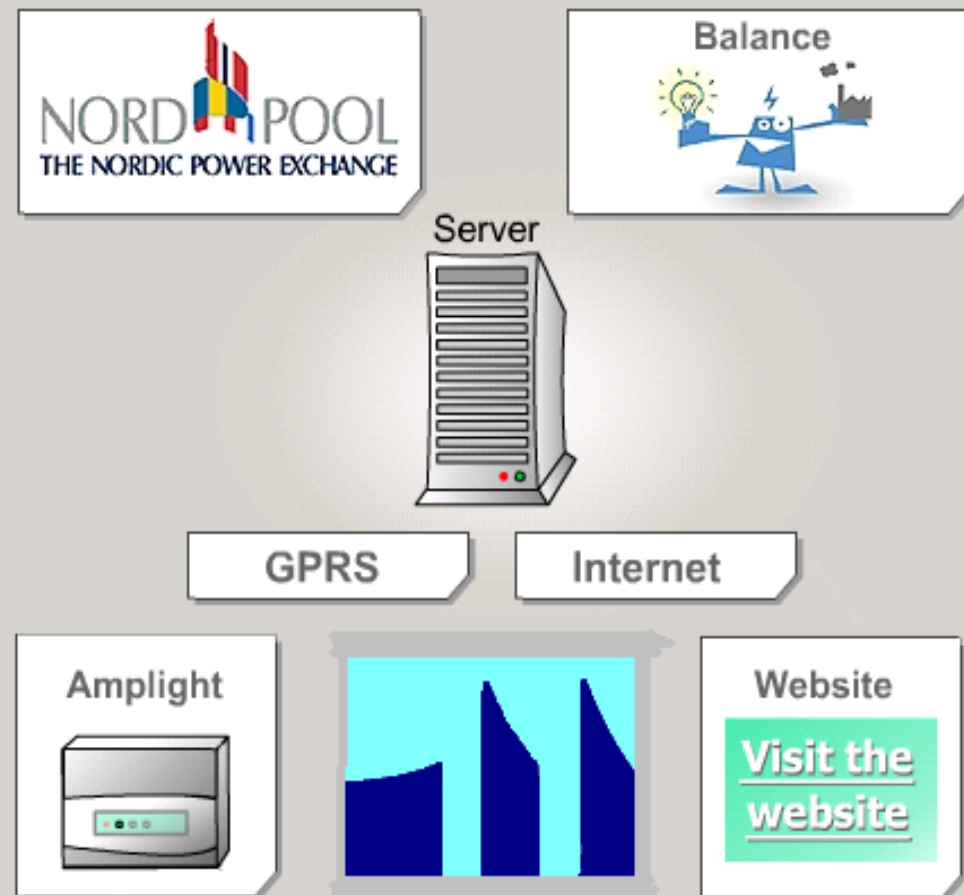
Presentation 10-06-2004

1. Interactive demonstrator
2. Web site for the customers
3. Organisation
4. Results
5. Plans for next winter
6. Vision for the coming years



Interactive Demonstrator

The Danish EFFLOCOM Pilot



WEB site for the customers

Welcome

Welcome

Setup

Stop switch off

Energy & Bonus

About EFFLOCOM

Logout

"Setup" includes the customers specification of the accepted maximum duration of an interruption for the periods where the heating might be switched off. The maximum duration can be no longer than three hours. The largest accumulated bonus will be obtained by accepting the duration 3 hours for all periods and levels of bonus.

"Stop switch off" can be used to stop an actual interruption within few minutes. The duration of a switch off period will typically be 1-2 hours and maximum three hours.

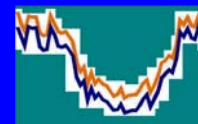
"Energy & bonus" include a report which is updated in the morning every day. It is possible to see the hourly consumption during the last week and month as well as the total consumption per week and month. Finally is showed, the accumulated bonus gained by switching off the heating load.

In case of questions or comments please contact Casper Kofod at the email adress epiano@image.dk

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Energy piano



A EU SAVE
programme

Organisation

- Support + ideas: ELTRA + Elkraft System (TSO)
- Support and customers: SEAS Energiservice
- Management, design, customer contact, analysis and reporting: Energy piano
- Installation: Filtenborg EL
- Hardware, GRPS and Web site: Amplex A/S
- Software for customer reporting: IT Energy

Background

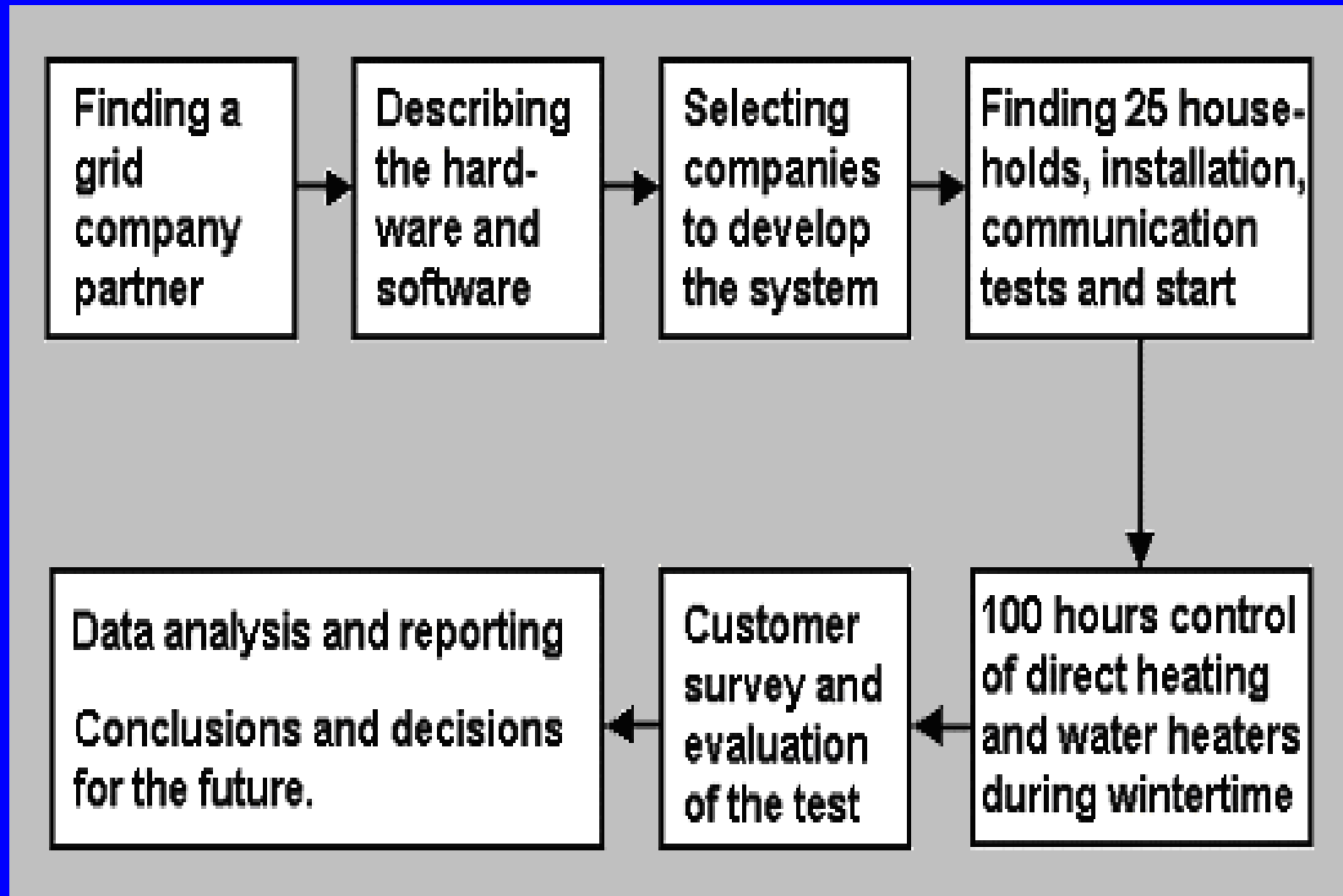
The Nordic power system is gradually turning more tight.

The objectives of demand response are:

- to secure supply and demand meets in the liberalised market.
- To increase competition.

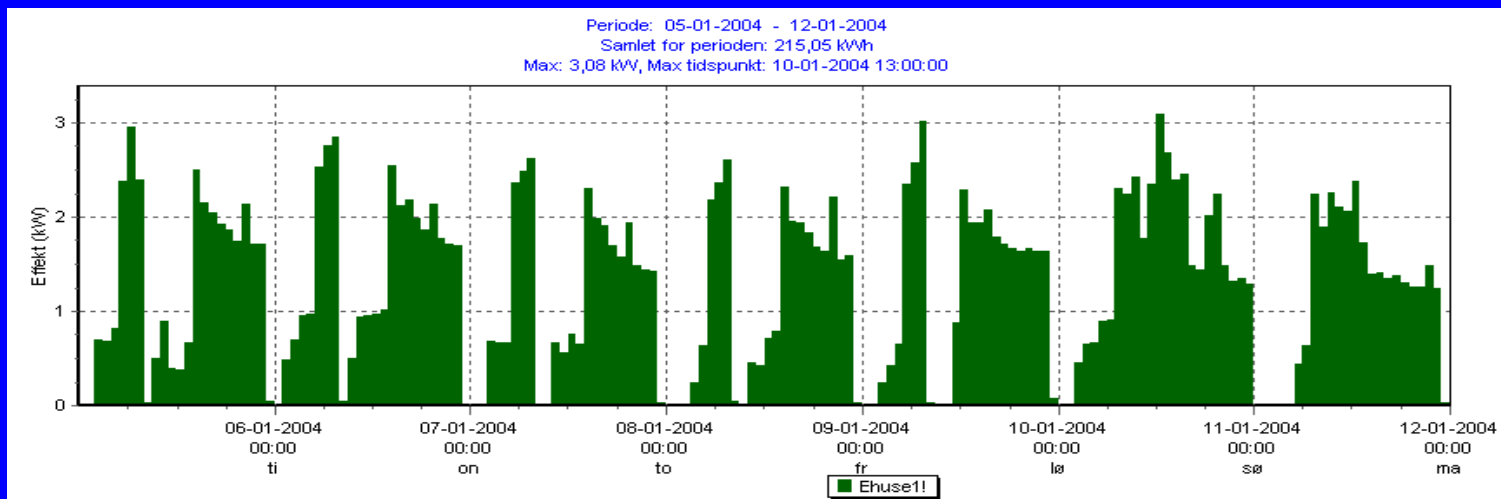
New market products with flexibility and dynamic time periods with very high prices is giving incentive for activation of demand response activities offered by the customers.

Major activities

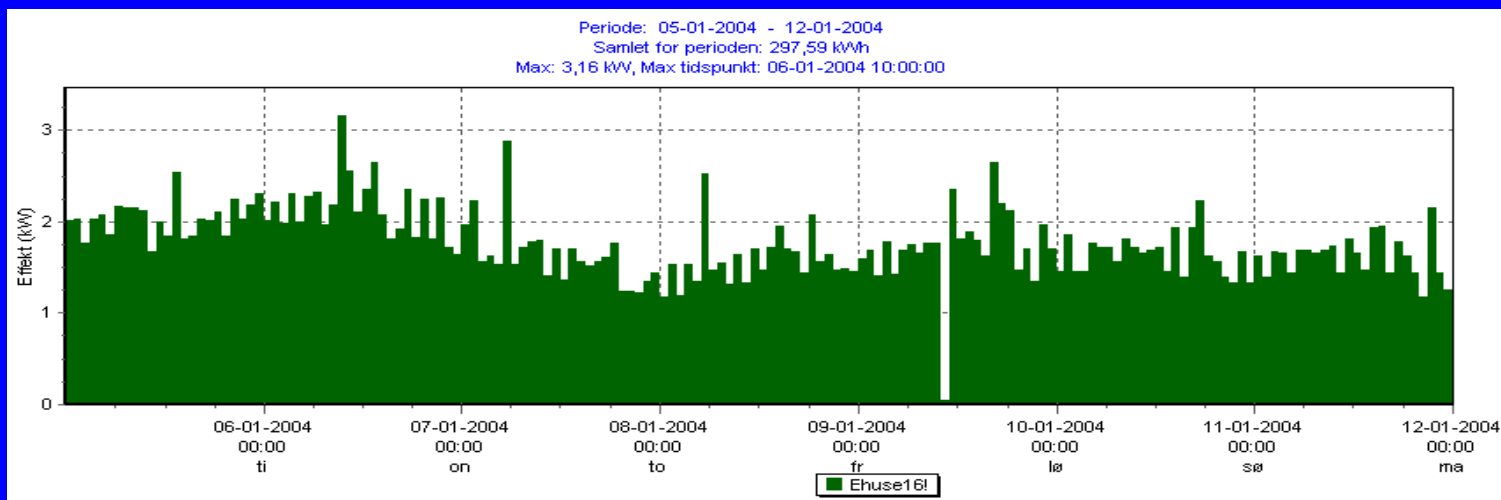


Customers using > 16.000 kWh/year

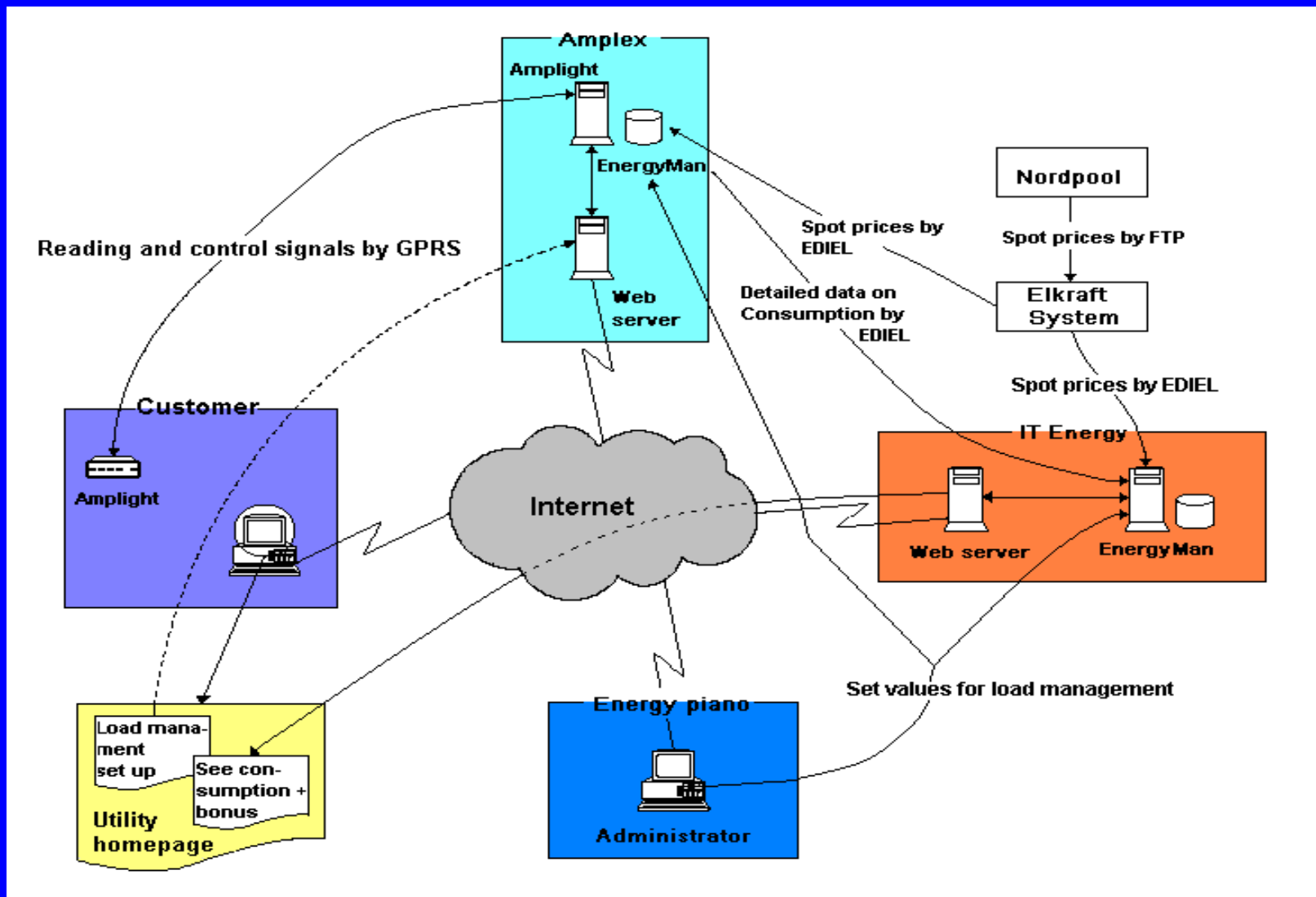
One
Customer



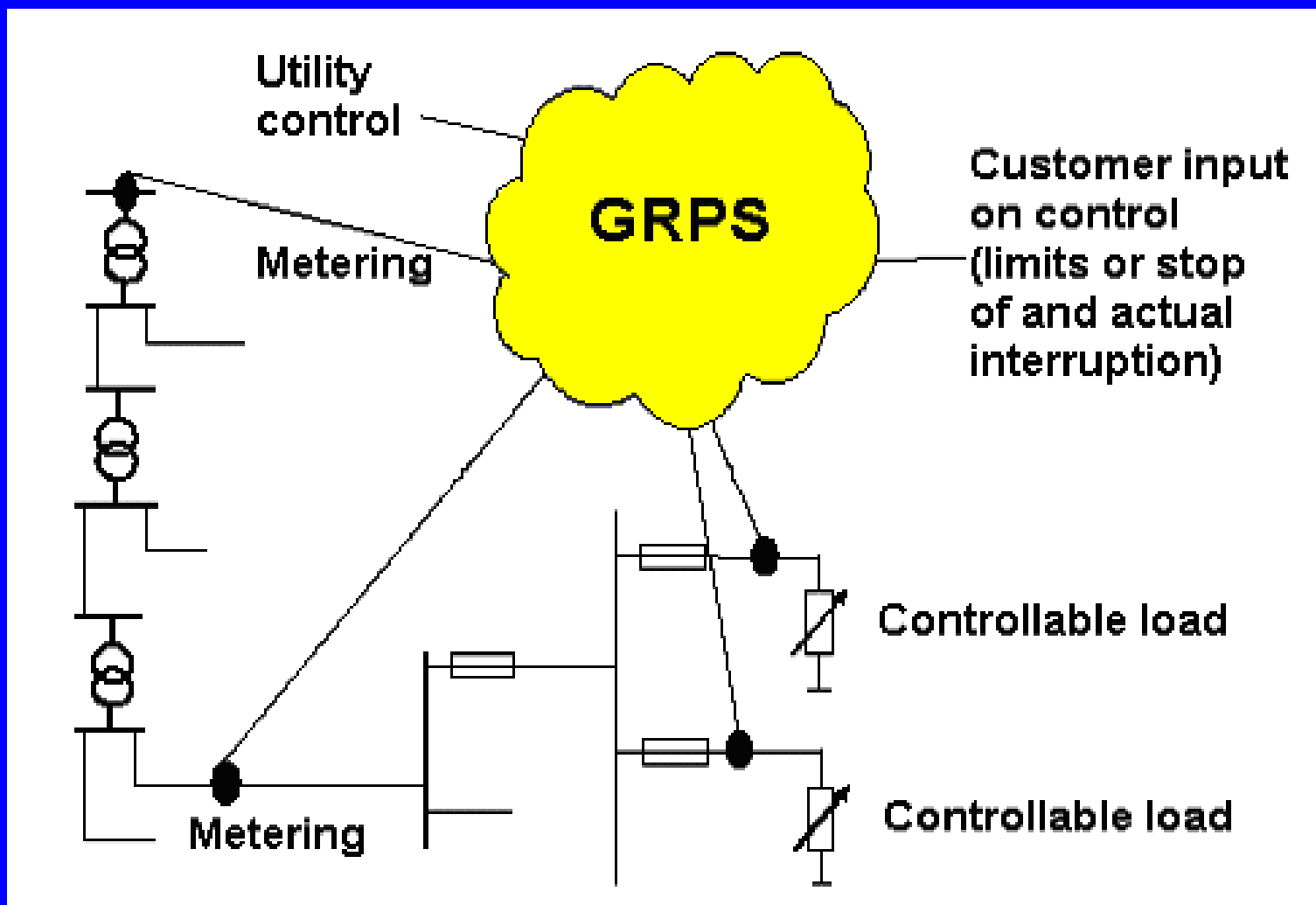
Another
Customer



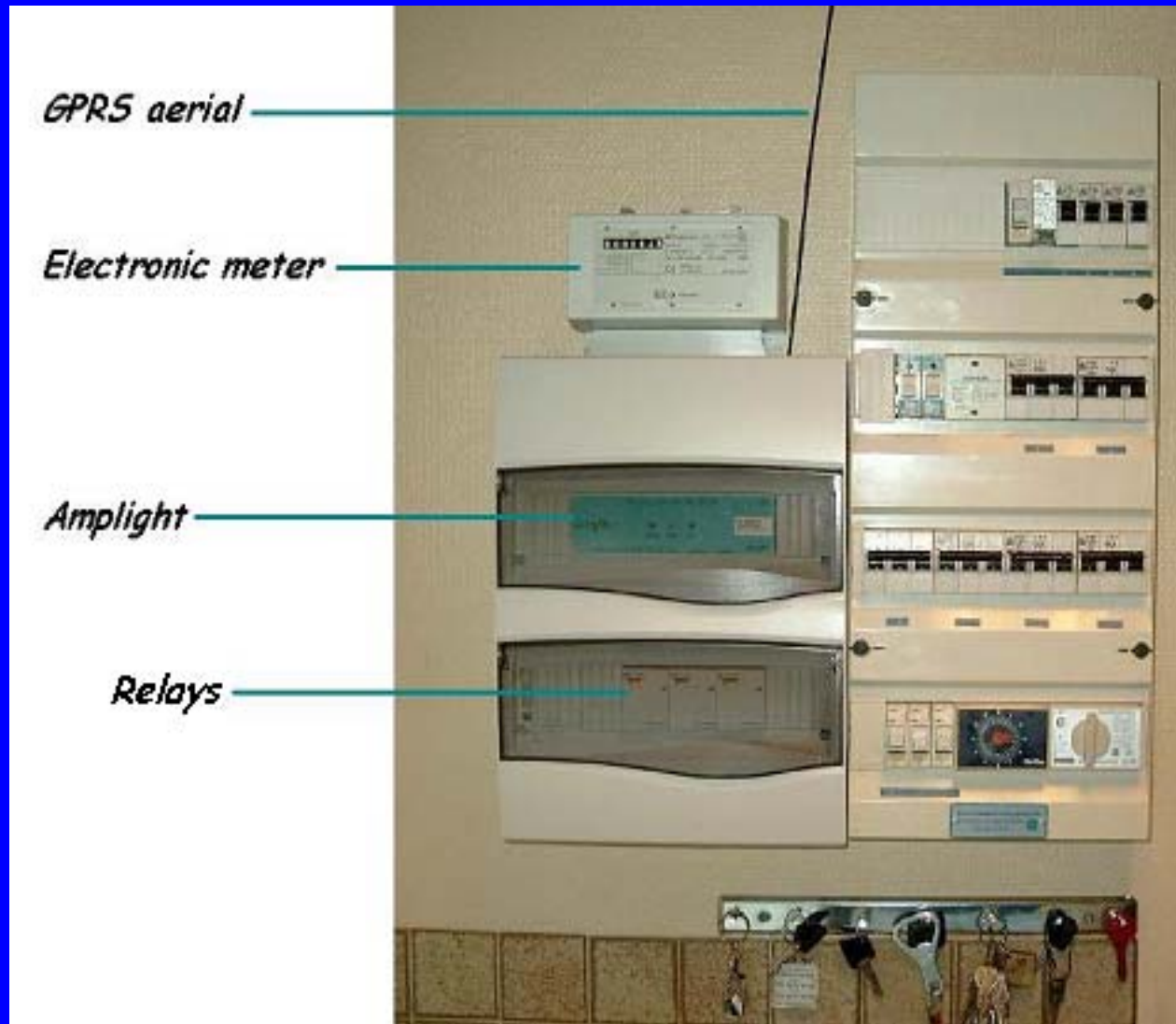
IT Configuration



Wireless communication



Installation



Control

Methode

- Simulating the customers are using a spot price tariff. Electrical heating is reduced by use of automatics when the spot price is very high. The customers receive a bonus depending on the amount of energy removed.

Control

- 100 hours of control with bonus 0.13 Euro/kWh, 0.27 Euro/kWh or 0.40 Euro/kWh.

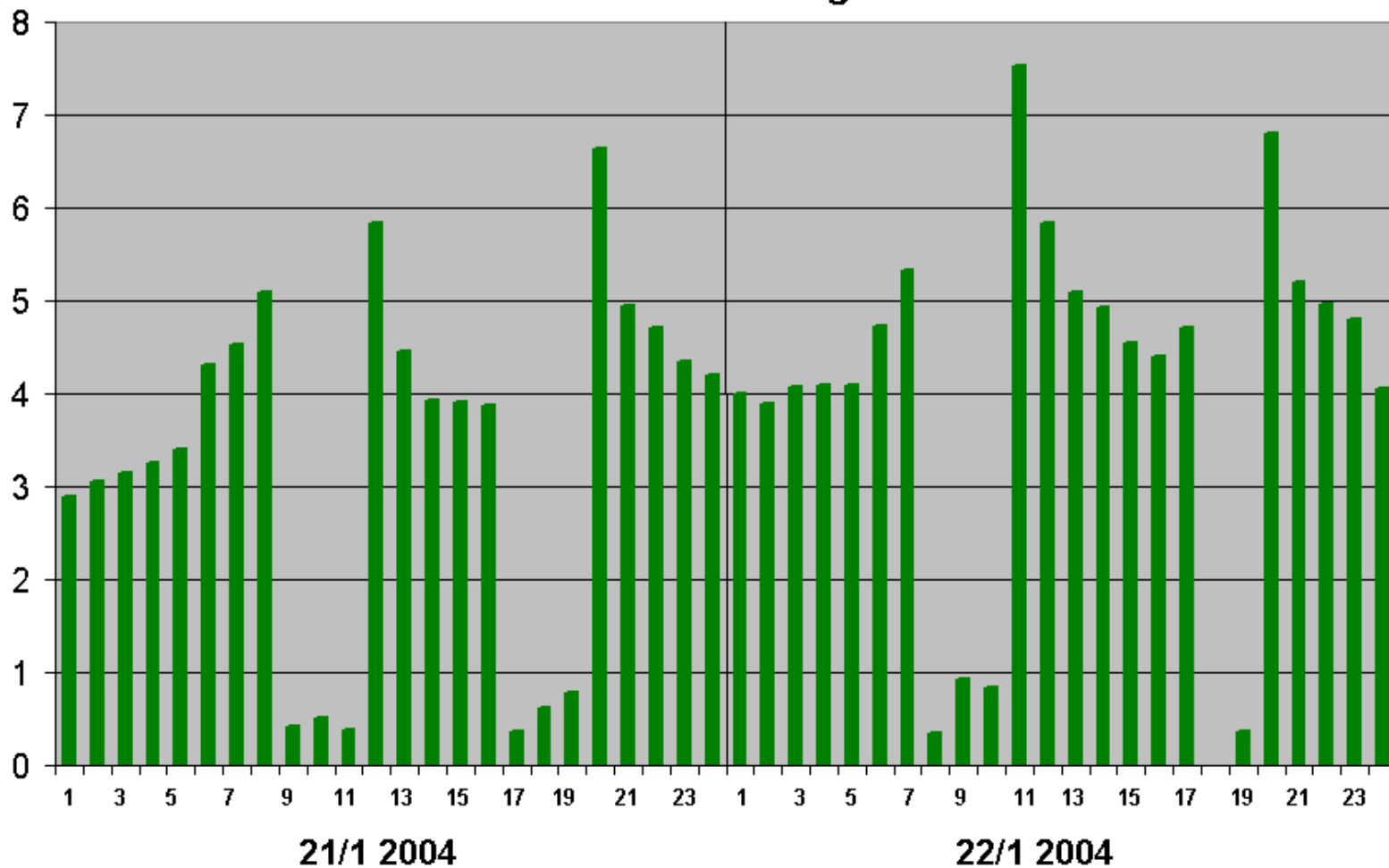
Installation

- No customer payment in the pilot project

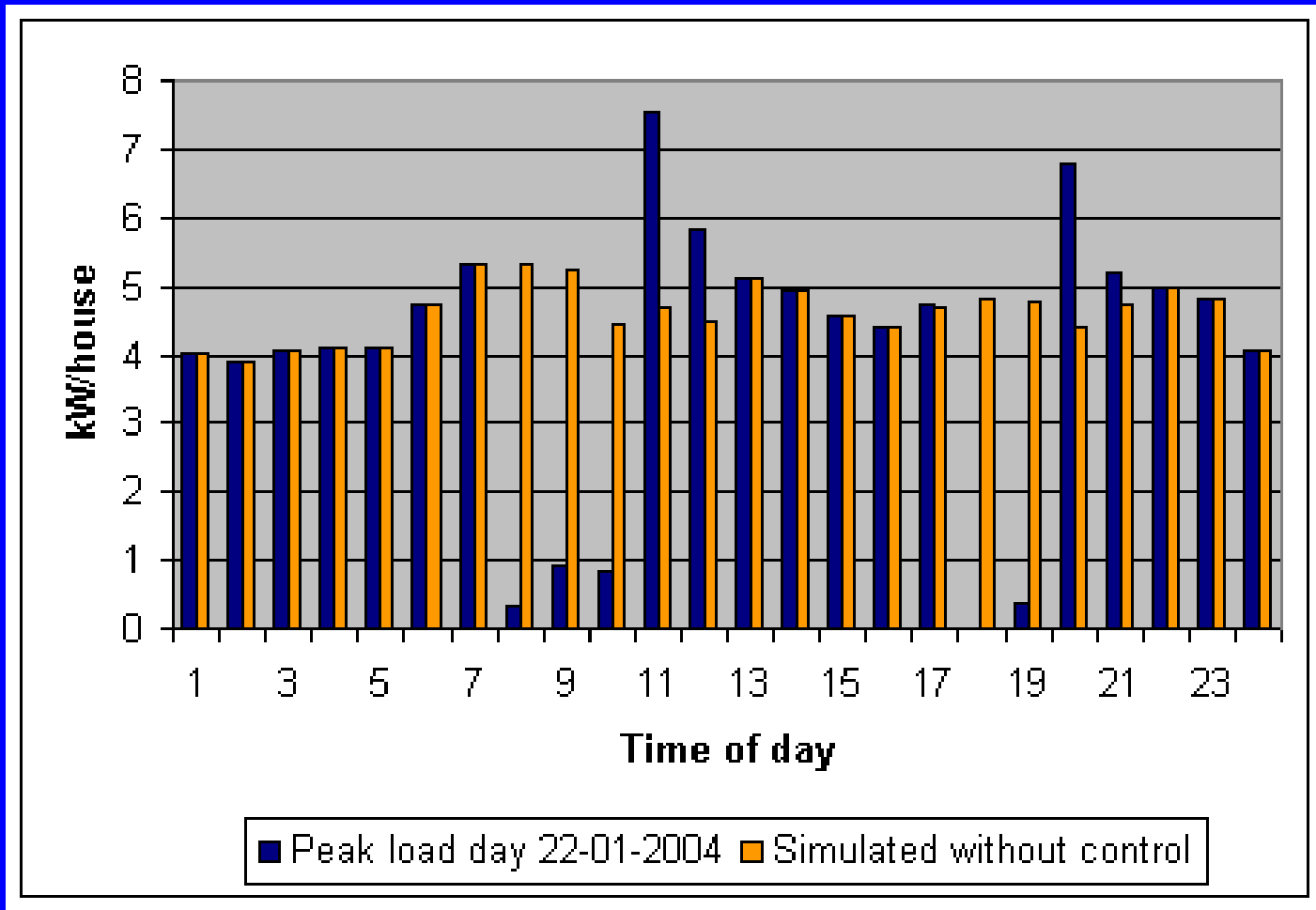
Danish Peak Load Days in the winter 2003/04

Average kW per house

Electric Heating



Peak load day 2003/2004



Results from the winter 2003/2004 (1)

- Oct. – Dec. 2003 was a "green" winter period.
- 11 to -8 C <-> 2.5 to 5.3 kW/house interrupted
- 10 of 25 houses have used the facility to stop an interruption (3 x 1, 4 x 2, 6, 16 and 18 times).
- 6 of 25 house have limited the duration of the interruptions to less than three hours for some zones and time periods of the day.
- The Web site is used regularly by the customers.
- The Web site is evaluated: Easy to use and valuable.
- The average bonus per customer has been 80 Euro.
- All customers would like to continue next winter.

Results from the winter 2003/2004 (2)

Regression analysis on the electric heating have resulted in the model below:

$$\text{Con}_{\text{hour}} = 0,457 + (0,171 - 0,180 * \text{Interrupt} + 0,081 * \text{Return} - 0,0420 * \text{Night}) * \text{DDV}$$

Interrupt is 1 when an interruption takes place and else 0

Return is a description of the load after an interruption

Night is 1 at 00-06 and else 0

DDV is a degree day variable building on the last 24, 48 and 72 hours

Degree days is 17 – average daily temperature.

80% of the variation can be explained by the model.

All variables are significant.

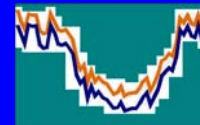
The model tells only 45% (81/180) of the interrupted consumption is used afterwards => customer saving 40 Euro/years.

Results from the winter 2003/2004 (3)

- The enabling technology has been working well.
- Start and stop for an interruption is send in the same message to avoid problems.
- Data for electric heating is collected for a year.
- Installation work done with quality and looks nice.
- The average economical benefit for the customer $80+40 = 120$ Euro/year
- Equipment, software and installation in around 1000 houses is estimated to cost 800 Euro/house. Assuming 5 kW interruption per house this equal to 160 Euro/kW or 31 Euro/kW per year (10 years, 7%). Investment in gas turbines is around 80 Euro/kW.

Plans for next winter 2004/2005

- To test if the customers continue to be happy about participating.
- Hopefully get experience from a more normal winter.
- To add customer services at the Web site to lower the temperature in the night and/or in the middle of the day by setting up own control schedules.
- Add a control room facility in order to follow the total of all controllable loads updated every hour.



Vision for the coming years

