Hourly metering and remote load control:

technology and incentives for demand response in a large scale test project

– Preliminary results and experiences

Ingeborg Graabak
Research Scientist
SINTEF Energy Research

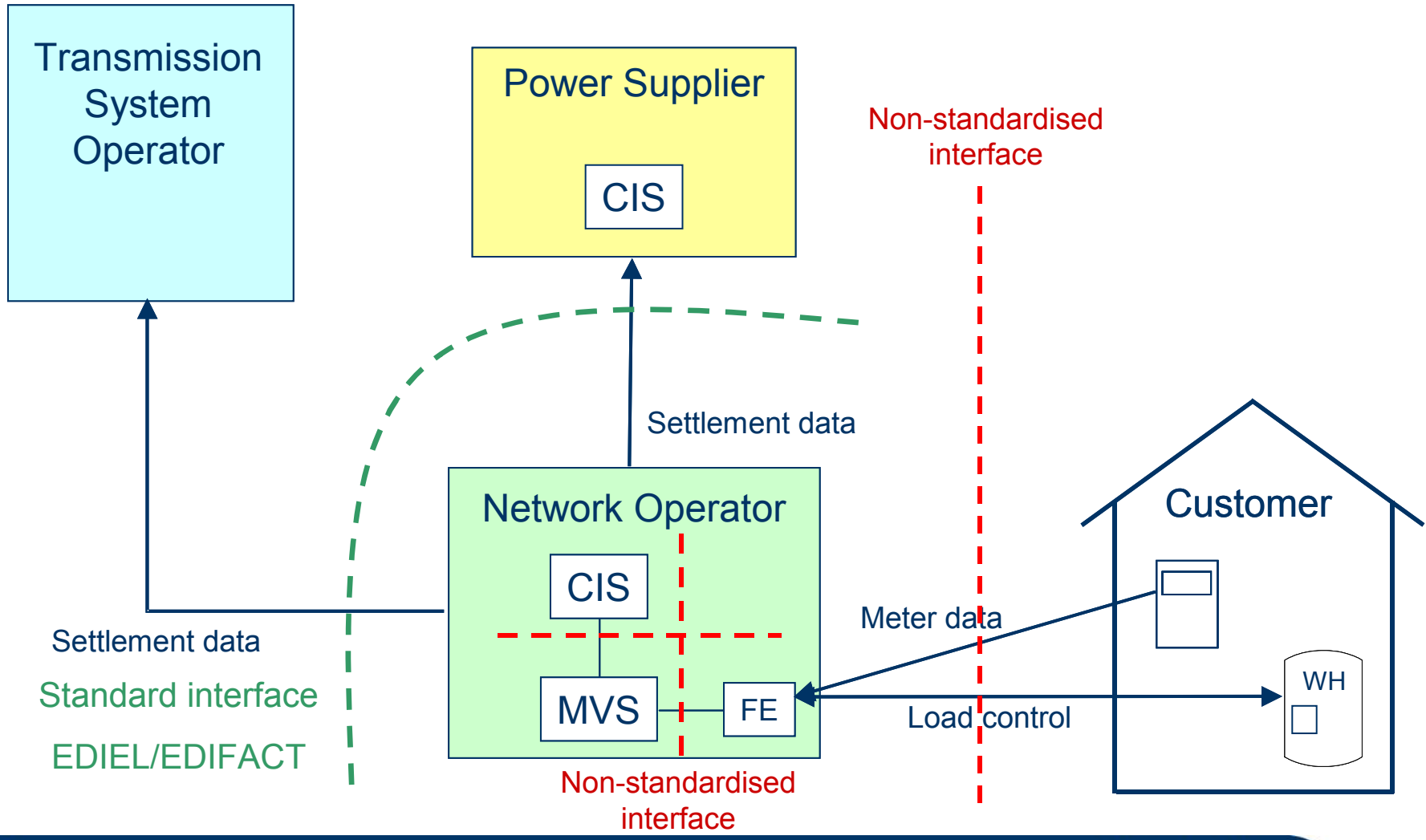
Outline

- Background
- Project ”End user flexibility by efficient use of ICT”
- Description of technology
- Experiences technology
- Tariffs and power products
- Peak power response
- Cost/benefit
- Recommendations

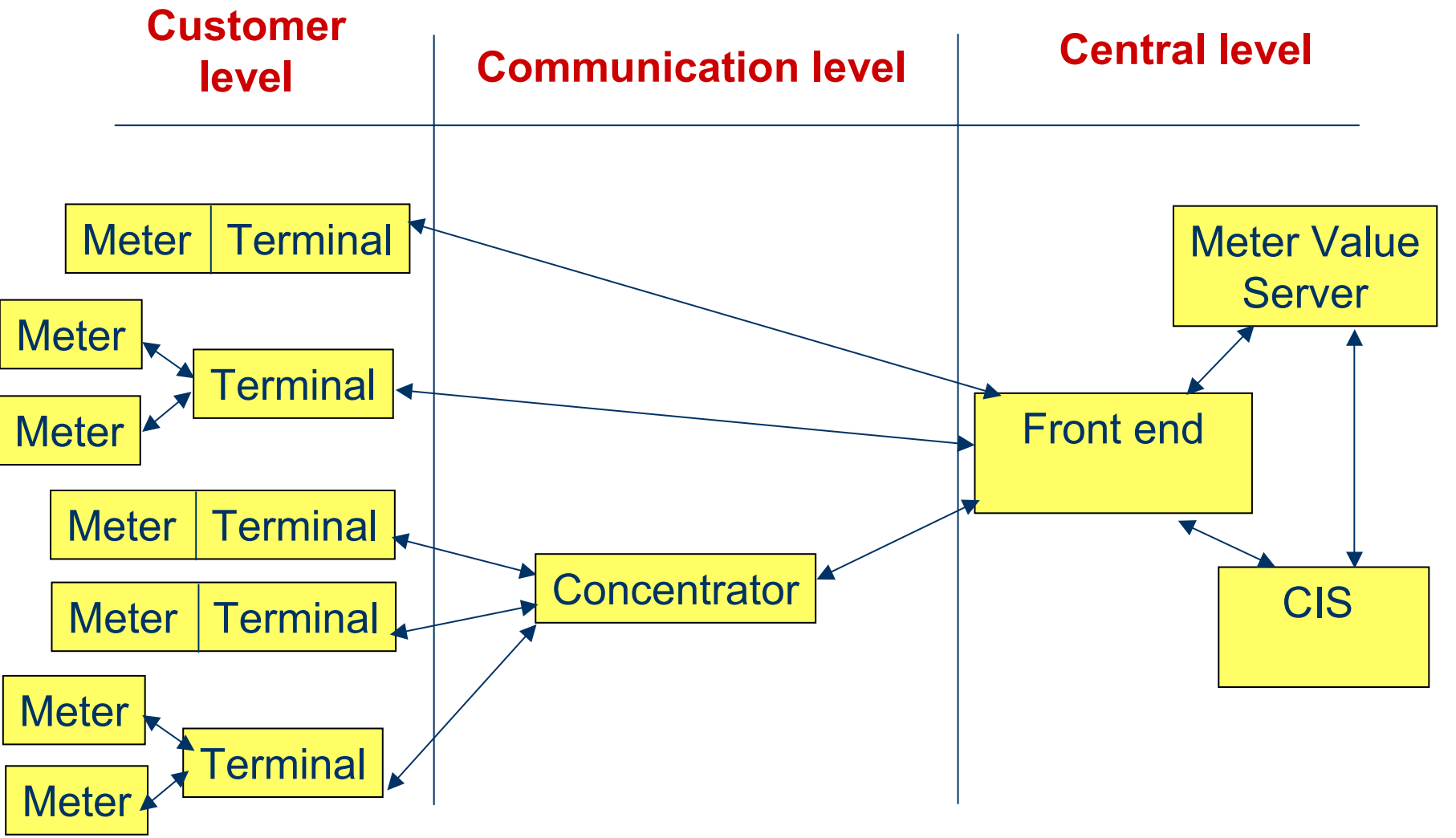
Background

- In the Nordic countries:
  - Lack of peak power capacity
  - Large customers (consumption above 100 000 kWh per year) are hourly metered
- Sweden requires monthly metering of all customers from middle of 2009
- Norway:
  - Large political focus on end user flexibility
  - End user flexibility at smaller customers?

Metering and remote load control. Actors involved and interfaces between them



In principle description of two way communication



End user flexibility by efficient use of ICT

- EBL-K (Norwegian Electricity Industry Association) project
- Project period: 2001-2004
- Two-way communication is established to 10 894 customers at 2 network operators: Buskerud Kraftnett and Skagerak Nett
- Main goal: Increase consumer flexibility in shortage periods for energy and power by:
  - Establishing a decision basis and propose framework for a prioritized development of infrastructure based on the futures`ICT solutions
  - Develop, test and evaluate solutions that stimulates consumption flexibility

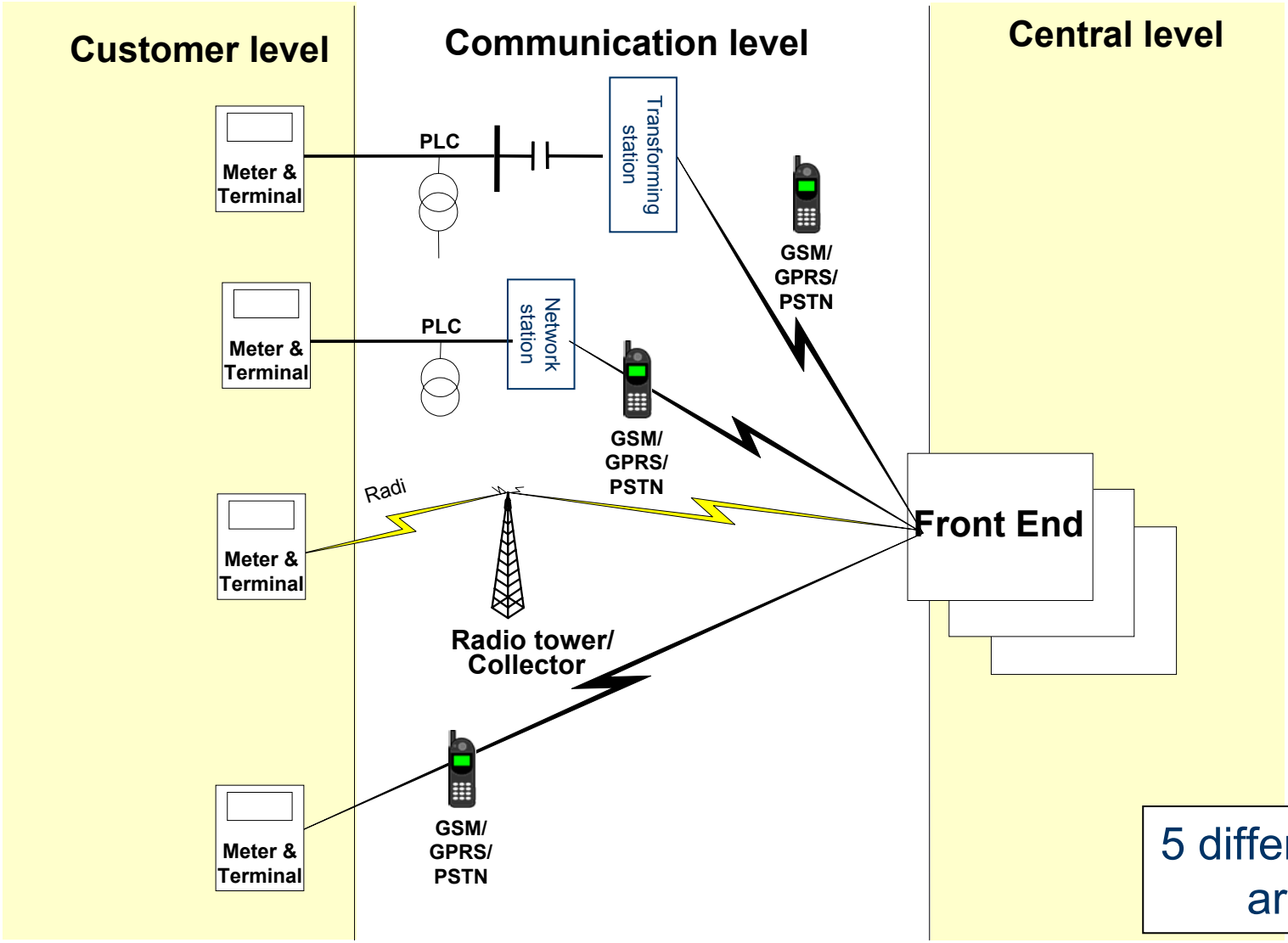
http://www.energy.sintef.no/prosjekt/Forbrukerflex/engelsk/uk_index.asp

Metering and load control

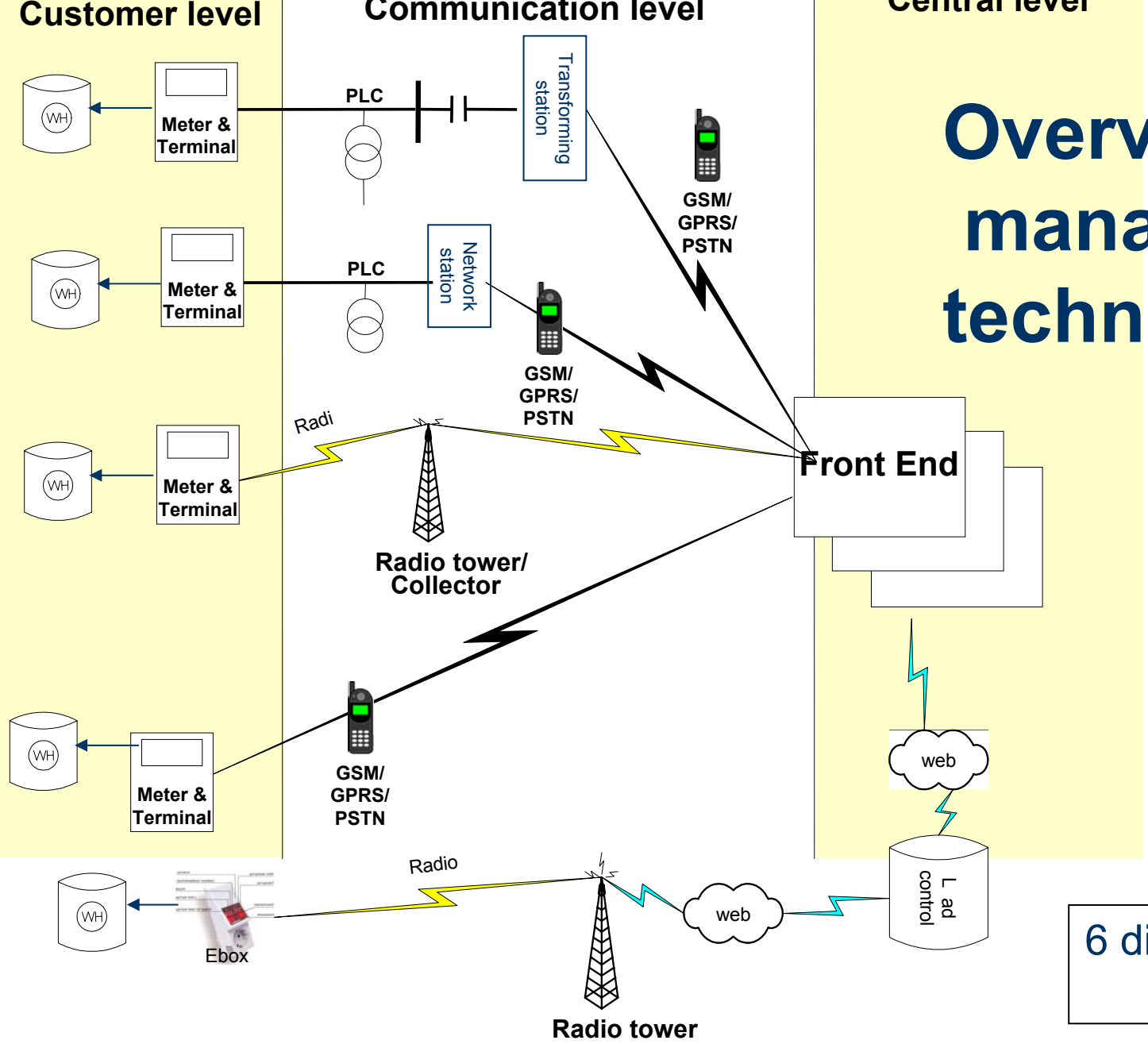
	Metering of electricity consumption		Load control	Energy consumption [kWh/year]
	Hourly metering	Daily metering		
Households	9045	1440	49%	8.000-40.000
Industrial	407	3	23%	40.000-100.000

Load control mainly of water heaters

Overview communication technology



5 different vendors are tested



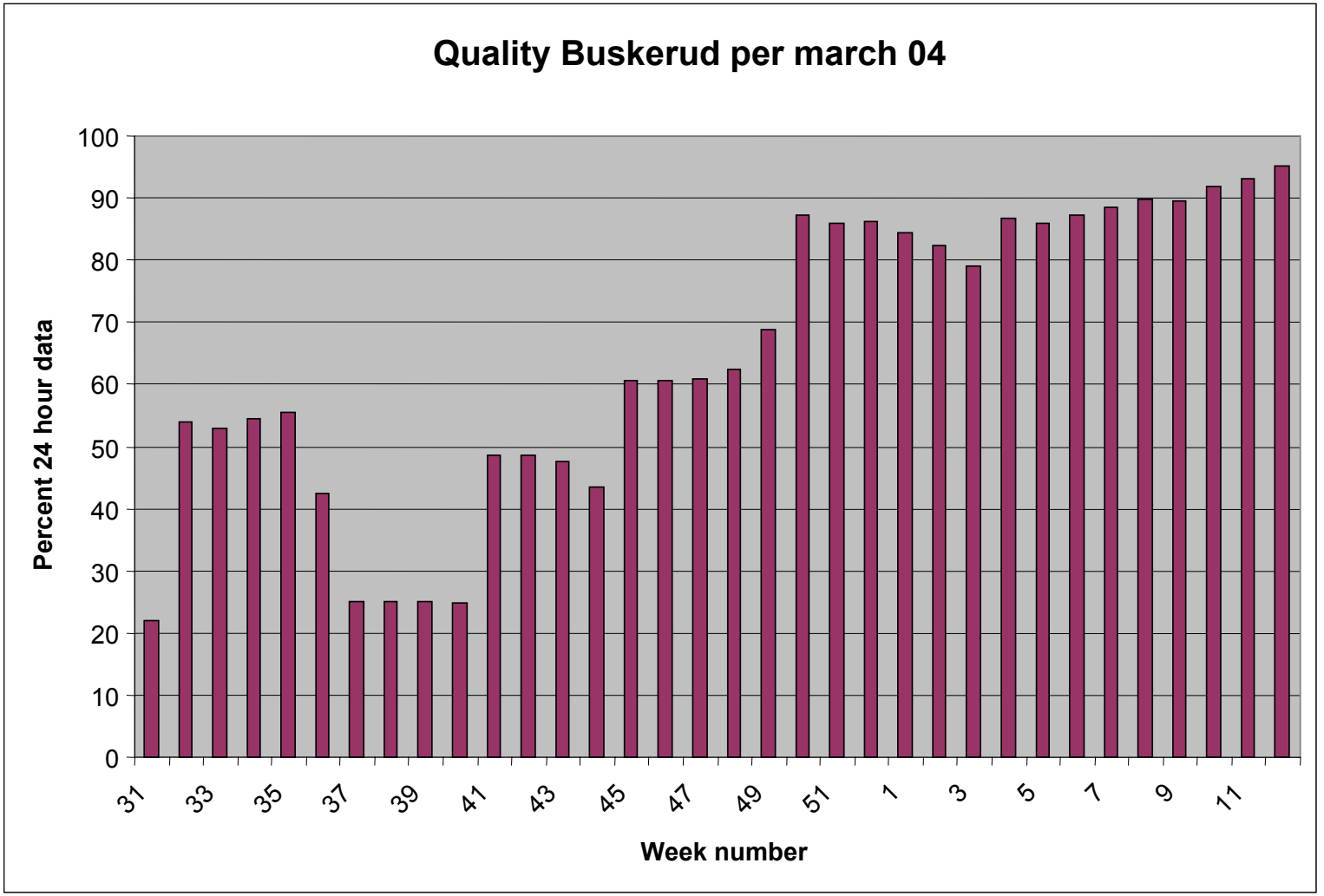
Overview load management technology

6 different vendors are tested

Experiences two way communication technology

- More problems with technology than expected
  - Immature technology
  - Problems with integration between two way communication system and other IT-systems
  - Vendors without experiences with large scale establishment
  - Utilities without experiences with this type of projects
- Considerably improvement in technology during project period
  - Communication percent up to 97% - at least 3.5% of meter values are incorrect
- Subjects for further improvement identified

Quality of hourly metering Buskerud Kraftnett



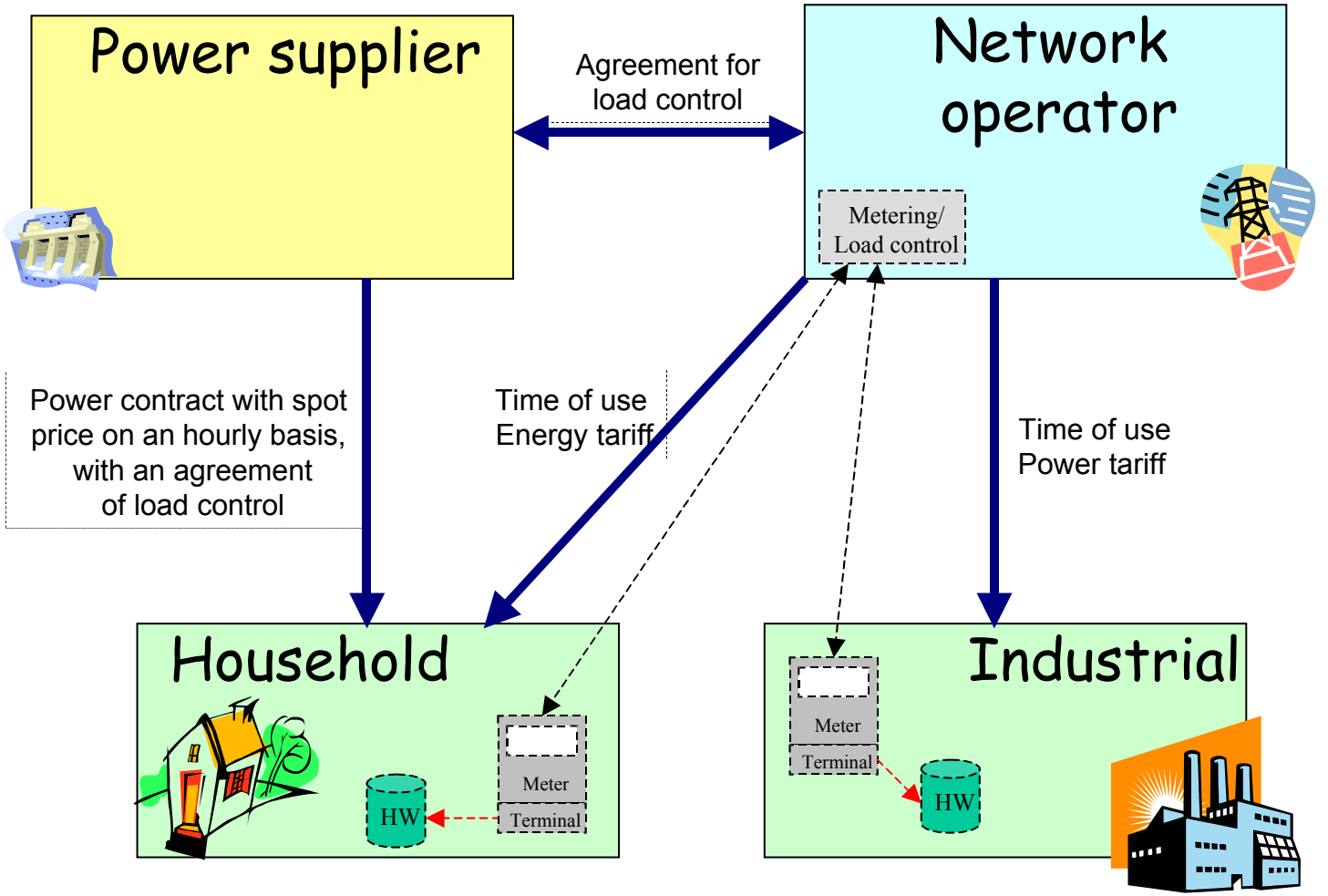
“Price signals” used in the project

- Network tariff (NO)
  - Time of use tariff with high price in periods with shortage
    (Shortage defined by time: Mon-Fri, hour 7-11 and 16-19, November - March)

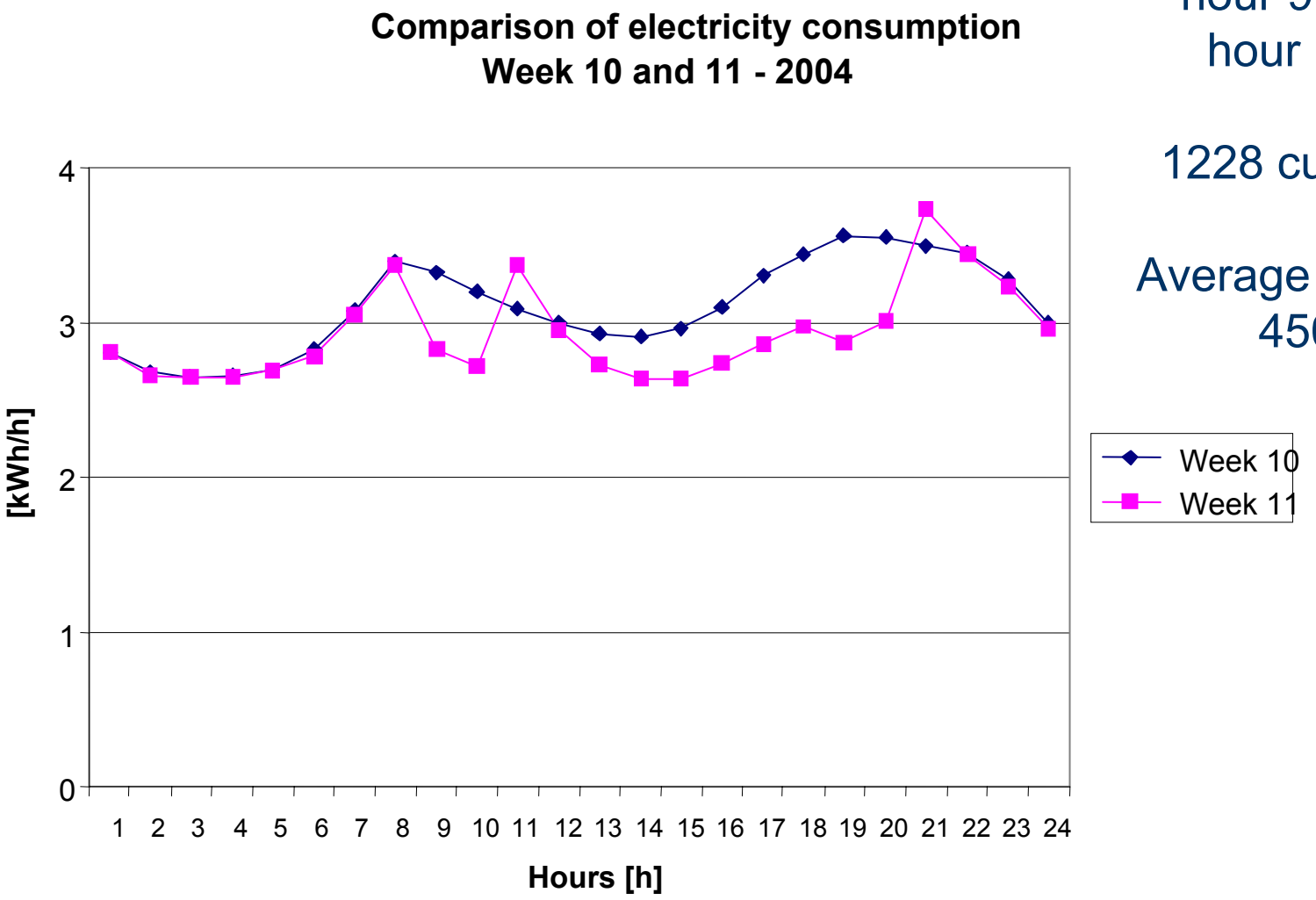
- Energy price (Supplier)
  - Spot price products
  - Spot price products with agreement of remote load control

- Remote load control based on spot price
  - Buskerud: Hour with highest spot price + hour before or after
  - Skagerak: Every hour with spot price above a predefined limit

Buskerud Kraftnett – Network operator



Preliminary test result (1:2)

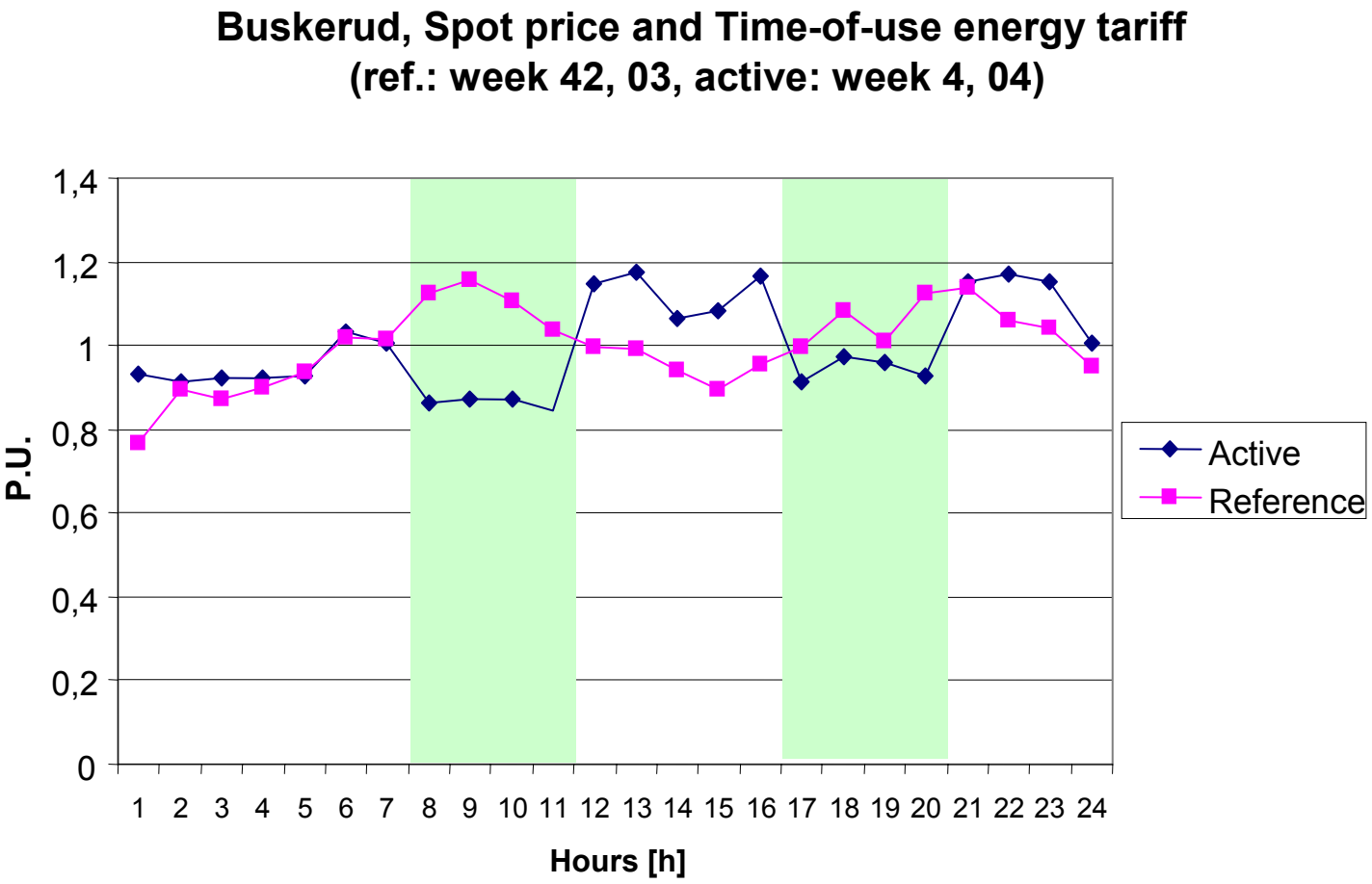


Load disconnection hour 9-10 and hour 19-20.

1228 customers

Average reduction 450 W

Preliminary test result (2:2)



Max reduction
morning 32%

Max reduction
afternoon: 21%

Cost/benefit

	SKN	BKN
Number of points	4000	4100
Investment [Euro/point]	407	358
Investment costs [Euro/pnt,y]]	-59	-52
Operational costs[Euro/pnt,y]	-52	-24
Cost reductions [Euro/pnt, y]	35	12
Net benefit [Eur/point,year]	**-76**	**-64**

1 Euro = 8.4 NOK
Interest 7.5 %
Depreciation period 10 years

Investment costs are including costs for establishment of load management

Costs reduction: more effective solutions for collection of meter values, reduction in current leakage, reduction in need for strengthening of the network etc

Recommendation/conclusion

- Work for standardization between systems for two-way communication and other IT-systems.
- Work for standardization of interfaces for information exchange in two-way communication systems.
- Contribute to improved cost/benefit for two-way communication.
- Contribute to a situation where utilities share information and experiences with each other (especially in countries with several utilities).
- Evaluate experiences with load management.