EFFLOCOM project overview
Results and recommendations

EFFLOCOM Workshop

Trondheim 10 June 04

Ove S. Grande

SINTEF Energy Research

Outline

- Background and progress
  - Project
  - Pilots
- Results
  - Load curve studies
  - Impact of infrastructure
  - Cost/benefit
  - Incentives for load reduction
- Recommendations
  - Technology
  - Network tariffs and energy products
  - Policies

EFFLOCOM

www. efflocom.com

Energy EFFiciency and LOad curve impacts of COMmercial development in competitive markets

- **EU-SAVE project 2002-2004**
- **Partners**:
  - **SINTEF Energy Research**, Norway (Coordinator)
  - **Electricity Association** , England (until July 03)
  - **VTT**, Finland
  - **Energy Piano**, Denmark
  - **EDF**, France
  - **E-CO Partner => E-CO Tech** (from May 03), Norway

EFFLOCOM objectives

- Establish specifications for load profiles in deregulated markets
- By the means of market solutions, dynamic pricing options, new technology solutions and information services quantify the potential for:
  - Peak power demand reductions in competitive electricity markets
  - Energy efficiency in competitive electricity markets.
- Determine which policy actions are the most efficient in removing existing barriers.

EFFLOCOM Phases

1. Basis for load management **(EA=> SINTEF)**

2. Influence of competition **(EA=> SINTEF)**

3. Impacts of communication infrastructure and economical incentives for load reduction **(SINTEF)**

4. Removing barriers – pilot tests **(VTT)**

5. Policies and tools for energy efficiency **(SINTEF)**

EFFLOCOM Pilots

Pilot no.	Country	Title
1	Denmark	**Hourly metering with two-way communication and web-based interface for control and following consumption**
2	Finland	**Effect of web-based feedback on the electricity consumption and load curves**
3	France	**Tempo tariff feedback at EDF**
4	Norway	**Implementation of Demand Side management in Oslo**
5	Norway	**New technology for controlling of Power load in Oslo**
6	Norway	**Improved end-user flexibility by efficient use of ICT**

EFFLOCOM documentation

Web page

7 technical reports

~8 International papers and presentations

All documents will be available on www.efflocom.com from September 04

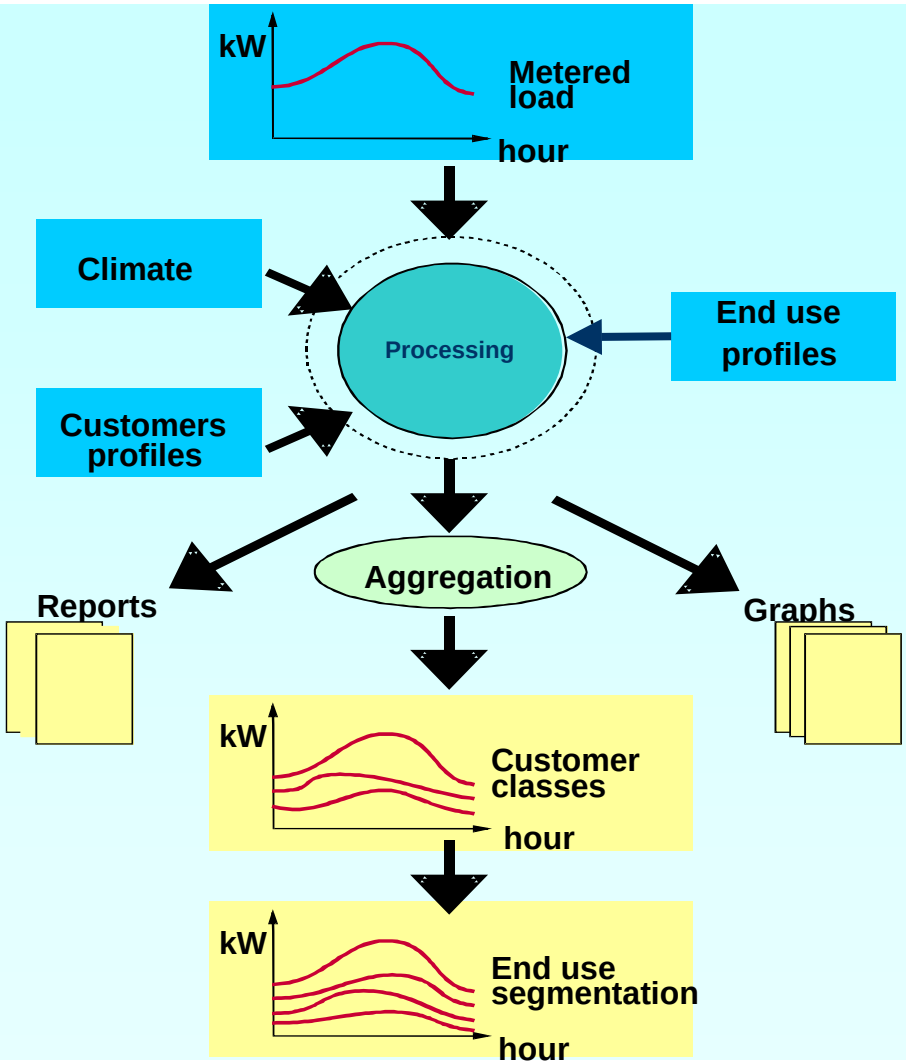
Phase 1 & 2

Load curve studies

- Load curves from 6 countries: Norway, Denmark, Finland, Sweden, France, UK
  - **Temperature sensitivity**
  - **Seasonal and day type characteristics**
  - **Load duration and peak load characteristics**
  - **Demand response potential**
  - **Impacts of deregulation**

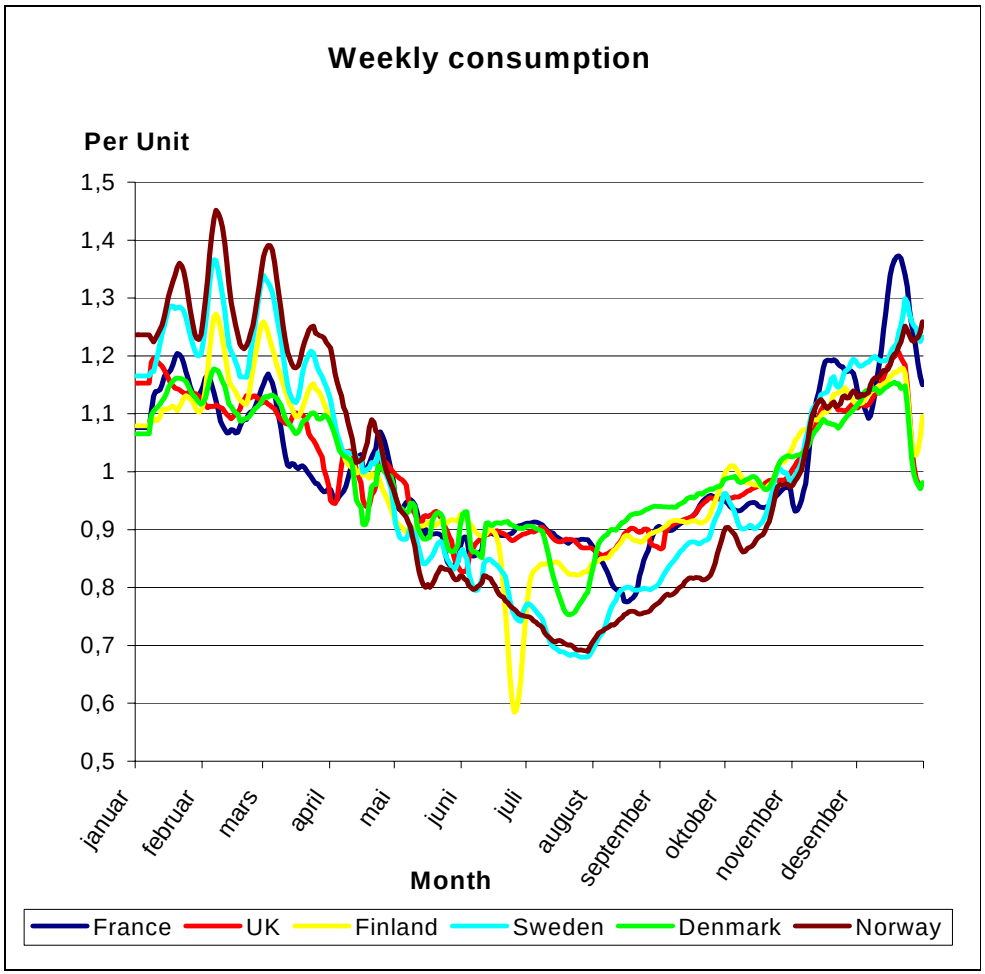
- The computer tool USELOAD is used for the analysis

Useload



Joint development by Sycon, EDF, EA, Energy Piano, VTT, SINTEF

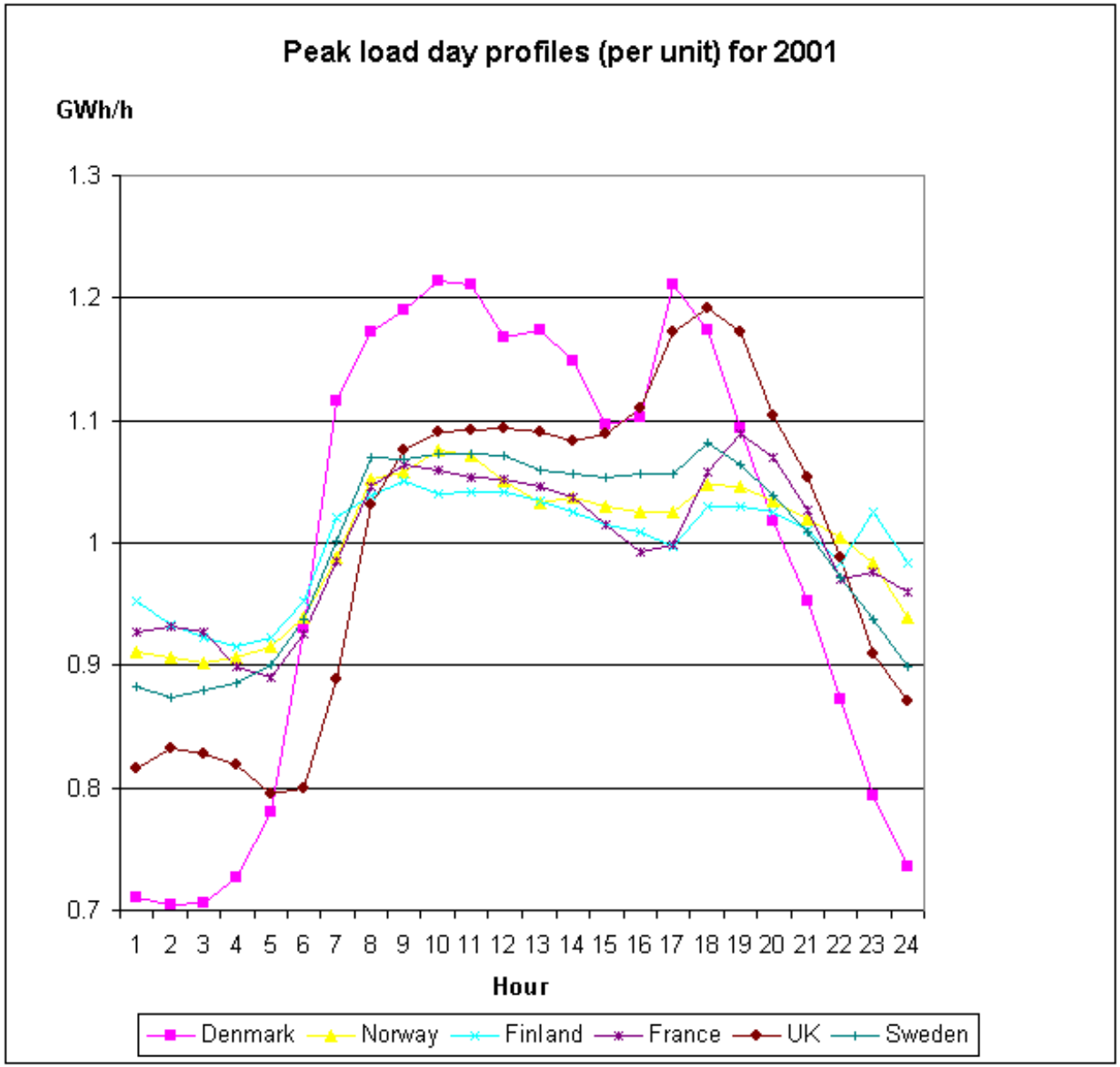
- Load modelling at all voltage levels
- End-use modelling
- Update model by load analysis
- Calibration to total load
- Rapid risk analysis, temperature dependent

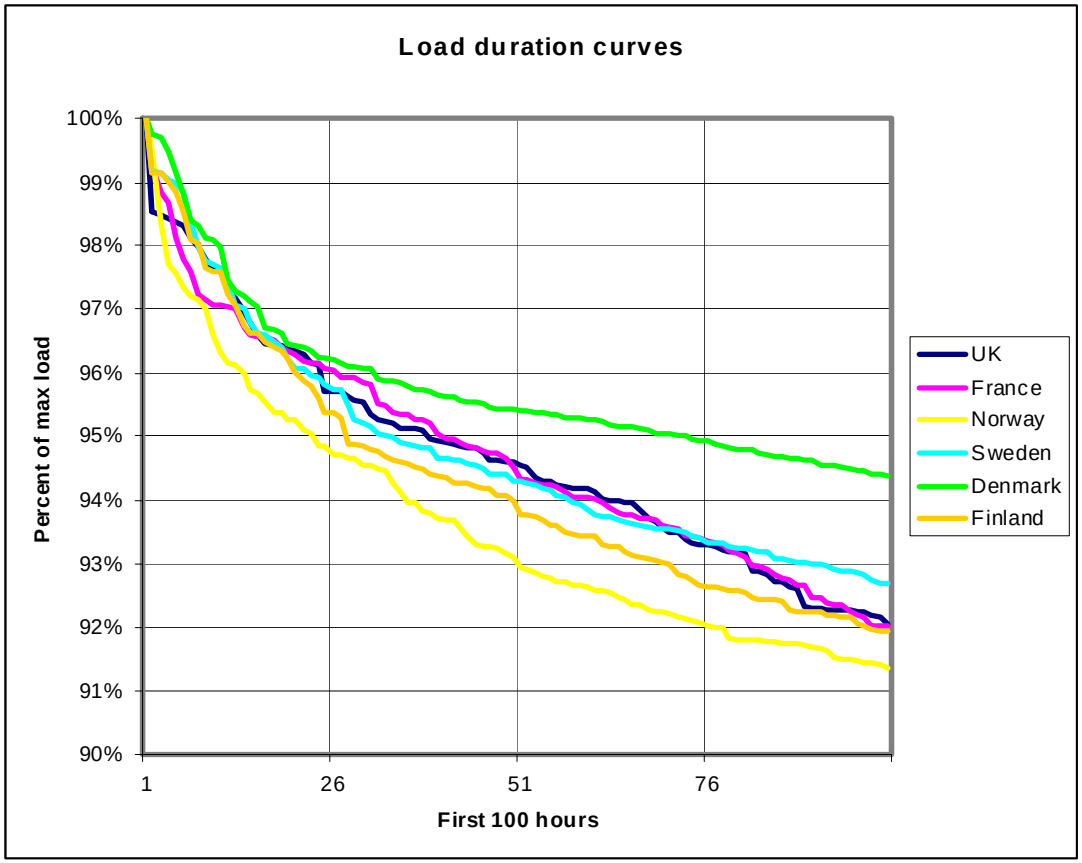


Temperature sensitivities high during spring and autumn, being the result of electric space heating

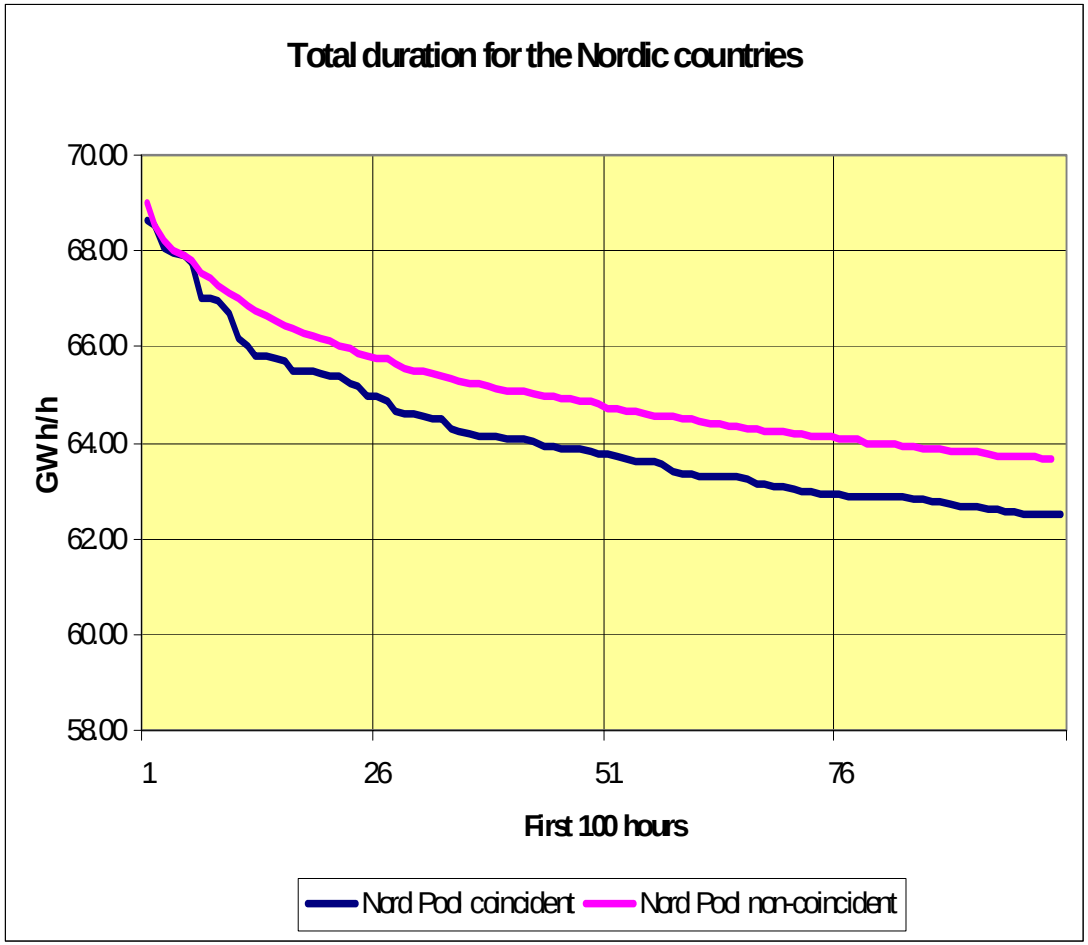
and

in some countries during summer due to cooling and air conditioning

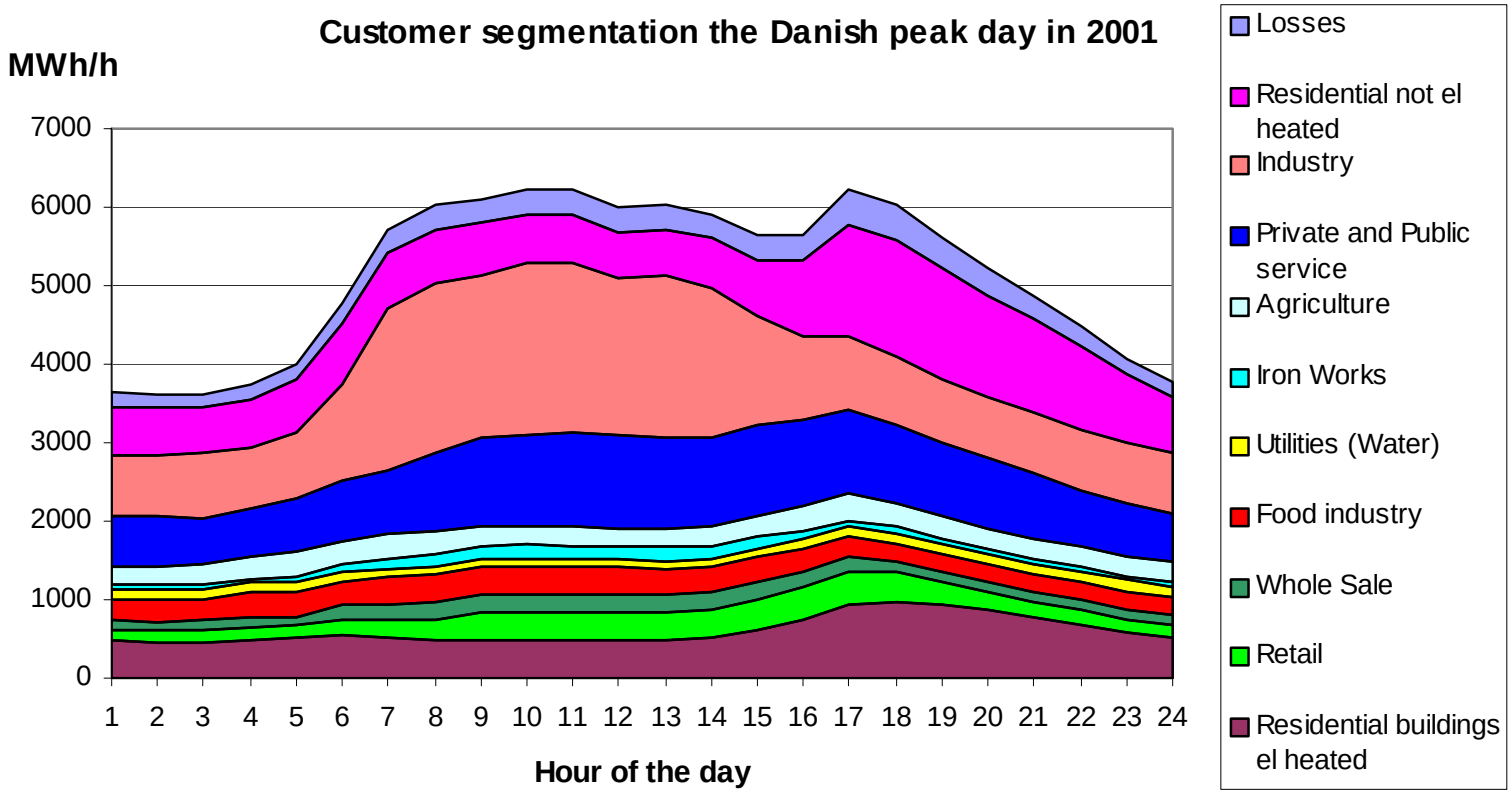

Peak load day profiles (per unit) for 2001
GWh/h
1.3
1.2
1.1
1
0.9
0.8
0.7
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour
Denmark
Norway
Finland
France
UK
Sweden

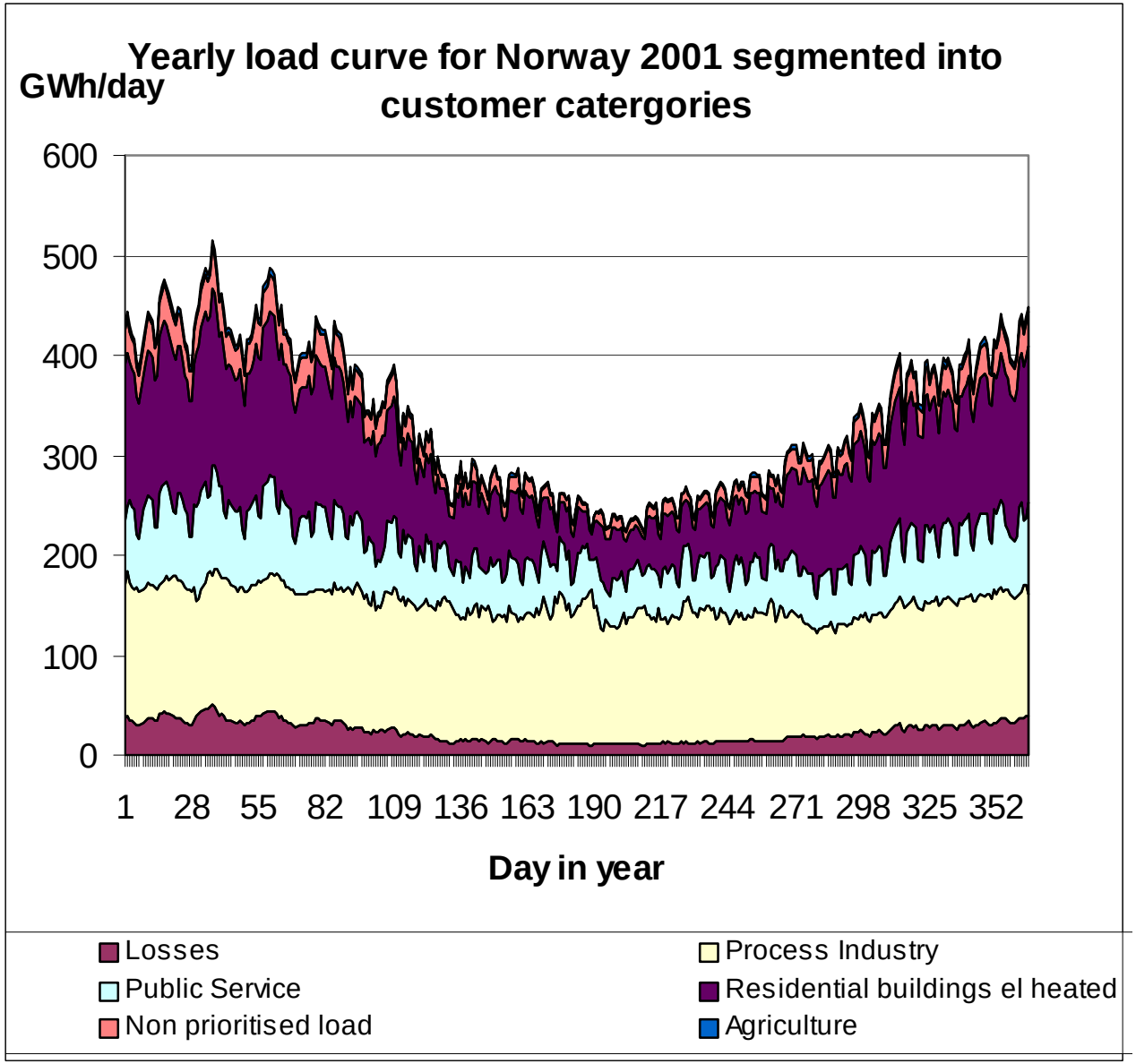


	Denmark	Finland	France	Norway	Sweden	UK
Peak demand [MW]	6.233	13.360	76.298	23.054	16.323	52.079
20-30 h [MW]	200	650	3000	1300	1000	2000
100 h [MW]	300	1100	6000	2000	2000	4000



Peak load reduction in one Nordic country gains the whole region due to high degree of coincidence in the peak hours


Customer segmentation the Danish peak day in 2001
MWh/h
7000
6000
5000
4000
3000
2000
1000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour of the day
Losses
Residential not el heated
Industry
Private and Public service
Agriculture
Iron Works
Utilities (Water)
Food industry
Whole Sale
Retail
Residential buildings el heated


Yearly load curve for Norway 2001 segmented into customer catergories
GWh/day
600
500
400
300
200
100
0
1
28
55
82
109
136
163
190
217
244
271
298
325
352
Day in year
Losses
Process Industry
Public Service
Residential buildings el heated
Non prioritised load
Agriculture

Demand response potential

- Reduction of peak load is possible for most countries due to the high activity of the domestic sector during the winter peaks.
- The load from the Industry sector represents the most interesting objects for demand response and power reserves
- Automatic switching off of loads as water heaters and space heating would yield a more even peak load profile, and a lower peak
- The load duration curves for all countries show that 5 % peak load reduction could be achieved by concentrated demand response efforts in 20-75 hours

Impacts of deregulation

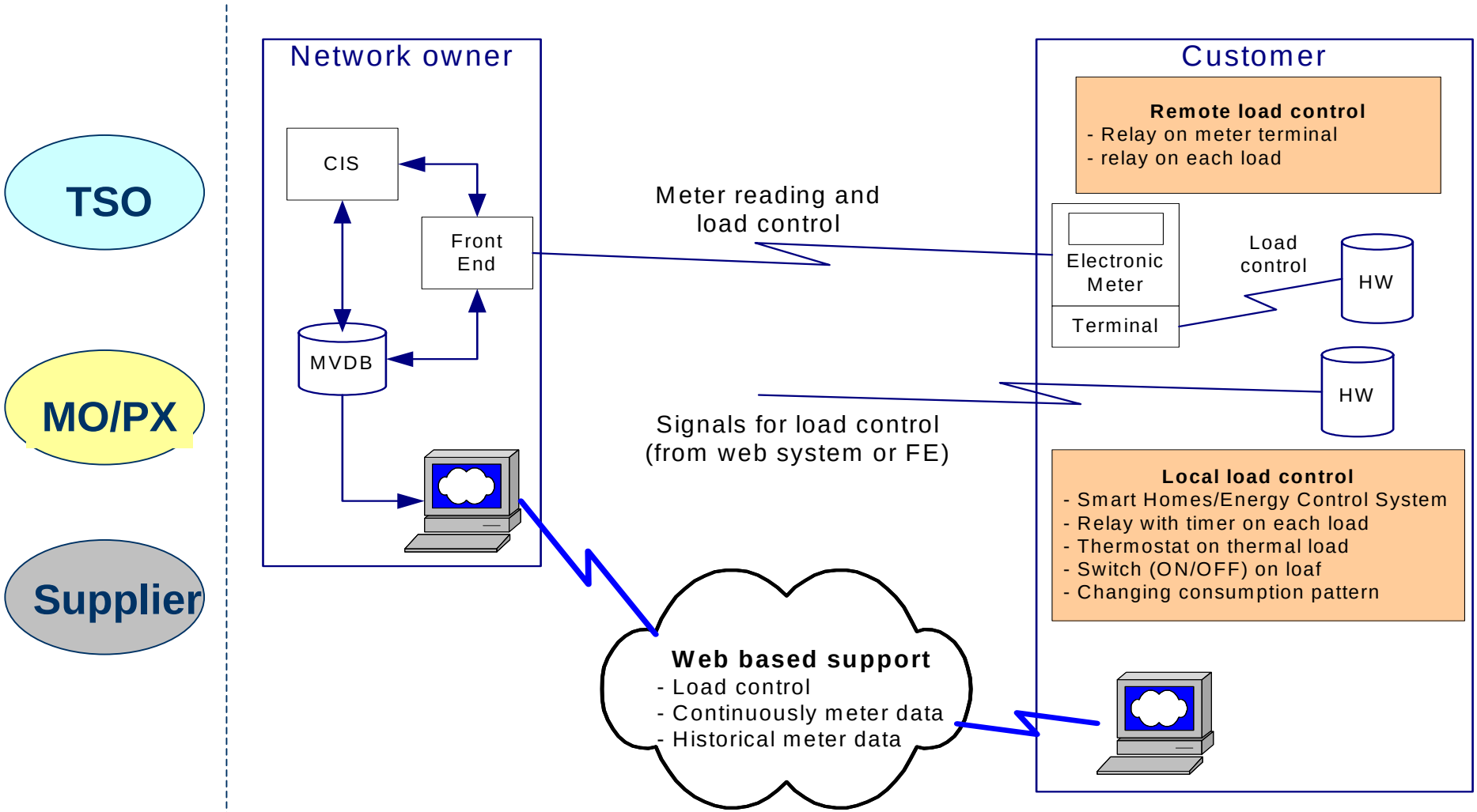
No radical changes in temperature sensitivity, peak load profiles, utilisation factors and distribution of annual energy consumption caused are found

Phase 3

Impact of ICT and economical incentives for load reduction

- Description of technology for Direct Communication
- Price signals, incentives for investments and cost/benefit analyses

Technology and actors



Metering

- Hourly metering is needed to give incentives to load reduction in peak hours (capacity shortage)

- Weekly (or monthly) meter reading is needed to favour load reductions in periods with energy shortage

Implementation of Direct communication Lessons learned

- Technology seems surprisingly immature
- Most of the problems can be referred to the data transfer between customer and utility
- More focus on the total meter value chain included the data handling at the receiver end
- The interfaces within the direct communication system and between this and other ICT systems should be standardized.

Motivations for investments

- Improved end user response to shortage in production and/or transmission capacity
- Efficiency improvements with regard to metering and data management procedures
- Improved quality and precision of metered data
- Profit and cost savings

Actors' interest in investments

Technology		Customer	Network Operator	Supplier	TSO	Others
AMR			x	(x)	(x)	(x)
Load control	Remote	x	x	x	x	(x)
	Local	x				(x)
MVDB/CIS			x	(x)		
Web support		x	x	x	x	x

Cost/benefit

- EUBC-methodology used for qualitative evaluation
- So far investments in technology have been limited of economical reasons because the different actors does not find profitability alone.
- More cooperation between the stakeholders and regulatory arrangement are needed to secure that projects that are proven socio-economic beneficial will be accomplished.

”Price signals”

Main elements	Categories	Finland	Denmark	Norway	France
Network tariffs	Standard	X	X	X	X
	ToU	X	X	X	X
	Dynamic		(testpr.)	(testpr.)	
Energy price	Firm	X	X	X	Confi-
	ToU	X			den-
	Variable		X	X	tial
	Spot	X	X	X	
Taxes	Electricity tax	X	X	X	X
	VAT	22 %	25 %	24 %	19,6% /5,5 %

Incentives for load reduction

- *The following **price signals** give the best motivations for load reduction in a deregulated market based system:*

  Network tariffs:

  - ToU-tariffs with inter day/ seasonal variations in price
  - Dynamic tariffs that are amplified in periods with shortage

  Energy Price:

  - Hourly spot price
  - Hourly spot price combined with automatic load reduction when the spot price is high
  - ToU-price e.g. with day /night variation

- ***Bilateral contracts for load reduction*** are efficient alternatives to price elasticity efforts.

Recommendation I

- The potential of demand response should be defined and utilised as an alternative to investments in new production
- Country/regional based targets for annual released demand response potential should be considered

Recommendation II

- Hourly metering, alternatively weekly/monthly metering should be required by regulations (provided cost-efficient)
- Further development of ICT solutions for metering and load control
- Work for standardisation of interfaces
- Economical incentives for a cost-effective development of infrastructure for automatic meter reading and load control should be provided through regulations from the authorities

Recommendation III

- ToU/dynamic tariffs (if appropriate) and spot price energy products should be offered to all customers
- The concept of automatic spot price related demand response should be further developed
- Bilateral/ multilateral contracts for load reduction are well suited for reserves and reliability purposes when capacity shortage in production and/or network occurs


Thank you all!