



Demand Response Activities in Finland

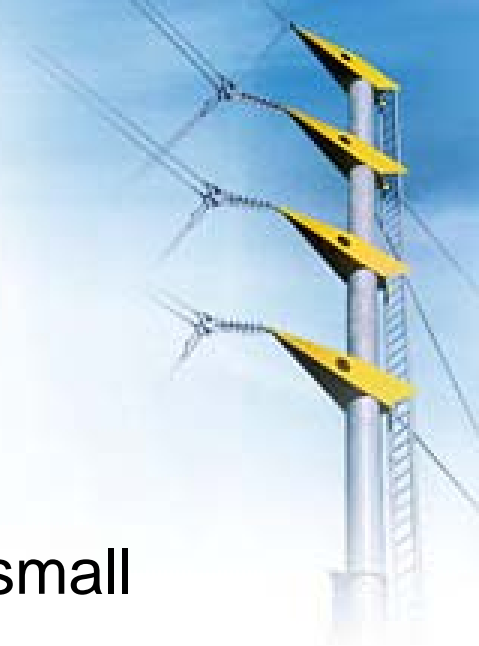
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Fingrid Oyj

Oslo 25 April 2005

DR activities in Finland

- DR in electric space heating
- Project on DR based on spot pricing for small customers
- Developing pre-requisites for DR of small customers
- Survey on DR potential in industry
- Utilisation of demand resources as disturbance reserves
- Increasing common understanding of DR



DR in electric space heating

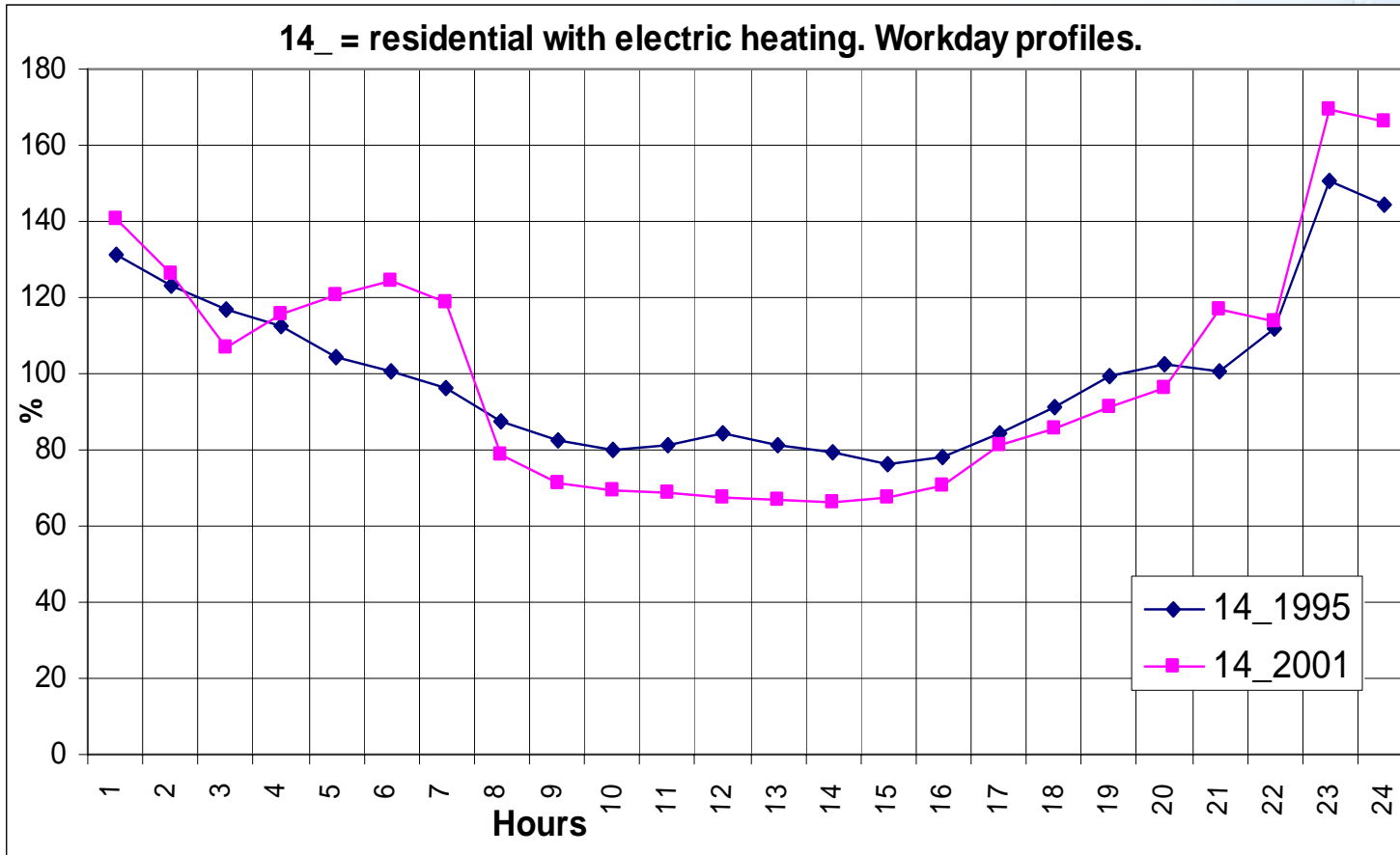
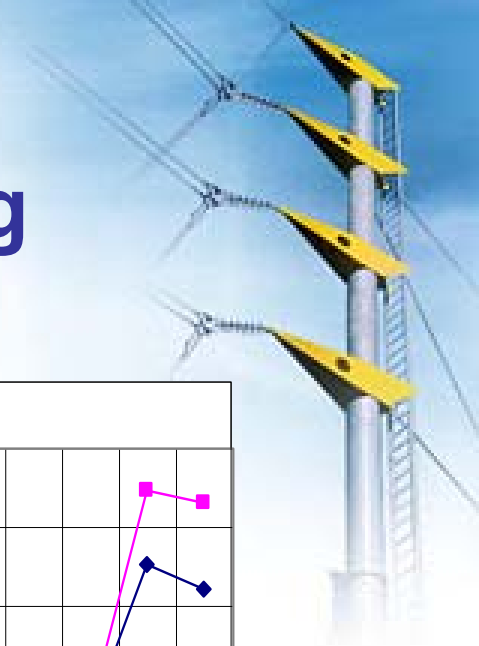


Time of use tariffs applied since beginning of 1970s

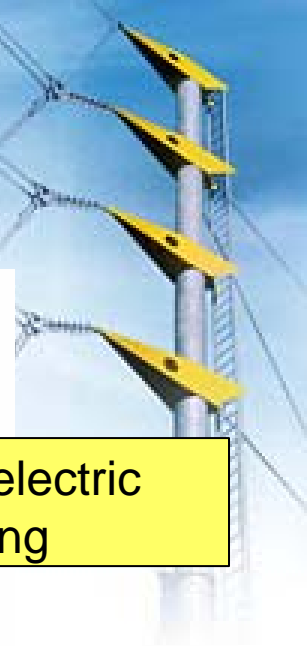
Development of new technologies and demand pattern

- Floor heating with storing capacity (heating in night time)
- Domestic hot water production in night time (heat storage)
- Switching off part of heating when sauna (8 – 12 kW) is switched on
- Disconnection of heating loads by using ripple control (reduced price)
- Development of new technical solutions for systems inside the house
- Efficient insulation in houses, heat recovery

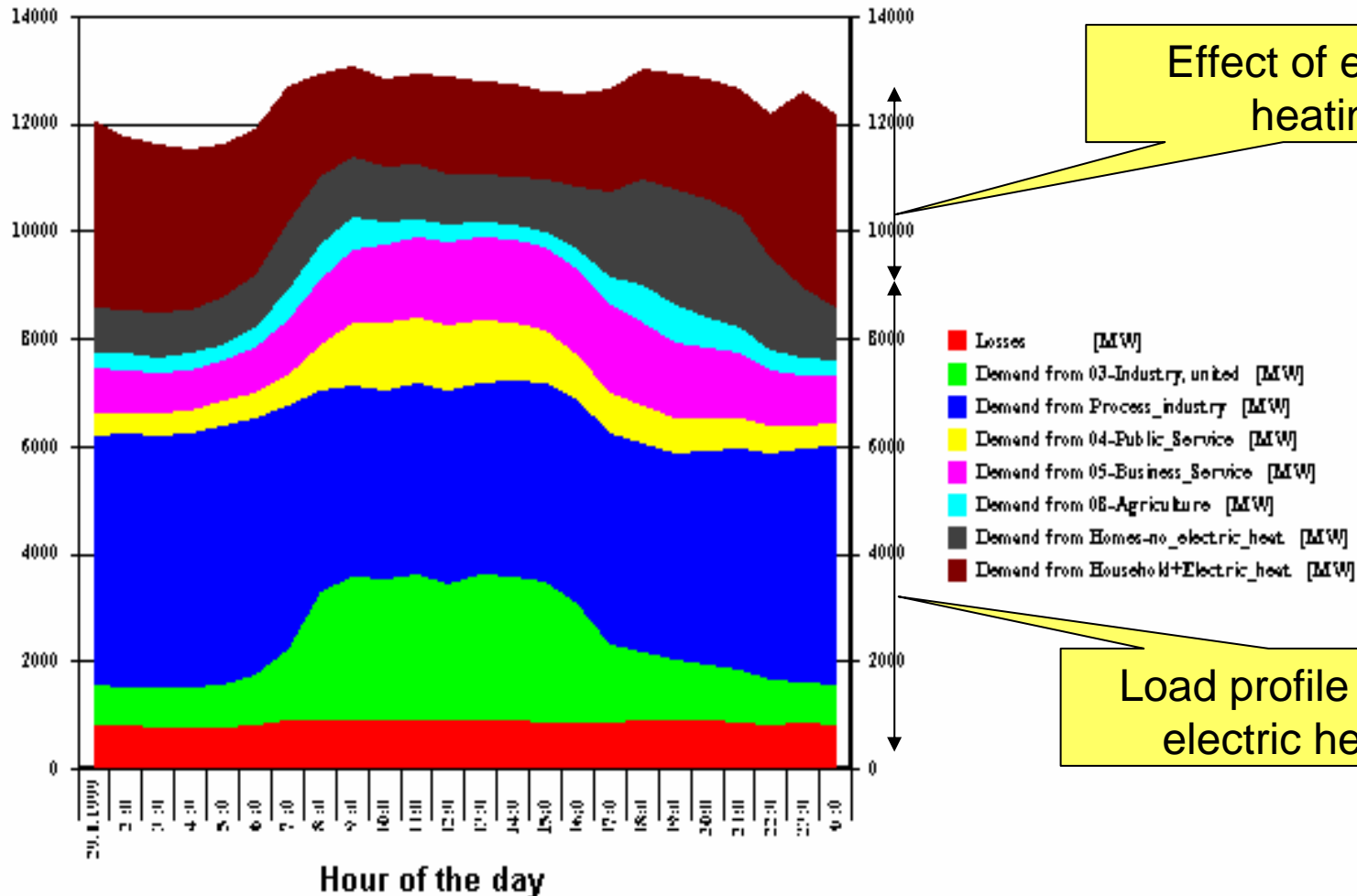
Average load profiles of small customers with electric heating



Effect of demand response of electric heating in Finland



MW Peak load curve segmented into customer categories



Future challenges in electric space heating

Unbundling of retail and network business

- TOU tariffs still exist, but may change in the future
- No incentive for direct load control

New ideas needed

- Real time pricing based on spot price
- Interval metering and automated meter reading
- New business concepts and aggregation



Project on DR based on spot pricing for small customers



- Field test of demand response due to spot price
- Test period 2004-2005 (probably extended to 2006)
- Objective to study and develop solutions that enhance utilisation of DR of small customers
- Test sites:
 - 10 electrically heated houses and bigger buildings
 - Building automation in 4 houses

Project on DR based on spot pricing for small customers



Problems and barriers identified so far

- Differences in DSO practices in hourly metering may restrict extension of spot pricing in other regions
- Use of profile curves for outside sellers instead of hourly metering (legislation)
- Metering and billing systems may be inaccurate, inflexible and costly for small customers
- TOU distribution tariff and spot price sometimes counteract

Developing pre-requisites for DR of small customers

- Automated meter reading of about 70 000 customers
- Vattenfall investing in new metering system
 - Installation to 330 000 customers in 2005-2007
 - Metering values directly into customer data base
 - Partner TeliaSonera responsible for meters and their installation as well as reading of the meters and telecommunication (GSM)
 - The system can create new opportunities in power trading and remote control of power deliveries

Survey on DR potential in industry



- Objectives
 - to map the demand response potential available to the market
 - to find out the most important factors affecting the potential
- Survey was financed by Fingrid Oyj and Ministry of Trade and Industry
- Survey was carried out by VTT Processes in 2005 by visiting factories and interviewing energy experts
- Surveyed companies' electricity consumption 16 TWh/a (the sectors totally 33 TWh/a)
- Company specific information is confidential

Surveyed technical DR potential



Flexible loads: Grounwood plants and mechanical pulping plants, electrolysis, arc furnaces, rolling mill, grinding plants, extruders, gas compressors

	year 2004	year 2010
Total power demand of the industry in survey	4 180 MW	
Total power demand of all flexible loads	1 400 MW	1 400 MW
- reserved for disturbance reserve (Fingrid)	402 MW**	800 MW**
- maximum power available for electricity markets	814 MW	410 MW
- non-flexible part of loads in flexible processes	184 MW	190 MW
Peak load duration of flexible loads h/a	6000 h	6000 h

Response power that can be offered for the electricity market [yr2004&(yr2010)]

First and last column (0 h, total) are cumulative, rows are non-cumulative

Response duration	notice time/ preparatory interval				
	0 h	2 h	8 h	24 h	total
1 h	625(241)* MW	149(129)* MW		38 MW	812(408)* MW
1 – 3 h	625(241)* MW	65 MW		41 MW	731(347)* MW
3 – 6 h	155(99)* MW	35 MW	30 MW		220(164)* MW
6 – 12 h	107(50)* MW			30 MW	137(80)* MW
> 12 h	106(50)* MW			35 MW	141(85)* MW

* in brackets demand response power available after the new nuclear power unit comes on-line

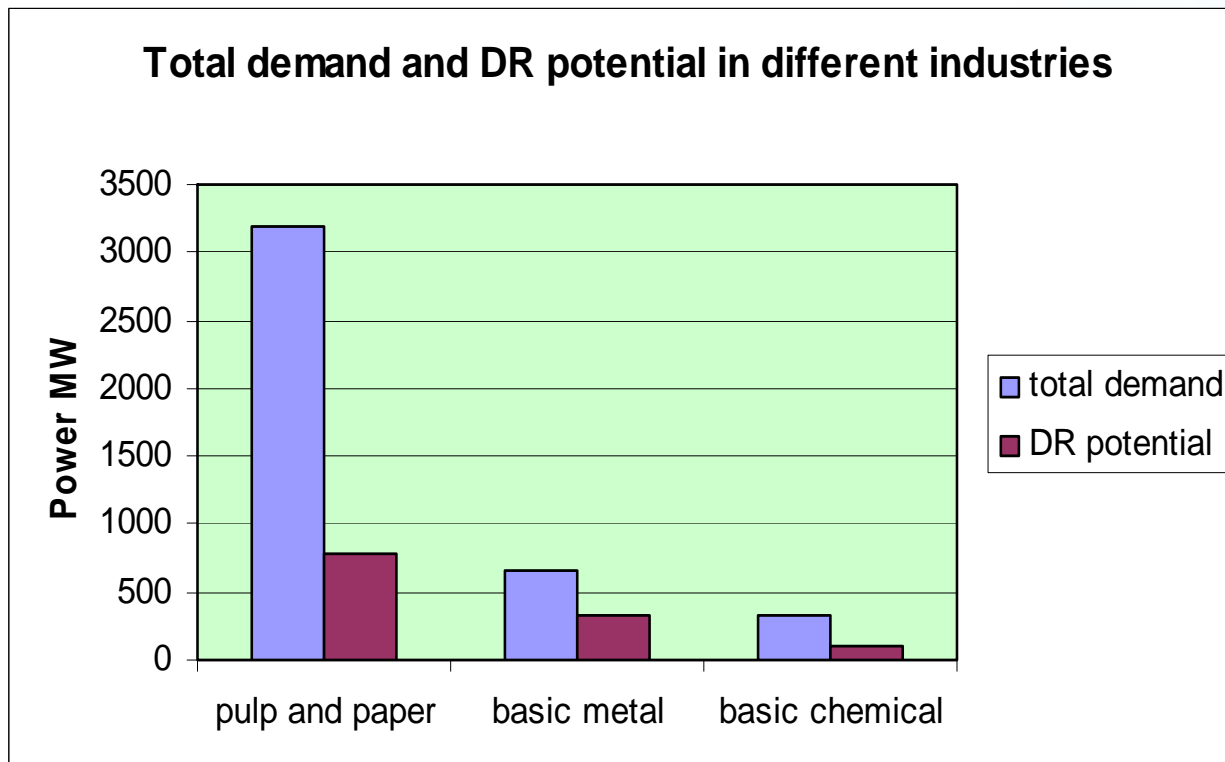
** these values are based on 7000 h availability

DR total potential

1 210 MW

Surveyed technical DR potential

Surveyed potential 1 210 MW is about 8.6 % from the peak demand in Finland (14 000 MW)



Effect of electricity price on activation of industrial DR



Effect of electricity price on activating power response

These values doesn't include the power reserved for disturbance reserve

Price limit that activates the response	Response duration	
	max 3 h	over 12 h
100 EUR/MWh		5 MW
200 EUR/MWh	148(128)* MW	182(126)* MW
300 EUR/MWh	646(300)* MW	186(130)* MW
500 EUR/MWh	650(300)* MW	186(130)* MW
1000 EUR/MWh	740(300)* MW	266(190)* MW

* in brackets demand response power available after the new nuclear power unit comes on-line

Price is very sensitive to the prevailing business situation.

Barriers for industrial DR

- Stopping and restarting of a process can increase production costs, lead to faults in equipments and stopping of the production line and integrated processes
- DR actions happen seldom and require additional measures of the personnel
- Risk of freezing in the winter time
- Lack of intermediate storage capacity to carry out DR actions
- Internal unbundling of process and energy management
- Internal decisions are not made locally
- Reduction in production, but fixed costs remain
- Hedging of electricity purchase

Utilisation of demand resources as disturbance reserves

- Contracts on about 1000 MW disconnectable loads to be available from 2005 to 2015
- Contracts divided into two periods
- Resources either frequency controlled or to be manually activated within 15 min
- Contracted resources will ensure the reliability of the power system when the new nuclear power unit (1600 MW) is in operation
- Contractual terms and payments are equal for all participants

Increasing common understanding of DR

Forum for interest groups

- Informal co-operation body
- Objectives
 - Exchange information between various interest groups
 - Identify and initiate development projects and agree on financing
 - Function as a steering or a follow-up group for projects
 - Act as an expert group in DR issues
 - Activate interest groups for actions in their field
 - Meets 3-4 times a year
 - Arrange DR seminar once a year (first on 19 April 2005)





A Nordic Conference on

Enhancing and Developing Demand Response in the Energy Markets

Copenhagen, 27 May 2005

Further information www.nordicenergy.net