

Success in the Field

Small Customers and Demand Side Measures

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EA Technology

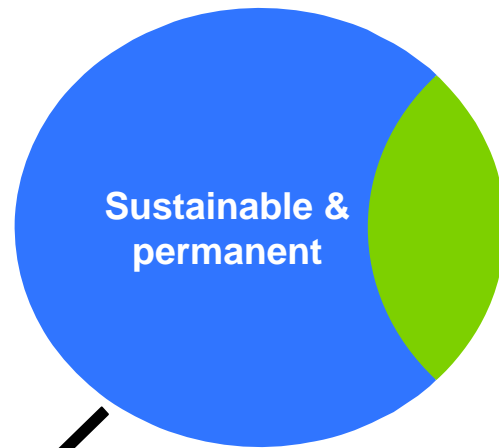
Smart Metering Seminar, EA Technology, 17 January 2007



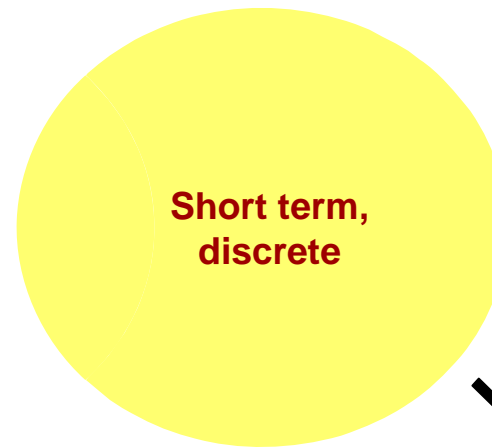
Overview

- Demand side measures
- Overview of recent IEA project
 - Review of trials involving small customers
 - Summary of the results
- Current IEA project
 - Implications of demand side measures
 - Metering / settlement issues

Types of DSM measures



Energy efficiency
Static load management
Local generation
Fuel switching

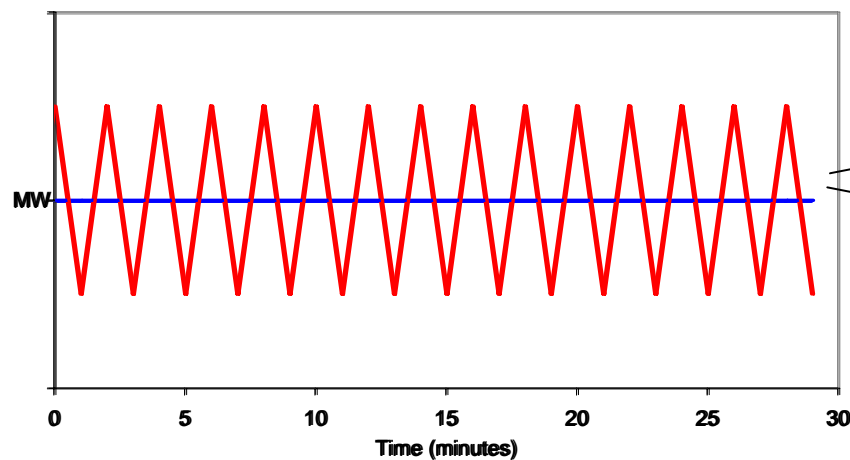


Load interruptions
Dynamic load management
Local generation
Fuel switching

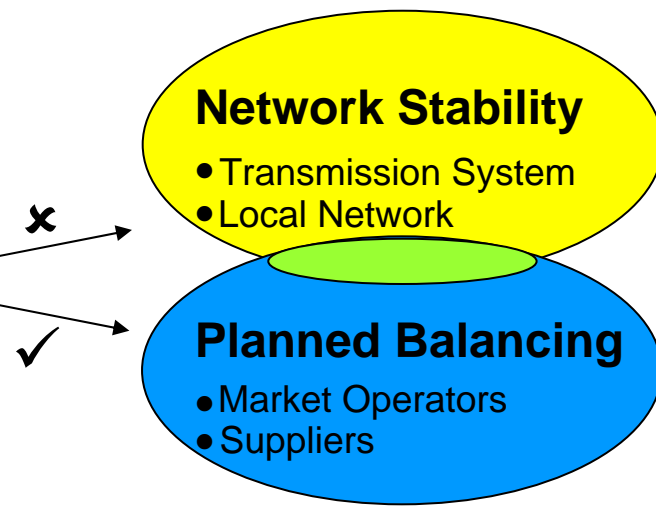
Short term discrete actions

Why?

- to maintain balance between supply and demand
 - in real time (to maintain system stability)
 - across settlement periods (for financial balancing)



Total electricity generated = 0.5 MWh



IEA Project Overview

Title Time of Use Pricing and Energy Use for Demand Management Delivery

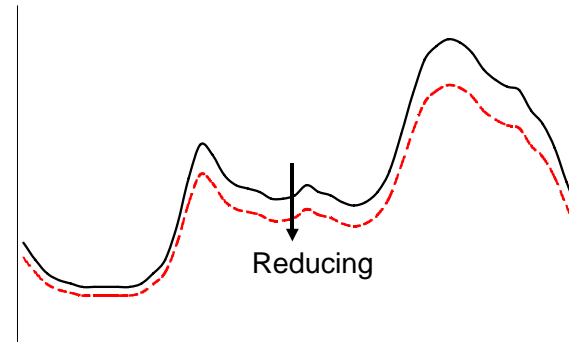
Task XI of the IEA Implementing Agreement on Demand Side Management Technologies and Programmes

Objective To determine whether and how small customers can and will change end uses of energy and behaviour

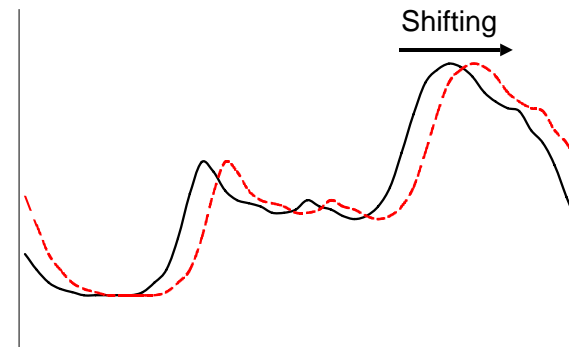
Participants Denmark, Finland, Greece, Netherlands, Spain, Sweden, UK

Motivating Small Customers?

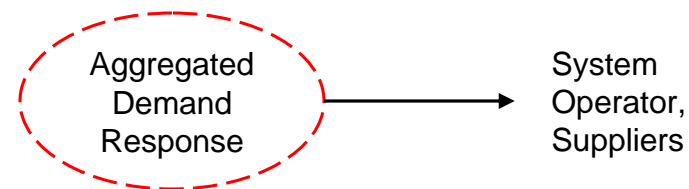
1. To reduce energy consumption



2. To shift energy consumption



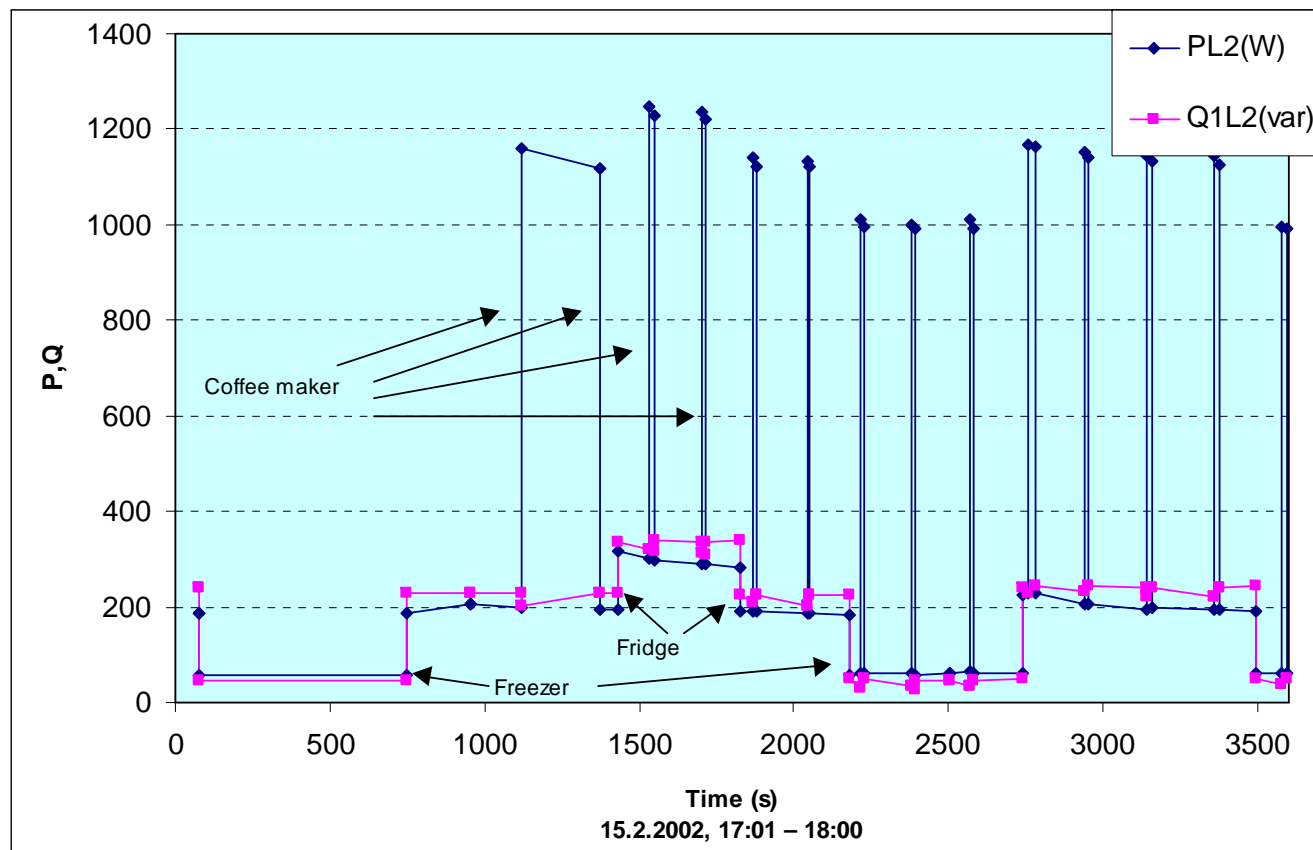
3. To participate in Demand Side Bidding schemes



Reducing Energy Consumption by providing information

- Demand disaggregation
 - sub metering, non-intrusive monitoring, interviews
- Feedback options
 - displays, interview (face to face / telephone), information (leaflets, information on bills)

Non-Intrusive Appliance Load Monitoring (Finland)



End-Use monitoring of electric cookers

(Mansouri and Newborough, 1990's)

Results:

- 40 houses
- Over 16 weeks

Group	No. of households in trial	Average change in energy consumption	Range of energy reductions achieved*
1: Information Pack	12	-3%	-1% to 13%
2. ECI	10	-14%	-5% to -39%
3. Information Pack and ECI	9	-4%	-2% to -27%

Northern Ireland Key Pad Trial

- Pre-payment meters
 - with a remote key pad / customer display
 - number of days before credit expired
 - average daily consumption over previous week
 - led to a 3 % reduction in electricity consumption
 - based on trial of 100 people



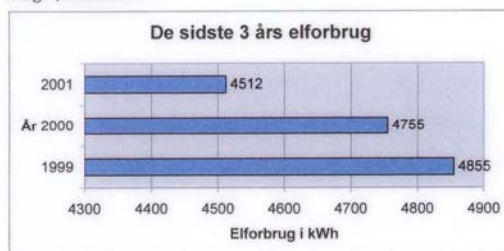
Key pad / customer display
Liberty meter
Source: www.pri.co.uk

Informative Electricity Bill (Denmark)

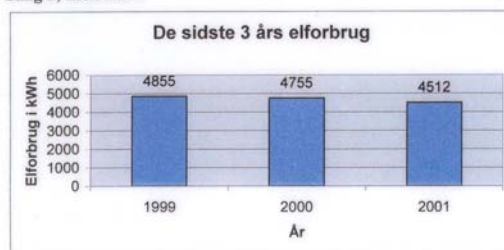
Tag indstikket ud!

Da vi ofte henviser til bilagene, kan det tjene til støtte under læsningen af rapporten. På bagsiden findes bilag 5 og 6.

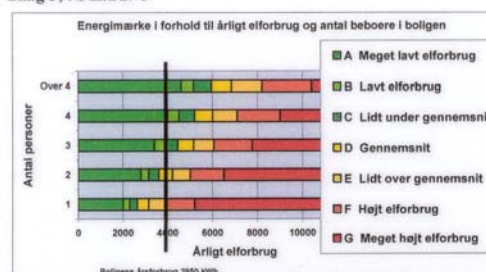
Bilag 1, Histo risk 1



Bilag 2, Histo risk 2



Bilag 3, No m a tiv 1



Boligens årsforbrug er opgjort til 3.950 kWh markeret med en fed streg i diagrammet. Afhængig af antallet af beboere i boligen kan du aflæse dit/jeres aktuelle energimærke.

Bilag 4, No m a tiv 2

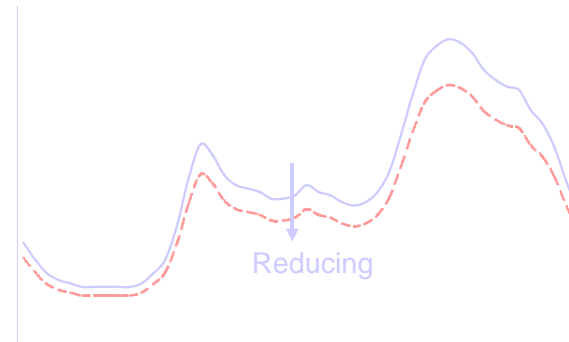
Energimærke i forhold til årligt elforbrug og antal beboere i boligen

Antal beboere	1	2	3	4	over 4
A Meget lavt elforbrug	Under 2000	Under 2800	Under 3400	Under 4000	Under 4600
B Lavt elforbrug	2000-2300	2800-3150	3400-3850	4000-4500	4600-5150
C Lidt under gennemsnit	2300-2650	3150-3600	3850-4450	4500-5200	5150-5950
D Gennemsnit	2650-3150	3600-4200	4450-5150	5200-6000	5950-6850
E Lidt over gennemsnit	3150-3900	4200-5000	5150-6050	6000-7100	6850-8200
F Højt elforbrug	3900-5200	5000-6500	6050-7750	7100-9000	8200-10400
G Meget højt elforbrug	Over 5200	Over 6500	Over 7750	Over 9000	Over 10400
Gennemsnit	2.900	3.900	4.800	5.600	6.400

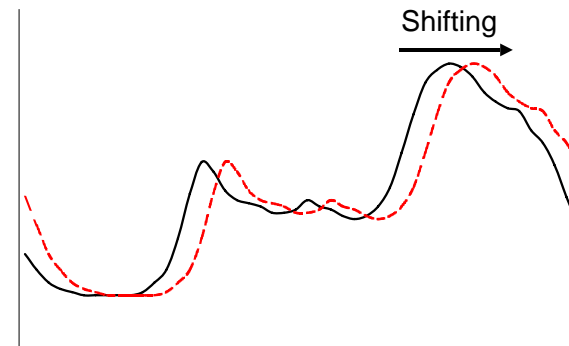
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Motivating Small Customers?

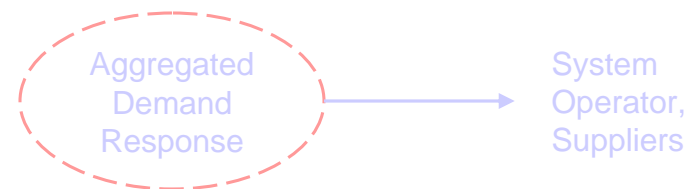
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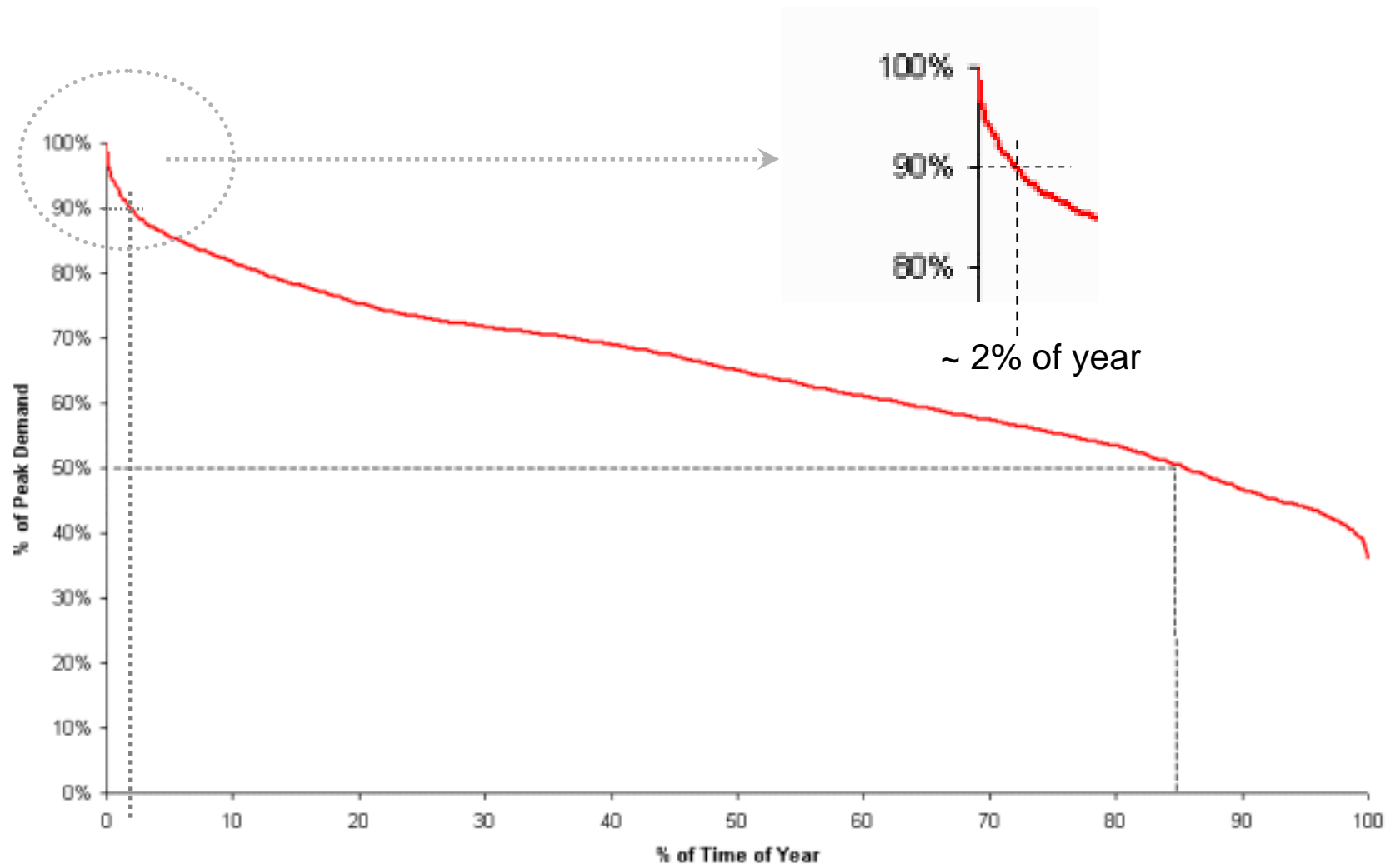
3. To participate in Demand Side Bidding schemes



Energy Shifting through Time of Use Pricing

- Pricing options
 - fixed tariff, day-ahead, real-time
- Control method
 - manual, automatic
- Impact on end use demand
 - obtrusive / non-obtrusive
- Settlement
 - profiles / interval metering

Load Duration Curve

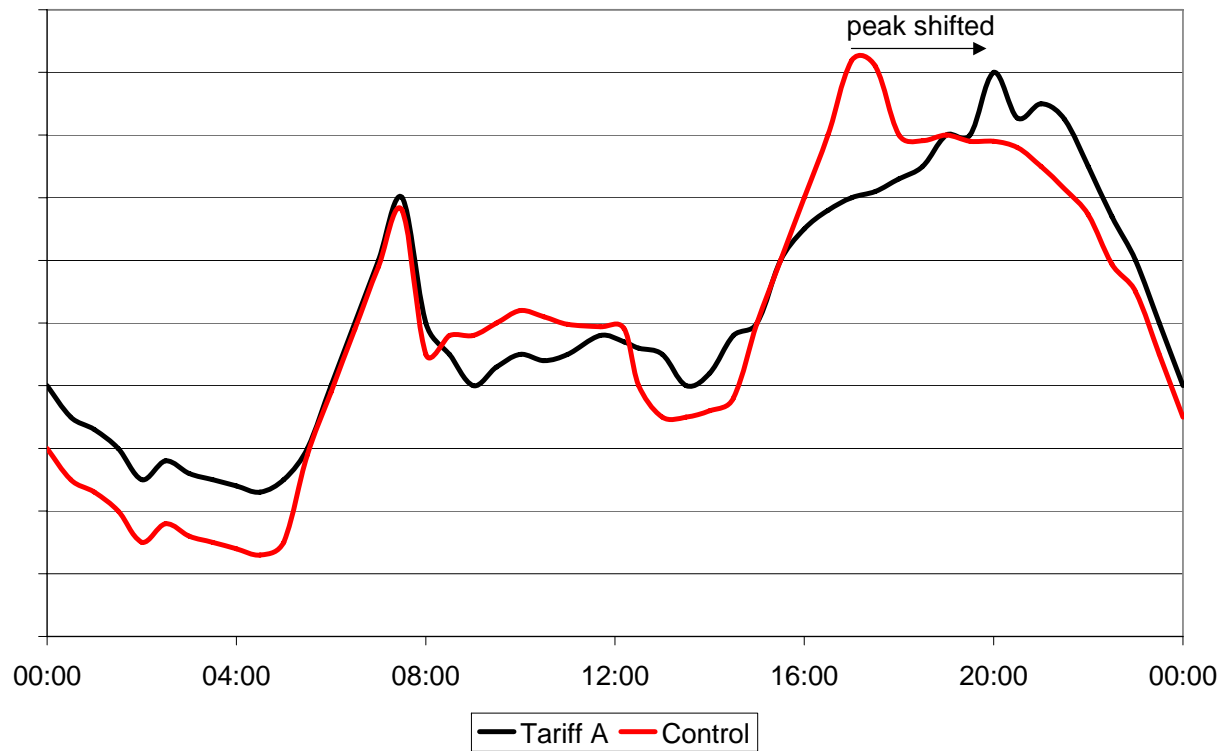


Source: NGC 7 year statement

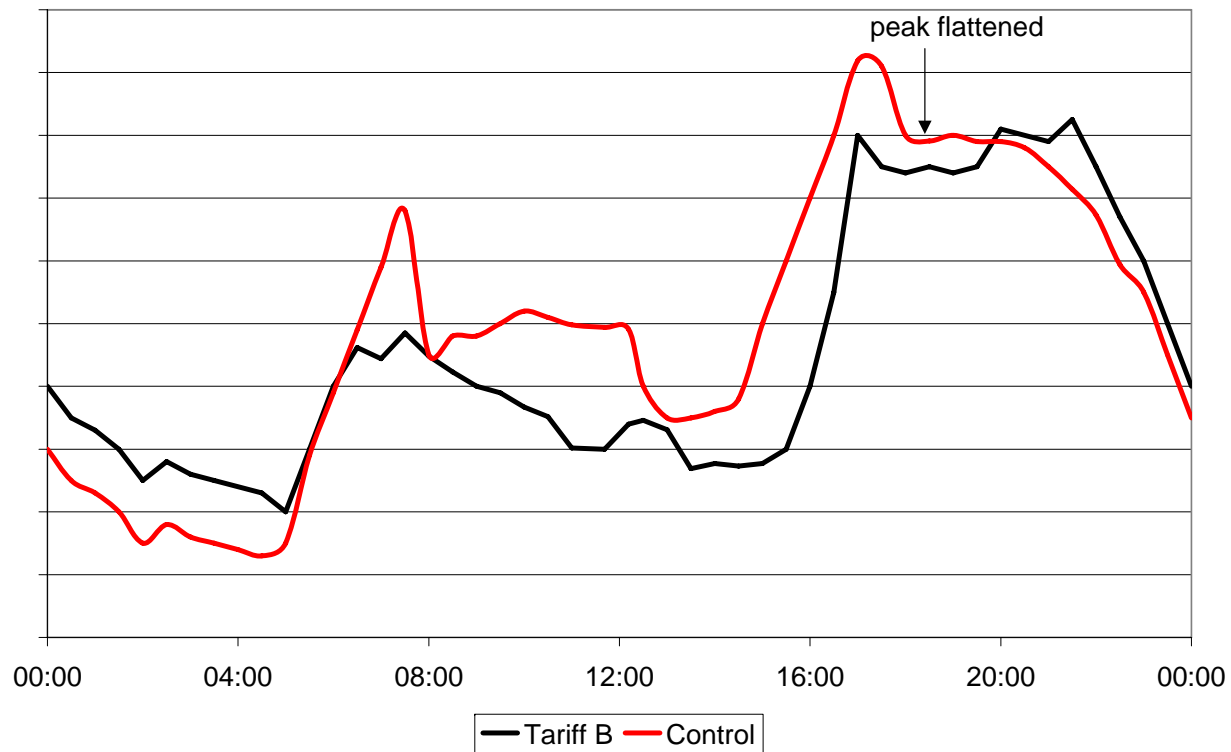
Energy Management Unit Project (UK)

- Trial involved 500 customers
- Results
 - Evidence that load shifting had occurred
 - 20% for former Standard tariff customers
 - 40% for former Economy 7 customers
 - 80% of participants had actively changed their consumption patterns
 - predominately washing machine usage, but also tumble dryer, immersion heater, built-in oven and direct acting space heating
 - no effect on purchase of appliances

Energy Management Unit Project (UK)



Energy Management Unit Project (UK)



EU Efflocom Project (Denmark)

- Pilot conducted as part of EU Efflocom project
- 25 houses with direct electric heating
- Customer access via internet
- Relays connected to up to five rooms / zones in the home
 - e.g. water heater, bedroom, kitchen, sitting room
- Main Conclusions:
 - Optional override is important
 - Differentiation in bonus / interruption duration not so important
 - Peak load reduction delivered
 - Energy use reduced also

EU Efflocom Project (Denmark)

User Setup (on Internet)	Bonus pr. kWh moved					
	1 DKR		2 DKR		3 DKR	
	Time		Time		Time	
	6-11	16-19	6-11	16-19	6-11	16-19
Bedroom	1	3	2	3	3	3
Dining room	3	1	3	3	3	3
Sitting room	3	1	3	3	3	3
Water heater	3	3	3	3	3	3
Guest room	3	3	3	3	3	3

Northern Ireland Key Pad Trial

- Time of day trial conducted
 - 3 rates over 4 time periods
 - Annual consumption 3.5% less than 'average' customer
 - Evidence that evening peak could be reduced by 10%
 - Monetary savings ranged from 1.5% to 15%



Source: www.pri.co.uk

Why better information is so important

- Savings in energy consumption
 - Ranged from 3% to 15%
- Significant potential to shift demand
 - Savings of 10% possible

Next Steps

- Next phase of IEA Project commenced Nov 2006
- Aim
 - Investigate impact on metering and settlement
 - Explore possibilities within existing settlement system
- Participants
 - UK, Netherlands and Spain