Demand bidding into power pools – saving money and improving business efficiency

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IEA DSB-project

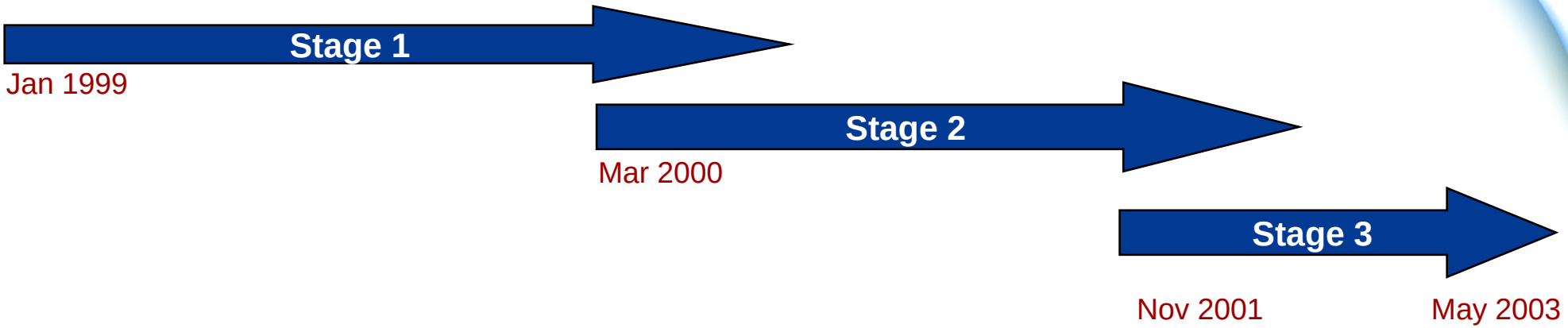
This presentation is mainly based on the ongoing IEA DSB-project.
The participating countries of the project are

- Finland
- Netherlands
- Norway
- Spain
- Sweden
- United Kingdom
- (Greece)

The newest results of the project are confidential. General rule is that the publications of the project are public one year after the finishing the report. The public reports can be found from

dsm.iea.org, task publications

Work programme of IEA DSB project - overview



Sub-Tasks
1. Definition of DSB
2. Market Survey
   - •market operators
   - •system operators
   - •regulators
   - •suppliers / traders

Sub-Tasks
3. Consumer Survey
4. Technologies for DSB
5. Analysis / evaluation

Sub-Tasks
6. Workshop
7. Technical issues
8. Practical guide

Stage 1 publications

Publication	Date	Status
Market participants' views towards and experiences with DSB	Version 1: May 2000 Version 2: January 2002	Public
General Brochure	March 2001	Public

Stage 2 publications

Publication	Date	Status
Consumer potential for DSB, National Reports	June 2002	Confidential
Technologies for DSB	October 2001	Public
Evaluation of DSB	Draft	Awaiting approval

Stage 3 publications

Publication	Date	Status
Technical Requirements for DSB National Reports	Awaiting completion	Awaiting completion
Practical Guide for DSB	Awaiting completion	Awaiting completion

Demand Side Bidding-project

Aims & Objectives

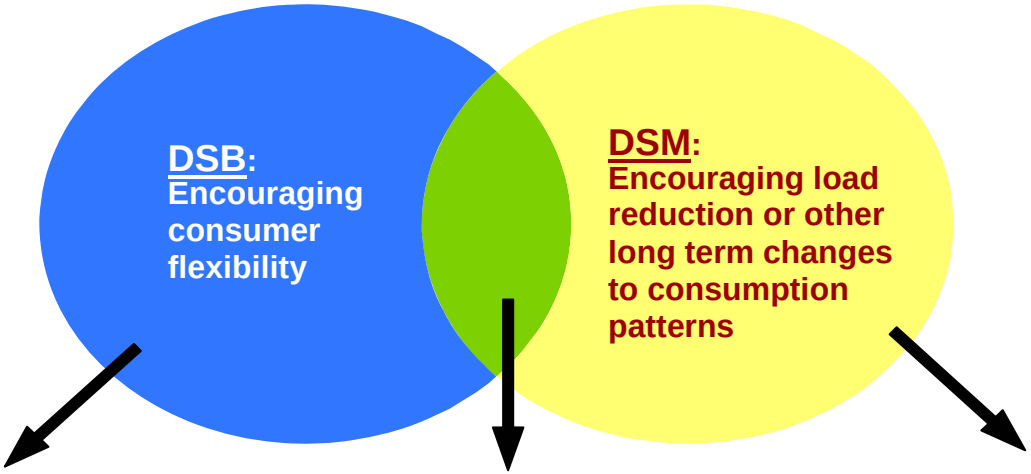
- To promote DSB as a means of improving the global environment
  - evaluation of current DSB schemes
  - analysis of strengths and weaknesses
  - guidelines for the development of new DSB schemes

Definition of DSB -1

" DSB is a mechanism that enables the demand side to **actively participate** in the trade of electricity "

- Involves a change in demand
  - increase OR decrease
- Primary focus has been on 'non-consumption'

Definition of DSB - 2



DSB

Short term, discrete actions

Market driven

Improves market efficiency

Opportunity to earn money

Potential environmental benefits

Overlap

Shared technologies

Cross fertilisation of ideas

DSM

Sustainable & permanent changes

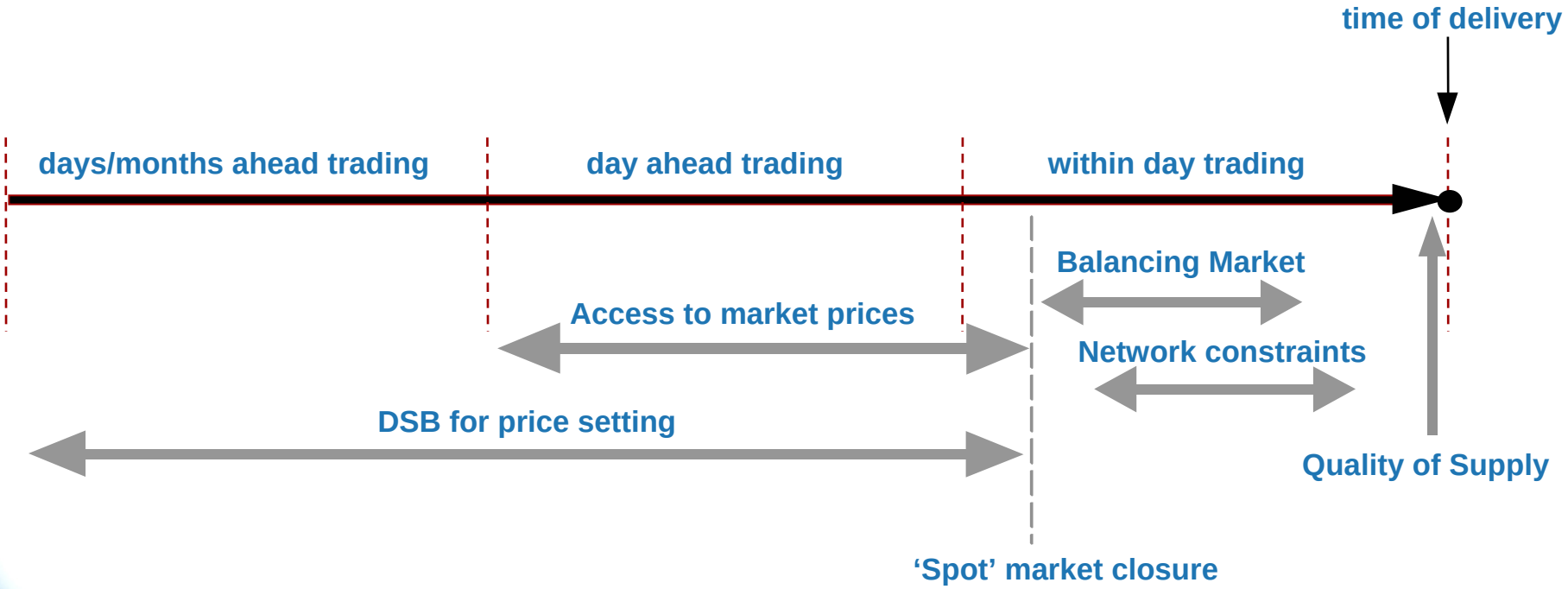
Mostly regulatory driven

Long term environmental benefits

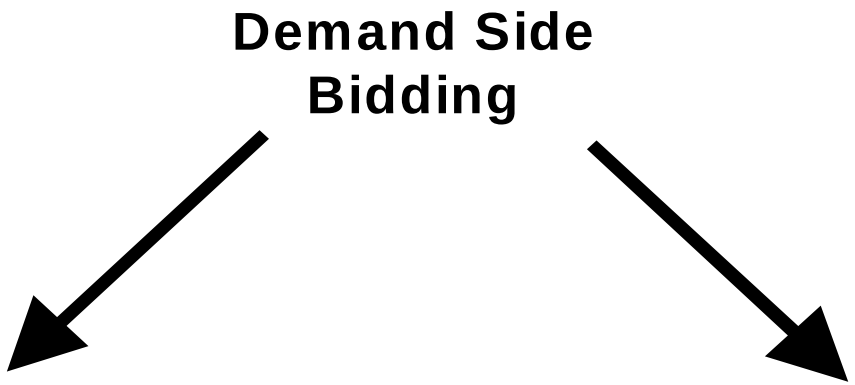
Cost savings for consumers

Definition of DSB - 3

DSB categories



Definition of DSB - 4



System Stability

- System Operators

Energy Balancing

- Market Operators
- Suppliers

Market Survey

- Aim:
  - Gather information from key market participants market operator, system operator, network owner,
    regulator, government
- Experiences
  - types of DSB products available
  - number of participants
- Opinions
  - is DSB viewed positively or negatively
- Barriers
  - types of barriers / real or perceived barriers

Market Survey - experiences

- DSB for System Stability
- DSB for Energy Balancing
  - balancing market
  - access to market prices

Market Survey - Experiences

DSB - system stability

Country:	**UK**	**UK**	**Finland**
Product / service:	Frequency Response	Standing Reserve	Momentary disturbance reserve
Purpose:	To provide rapid response at times of system stress	To take over from 'fast response' services in times of system stress	To provide rapid response at times of system stress
Payments to consumers:	Availability payments of ~£1.60/MWh per each half-hour	Tender process – participants paid as bid. Average price ~ £10/kW per annum.	Availability & utilisation
Maximum load available:	160MW	480MW	330MW
Method of load dispatching:	Automatic relay - disconnects supply if system frequency falls (~49.7 - 49.6Hz)	Notification of dispatch via Standing Reserve - dispatch is either automatic, via the computer, or manual.	Automatic relay which disconnects supply to a process if system frequency falls below a pre-set limit

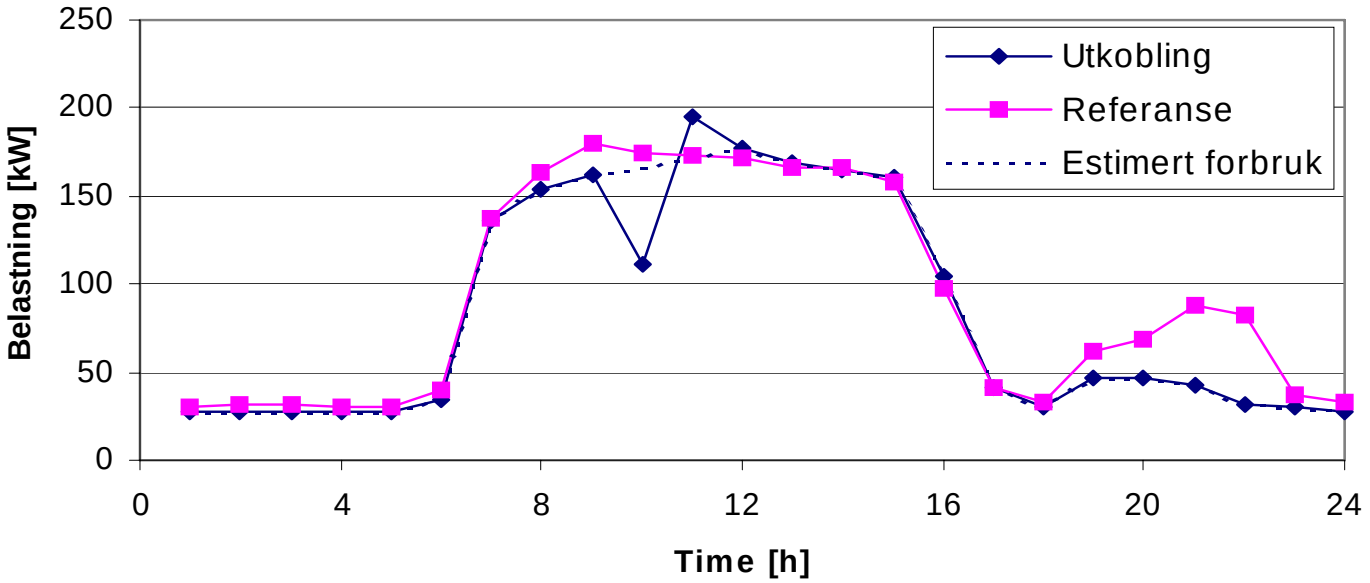
Market Survey - Experiences
DSB - energy balancing

Country:	Spain	Sweden	Finland	All(*)
Product / service	Energy trading	Elspot (2-hours ahead market)	Interruptible supply contract (domestic heating)	Balancing Market
Purpose:	Day ahead trading	Electricity trading	To allow supply companies to reduce peak load	Balance supply and demand in time leading up to delivery
Payments to consumers:	Participants are 'paid as bid'	Participants are 'paid as bid'?	50% reduction in standing / fixed charge element of the electricity bill	-
Maximum load available:	None	None	50 to 100 MW (but rarely used)	No participants
Method of load dispatching:	Self dispatch	Self dispatch	Automatic dispatching using 'ripple' control	Self-dispatch

(*) Survey undertaken prior to introduction of balancing market in UK

Market Survey - Experiences

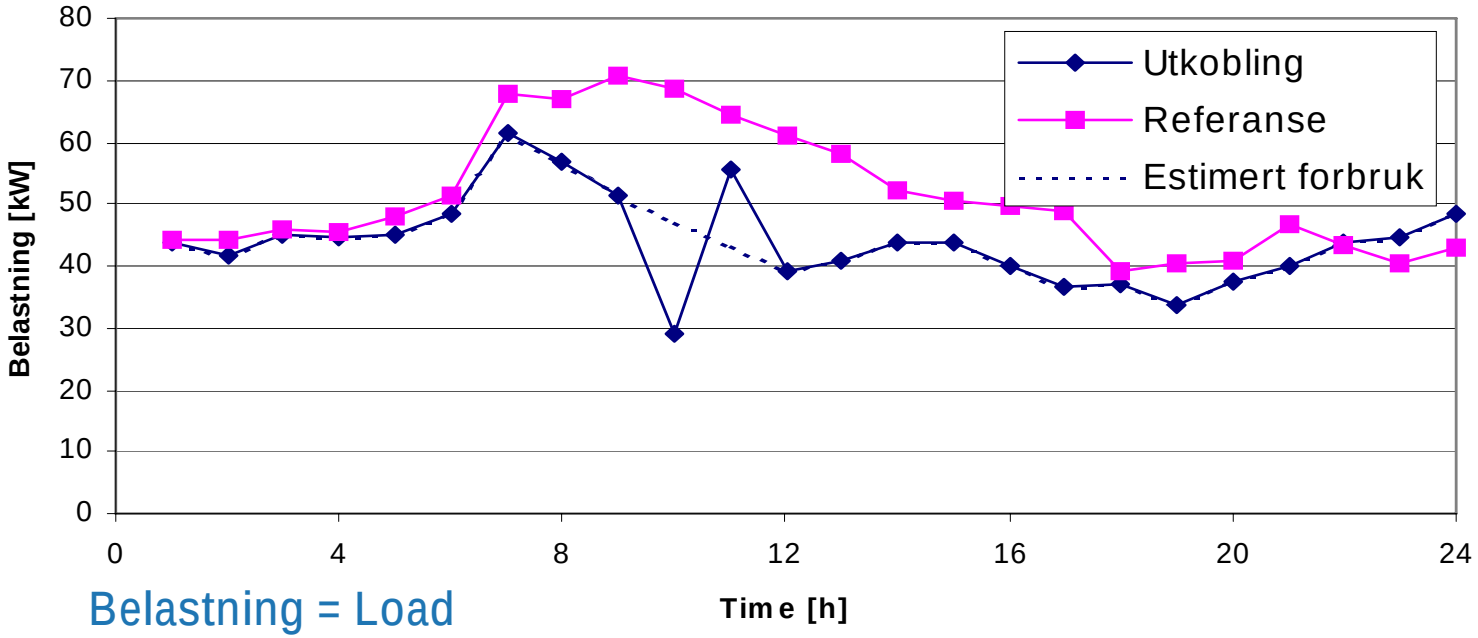
DSB Tests in Schools in Norwav - 1



Belastning = Load
Time = Hour
Utkobling = Disconnection
Referanse = Reference
Estimert forbruk = Estimated demand

Market Survey - Experiences

DSB Tests in Schools in Norway - 2



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Market Survey - Opinions

- New business opportunities
- Increased participation from the demand side
- Improved network efficiency

Market Survey - Barriers

- Technical barriers
- Structural barriers
- Ignorance
- Financial
- Tradition

Market Survey - Conclusions

- Wide range of DSB products available
- Mostly restricted to large consumers
- Barriers
  - many!
- Participants unaware of potential benefits

Consumer Survey and Potential for DSB

- AIM:-
  - to try to identify the potential for DSB
  - to obtain views / opinions from consumers

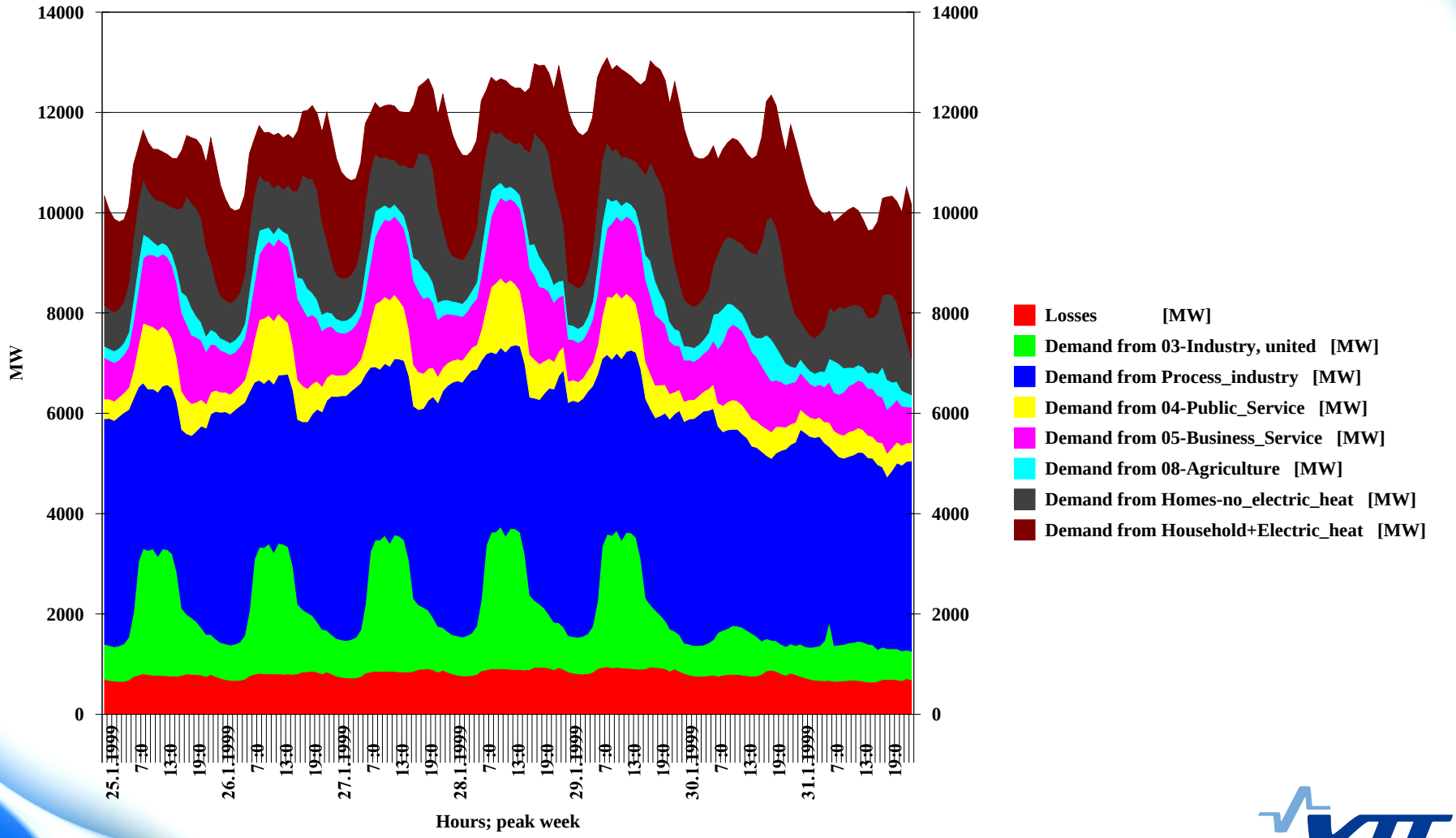
- RESULTS:-
  - country specific

Consumer Survey - continued

- Options for consumers included:
  - switching off a process
  - substitution (fuel substitution / standby generation)
  - storage (heat / cold / raw material)

Segmentation of loads during the peak load period in Finland

Metered load segmented into customer types.

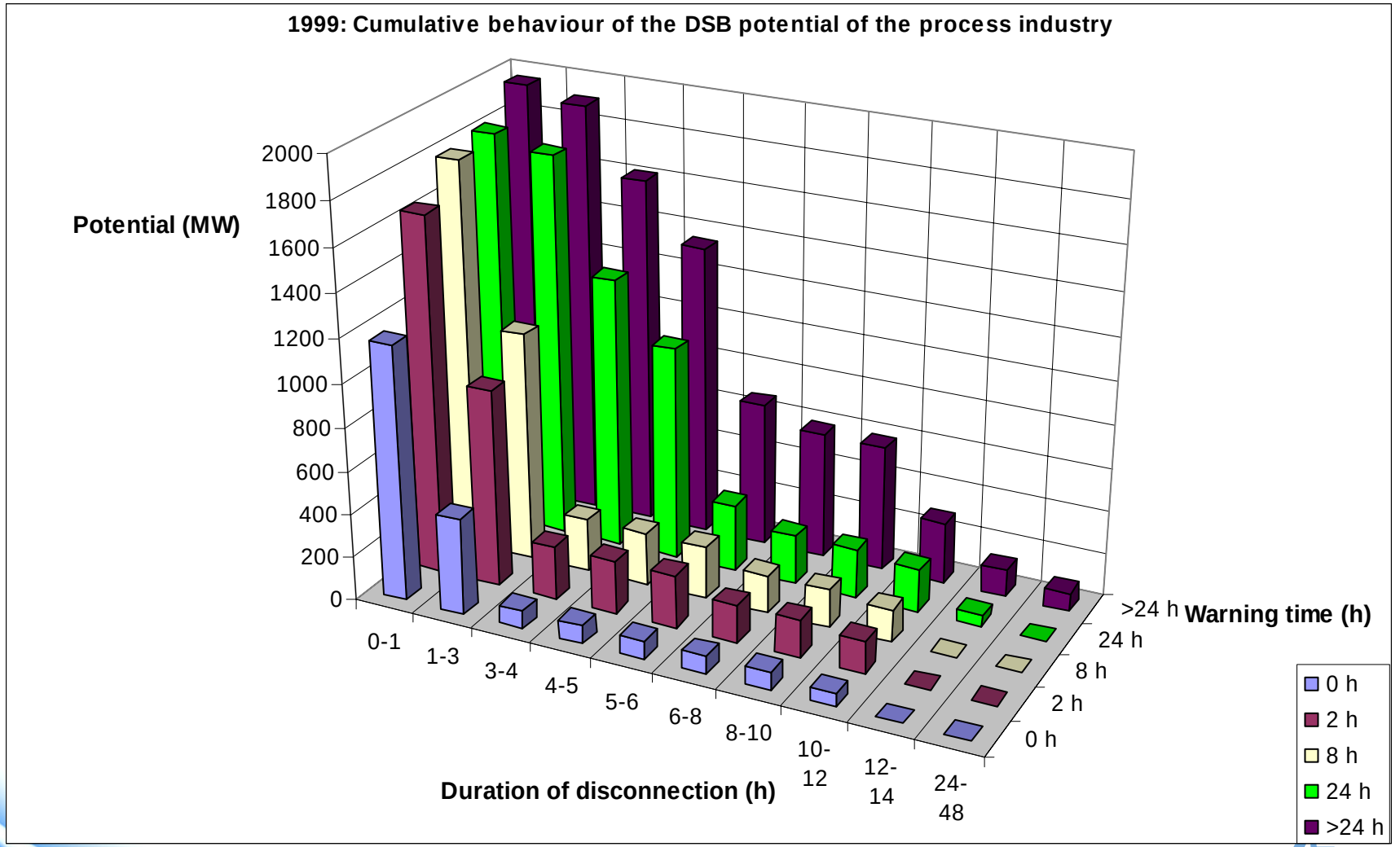


Useload

Estimate for DSB potential, Finland (1999)

Customer sector	**Number of customers** *thousands*	**Annual energy** *TWh*	**The hourly peak power** *MW*	**Technical DSB-potential** *MW*
INDUSTRY	30	42,4	6200	
- process industry	-	32,4	3600	1600 MW (max duration 1 h warning time 2 h)
- other industry (small & medium)	30	10,0	2600	145 - 225 MW
TOTAL SERVICES	199	13,4	2500	120 - 285 MW + 60 MW road lighting
- public service	57	4,8	1200	
- commercial service	142	8,6	1400	
AGRICULTURE	144	2,5	600	
PRIVATE RESIDENTIAL	2587	16,8	2800	
- electric heating	580	8,1	1100	600 - (1200) MW
- other residential	2007	8,7	1700	
CONSUMPTION & POWER	-	75,0	12100	-
Losses	-	2,8	1000	
TOTAL	2960	77,8	13100	About 2500 – 3300 MW.

Consumer Survey - Finland
DSB potential in process industry



Consumer Survey - Conclusions

- Potential for DSB
  - differs from country to country
- Length of interruption time important
  - ‘process is king’
  - DSB must not impact on ‘business’
- Consumer must understand implications of DSB
  - not just a way to earn ‘money for nothing’

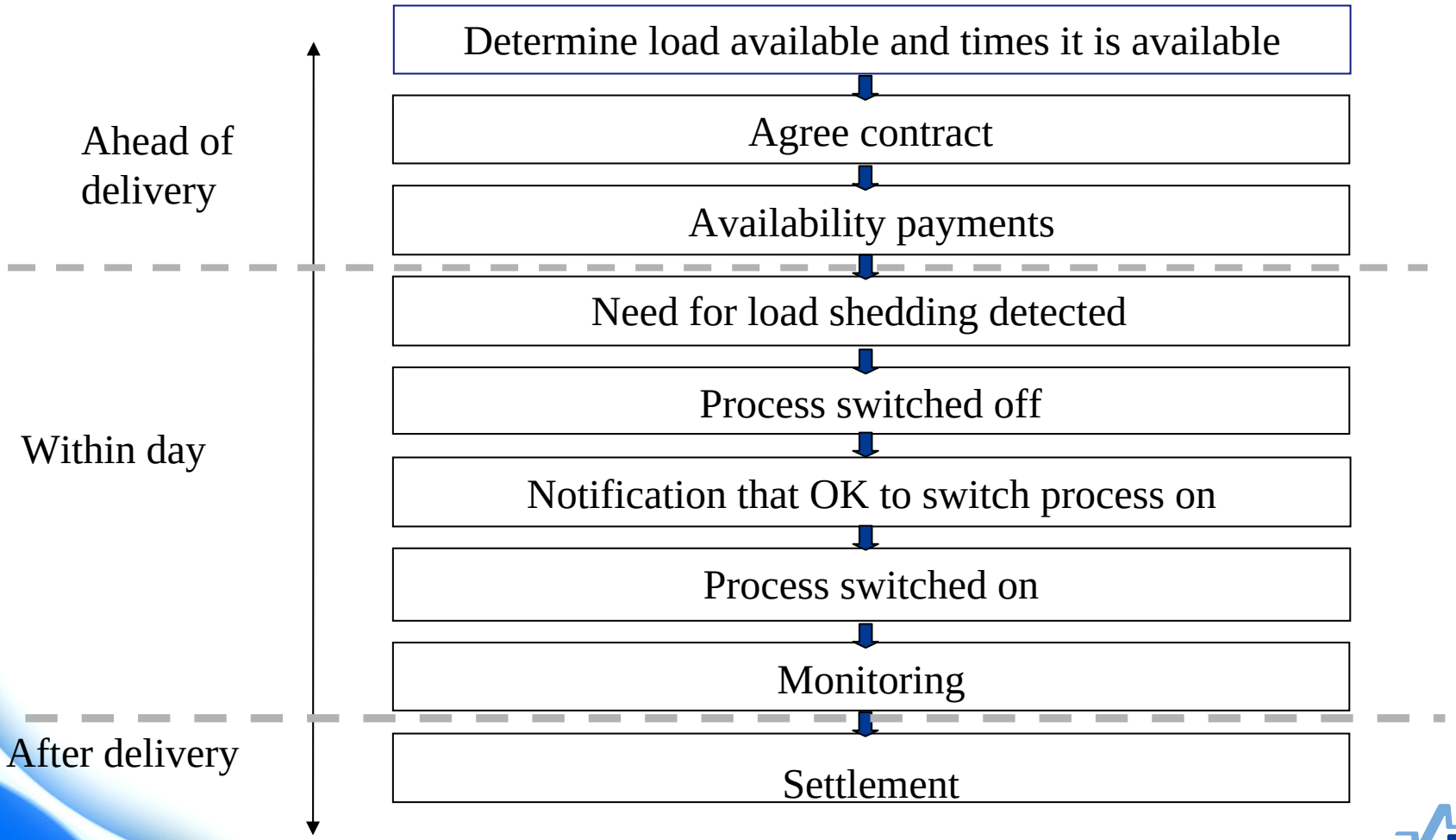
Technologies for DSB

- Aim:
  - Study of technologies that can be controlled in ways suitable for use in DSB schemes
  - Lot of experience from traditional DSM measures
  - Therefore, focus on:
    - implementing different DSB products
    - control / monitoring / communication requirements for each product

Technologies for DSB

- Approach:
  - participants in DSB
    - buyers / sellers of different DSB products
  - properties of DSB products
    - purpose, seller, buyer, alternatives
  - simple schematics showing steps involved in implementing DSB
  - detailed examples of DSB

Technologies for DSB - Generic Requirements



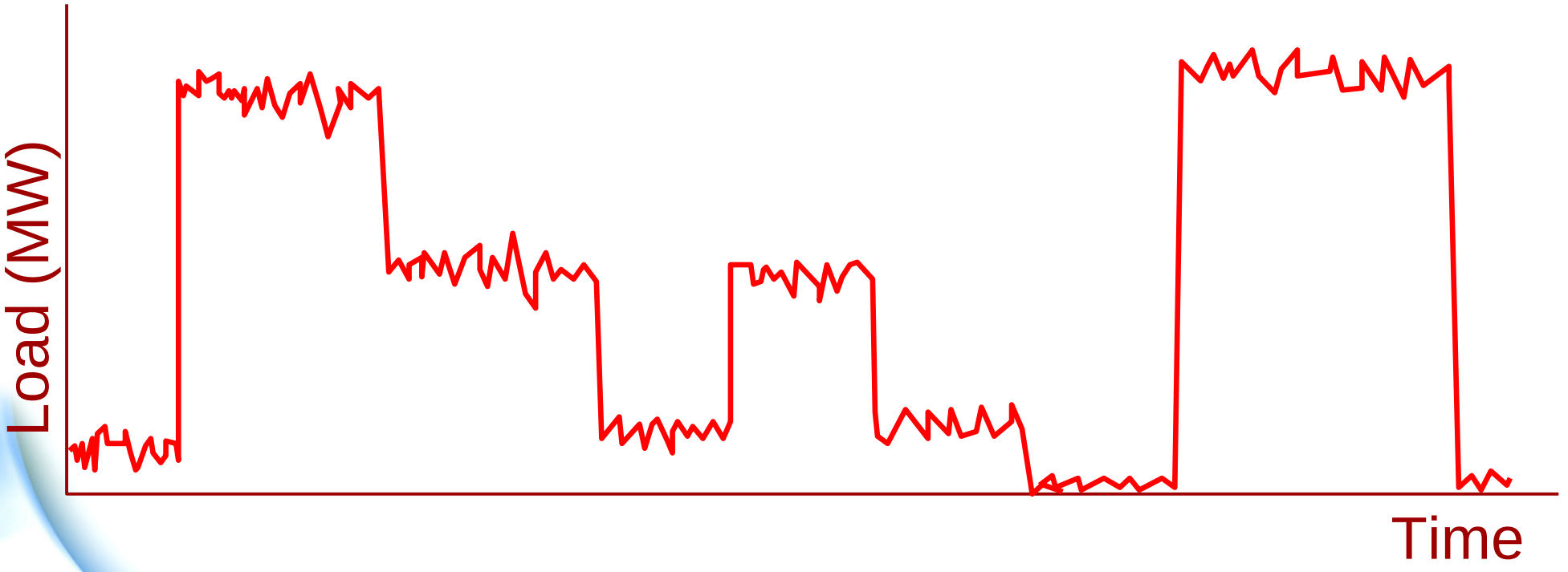
Technologies for DSB - Example

Frequency Control by Demand Management

- Probabilistic Service
  - Demand which is unpredictable - random or cyclic
  - A single plant cannot provide a consistent service
  - Several sites can provide a base level of reliable demand
- Example
  - steel works / arc furnace

Technologies for DSB - Example

Frequency Control by Demand Management - Arc Furnace Load

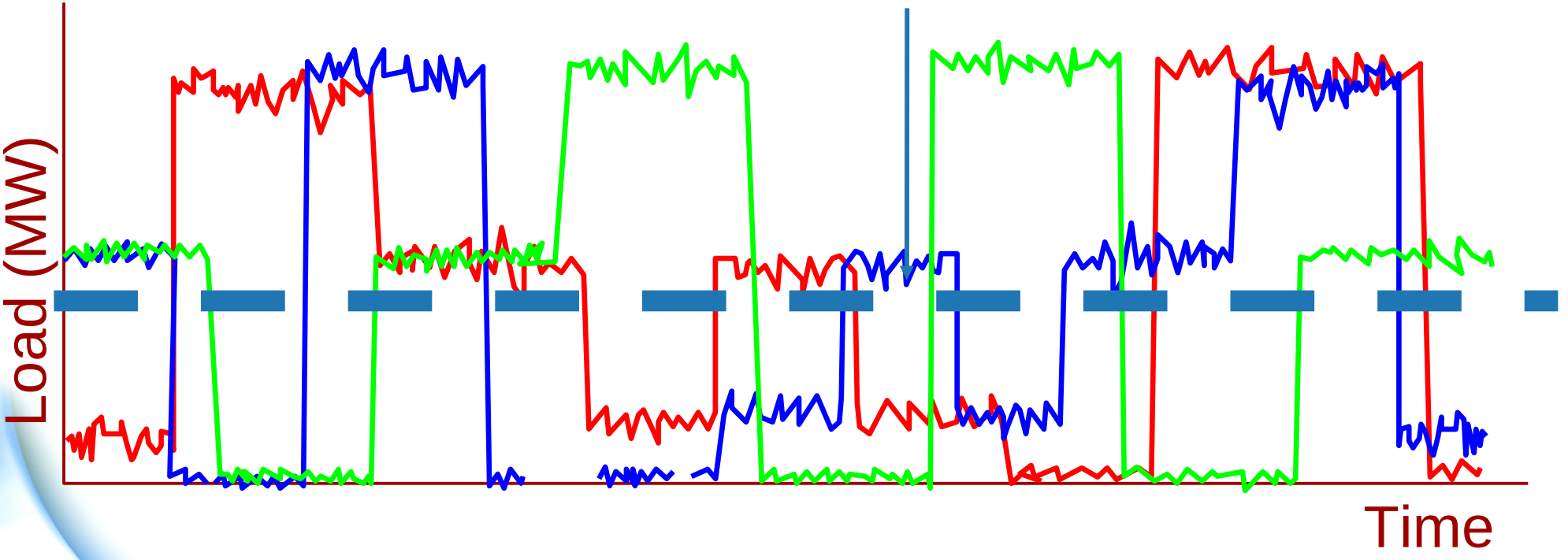


Technologies for DSB - Example

Frequency Control by Demand Management - Arc Furnace Load

Three Furnaces

90% Reliable Demand



Technologies - Conclusions

- Control / Monitoring / Communication technology
  - already exists
  - costs make it more favourable for larger consumers
    - consumers not ‘tied in to their supplier’
  - technology for smaller consumers
    - complicated by market liberalisation
    - improved / new technology in future (e.g. flexible gateway)

DSB as a means of improving global environment

- Reducing CO_2 emissions
  - reducing consumption
  - improving efficiency of generation / transport
- BUT, DSB - short-term discrete actions
  - difficult (impossible?) to quantify impact
  - Example: short-term reduction in demand
    - interruption: is demand avoided or taken later
    - substitution: comparison of emissions
    - storage: impact of losses

Workshop arranged for system and market operators in February 2002 - Conclusions / Summary

- Ensuring efficient operation and investment
  - A competitive marketplace should be sufficient
- Competitive marketplace requires an active demand side
  - i.e. consumers expected to reduce demand at times of high prices
  - but, does not happen at the moment
- Therefore, need for initiatives to encourage demand side participation
  - should be developed and tested, to avoid non-optimal solutions

Conclusions

- Successful DSB products exist
  - operate within a ‘well-defined’ set of rules
- Main barrier to DSB:
  - market structure / technical rules

➔NEED TO EXPLORE THESE ‘RULES’

➔PRIMARY FOCUS OF STAGE 3 OF DSB PROJECT