Energy DSM
Which actions to improve Energy Efficiency in buildings?”

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The International Programme for DHC

- The IEA District Heating and Cooling Programme (IEA DHC) is the major international research and development programme for district heating and cooling.

- Established in 1983, IEA DHC currently has participants from North America, Europe and Asia. Through its involvement in the IEA's Building Coordination Group, the DHC programme has contributed to the IEA work for G8.
- Members are very keen to attract new member countries from all continents, including the Plus 5 countries (Brazil, China, India, Mexico and South Africa).

VEKS

What does IEA DHC do?

- The programme coordinates an international programme of competitively tendered Research and Development projects, and also contributes to policy analysis and IEA Secretariat initiatives.

www.iea-dhc.org

EU financed project "District Heating in Candidate Countries (DHCAN)".

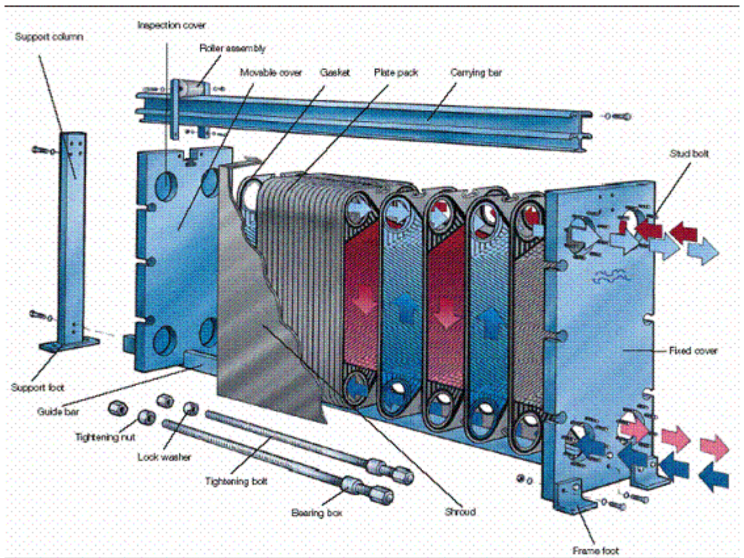
- The Case for District Heating: 1000 Cities Cannot be Wrong
  For decision makers – setting out the main benefits
- District Heating System Modernisation and Rehabilitation Guide
  For energy managers – key issues for refurbishing networks
- District Heating System Management Guide
  For district heating company managers
- District Heating System Ownership Guide
  Options for public and/or private ownership models
- District Heating System Institutional Guide
  Background policy and regulatory issues
- Guide for Modernization of District Heating Systems by Implementation of Small / Medium Cogeneration
  Making the case for CHP - used for the pilot action in Romania
- The heat that turns the light on
  District heating promotional flyer for the general public

www.projects.bre.co.uk/DHCAN/guides.html

What is Demand Side Management?

- Definition:
  - A utility program aimed at reducing consumer use of energy through conservation or efficiency measures.

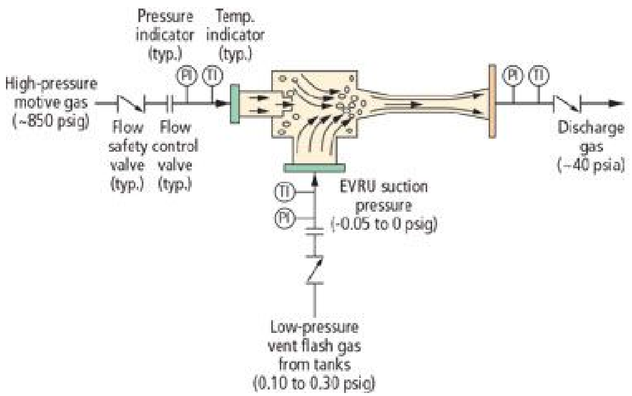
Technical aspects of DSM



- The efficiency of heat use in customer buildings is often low because substations and receiving installations are old technology often in poor technical condition.

- There is a general lack of automatic control and metering. Simultaneously heat losses in buildings are relatively high.

Technical aspects of DSM



- Buildings are equipped with internal space heating and domestic hot water installations, which are connected to the DH network by substations.
- Various types of substation
  - 'hydro elevators' (ejectors)
  - mixing pumps
  - shell and tube heat exchangers
  - direct connections - in industrial buildings

Technical aspects of DSM

- Traditionally, heat supply control in DH systems in CEE countries is ‘qualitative’.
  - Constant water flow during the heating season and periodic changes of primary water temperature in the heat source depending on weather conditions.
  - Water flow rate is less in summer time with constant water temperature at a lower level.
  - Low water flow speed and time delays in the DH network, together with uneven customer heating needs means that this kind of heat supply control does not secure rational heat utilisation, and customers often receive either surplus or deficit in heating.

Technical aspects of DSM

- Modernisation of substations is one of the most important tasks involved with changing the DH system operation philosophy from generation to demand driven.

- The modernisation of substations should be well co-ordinated both on demand and supply side. It should take into account the possible scope of investments connected with automatic and remote control of heat supply.

DH system modernisation plan

Main elements of substation modernisation

- Implementation of modern techniques and equipment, including:
  - Plate heat exchangers replacing obsolete equipment like “hydro elevators” (injectors) as well as shell and tube heat exchangers.
  - IMPORTANT: When using plate heat exchangers it is evident to ensure proper water treatment is incorporated and water quality is monitored and controlled to the required quality.

DH system modernisation plan

Main elements of substation modernisation

- Updating of existing substations including implementation of automatic control of heat supply for heating according to weather conditions and automatic control of domestic hot water temperature.
- Implementation of heat meters together with a new tariff system.

Modernisation of substations

- Modernisation of substations, the key element of DH system rehabilitation, is difficult.
- In most networks it would not be possible to replace all substations during one summer – it usually takes several years.
- This means that both old and new substations have to be operated at the same time and supplied from the same network.

Modernisation of substations

- The problems:
  - Old and new substations are not able to co-operate because they are working according to a different mode of DH system operation.
  - Old substations, working at constant water flow in the DH network, will be disturbed by modern substations equipped with a ‘weather controller’ (an electronic device with a control valve).
  - Closing the control valves in modern substations (especially in spring and autumn) will cause excess heat (DH water flow) to the old substations and overheating of buildings.

Modernisation of substations

- The customer's only choice is to open a window and ventilate the excess heat out.

- The opposite situation causes under-heating, which leads to the use of additional heat sources (probably electric heaters) to keep room temperature at the required level. This problem means that the actual benefit of modernisation is less than expected.

Modernisation of substations

- To reduce or even avoid disturbances in DH system operation during the transition years pressure difference controllers (limiting valves) should be installed in ‘old’ substations or even in distribution network branches.
- Simultaneously variable speed pumps should be installed in heat sources and pumping stations in DH systems.

Modernisation of substations

- Transmission of warm water from group substations to buildings causes large heat losses due to poor thermal insulation of pipes.

- The suggested solution is to use existing space heating pipes as a two pipe network delivering heat for heating and domestic hot water needs, pipes circulating domestic hot water and installing in buildings heat exchangers for domestic hot water needs.

Thermal upgrade of buildings

- Low-cost building modernisation
  - Improvement of window sealing
  - Installation of ”heat reflector-insulation” between radiator and wall in rooms
  - Replacing or tightening old radiator

- Low-cost building modernisation
  - Replacement of old windows with high heat looses
  - Additional thermal insulation to walls and roofs
  - Better insulation of internal pipelines

Thermal upgrade of buildings

- Low-cost building modernisation
  - Implementation of thermostatic radiator valves, heat cost allocators and individual billing system for flat users

- Low-cost building modernisation
  - Replacement of space heating and domestic hot water installations (pipelines, radiators)

Measurements and heat tariffs
Individual billing system

- DSM
  - Installation of meters
  - Implementation of a new tariff system
  - System should be carefully prepared

- Tariff conversion should be implemented only when sufficient reliable metered heat consumption data is available

District heating tariff

Two main components reflecting the cost structure

- A fixed charge
  - Calculated according to the heat output ordered by the customers.
  - The charge should cover the cost of permanent staff and part of the maintenance cost and heat losses.
- A variable charge
  - Calculated according to the amount of heat delivered to the building.
  - Should cover the cost of fuel, water, electricity and heat purchase, together with the remaining part of the maintenance cost.

District heating tariff
How to meter the consumption

- Building supplied from a DH network should be equipped with one main heat meter installed in the connection to the DH network.

- Sometimes heat supplied to the building has to be divided into space heating and domestic hot water installations –> an additional heat meter has to be installed in the heat exchanger.

District heating tariff

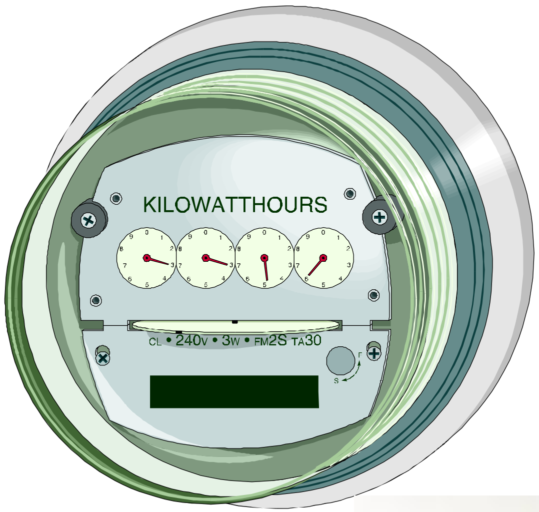
How to meter the consumption

- To divide heat supply cost between flat users in the building the metered heat amount should be allocated to the particular flats.

- Billing system implemented for flat users, based on heat cost allocators installed at room radiators and water meters installed in taps.

DSM in DH sector

Introduction of individual meters



- Introduction of meters
- Three cases:
  - Dense/low owner-occupies dwellings (terraced houses).
  - Dense/low rented dwellings (terraced houses).
  - Multi-storey buildings.

DSM in DH sector

Introduction of individual meters - Summary of the cases

- Reduction of consumption:
  - Up to 30% has been registered.
  - Becomes apparent relatively quickly, usually around one or two years following the transition to individual metering.
  - Is maintained in the subsequent years.

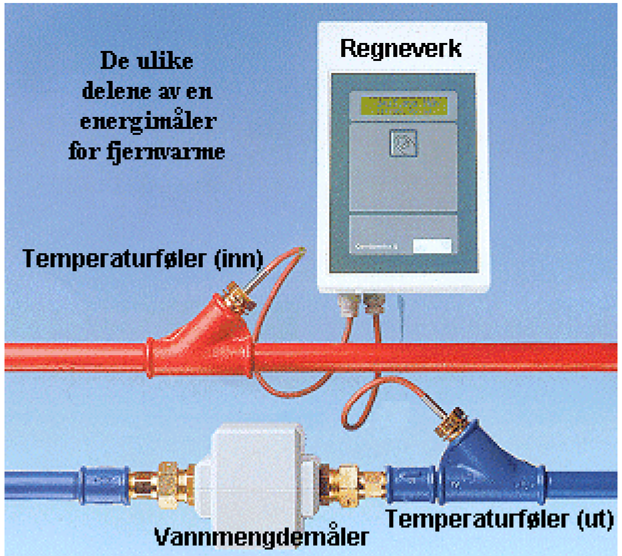
DSM in DH sector

Introduction of individual meters - Summary of the cases

- Impossible to calculate the exact expected reduction in consumption following the transition to individual metering.
- A reduction of at least 15-17% is not, however, thought to be unrealistic.

DSM in DH sector

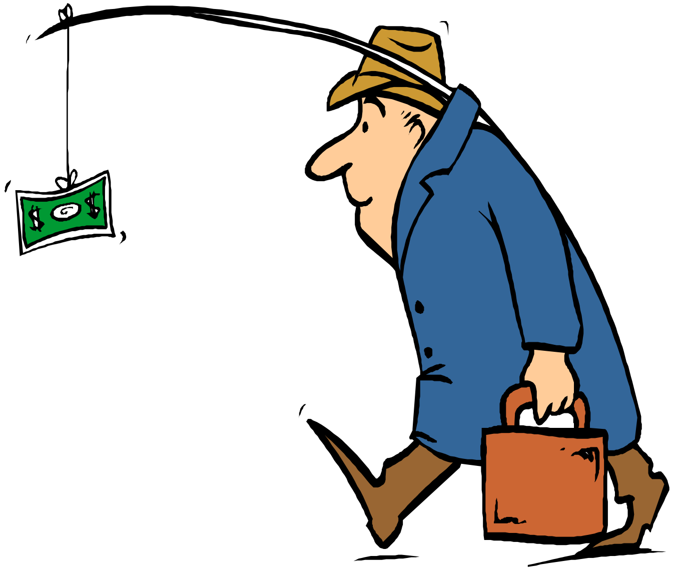
Introduction of individual meters - Summary of the cases



- When a general requirement to reduce energy consumption exists, it is absolutely vital to introduce meters.

DSM in DH sector

Introduction of individual meters - Summary of the cases



- Only
  - If the consumers themselves feel that they benefit from the advantages that can be achieved by reducing the consumption
  - Then they will choose to make such reductions!

DSM in DH sector

Summary - Start to think in a new way

- Reverse the "chain" and focus on:
  - Consumption
  - Distribution
  - Production.

- Otherwise investments in production facilities and distribution network will be wasted due to reduced heat demand as a consequence of new billing systems etc.

Thank you

For further information:

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ENERGI TIL DIG PÅ VESTEGNEN