ActNOW: Improving Energy Efficiency through Capacity Building of Public Administrations

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Round Table
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Motivation

In EU 50% of final energy is used for heating and cooling (80% from that in buildings)

Directive 2010/31/UE
• new public buildings (after 31 Dec. 2018) should demand „close to zero energy“ – they should produce Energy for their needs;
• after 31 Dec. 2020 all buildings including private.
Cities formulated their SEAPs (Sustainable Energy Action Plans) to fulfill requirements but their implementation is not always satisfying – therefore ActNow – supports cities in their efforts.

But EU continues - new Directive 2018/844/UE (to be implemented in EU countries by 20.03.2020):
• long term thermomodernization plans are required
• self-regulating systems (regulating temperature in all rooms) are postulated
• support for electromobility (parking with electro-charging systems)
• compatibility with smart grids are postulated
• heating/clima system should be reviewed
Motivation

Local (cities) administration plays key role not only in 'Energiewende' energy transformation but any innovative (disruptive) technology implementation (lesson learned from PEA project – public buildings).

Action plans should differentiate between old and new buildings (where much stronger requirements are proposed)
• in old blds thermomodernization and implementation of better (more energy efficient) technologies should be progressively performed
• new blds should be smart and more energy efficient (e.g. they should include EMS systems and efficient heat sources like Low Temperature DH (4 G) systems, heat storages or waste/surplus heat utilization, etc.)

ActNow Project is going to identify challenges, barriers and chances in every participating city to fulfil the EU regulations
Main goals and actions

In ActNow project municipalities together with their expert partners (from science and energy efficiency entities) are working on implementation of respective SEAPs.

1. First, challenges, barriers and chances for increase of energy efficiency in every participating city were identify (including SWOT analysis) and customized capacity building schemes (including plans for necessary workshops) was formed.
2. The local energy efficiency Groups (LEEGs) has been created in order to facilitate the SEAP/SECAP implementation.
3. Investment plans (in agreement with SEAP/SECAP) and their financing are under development.
4. Pilots investments focusing on energy monitoring and management systems are being implemented.
1. Problems opportunities identification

The works are being done in tandems municipality/expert partner
• First, challenges, barriers and chances for increase of energy efficiency in every participating city were identify (including SWOT analysis)
  ➢ This included:
  ❖ policy issues (SEAP, management, stakeholders, etc.)
  ❖ energy planning (monitoring, targets being set,
  ❖ implementation (documentation, control, procurement, auditing)
  ❖ resources (personal, financial, technical, market, ...)
  ❖ Infrastructure (technical: buildings, metering)

• customized capacity building schemes (including plans for necessary workshops) was formed based on SWOT analysis.

Problems, often political changes may inhibit strategy implementation (lack of long term planning – from election to election).
2. Local Energy Efficiency Groups (LEEGs)

The local energy efficiency Groups (LEEGs) has been created in order to facilitate the SEAP/SECAP implementation.

LEEGs consist of city administration (the higher level the better), expert partner and other experts (heat and power production and distribution, financing bodies, local administration, building associations, private owners association, etc.) and stakeholders.
3. Investment planning

Investment plans (in agreement with SEAP/SECAP) and their financing are under development.

The plans are being developed on the bases of SEAP/SECAP, knowledge of modern technologies and auditing activities, in Gdynia they concentrate on educational buildings (more than 10 audits and certificates are being issued)
4. Pilot investment

Pilots investments focusing on energy monitoring and management systems are being implemented.

Functions
- well being - air conditioning (CO2, temperature, …)
- balancing demand and supply
- demand and supply flexibility (heat/power storage necessary)
- planning on the base of weather prognosis
  buy when there is bad forecast
- cooperation with local energy suppliers (special energy management programs)

Need for special infrastructure to fully apply the knowledge gained from EMS: energy and heat storage installations
Systemy monitoringu
Easy and fast

Reading consumption values from smart meter data interface

• Pulse
• M-bus
• (analog)

Storing the consumption data to the dedicated db

Kamstrup 801 / 601 / 602

M-bus

250€
M-bus master
Elvaco CMa30

Raspberry pi

50€

AMQP / IP

USB

db
Online registration by camera system

Heat supply, GJ

Date and time
Innovative technologies to be introduced
Modern insulation technologies (PCM)
Phase changing materials

For walls with Alba®balance plasterboards, the room temperature measured over a longer period of time remained consistently in a comfort zone between 22 and 25°C (with the exception of a few peaks and troughs).
Heat storage needs

Temperature

Heat demand
Oversized boiler systems

Case study 1 - mismatch between the energy production and demand

Old town

44 objects were identified for potential modernisation

The installation place of a heat storage

1 MWh of heat
Low Temperature District Heating (4G LT DH)

From 1 generation (above 100°C) to 4 generation (below 60°C) district heating

After „Guidelines for Low-Temperature District Heating”
Advantages:

+ low temperatures reduce heat losses in DH pipes
+ LT DH enables inclusion of other RES e.g. thermal collectors, geothermal sources, ...
+ use of low temperature waste (surplus heat)
+ low temperatures reduce the thermal stress in pipes and prolong DH life
+ low temperature of return flow heat enable its application for flue gas condensation
Roadmap to Low Temperature DH

a) Connecting new development area
b) Small-scale district heating for new development area
c) Connecting existing area
d) Renovation of existing district heating system
e) Low temperature waste heat source to heat pump

After „Guidelines for Low-Temperature District Heating”
Low Temperature grid in Albertslund

New measures: isolation of roof and walls

Isolation of windows, toilets and new radiators

Before:
Old townhouse on high temp. DH

Now:
Refurbished house on low temp. DH
Low Temperature grid in Albertslund

More than 50% reduction of heat bills
LTDH in existing building from 70\textsubscript{ies} without renovation

- Pilot GATE 21 – in after-school care facility 191 m\textsuperscript{2}, built in the 1970’s (before energy standards in national building regulations), 200 mm insulation in walls, 250 mm insulation on roof, 200 mm insulation in floors and 2-layered thermo windows
- Ventilation with intake and exhaust. 80 \% heat recirculation (not in all rooms)
- Heated with 2-strand heat system with radiators in all rooms (both small and big)
- Wish from users: 20 °C in all 12 rooms all year
- 70 users every working day (mon.-fri.)
LTDH in existing building from 70ies

- It is possible to convert to low temperature district heating in an existing building without optimising it energetically
  
  With the right technical installations and operational control
  
  Especially important, that the radiators work and are a bit overdimensioned in order to ensure the room temperature and good cooling of the return heat

- Low temperature DH can provide enough heat through the winter months (at a few minus C)
  
  In this case, down to -5 °C
  
  if lower, then no night-time drop - necessary to think more solutions (e.g. heat pumps) in the heat system of the building

- Much more energy than first believed can be saved converting to low temperature DH in existing buildings – in this case, 30 % savings (one part is energy savings, the other part building control...)
Waste heat utilisation in Kalundborg

Kalundborg City: dense industrial sites; thus, a substantial amount of surplus (waste) heat

Heat transfer – long distance
DH return flows as source for LTDH

After „Guidelines for Low-Temperature District Heating”
Conclusions

• Administration place a **key role** in energy transformation and other innovative technologies, but it needs support from local stakeholders to make long term plans and to advance their implementation;

• Local Energy Efficiency Group can support the positive changes

• Modern technologies are ready but their implementation need promotion, courage and consequence in advancement;

• Thermal renovation is required but it is long process, nevertheless even in old houses energy efficiency could be improved.
Minor and Major Changes