

# Technology Fact Sheet – Heating, Ventilation and Air Conditioning (HVAC)

provided by Baltic Energy Conservation Agency (BAPE)

## Step by step to implement a feasibility study

### 1 Analysing Status Quo

#### 1.1 Check lists

##### a) Space heating

Check type of heating (water radiators, convectors, air heating, other)	<input type="checkbox"/>
Check hours of operation against working hours and facility usage	<input type="checkbox"/>
Check parameters of heating against the facility operation and requirements	<input type="checkbox"/>
Check actual internal temperature against designed temperature (comfort conditions)	<input type="checkbox"/>
Check utilisation of heating system	<input type="checkbox"/>
Check location, operation and technical conditions of heaters	<input type="checkbox"/>
Check location, operation, settings and technical conditions of existing controllers	<input type="checkbox"/>
Check necessity of additional control: time, temperature setting, zoning	<input type="checkbox"/>
Check potential for reduction of heating load	<input type="checkbox"/>

##### b) Ventilation and air conditioning (VAC)

Check type of installed system (s)	<input type="checkbox"/>
Check parameters of VAC against the facility operation and requirements	<input type="checkbox"/>
Check actual parameters against designed comfort conditions	<input type="checkbox"/>
Check capacity of heating and cooling and volume of air change	<input type="checkbox"/>
Check location, operation and technical conditions of air terminal units	<input type="checkbox"/>
Check location, operation, settings and technical conditions of existing controllers	<input type="checkbox"/>
Check necessity of additional control functions	<input type="checkbox"/>
Check leakages and losses in VAC systems	<input type="checkbox"/>
Check potential for heat recovery	<input type="checkbox"/>
Check potential for reduction of cooling load	<input type="checkbox"/>

##### c) Tap hot water (THW)

Check system of THW: water heating, tanks, piping, fittings, taps	<input type="checkbox"/>
Check temperature of supply and circulation	<input type="checkbox"/>
Check outflows from taps and water	<input type="checkbox"/>
Check standard and quality of insulation	<input type="checkbox"/>
Check possibility of using waste heat or heat pump for water heating	<input type="checkbox"/>

## 1.2 Key figures

How much final energy is used for space heating, VAC and DHW (in kWh)?

What is the heated floor area and volume of heated space?

What are the energy consumption specific figures: kWh/m<sup>2</sup> or/and kWh/m<sup>3</sup>?

What is air supply and exhaust of VAC systems (m<sup>3</sup>/h) and total balance of air exchange against ventilated volume (1/h).

Estimation of electricity consumption as auxiliary energy (drives of fans, pumps, compressors, chilliers).

Heating, cooling and ventilation profile during a day and week.

What is the thermal demand in kW in total?

What is the age of the existing HVAC systems?

What are the relevant energy prices (heat and electricity)?

Is the heating demand more specifiable?

- Room heating in kWh
- Ventilation and air conditioning heat consumption in kWh
- Energy consumption for warm water in kWh
- Energy consumption for cooling devices

How is the generation of warm water implemented?

- Centralised
- Decentralised
- Use of heat recovery and solar thermal facilities

Are there any incentives available?

## 2 Technical Assessment

### *Space heating*

- Use of convection heaters vs. gas or electric radiators
- Temperature control and reductions after working hours

### *Ventilation and air conditioning*

- Air quality in working space
- Operation of dilution-type ventilation and local exhaust ventilation
- Air exchange control and reductions after working hours
- Prevention of unwanted draughts (gates, doors, windows)
- Centralised vs. decentralised air conditioning

### *Tap hot water*

- THW control and reductions after working hours
- Possibilities for heat recovery in VAC systems
- Possibilities for heat recovery, solar heat and heat pump in THW

### 3 Further assumptions

- Development of energy prices at local market

### 4 Economical calculation

- Calculation of total costs
  - Investment – costs at local market
  - Operation and maintenance
  - Others
  - Financing
- Calculation of total revenues
  - Savings in heat use
  - Savings in electricity consumption
  - Savings in water use
- Feasibility and profitability of retrofits (no-cost, low-cost and hi-cost measures)

### 5 Recommendations

#### ***Systems of heat recovery in VAC***

- Coupled heat exchangers
- Cross-flow recuperator
- Heat pipes
- Rotary regenerator
- Heat pump with two heat exchangers
- Combination of cross-flow recuperator and heat pump

#### ***Systems of air cooling in AC systems***

- Use of free cooling
- Use of VRV systems with heat recovery

#### ***Systems of THW preparation***

- Use of waste heat (air, water, technology)
- Use of heat pump with waste heat as lower source
- Use of solar energy

#### ***Potential for trigeneration***

- Demand for heat, hot water, cooling and electricity to be considered jointly