



## **EIE Projekt ROSH**

Development and marketing of integrated concepts for energy efficient and sustainable retrofitting of social housing

[www. Rosh-project.eu](http://www.Rosh-project.eu)

## **Cost data base on retrofitting investments / equipment**

**WP 3** Advanced Tailored Financial Schemes  
**Task 3.1** Analysis of existing financial mechanisms and economic conditions  
**Deliverable** D 14

**Country** Bulgaria  
**Organisation** BSREC  
**Editor** N.Moumdjian

Sofia 11.07.2007

## Investment costs

### Windows & doors

Total investment costs, including material, manwork and transport

**Reference building:** stand alone building, 1.000 m<sup>2</sup> floor area, 140.000 kWh/m<sup>2</sup>.a, 100 kW, 12 flats, 4 floors, gross floor area: 320 m<sup>2</sup>, building height 13 m

**Reference installations:** central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

| Nr.   | activity  | material                  | thermal quality                                     | net amount | reference              | VAT  | gross amount | share of salery on total costs | average life |
|-------|---|---------------------------|---|------------|------------------------|------|--------------|--------------------------------|--------------|
|       |   |                           |   | [€]        |                        | [%]  | [€]          | [%]                            | [a]          |
| 1.1.1 | repair of windows: painting of window frame                           | -                         | -   | 7,86       | /m <sup>2</sup> window | 20,0 | 9,43         | 0-20                           | 2            |
|       | repair of windows: painting of window frame & improving air tightness | -                         | -   | 13,03      | /m <sup>2</sup> window | 20,0 | 15,64        | 20-40                          | 2            |
| 1.1.2 | replacement of panes  | -                         | thermal insulation glazing and thermal edge bonding | 34,37      | /m <sup>2</sup> window | 20,0 | 41,24        | 0-20                           | 10           |
|       |   | -                         | 3-pane glazing                                      | 45,03      | /m <sup>2</sup> window | 20,0 | 54,04        | 0-20                           | 10           |
| 1.1.3 | replacement of windows  | wood frame                | thermal insulation glazing and thermal edge bonding | 108,66     | /m <sup>2</sup> window | 20,0 | 130,39       | 0-20                           | 10           |
|       |   | wood frame                | 3-pane glazing                                      | 114,09     | /m <sup>2</sup> window | 20,0 | 136,91       | 0-20                           | 10           |
|       |   | aluminium clad wood frame | thermal insulation glazing and thermal edge bonding | 132,95     | /m <sup>2</sup> window | 20,0 | 159,54       | 0-20                           | 10           |
|       |   | aluminium clad wood frame | 3-pane glazing                                      | NA         | /m <sup>2</sup> window |      |              |                                |              |
|       |   | vinyl frame               | thermal insulation glazing and thermal edge bonding | 97,91      | /m <sup>2</sup> window | 20,0 | 117,49       | 0-20                           | 10           |
|       |   | vinyl frame               | 3-pane glazing                                      | 120,42     | /m <sup>2</sup> window | 20,0 | 144,50       | 0-20                           | 10           |
| 1.2   | installation of shutters  | jalousie                  | -   | NA         | /m <sup>2</sup> window |      |              |                                |              |
|       |   | rolling shutter           | -   | 18,98      | /m <sup>2</sup> window | 20,0 | 22,78        | 0-20                           | 5            |
|       |   | marquee                   | -   | 70,00      | /m <sup>2</sup> window | 20,0 | 84,00        | 0-20                           | 5            |
| 1.3   | replacement of main entrance door                                     | wooden                    | -   | 65,00      | /m <sup>2</sup> door   | 20,0 | 78,00        | 0-20                           | 5            |
|       |   | vinyl                     | -   | 70,00      | /m <sup>2</sup> door   | 20,0 | 84,00        | 0-20                           | 5            |
|       |   |                           |   |            | /m <sup>2</sup> door   |      |              |                                |              |

## Investment costs

### Insulation

Total investment costs, including material, manwork and transport

**Reference building:** stand alone building, 1.000 m<sup>2</sup> floor area, 140.000 kWh/m<sup>2</sup>.a, 100 kW, 12 flats, 4 floors, gross floor area: 320 m<sup>2</sup>, building height 13 m

**Reference installations:** central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

| Nr. | activity  | material               | thickness              | net amount | reference              | VAT  | gross amount | costs for additional insulation | share of salery on total costs | average life |
|-----|---|------------------------|------------------------|------------|------------------------|------|--------------|---------------------------------|--------------------------------|--------------|
|     |   |                        |                        | [€]        |                        | [%]  | [€]          | [€/cm]                          | [%]                            | [a]          |
| 1.4 | total insulation of balconies                     | PS                     | 10 cm                  | 26,58      | /m <sup>2</sup> wall   | 20,0 | 31,90        | 0,62                            | 0-20                           | 5-10         |
|     |   | PS                     | 16 cm                  | 34,12      | /m <sup>2</sup> wall   | 20,0 | 40,94        | 0,66                            | 0-20                           | 5-10         |
|     |   | PU                     | 10 cm                  | 20,15      | /m <sup>2</sup> wall   | 20,0 | 24,18        | 0,40                            | 0-20                           | 5-10         |
|     |   | PU                     | 16 cm                  | 27,64      | /m <sup>2</sup> wall   | 20,0 | 33,17        | 0,43                            | 0-20                           | 5-10         |
|     |   | mineral wool           | 10 cm                  | 18,00      | /m <sup>2</sup> wall   | 20,0 | 21,60        | 0,44                            | 0-20                           | 5-10         |
|     |   | mineral wool           | 16 cm                  | 24,27      | /m <sup>2</sup> wall   | 20,0 | 29,12        | 0,47                            | 0-20                           | 5-10         |
| 1.5 | changing balconies to wintergardens               | wooden construction    | low energy standard    | 114,09     | /m <sup>2</sup> window | 20,0 | 136,91       | 0,44                            | 20-40                          | 5-10         |
|     |   | wooden construction    | passive house standard | 125,53     | /m <sup>2</sup> window | 20,0 | 150,64       | 0,62                            | 20-40                          | 5-10         |
|     |   | aluminium construction | low energy standard    | 97,60      | /m <sup>2</sup> window | 20,0 | 117,12       | 0,44                            | 20-40                          | 5-10         |
|     |   | aluminium construction | passive house standard | 120,42     | /m <sup>2</sup> window | 20,0 | 144,50       | 0,62                            | 20-40                          | 5-10         |
| 2.1 | insulation of basement walls against external air | PS                     | 10 cm                  | 26,58      | /m <sup>2</sup> wall   | 20,0 | 31,90        | 0,62                            | 0-20                           | 5-10         |
|     |   | PS                     | 16 cm                  | 36,77      | /m <sup>2</sup> wall   | 20,0 | 44,12        | 0,66                            | 0-20                           | 5-10         |
|     |   | PU                     | 10 cm                  | 23,22      | /m <sup>2</sup> wall   | 20,0 | 27,86        | 0,40                            | 0-20                           | 5-10         |
|     |   | PU                     | 16 cm                  | 31,53      | /m <sup>2</sup> wall   | 20,0 | 37,84        | 0,43                            | 0-20                           | 5-10         |
|     |   | mineral wool           | 10 cm                  | 18,00      | /m <sup>2</sup> wall   | 20,0 | 21,60        | 0,44                            | 0-20                           | 5-10         |
|     |   | mineral wool           | 16 cm                  | 25,66      | /m <sup>2</sup> wall   | 20,0 | 30,79        | 0,47                            | 0-20                           | 5-10         |
| 2.2 | insulation of basement walls against soil         | PS                     | 10 cm                  | 29,15      | /m <sup>2</sup> wall   | 20,0 | 34,98        | 0,62                            | 0-20                           | 5-10         |

| Nr.          | activity  | material     | thickness  | net amount | reference             | VAT   | gross amount          | costs for additional insulation | share of salery on total costs | average life |      |      |
|--------------|---|--------------|--|------------|-----------------------|-------|-----------------------|---------------------------------|--------------------------------|--------------|------|------|
|              |   |              |  | [€]        |                       | [%]   | [€]                   | [€/cm]                          | [%]                            | [a]          |      |      |
| 2.3          | insulation of basement wall against unheated basement | PS           | 16 cm  | 41,84      | /m <sup>2</sup> wall  | 20,0  | 50,21                 | 0,66                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 10 cm  | 19,43      | /m <sup>2</sup> wall  | 20,0  | 23,32                 | 0,40                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 16 cm  | 27,62      | /m <sup>2</sup> wall  | 20,0  | 33,14                 | 0,43                            | 0-20                           | 5-10         |      |      |
|              |   | mineral wool | 10 cm  | 18,00      | /m <sup>2</sup> wall  | 20,0  | 21,60                 | 0,44                            | 0-20                           | 5-10         |      |      |
|              |   | mineral wool | 16 cm  | 25,66      | /m <sup>2</sup> wall  | 20,0  | 30,79                 | 0,47                            | 0-20                           | 5-10         |      |      |
|              |   | PS           | 10 cm  | 20,58      | /m <sup>2</sup> wall  | 20,0  | 24,70                 | 0,62                            | 0-20                           | 5-10         |      |      |
|              |   | PS           | 16 cm  | 28,18      | /m <sup>2</sup> wall  | 20,0  | 33,82                 | 0,66                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 10 cm  | 19,43      | /m <sup>2</sup> wall  | 20,0  | 23,32                 | 0,40                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 16 cm  | 27,62      | /m <sup>2</sup> wall  | 20,0  | 33,14                 | 0,43                            | 0-20                           | 5-10         |      |      |
|              |   | mineral wool | 10 cm  | 16,00      | /m <sup>2</sup> wall  | 20,0  | 19,20                 | 0,44                            | 0-20                           | 5-10         |      |      |
| 2.4.1        | insulation of base plate                              | mineral wool | 16 cm  | 22,40      | /m <sup>2</sup> wall  | 20,0  | 26,88                 | 0,47                            | 0-20                           | 5-10         |      |      |
|              |   | PS           | 10 cm  | 29,15      | /m <sup>2</sup> floor | 20,0  | 34,98                 | 0,62                            | 0-20                           | 5-10         |      |      |
|              |   | PS           | 16 cm  | 39,33      | /m <sup>2</sup> floor | 20,0  | 47,20                 | 0,66                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 10 cm  | 20,15      | /m <sup>2</sup> floor | 20,0  | 24,18                 | 0,40                            | 0-20                           | 5-10         |      |      |
|              |   | PU           | 16 cm  | 28,96      | /m <sup>2</sup> floor | 20,0  | 34,75                 | 0,43                            | 0-20                           | 5-10         |      |      |
|              |   | mineral wool | 10 cm  | 18,25      | /m <sup>2</sup> floor | 20,0  | 21,90                 | 0,44                            | 0-20                           | 5-10         |      |      |
|              |   | mineral wool | 16 cm  | 26,00      | /m <sup>2</sup> floor | 20,0  | 31,20                 | 0,47                            | 0-20                           | 5-10         |      |      |
|              |   | 2.4.2        | insulation of basement ceiling against unheated basement | PS         | 10 cm                 | 29,15 | /m <sup>2</sup> floor | 20,0                            | 34,98                          | 0,62         | 0-20 | 5-10 |
|              |   |              |  | PS         | 16 cm                 | 39,33 | /m <sup>2</sup> floor | 20,0                            | 47,20                          | 0,66         | 0-20 | 5-10 |
|              |   |              |  | PU         | 10 cm                 | 20,15 | /m <sup>2</sup> floor | 20,0                            | 24,18                          | 0,40         | 0-20 | 5-10 |
| PU           | 16 cm   |              |  | 28,96      | /m <sup>2</sup> floor | 20,0  | 34,75                 | 0,43                            | 0-20                           | 5-10         |      |      |
| mineral wool | 10 cm   |              |  | 18,22      | /m <sup>2</sup> floor | 20,0  | 21,86                 | 0,44                            | 0-20                           | 5-10         |      |      |
| mineral wool | 16 cm   |              |  | 26,00      | /m <sup>2</sup> floor | 20,0  | 31,20                 | 0,47                            | 0-20                           | 5-10         |      |      |
| 2.5.1        | insulation of exterior wall                           |              |  | PS         | 10 cm                 | 23,58 | /m <sup>2</sup> wall  | 20,0                            | 28,30                          | 0,62         | 0-20 | 5-10 |

| Nr.   | activity  | material     | thickness | net amount | reference             | VAT  | gross amount | costs for additional insulation | share of salery on total costs | average life |
|-------|---|--------------|-----------|------------|-----------------------|------|--------------|---------------------------------|--------------------------------|--------------|
|       |   |              |           | [€]        |                       | [%]  | [€]          | [€/cm]                          | [%]                            | [a]          |
|       |   | PS           | 16 cm     | 31,44      | /m <sup>2</sup> wall  | 20,0 | 37,73        | 0,66                            | 0-20                           | 5-10         |
|       |   | mineral wool | 10 cm     | 18,00      | /m <sup>2</sup> wall  | 20,0 | 21,60        | 0,44                            | 0-20                           | 5-10         |
|       |   | mineral wool | 16 cm     | 25,60      | /m <sup>2</sup> wall  | 20,0 | 30,72        | 0,47                            | 0-20                           | 5-10         |
| 2.5.2 | painting of outer wall                            | -            | -         | 8,38       | /m <sup>2</sup> wall  | 20,0 | 10,06        | -                               |                                |              |
| 2.5.3 | renewing of external plaster (without insulation) | -            | -         | 3,17       | /m <sup>2</sup> wall  | 20,0 | 3,80         | -                               |                                |              |
| 2.6   | insulation of top floor slab                      | PS           | 24 cm     | 75,00      | /m <sup>2</sup> floor | 20,0 | 90,00        | 1,18                            | 0-20                           | 5-10         |
|       |   | PS           | 36 cm     | 102,40     | /m <sup>2</sup> floor | 20,0 | 122,88       | 1,29                            | 0-20                           | 5-10         |
|       |   | mineral wool | 24 cm     | 69,00      | /m <sup>2</sup> floor | 20,0 | 82,80        | 0,94                            | 0-20                           | 5-10         |
|       |   | mineral wool | 36 cm     | 87,25      | /m <sup>2</sup> floor | 20,0 | 104,70       | 1,03                            | 0-20                           | 5-10         |
| 2.7   | insulation of high peaked roof                    | PS           | 24 cm     | 85,60      | /m <sup>2</sup> floor | 20,0 | 102,72       | 1,18                            | 0-20                           | 5-10         |
|       |   | PS           | 36 cm     | 109,80     | /m <sup>2</sup> floor | 20,0 | 131,76       | 1,29                            | 0-20                           | 5-10         |
|       |   | mineral wool | 24 cm     | 78,30      | /m <sup>2</sup> floor | 20,0 | 93,96        | 0,94                            | 0-20                           | 5-10         |
|       |   | mineral wool | 36 cm     | 97,90      | /m <sup>2</sup> floor | 20,0 | 117,48       | 1,03                            | 0-20                           | 5-10         |
| 2.8   | substitution of a flat roof with an attic roof    | -            | -         | NA         | /m <sup>2</sup> roof  |      |              |                                 |                                |              |
| 2.9   | insulation of flat roof                           | PS           | 24 cm     | 90,00      | /m <sup>2</sup> roof  | 20,0 | 108,00       | 1,18                            | 0-20                           | 5-10         |
|       |   | PS           | 36 cm     | 116,30     | /m <sup>2</sup> roof  | 20,0 | 139,56       | 1,29                            | 0-20                           | 5-10         |
|       |   | PU           | 24 cm     | 58,54      | /m <sup>2</sup> roof  | 20,0 | 70,25        | 0,60                            | 0-20                           | 5-10         |
|       |   | PU           | 36 cm     | 75,20      | /m <sup>2</sup> roof  | 20,0 | 90,24        | 0,66                            | 0-20                           | 5-10         |
|       |   | mineral wool | 24 cm     | 85,60      | /m <sup>2</sup> roof  | 20,0 | 102,72       | 0,98                            | 0-20                           | 5-10         |
|       |   | mineral wool | 36 cm     | 109,80     | /m <sup>2</sup> roof  | 20,0 | 131,76       | 1,05                            | 0-20                           | 5-10         |

## Investment costs

### Building services

Total investment costs, including material, manwork and transport

**Reference building (insulated!):** stand alone building, 1.000 m<sup>2</sup> floor area, **70.000 kWh/m<sup>2</sup>.a, 50 kW**, 12 flats, 4 floors, gross floor area: 320 m<sup>2</sup>, building height 13 m

**Reference installations:** central heating system, fuel: oil (extra light), boiler: constant temperature, domestic hot water: decentral (electric), regulation: depending on outside temperature, 2 heater circuits, 2 pipes-system, pipes insulated (2/3 of the pipe diameter), 2 pumps: single level - not insulated, 5 radiators per flat (total 60 radiators), manually operated radiator valves, conventional chimney: 16 cm diameter

| Nr.   | activity  | net amount<br>[€]     | reference                  | VAT<br>[%] | gross amount<br>[€] | costs for<br>additional<br>power<br>[€/10kW] | share of<br>salery on<br>total costs<br>[%] | average life<br>[a] |
|-------|---|-----------------------|----------------------------|------------|---------------------|--|---|---------------------|
| 3.1   | installation of a condensing gas-boiler (including fee for connecting to the gas-net)   | 18                    | /m <sup>2</sup> floor area | 20,0       | 22                  |  | 20-40                                       | 20                  |
| 3.2   | installation of a gas-boiler (including fee for connecting to the gas-net)  | 18                    | /m <sup>2</sup> floor area | 20,0       | 22                  |  | 20-40                                       | 20                  |
| 3.3   | installation of a condensing oil-boiler   | 15                    | /m <sup>2</sup> floor area | 20,0       | 18                  |  | 20-40                                       | 20                  |
| 3.4   | installation of an oil-boiler   | 15                    | /m <sup>2</sup> floor area | 20,0       | 18                  |  | 20-40                                       | 20                  |
| 3.5   | installation of a district heating station, including fee for connection to district heating system                               | 10                    | /m <sup>2</sup> floor area | 20,0       | 11                  |  | 20-40                                       | 20                  |
| 3.6   | installation of a pellets-boiler  | 60                    | /m <sup>2</sup> floor area | 20,0       | 72                  |  | 20-40                                       | 10                  |
| 3.7   | installation of a biomass-boiler with heat storage  | 60                    | /m <sup>2</sup> floor area | 20,0       | 72                  |  | 20-40                                       | 20                  |
| 3.8.1 | installation of an electric heatpump (vertical borehole system)   | 55                    | /m <sup>2</sup> floor area | 20,0       | 66                  |  | 20-40                                       | 10                  |
| 3.8.2 | installation of an electric heatpump (horizontal pipe trench system)  | 55                    | /m <sup>2</sup> floor area | 20,0       | 66                  |  | 20-40                                       | 10                  |
| 3.9   | installation of a solar system for hot water supply (35 m <sup>2</sup> collectors, 1.700 l storage)                               | 21                    | /m <sup>2</sup> floor area | 20,0       | 25                  |  | 20-40                                       | 10                  |
| 3.10  | installation of a solar combi system - for hot water & heating (90 m <sup>2</sup> collectors, 4.500 l storage)                    | Not applicable for BG | /m <sup>2</sup> floor area |            |                     |  |   |                     |
| 3.11  | installation of a photovoltaik system (40 m <sup>2</sup> PV-panels)   | 310                   | /m <sup>2</sup> floor area | 20,0       | 372                 |  | 20-40                                       | 10                  |
| 3.12  | installation of a decentral ventilation system - with heat recovery (3 ventilation appliances per flat)                           | 18                    | /m <sup>2</sup> floor area | 20,0       | 22                  |  | 20-40                                       | 10                  |
| 3.13  | installation of a central ventilation system - with heat recovery (3 exhausts for inlet air and 3 discharge air outlets per flat) | 20                    | /m <sup>2</sup> floor area | 20,0       | 24                  |  | 20-40                                       | 10                  |
| 3.14  | insulation of pipelines (thickness corresponds to diameter of pipes)  | 5                     | /m <sup>2</sup> floor area | 20,0       | 6                   |  | 20-40                                       | 5                   |
| 3.15  | installation of thermostatic valves   | 1                     | /m <sup>2</sup> floor area | 20,0       | 1                   |  | 20-40                                       | 10                  |
| 3.16  | installation of energyefficient and speed controlled pumps  | NA                    | /m <sup>2</sup> floor area |            |                     |  |   |                     |
| 3.17  | hydraulic adjustment  | NA                    | /m <sup>2</sup> floor area |            |                     |  |   |                     |

**Note:**

- 1 The prices referring to 3.1 ÷ 3.4, as well as to 3.6 and 3.7 include designing and building of boiler room.*
- 2 The given price regarding 3.8 is for installation of VRF system (-20 °C ÷ +43 °C) with frequency controlled machines of direct evaporation, with transformation coefficient of heatpump >3 at  $\theta_e = -20$  °C*

## Running costs

Fuel costs only for heating

**Reference building:** insulated! (see 1.3\_Building services)

**Definitions:**

**old heating system:** ~ 30 years old

**new heating system:** new installed heating system

**efficiency of heating system:** includes heat losses of boiler (heat exchanger, heat pump, oven), storage, distribution and heat dissipation (e.g. radiator) for an average old heating system and for an average new heating system

| Nr.  | heating system             | fuel             | unit<br>[...]  | net amount<br>[€/...] | energy content<br>[kWh/...] | efficiency of old heating system<br>[%] | efficiency of new heating system<br>[%] |
|------|----------------------------|------------------|----------------|-----------------------|-----------------------------|---|---|
| 1.1. | central heating            | biomass          | kg             | 0,065                 | 3,49                        | 71                                      | 77                                      |
| 1.2  |                            | pellets          | kg             | 0,175                 | 5,47                        | 73                                      | 81                                      |
| 1.3  |                            | district heating | kWh            | 0,037                 | -                           | 87                                      | 90                                      |
| 1.4  |                            | oil              | l              | 0,630                 | 9,89                        | 79                                      | 81                                      |
| 1.5  |                            | gas              | m <sup>3</sup> | 0,299                 | 9,19                        | 81                                      | 84                                      |
| 1.6  |                            | heat pump        | kWh            | 0,014                 | -                           | 265                                     | 271                                     |
| 2.1  | individual central heating | biomass          | kg             | 0,065                 | 3,49                        | 70                                      | 74                                      |
| 2.2  |                            | pellets          | kg             | 0,175                 | 5,47                        | 77                                      | 84                                      |
| 2.3  |                            | district heating | kWh            | -                     | -                           | -                                       | -                                       |
| 2.4  |                            | oil              | l              | 0,630                 | 9,89                        | 83                                      | 84                                      |
| 2.5  |                            | gas              | m <sup>3</sup> | 0,299                 | 9,19                        | 84                                      | 87                                      |
| 3.1  | stove heating              | biomass          | kg             | 0,065                 | 3,49                        | 47                                      | 65                                      |
| 3.2  |                            | pellets          | kg             | 0,175                 | 5,47                        | 77                                      | 84                                      |
| 3.3  |                            | oil              | l              | 0,630                 | 9,89                        | 74                                      | 84                                      |
| 3.4  |                            | gas              | m <sup>3</sup> | 0,299                 | 9,19                        | 84                                      | 87                                      |
| 3.5  |                            | electricity      | kWh            | 0,075                 | -                           | 93                                      | 93                                      |
| 3.6  |                            | coal             | kg             | 0,040                 | 4,42                        | 56                                      | 65                                      |

## Running costs for **old** heating systems

**Reference building:** insulated! (see 1.3\_Building services)

**Definitions:**

**Net amount in € per kWh:** is estimated by the total energy costs and the efficiency of the heating system

**Total energy costs** include fuel costs as well as costs for maintenance, for delivery of fuels, for chimney sweeper, for electricity of pumps, regulation etc., for mandatory checks, for meter charge, for demand rate (district heating) and for costs which occur irrespective of consumption (e.g. costs for network access)

**Efficiency of heating system:** see 2.1\_Fuel costs

| Nr.  | heating system             | fuel             | net amount<br>[€/kWh] | VAT<br>[%] | gross amount<br>[€/kWh] |
|------|----------------------------|------------------|-----------------------|------------|-------------------------|
| 1.1. | central heating            | biomass          | 0,028                 | 20,0       | 0,03                    |
| 1.2  |                            | pellets          | 0,043                 | 20,0       | 0,05                    |
| 1.3  |                            | district heating | 0,031                 | 20,0       | 0,04                    |
| 1.4  |                            | oil              | 0,071                 | 20,0       | 0,09                    |
| 1.5  |                            | gas              | 0,039                 | 20,0       | 0,05                    |
| 1.6  |                            | heat pump        |                       |            |                         |
| 2.1  | individual central heating | biomass          | 0,028                 | 20,0       | 0,03                    |
| 2.2  |                            | pellets          | 0,043                 | 20,0       | 0,05                    |
| 2.3  |                            | district heating | -                     |            |                         |
| 2.4  |                            | oil              | 0,071                 | 20,0       | 0,09                    |
| 2.5  |                            | gas              | 0,039                 | 20,0       | 0,05                    |
| 3.1  | stove heating              | biomass          | 0,020                 | 20,0       | 0,02                    |
| 3.2  |                            | pellets          | 0,034                 | 20,0       | 0,04                    |
| 3.3  |                            | oil              | 0,063                 | 20,0       | 0,08                    |
| 3.4  |                            | gas              | 0,031                 | 20,0       | 0,04                    |
| 3.5  |                            | electricity      | 0,063                 | 20,0       | 0,08                    |
| 3.6  |                            | coal             | 0,013                 | 20,0       | 0,02                    |

## Running costs for **new** heating systems

**Reference building:** insulated! (see 1.3\_Building services)

**Definitions:**

**Net amount in € per kWh:** is estimated by the total energy costs and the efficiency of the heating system

**Total energy costs** include fuel costs as well as costs for maintenance, for delivery of fuels, for chimney sweeper, for electricity of pumps, regulation etc., for mandatory checks, for meter charge, for demand rate (district heating) and for costs which occur irrespective of consumption (e.g. costs for network access)

**Efficiency of heating system:** see 2.1\_Fuel costs

| Nr.  | heating system             | fuel             | net amount<br>[€/kWh] | VAT<br>[%] | gross<br>amount<br>[€/kWh] |
|------|----------------------------|------------------|-----------------------|------------|----------------------------|
| 1.1. | central heating            | biomass          | 0,028                 | 20,0       | 0,03                       |
| 1.2  |                            | pellets          | 0,043                 | 20,0       | 0,05                       |
| 1.3  |                            | district heating | 0,031                 | 20,0       | 0,04                       |
| 1.4  |                            | oil              | 0,071                 | 20,0       | 0,09                       |
| 1.5  |                            | gas              | 0,039                 | 20,0       | 0,05                       |
| 1.6  |                            | heat pump        |                       |            |                            |
| 2.1  | individual central heating | biomass          | 0,028                 | 20,0       | 0,03                       |
| 2.2  |                            | pellets          | 0,043                 | 20,0       | 0,05                       |
| 2.3  |                            | district heating | -                     |            |                            |
| 2.4  |                            | oil              | 0,071                 | 20,0       | 0,09                       |
| 2.5  |                            | gas              | 0,039                 | 20,0       | 0,05                       |
| 3.1  | stove heating              | biomass          | 0,020                 | 20,0       | 0,02                       |
| 3.2  |                            | pellets          | 0,034                 | 20,0       | 0,04                       |
| 3.3  |                            | oil              | 0,063                 | 20,0       | 0,08                       |
| 3.4  |                            | gas              | 0,031                 | 20,0       | 0,04                       |
| 3.5  |                            | electricity      | 0,063                 | 20,0       | 0,08                       |
| 3.6  |                            | coal             | 0,013                 | 20,0       | 0,02                       |

## Running costs

Total operating costs: without energy costs

|            | <b>net amount</b><br>[€/per total floor area] | <b>VAT</b><br>[%] | <b>gross amount</b><br>[€/per total floor area] |
|------------|---|-------------------|---|
| minimum    | 0,50  | 20,0              | 0,60  |
| maximum    | 1,50  | 20,0              | 1,80  |
| on average | 1,00  | 20,0              | 1,20  |