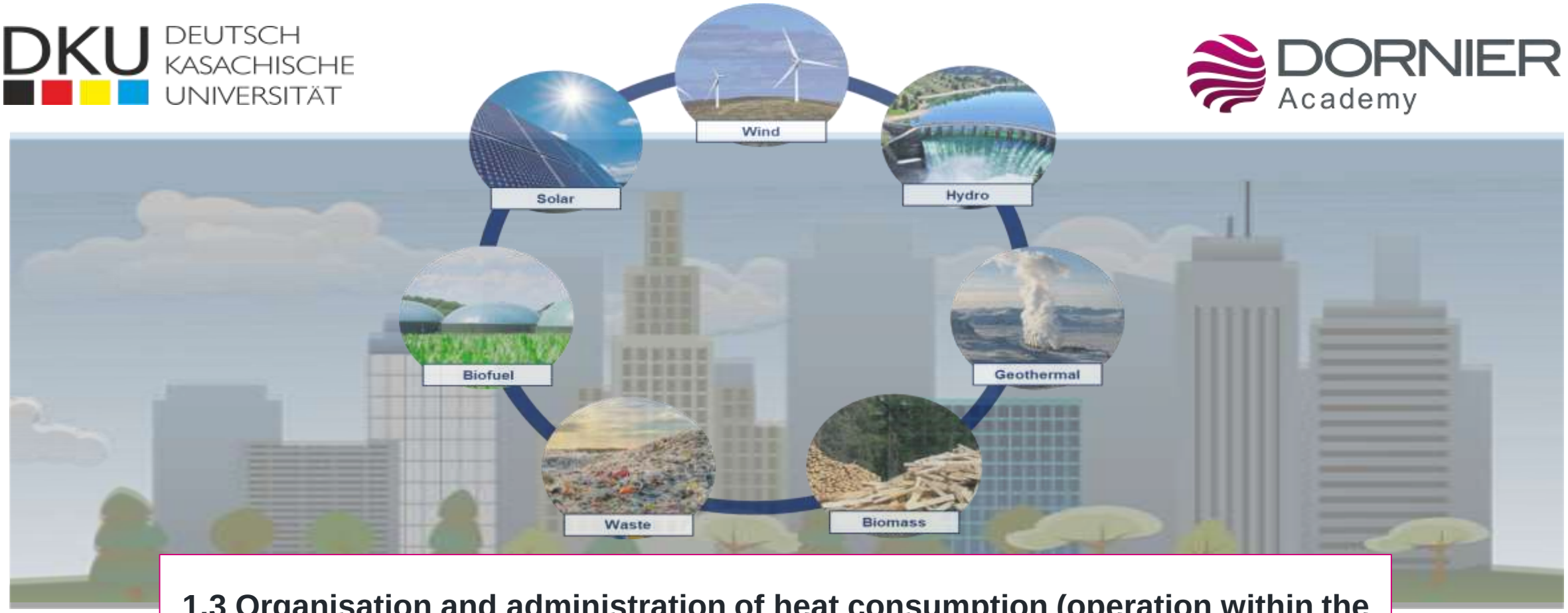


1.3 Organisation and administration of heat consumption (operation within the building systems, metering, billing)

Sergey Poleschuk

1.3 Heating systems for buildings and structures (incl. MAB) Consumption. Regulation. Saving. Payment.

Elements of the in-house heating system

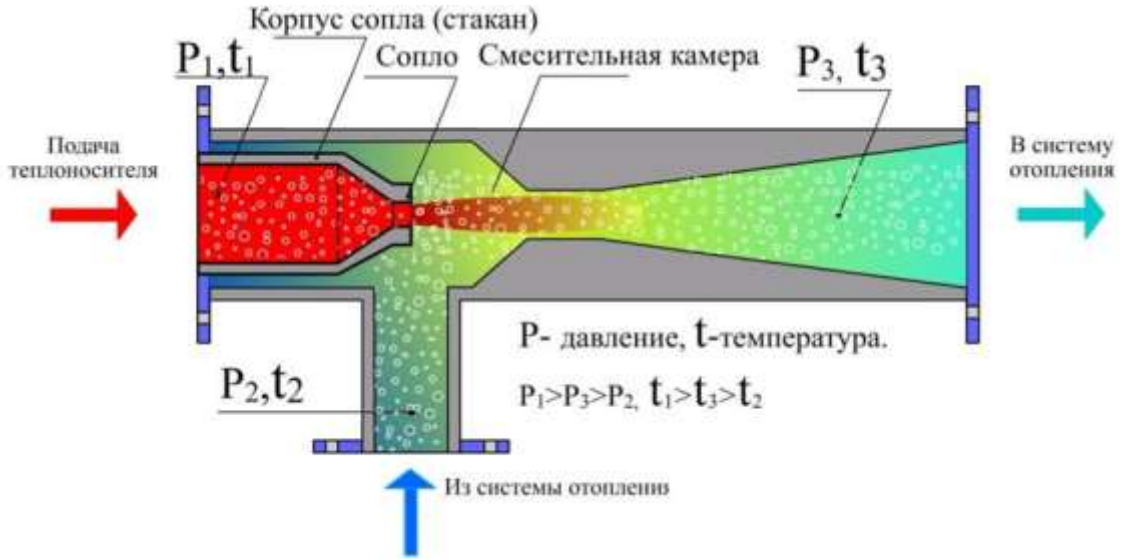
- control and shut-off valves;
- heat energy and hot water metering devices (building and appartment meters);
- automated heating substation (distribution station);
- wiring;
- heating appliances (radiators, warm floors, warm walls, convectors, etc.);
- other equipment.

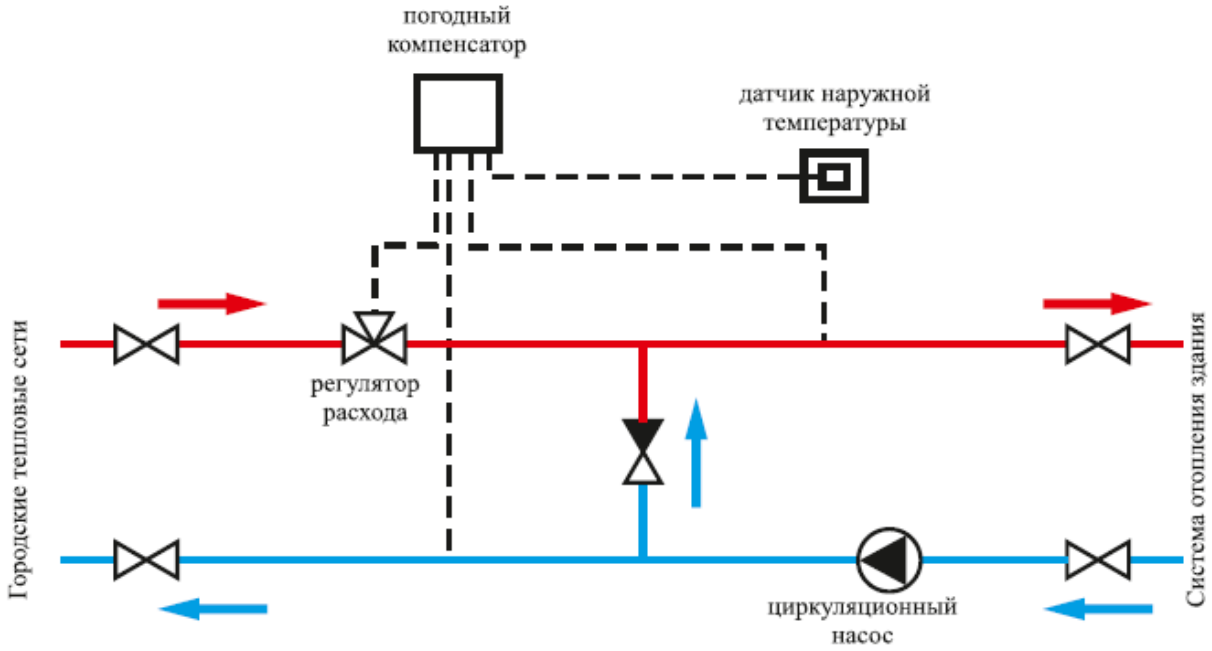
Heat substation

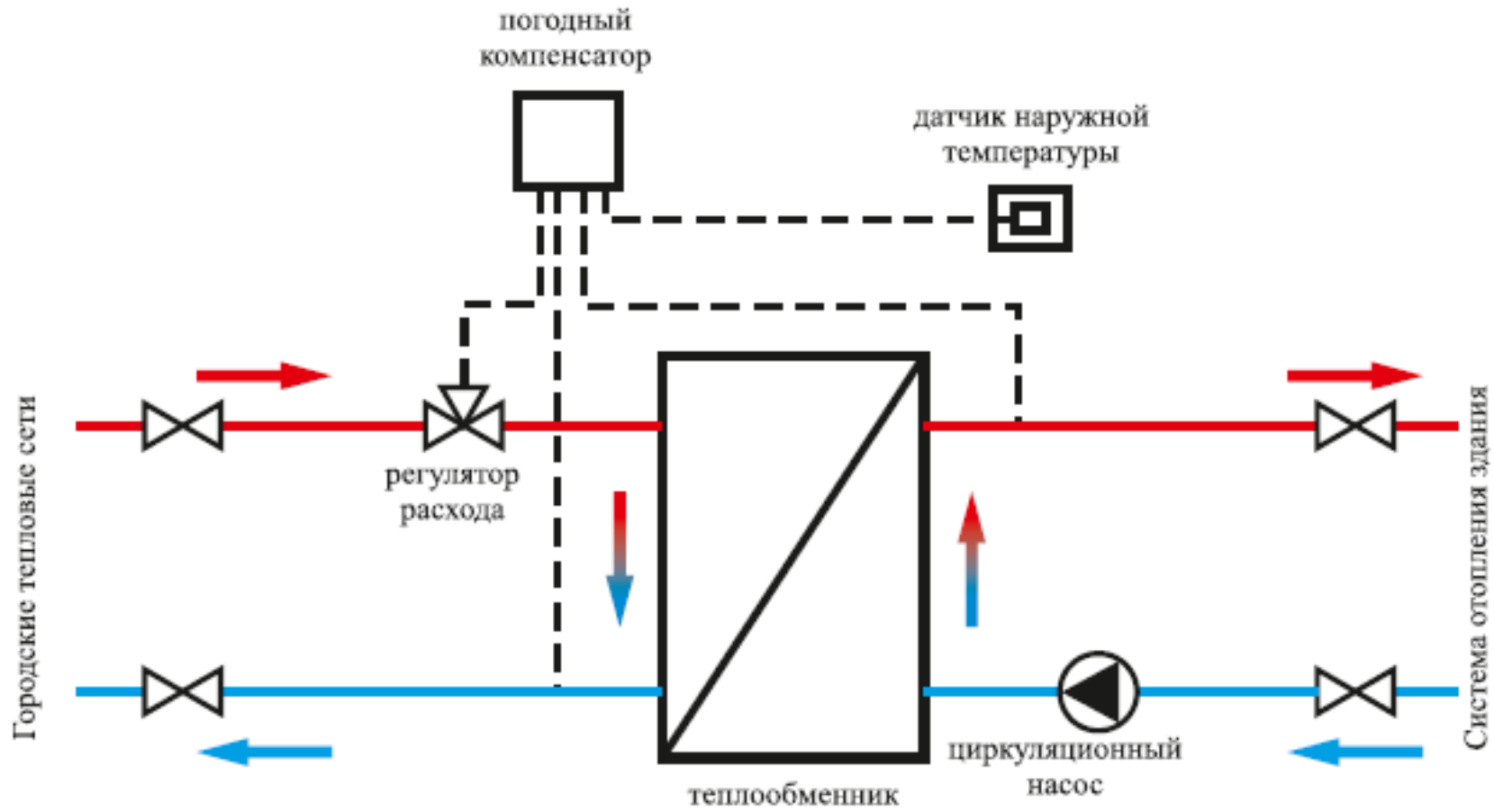
Heat substation - a set of devices for connecting heat consumption systems to the heat network

Types:

- ❑ Heat distribution station - regulation of temperature, pressure and flow of the heating carrier is performed in a centralised way (by the heat supplier)
- ❑ Automated heating substation (AHS) - control and automatic regulation of temperature depending on outdoor temperature






погодный
компенсатор
датчик наружной
температуры
регулятор
расхода
Городские тепловые сети
Система отопления здания
теплообменник
циркуляционный
насос

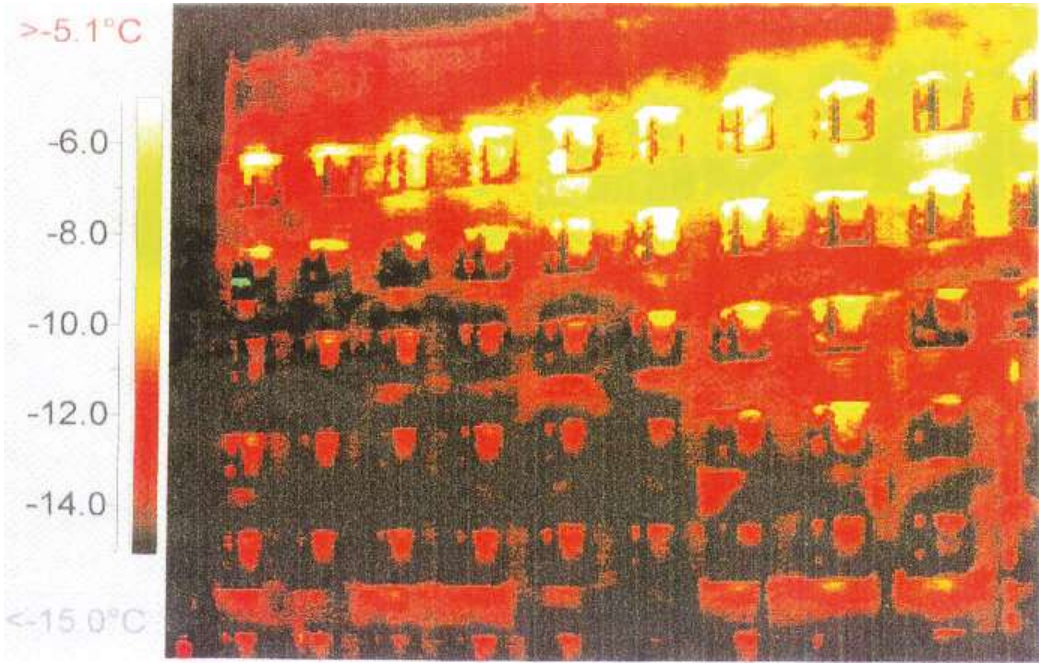
Heat distribution station

Advantages

- ❑ low cost;
- ❑ easy installation;
- ❑ energy-independent;

Disadvantages:

- ❑ NO regulation;
- ❑ excessive flow rate of the heat carrier
- ❑ frequent replacement of the heater nozzle (practically every heating season);
- ❑ the need for individual calculations when selecting an distribution station for a particular system;
- ❑ strict requirements for differential pressure at the inlet and outlet of the system;
- ❑ Δ P is bad - the distribution station becomes a straight pipe system



An example of poor circulation in the multi-apartment buildings or the result of a straight pipe system, or maybe both.

AHS

Advantages

- ❑ benefits for consumers:
- up to 40% reduction in heat consumption and payment;
- comfort
- ❑ for the networks - reduction of electricity costs for heat-carrier transportation (up to 6 times, in Astana the unit cost is 10 kWh/1Gcal, in Karaganda and Kokshetau - 60 kWh/1Gcal)
- ❑ reduces heat losses associated with transport of heat carrier;
- ❑ possibility of remote control and management.

Disadvantages

There are no disadvantages, but it is considered that :

- ❑ higher cost

AHS is the first priority after installing a heat meter.

"The sum changes depending on the rearrangement of the terms!!!"*

Main functions

- lowering the temperature of the heat carrier
- for the district heating system, lowering the required heat carrier pressure
- ensuring heat carrier circulation in the MAB and return pipe

Main difference

Heat distribution station

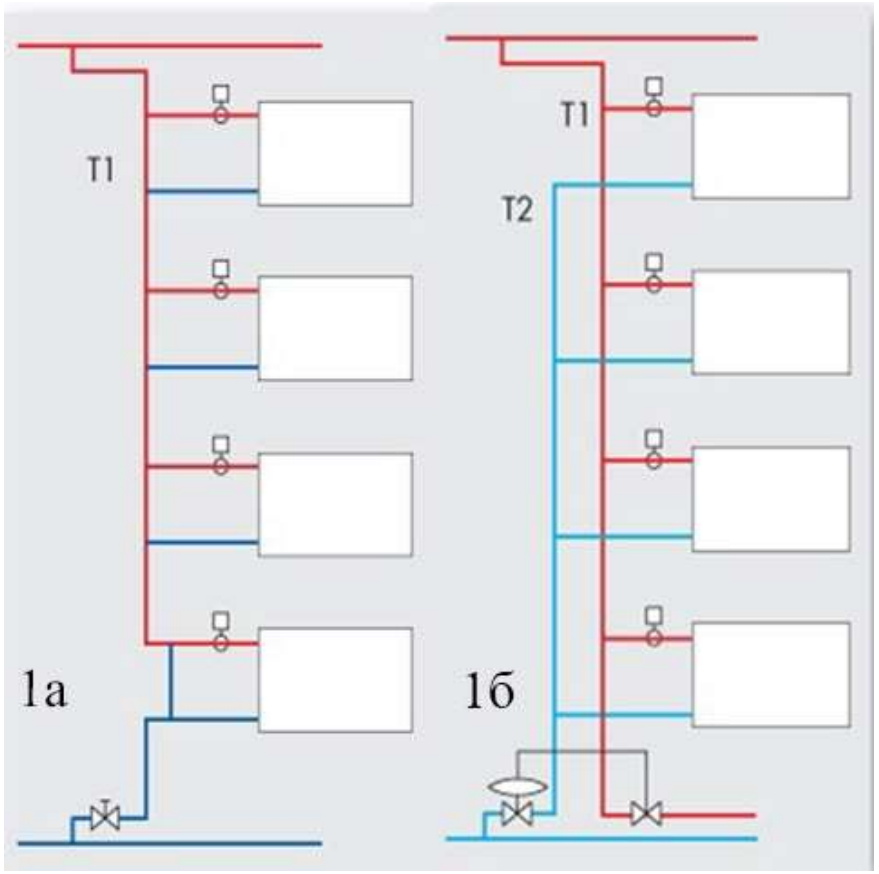
have paid for what was consumed,
consumed - how much was given

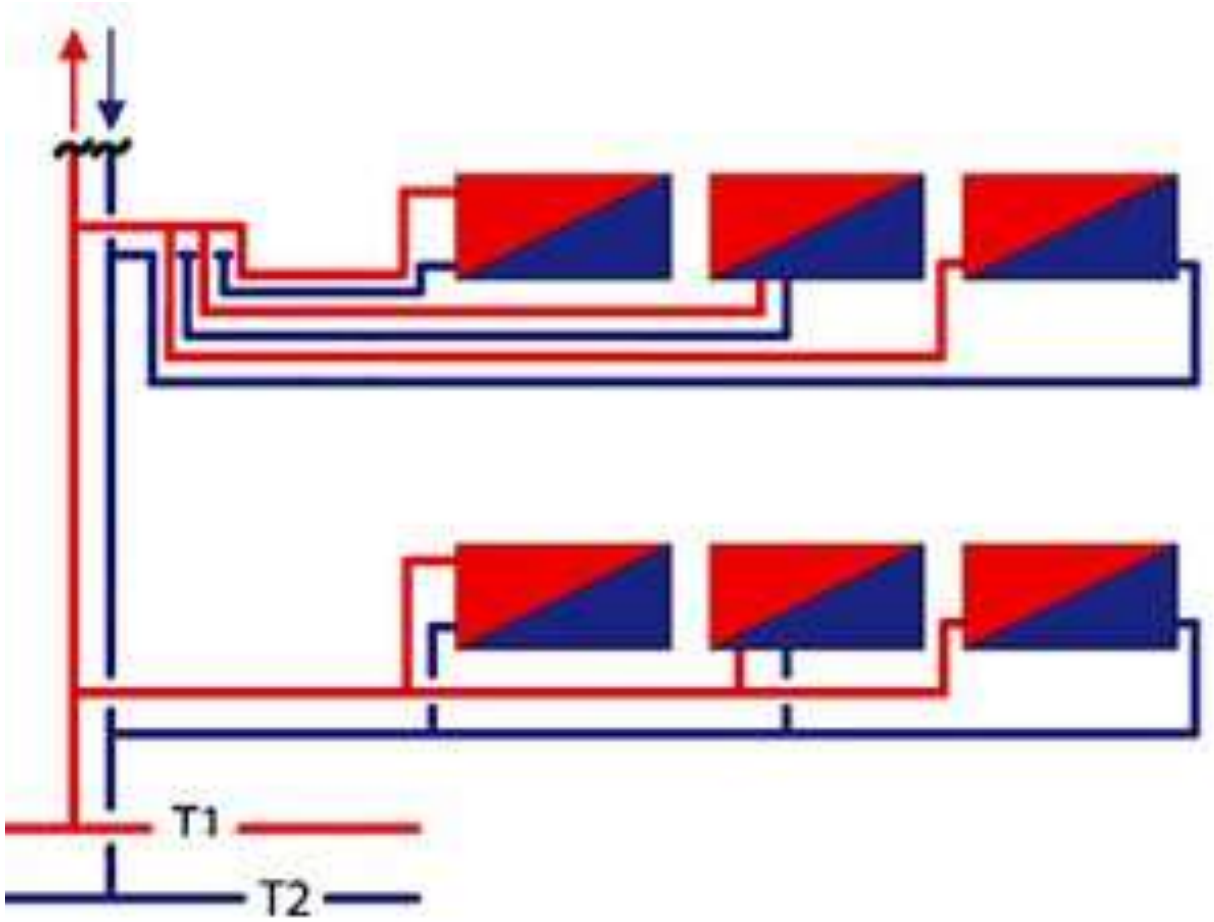
AHS

have paid for what was consumed
consumed - as much as was necessary

Vertical and horizontal pipework

With vertical pipe work, the radiators are connected to the vertical heating risers.
With horizontal pipework, the radiators are connected to a horizontally running pipe (riser pipe).





Horizontal pipework (everyone knows about vertical pipework)

Advantages

- ❑ the possibility of separate setting of each section.
- ❑ apartment-by-apartment regulation of heat consumption
- ❑ possibility of installing apartment meters

How do we pay for heating?

1. Metering - based on meter readings
2. Calculation method - based on normative

Classification of metering devices:

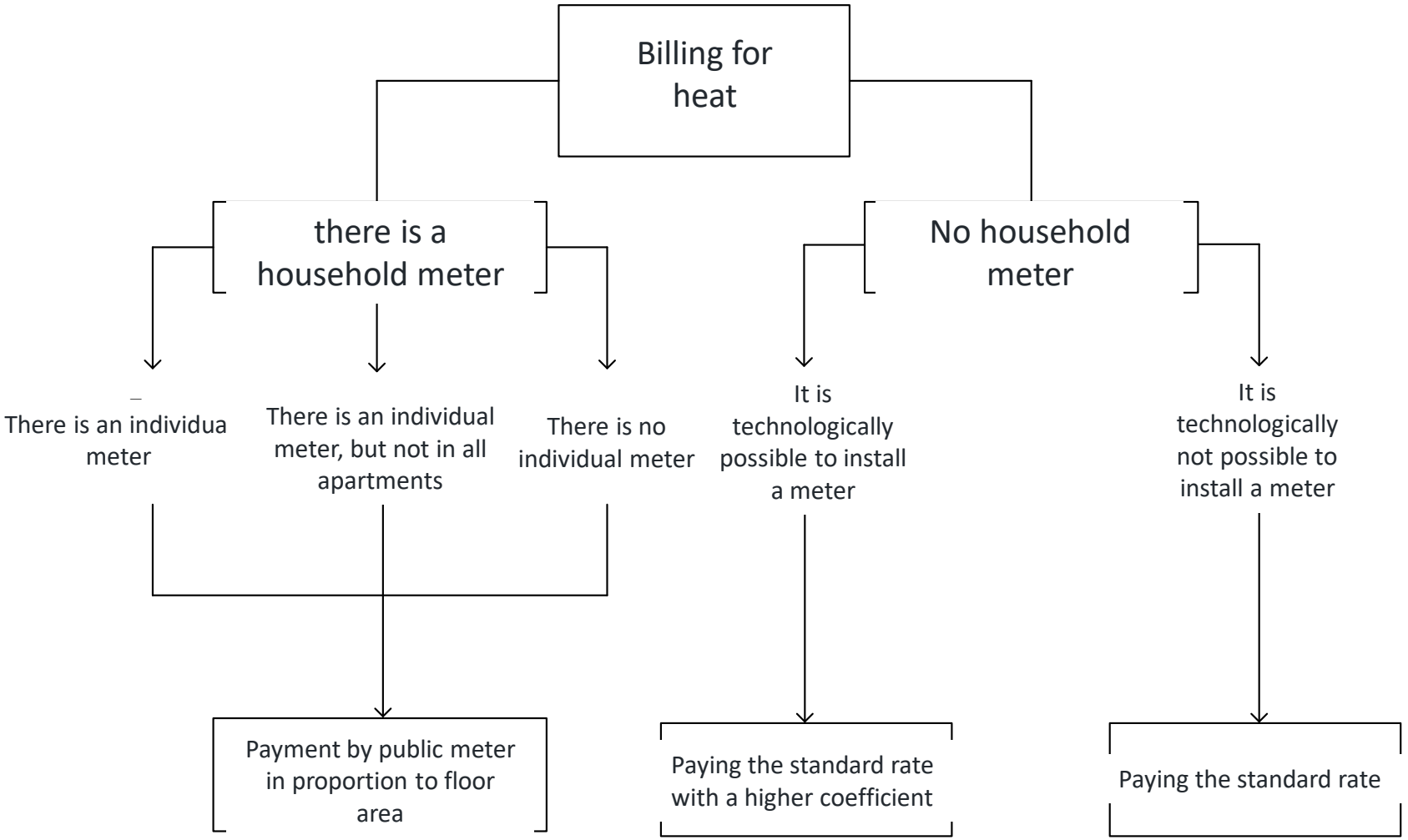
Commercial - metering device for legal entities located at the boundary of the balance sheet division.

In MAB

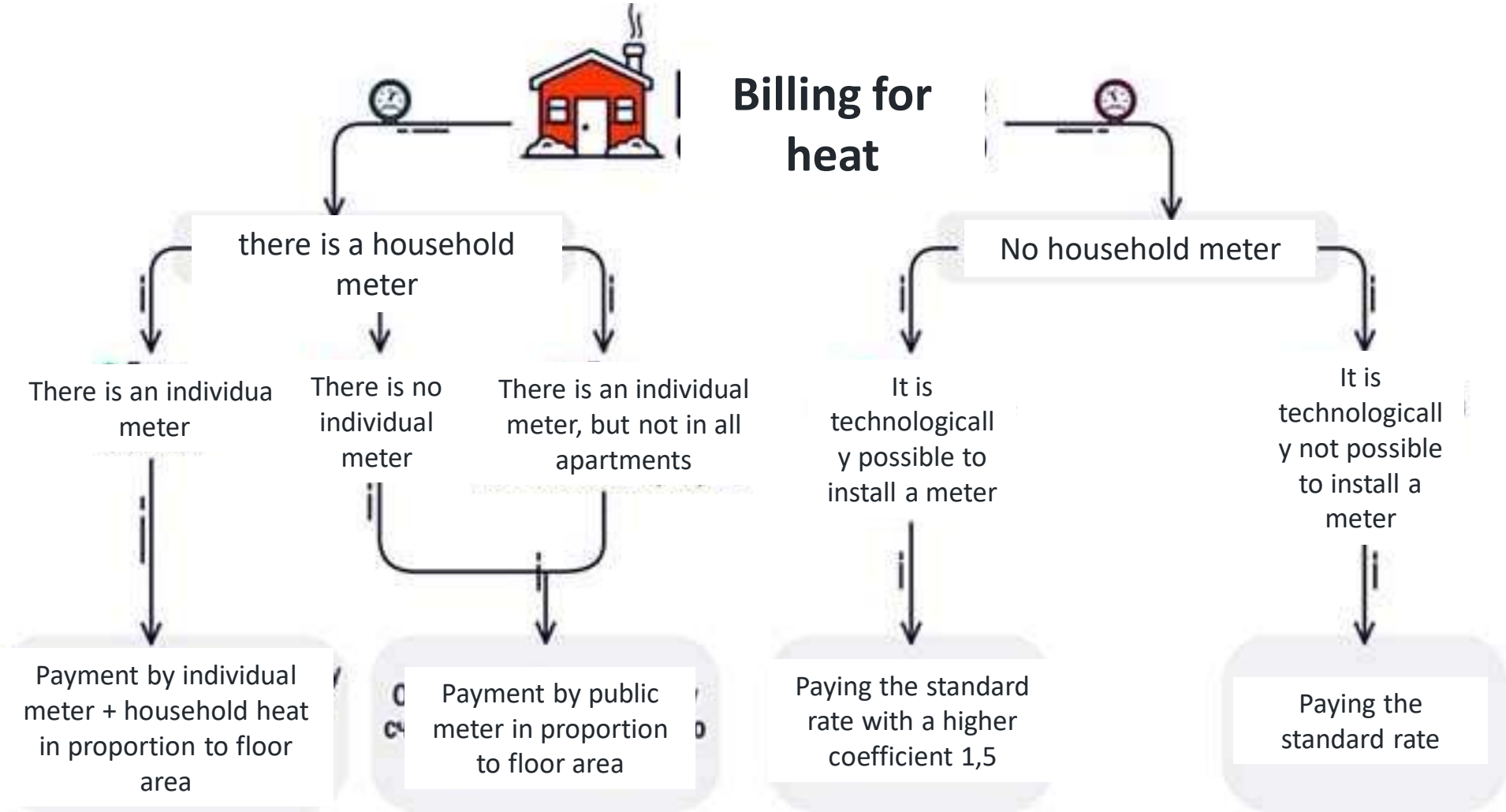
Public - metering device counting how much heat is supplied to the house by the heat supplier. It is installed on the main line from which heat is supplied directly to the appartments.

Individual - a device designed for metering heat consumption by the heating system of the appartment.

Billing for heat in Kazakhstan

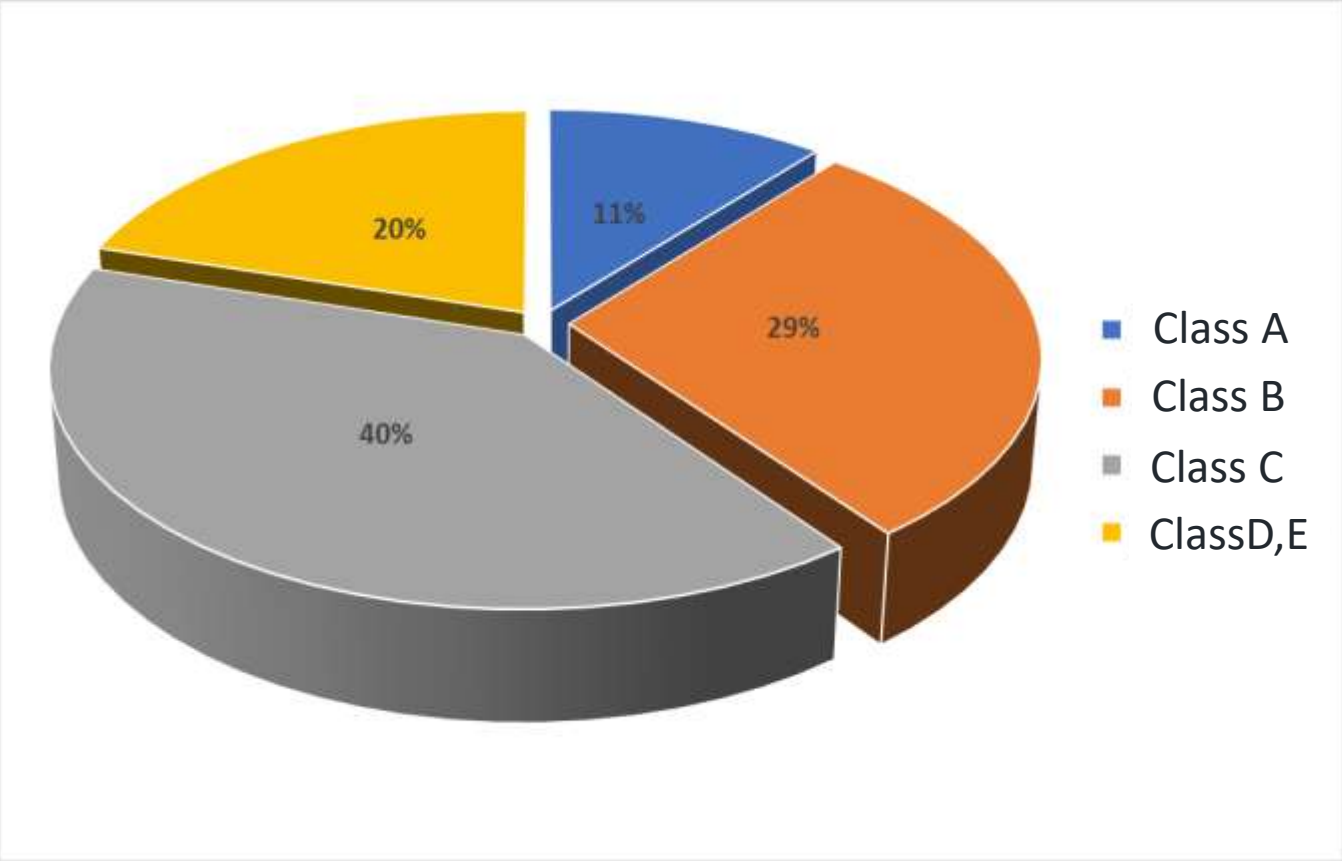


Billing for heat in Russia



And how much do the MABs consume?

More than 500 residential buildings have been surveyed, of which 210 (31%) have high energy efficiency class (A; B)



The average heat consumption of the buildings is 245 kWh/m2, a reasonable allowable heat consumption is 120 kWh/m2.

Possible heat savings when transferring MAB from Class E,D,C to Class B:

Number of houses – 281
Heat consumption - 122 588 Gcal/year
Saving of heat energy - 46 107 Gcal/year
Available capacity - 9,3 Gcal/hour
Possible connection of approx. 230,000 m2 of heated floor area

And that is only 500 MABs

***These calculations and indicators have been verified by the United Nations Development Programme in Kazakhstan (UNDP)**

An example of good ergonomics

Surface area - 2300 m2

Space - 6500 m3

Year of construction – 2007

Building envelope material - foam concrete, heat insulation

Glazing - 40% (southern facade)

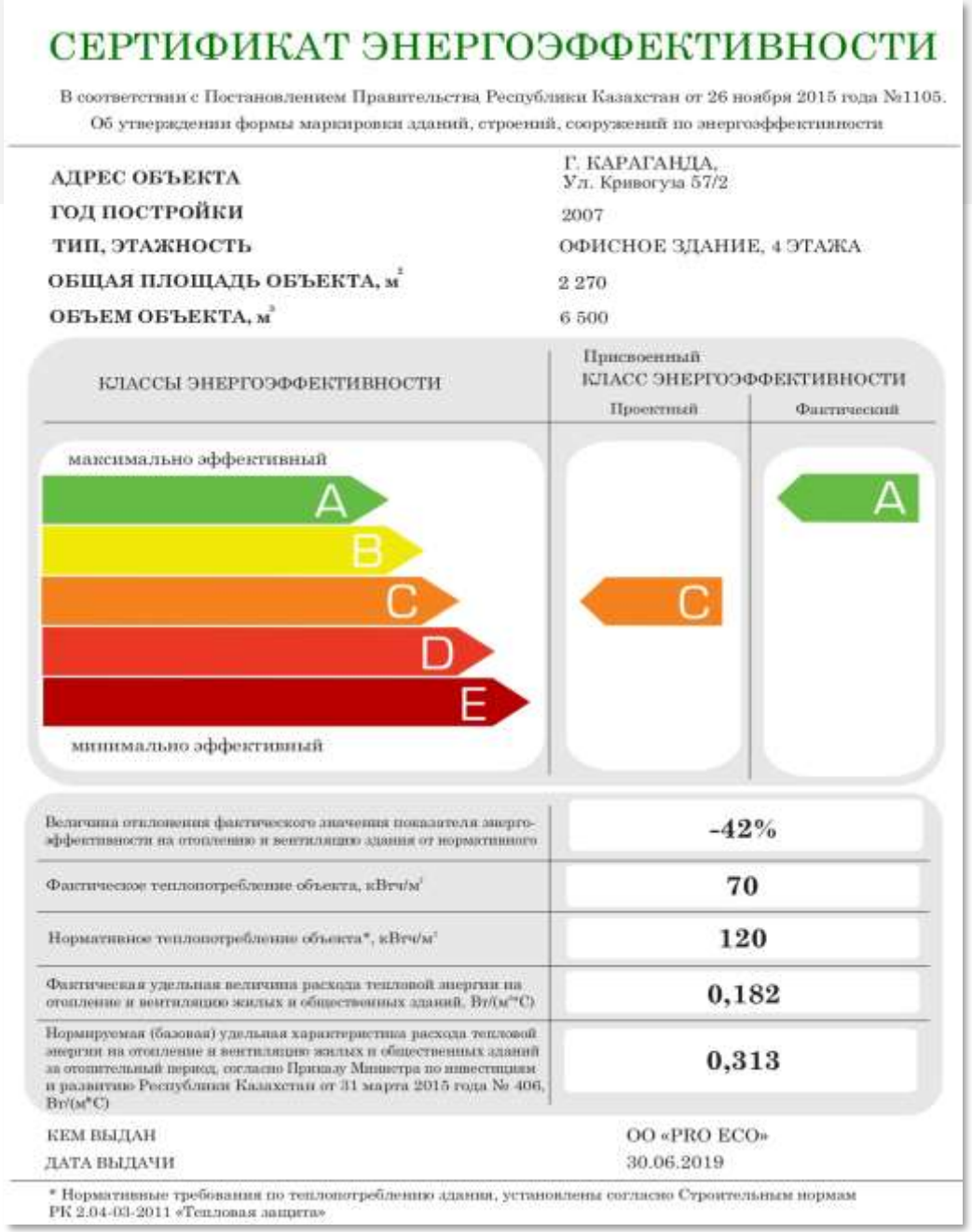
Maximum heat insulation (northern facade)

Separation of cold and warm zones

Heating – central

Air conditioning (cooling) – geothermal

Type of system - underfloor heating (cold)



СЕРТИФИКАТ ЭНЕРГОЭФФЕКТИВНОСТИ

В соответствии с Постановлением Правительства Республики Казахстан от 26 ноября 2015 года №1105. Об утверждении формы маркировки зданий, строений, сооружений по энергоэффективности

АДРЕС ОБЪЕКТА	Г. КАРАГАНДА, Ул. Кривогуза 57/2
ГОД ПОСТРОЙКИ	2007
ТИП, ЭТАЖНОСТЬ	ОФИСНОЕ ЗДАНИЕ, 4 ЭТАЖА
ОБЩАЯ ПЛОЩАДЬ ОБЪЕКТА, м²	2 270
ОБЪЕМ ОБЪЕКТА, м³	6 500

КЛАССЫ ЭНЕРГОЭФФЕКТИВНОСТИ	Присвоенный КЛАСС ЭНЕРГОЭФФЕКТИВНОСТИ	
	Проектный	Фактический
максимально эффективный A		A
B		
C	C	
D		
E		
минимально эффективный		

Величина отклонения фактического значения показателя энергоэффективности на отопление и вентиляцию здания от нормативного	-42%
Фактическое теплопотребление объекта, кВтч/м²	70
Нормативное теплопотребление объекта*, кВтч/м²	120
Фактическая удельная величина расхода тепловой энергии на отопление и вентиляцию жилых и общественных зданий, Вт/(м²°С)	0,182
Нормируемая (базовая) удельная характеристика расхода тепловой энергии на отопление и вентиляцию жилых и общественных зданий за отопительный период, согласно Приказу Министра по инвестициям и развитию Республики Казахстан от 31 марта 2015 года № 406, Вт/(м²°С)	0,313

КЕМ ВЫДАН	ОО «PRO ECO»
ДАТА ВЫДАЧИ	30.06.2019

* Нормативные требования по теплопотреблению здания, установлены согласно Строительным нормам РК 2.04-03-2011 «Тепловая защита»

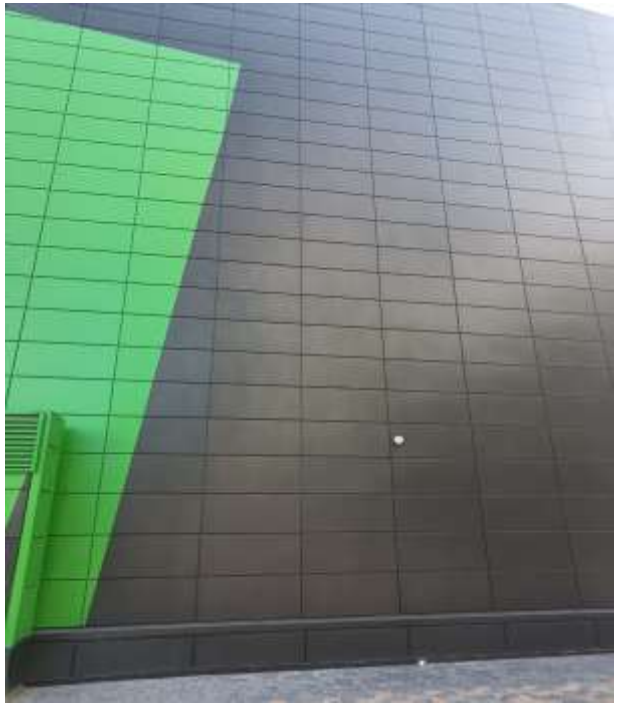
Underfloor heating - 85% of the load

Copper-aluminium radiators with built-in Danfoss thermostatic valves and low heat inertia (10 times less than cast iron radiators - 15% of the heat load) are used.

Precise separation of cold and warm zones using aluminium partition walls (stairwells/office areas)
AS A RESULT: NO DRAUGHTS

Air curtains at the entrance

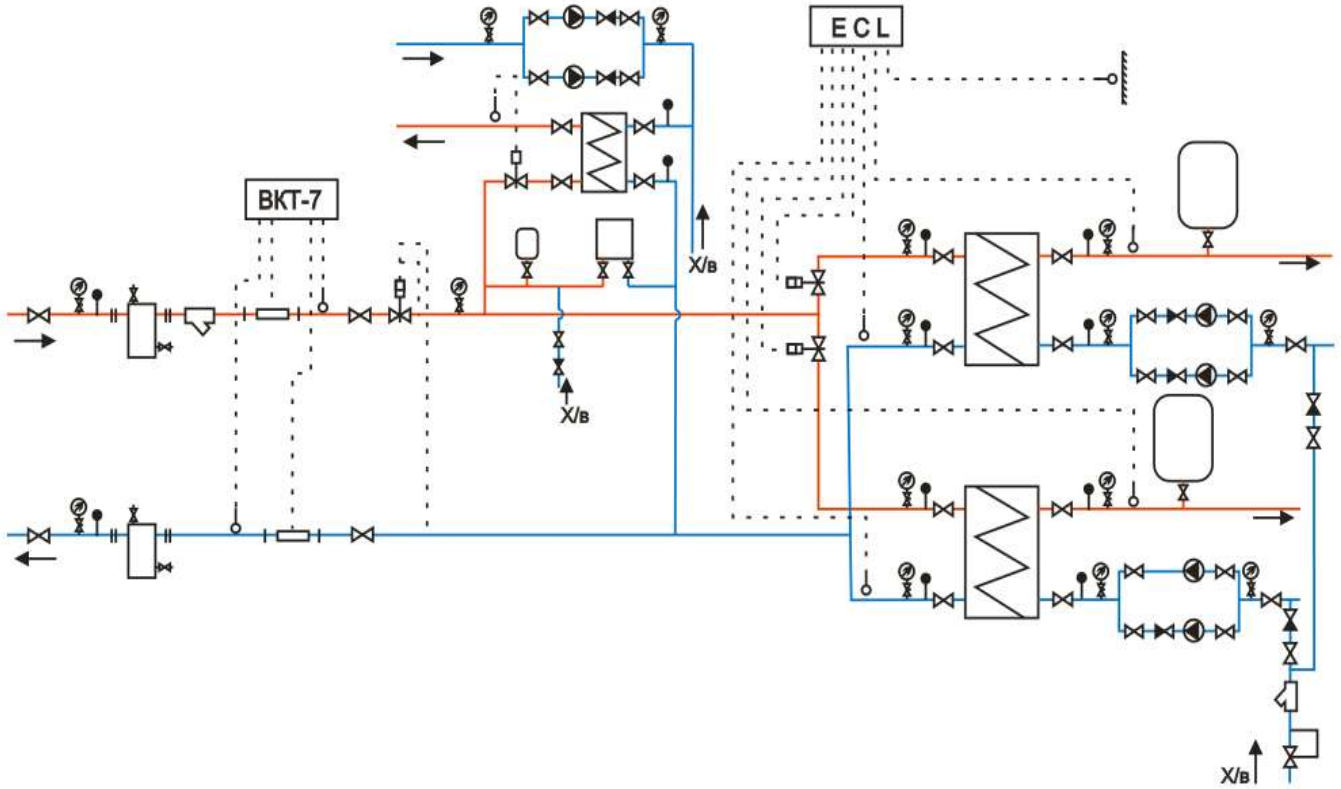
South facade - glazing



North facade - blank wall (maximum insulation)

Stained-glass heating - regulated by time of day and outside air temperature (morning/evening).

AHS with automation



How to get results?

1) Determine the level of energy consumption in buildings (desk heat audit).

2) Rank buildings by energy efficiency class and **highlight the lowest energy efficiency class (red zone)**.

3) Prioritise energy saving measures for the buildings with the **lowest energy efficiency class (MAB renovation programmes with compulsory thermo-modernisation)**

Where to get the money?

Performance conditions and financing to bring buildings up to high energy efficiency classes:

Budgetary organisations should be an example of implementing energy efficient measures when adopting and implementing public policies, which should focus on allocating budgetary funds for thermo-modernisation of buildings.

For legal entities, the allocation of funds from the loan funds of second-tier banks, taking into account the subsidised lending rate for 5 -year period;

For individuals, the allocation of funds in instalments, under government programmes for 10 years (programme for the thermo-modernisation of apartment buildings).

Possible options for thermo-modernisation of buildings

- Installation of automatic heat regulation systems, balancing the heating system
- Insulation of internal pipe heating system (basement)
- Insulation for entrances and doors
- Installation of energy-saving glazing
- Basement insulation
- Joint insulation (for panel buildings)
- Roof insulation
- Insulating walls

- Application of RES

(especially efficient recuperators, heat pumps, in terms of DHW organisation - local water heating stations).

Local water heating point Karaganda, N. Abdirova street, 9

Main components:

1. Non-pressurised tanks with heat exchanger
2. Electric boiler/heat pump
3. Pumping station
4. Control cabinet

Advantages:

1. Drinking quality DHW
2. Water reserve
3. Reduction of electricity consumption during peak hours
4. Reduction of the load on the water supply network

A simple example and uncomplicated calculation (current situation at the moment):

The total heated floor area of Kazakhstan's buildings is about 600 million m2:

- Actual heat consumption - 124 m Gcal/year.
- Actual specific heat consumption - 240 kWh/m2.
- Heat energy costs at average tariff of 10 thousand tenge/Gcal - 1.24 tr.tg.
- Kazakhstan budget for 2022 - 15.9 tr. tg.
- CO2 emissions - 62 million tons.
- The cost of one carbon unit from 2023 will be 16.9 $ / tCO2-eq, from 2026 - 50.8 $ / tCO2-eq.

Achievable level of heat consumption is - 120 kWh/m2

With a reduction in consumption from 240 kWh/m2 to 120 kWh/m2, the potential for savings would be:

- Heat energy - 62 million Gcal/year.
- Saving of payment (10 thousand tenge/Gcal) - 620 billion tenge.
- Reduction of emissions - 31 million tons of CO2. Which is more than 40% of the plan of the Republic of Kazakhstan to reduce CO2 emissions by 2030 (73.4 million tons) according to the roadmap of NDC.
- Required funds - $20.9 billion.

Ergonomic building (heating; distribution; metering; payment)

- AHS with heat exchanger
- horizontal layout
- underfloor heating; warm walls; radiator ducts
- district heat meter + individual heat and HTW meters - one system, with upper level of billing and invoicing
- DHW - LWSS. Implementation of heating:
  - 1 stage heat exchange - DHW return
  - 2nd stage heat exchange - central heating supply
  - capacity - air/water heat pump with recuperation and time of day regulation function
- even heating costs with year-end adjustments

Questions for discussion

1. What are the AHS and heat distribution station for?

2. Why is there a methodology for charging according to individual meter readings, but the payment is charged according to the apartment meter?
3. Why "0" on readings of the individual meter in MAB ≠ "0" and ≠ "0" payment? How to charge in such a case?
4. Why are legal entities interested in installing metering devices and physical persons are not?

Thank you for your attention!

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Tel.:+7-701-512-63-81