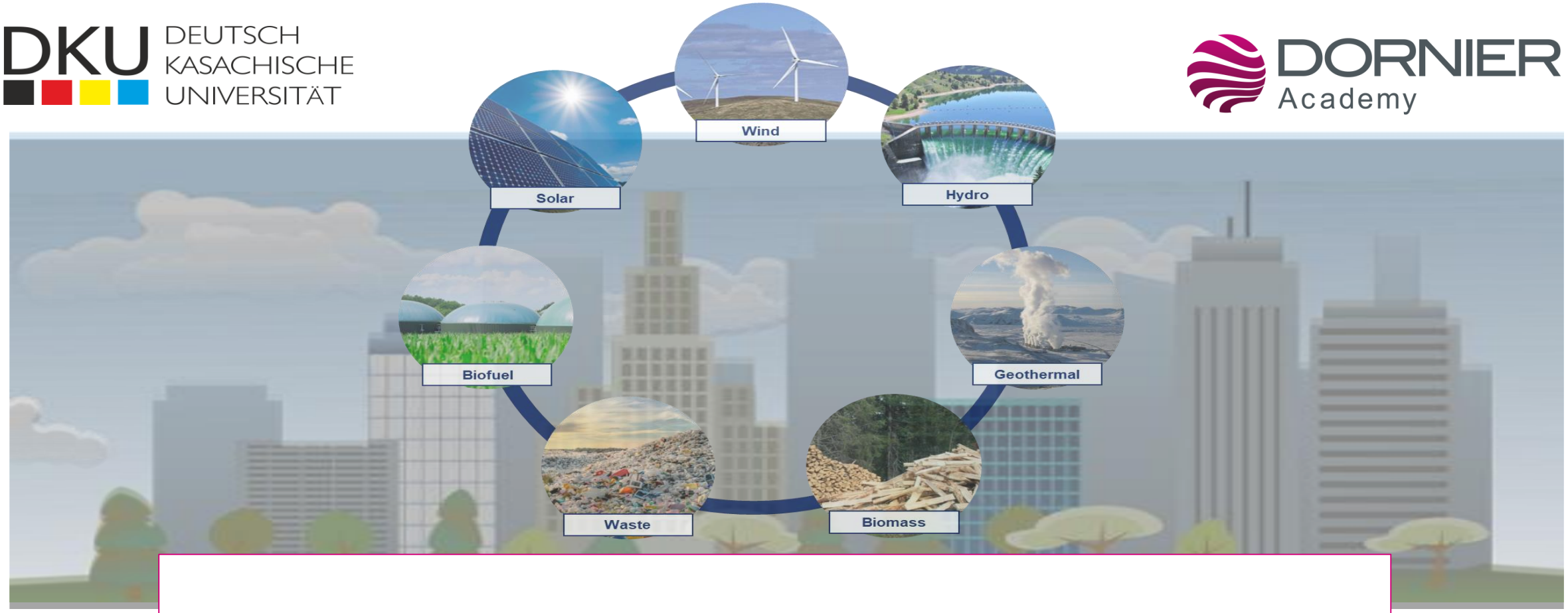
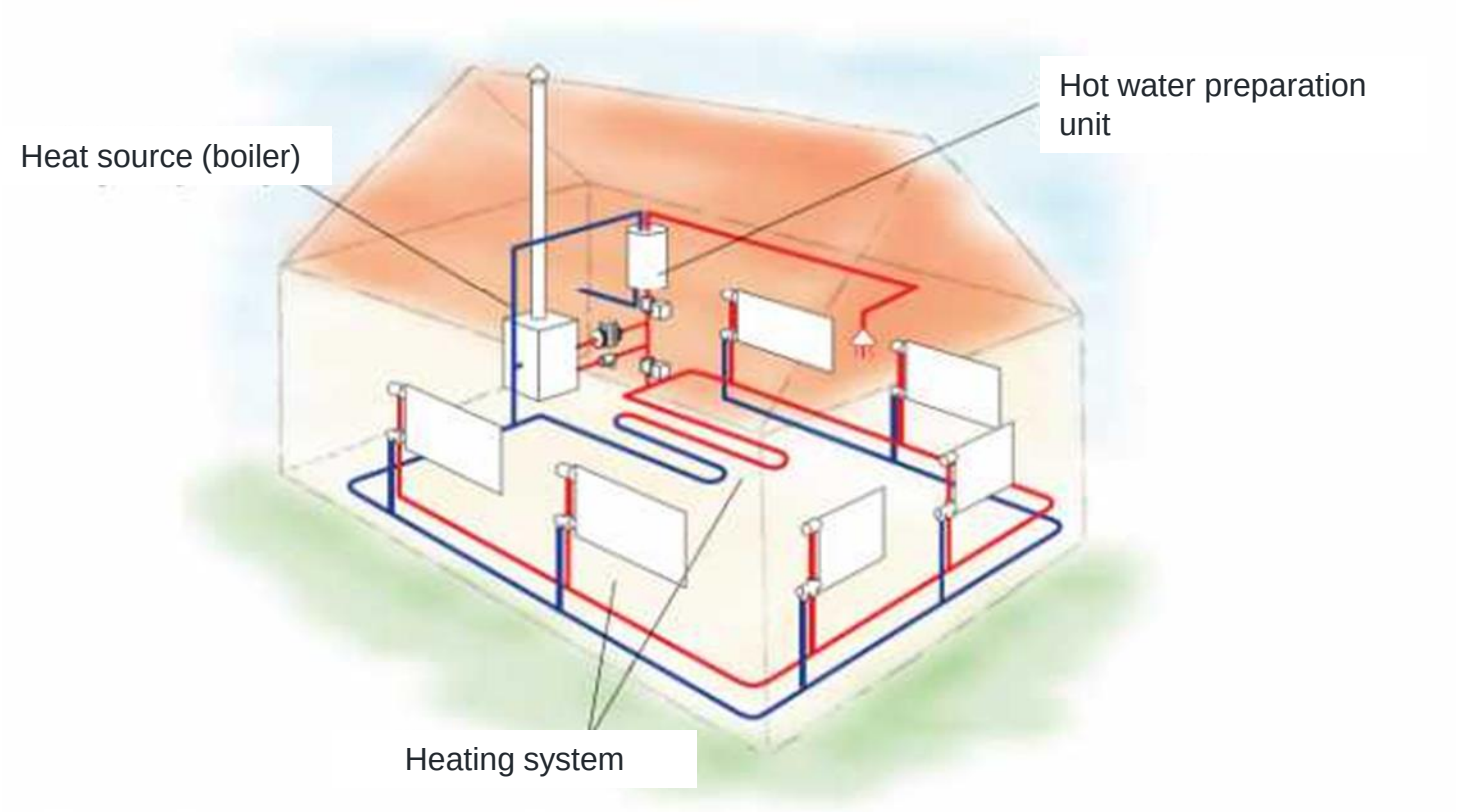


2.4 Individual heating systems. Energy saving. RES. Potential. Result.

Sergey Poleschuk

Individual heating is a system that operates independently of the district heating network and allows only your home to be heated. With individual heating, a heating boiler is installed in the apartment/house that heats the water to heat all rooms.



Characteristics of an individual heating system

- the source and the consumer are one entity;
- there are no networks.

There is no one in control at the moment

Heating sources

Furnaces / boilers

- Heat generation for indoor heating
- Fuel is supplied manually (solid fuel heating)
- Hot tap water is heated in a separate unit

Differentiated by:

- By type of fuel used
- By type of heat distribution

Electric radiators

- Produce heat from electricity
- Produces heat for indoor heating
- Tap water is heated in a separate device
- Usually at least one device in each room of the building
- Each device is equipped with a thermostat

General information (What do we have?)

The number of households	**about 5.1 million**
- urban areas	≈ 3,4 million
- rural areas	≈ 1,7 million
Total floor area	≈ 355 million square metres.
Heated area	≈ 283 million square metres.
Total floor area per household	≈ 70 sq. m
Heating surface per household	≈ 56 sq. m

Heating system used

		Heated area
District heating	**2,64 million**	**≈ 138 mln.sq.m** **about 9.4 million people**
- urban areas	2,59 million	
- rural areas	0,05 million	
Autonomous system	**0,87 million**	**≈ 145 mln.sq.m** **about 8.8 million people**
- urban areas	0,41 million	
- rural areas	0,46 million	
Individual furnace	**1,58 thousand**	
- urban areas	0,41 million	
- rural areas	1,17 million	

Conclusion: about half of the RK households heat themselves.

The heating of these households requires:

≈ **30 million Gcal/year** (35 million MWh/year) of heat energy

≈ **12 thousand Gcal/h** (14 thousand MW) of heat capacity, which is equivalent

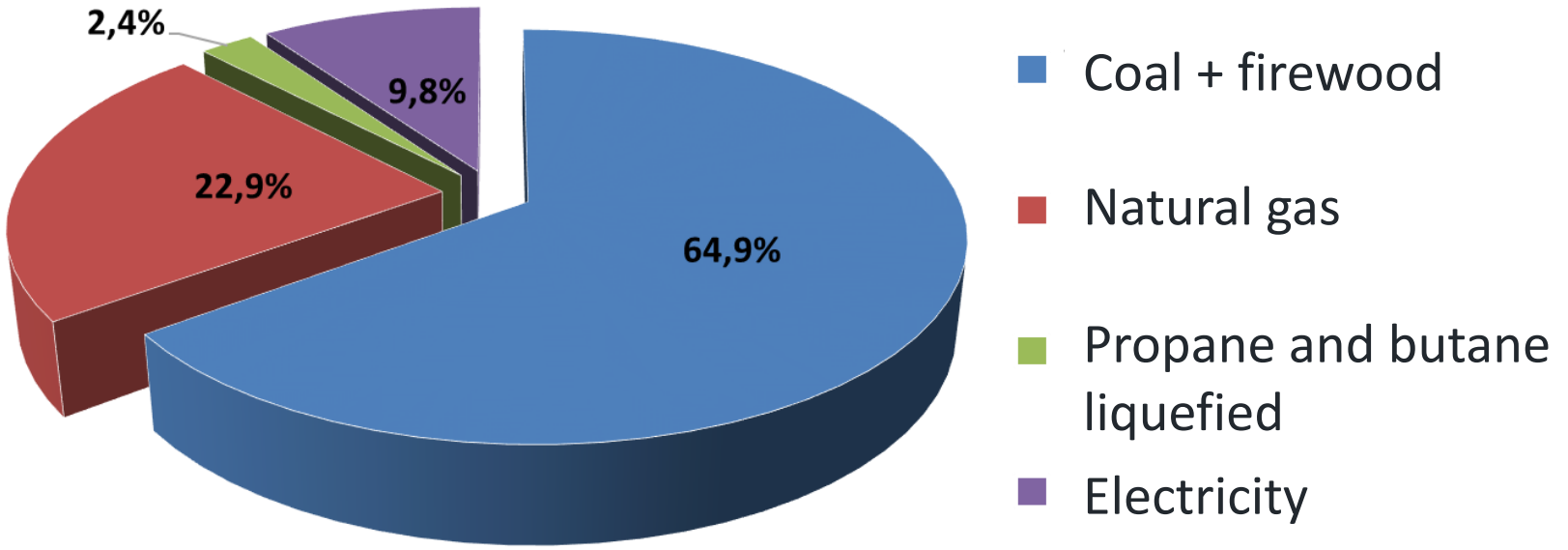
to:

- **9** units of Almaty CHP-2;
- **9** units of Karaganda CHP-3
- **36** HoPs of RK-1, Kokshetau
- **46** HoPs of RK-1 of Semipalatinsk

It turns out that almost 50% of the RK population "heat whatever turns up".

No one knows (does not control), no one evaluates the results!!!

Types of fuel and energy used for heating households not connected to the DH system



CAUTION!!!

More than one third of the population of Kazakhstan use solid fuels for heating.
According to statistics, the total annual consumption of coal for heating households is about 9 million tonnes.
At the same time, harmful emissions are about 17 million tCO2-eq/year (not including dust, ash, nerves, etc.).

Question? Why are more than 6 million people in the country "fed" by coal?

Reasons for the "popularity" of coal among "private individuals"

Let's compare:

Advantages??? (there's two sides to that coin):

- ❑ Low price !!! ???
- ❑ Availability

Disadvantages (no doubt):

- ❑ Low efficiency of boilers (overconsumption of coal)
- ❑ Fuel quality is NOT CONTROLLED (*black snow*)
- ❑ Low boiler lifetime - around 5 years (heating is expensive)
- ❑ Dangerous heating

Cost of heating 1 m2 of heated area

District heating	**100 tg/m2 month**
Natural gas	**200 tg/m2 month**
Coal	**300 tg/m2 month**
Electric boiler	**350 tg/m2 month**

The salary of the stoker is not taken into account

It turns out that all the virtues of coal are outweighed:

- poor fuel quality
- high specific costs of the boilers;
- Very low boiler efficiency (excessive fuel consumption);
- need to buy coal in advance;
- "hand and foot" method of heating.

And for the country, the harmful (disgusting) impact on the environment.

For information, switching households from coal to cleaner fuels would reduce up to 10 million tCO2eq, which is about 15% of Kazakhstan's greenhouse gas reduction commitment (the NDC plan).

How low is the price of coal 'low' (considering the efficiency of the system)?

Let's calculate the cost of 1 Gcal of heat energy from different sources, tg/1Gcal

	Cost of 1 Gcal, tg	Cost of heating boiler 20 kW, thousand tg
District heating	**3 500**	
Natural gas	**3 600**	**300**
Coal (efficiency 40%)*	**6 900-10 000**	**More than 500**
LPG	**15 000**	**300**
Electric boiler	**17 000**	**400**
Heat pump	**7 900**	

* According to calculations by a sectoral institute, the cost of 1 Gcal of heat energy for one of Kazakhstan's enterprises, including capital and operating costs, was 28,000 tg.

How to improve the situation?

If there is no possibility of connection to the DH:

1. Provide the possibility to provide heating from electricity with separate metering and a dedicated tariff, with limitation during peak hours.
2. Provide assistance (subsidy/loan) for conversion of heating from coal to gas
3. In case of lack of natural gas - construction of local gasworks (with financing from environmental funds, subsidies)
4. Conversion to heat pumps when comparing options and economic viability

The use of heat pumps in households is the most suitable alternative to coal-fired boilers (if there is no prospect of a natural gas connection).

At the same time:

- Around **1.6 million households** will receive comfortable and safe heating

- 94.1 million sq.metres of floor area will be heated from modern sources

- About **1.6 million** heat pump units will be required, making heat pump production in Kazakhstan economically viable (indirect benefit: development of new production facilities)

How much to spend?

The cost of converting heating from coal to cleaner fuels is between $1 and $10 billion, reducing emissions by up to 10 million tCO2-eq,

To convert all coal-fired households to heat by heat pumps, about **1.6 million** heat pump units are needed, which is about **$10 billion** in monetary terms.

To reduce the burden on the population due to the high cost of heat pumps, it is possible to provide state subsidies for their purchase (up to 50%), as it has been done in other countries (Denmark, Sweden, etc.).

A positive aspect for the state will be the reduction of greenhouse gas emissions. Conversion to heat pumps will reduce up to 7.5 million tCO2-eq., which in terms of money is about **$ 127 million** (according to the NDC roadmap).

The cost of one carbon unit from 2023 will be 16.9 $/tCO2-eq, and from 2026 - 50.8 $/tCO2-eq.

Conclusion

- One of the highest priority options for the introduction of RES for the population of the RK that uses coal is the use of heat pumps (where there is no natural gas).
- State support is required for subsidies and compensation of part of the cost of the population to purchase heat pumps due to their high cost.
- The state's subsidy costs are offset by the benefits of reduced emissions.
- Indirect benefits are the establishment of production; new jobs; and taxation.

The unit cost of reducing emissions, through government subsidies for the purchase of heat pumps, is lower compared to other methods and technologies presented in the NDC roadmap.

Changing heating from coal to cleaner fuels	From 10 to 100 tCO2-eq
Subsidies for the purchase of heat pumps	67$/1tCO2-eq
Dissemination of electric vehicle heating technology during cold weather to save fuel and reduce GHG emissions	81,9$/1tCO2-eq
Increasing the share of wind and solar power plants	121,3$/1tCO2-eq
Installation of solar photovoltaic panels on residential roofs	124,6$/1tCO2-eq
Increasing the electric vehicle fleet	7190,6$/1tCO2-eq

Questions for discussion

1. Do you think the modernisation of the individual heating sector is a private sector problem or is it our common problem? Why?
2. Where do you think it is better to start upgrading: private households or central heating?
3. Are private households eligible for subsidies for thermo modernisation of their homes? Why?
4. We turn to those present who heat themselves (and not only): Have you thought about how much fuel you use? Have you evaluated your fuel consumption? Savings potential?

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Thank you for your attention

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