

# **Environmental aspects of solid fuel combustion in small installations: the experience of Belarus**

**Экологические аспекты сжигания твердого топлива в  
малых топливосжигающих установках:  
опыт Беларуси**

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# Rationale

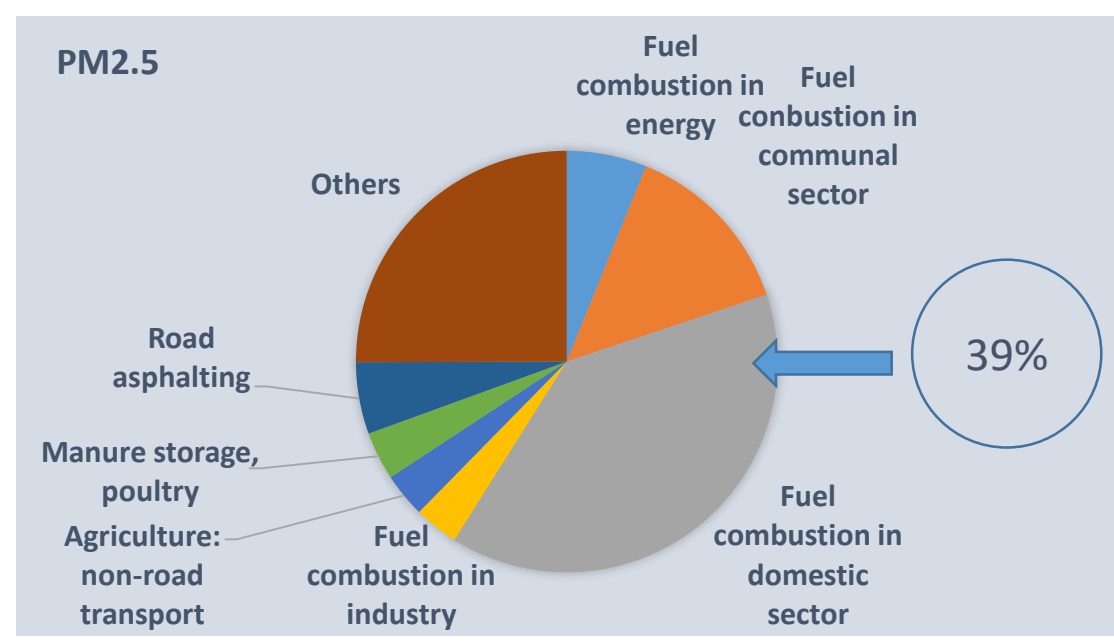
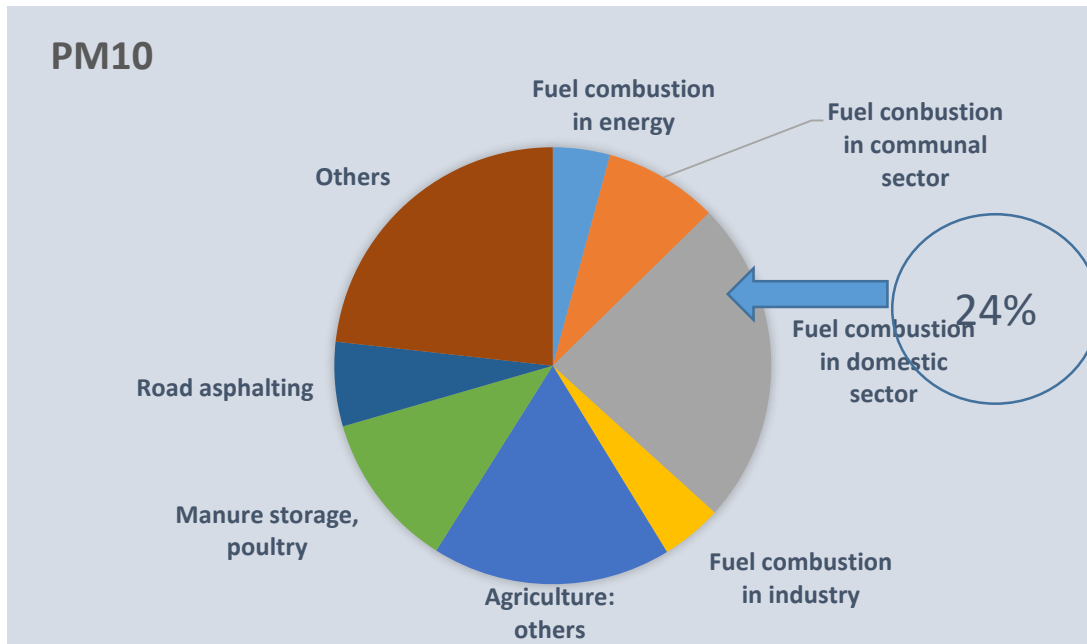
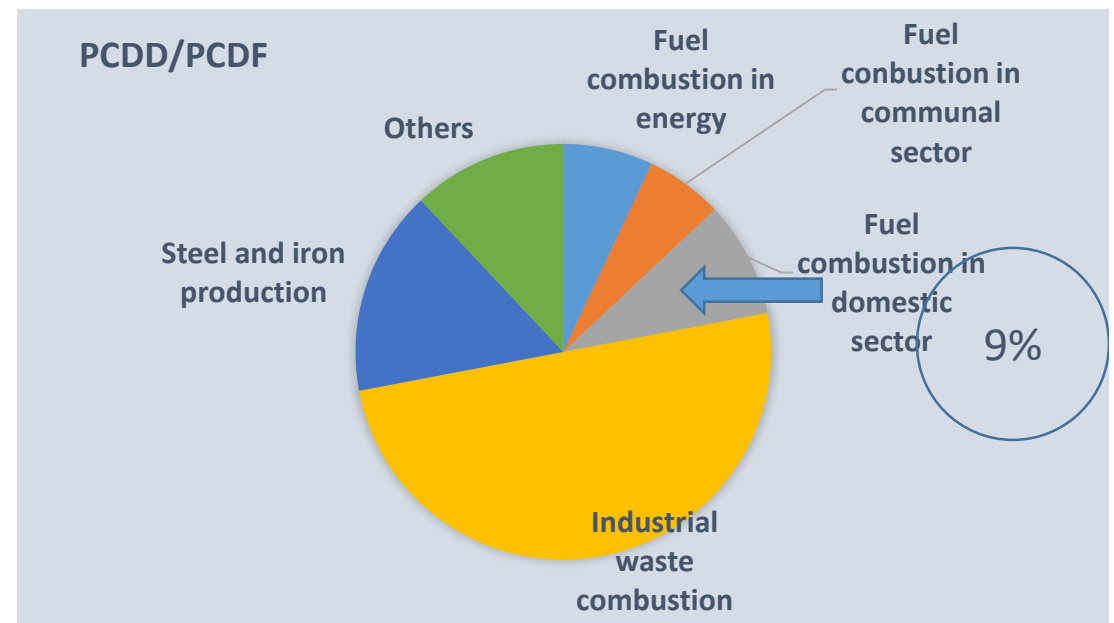
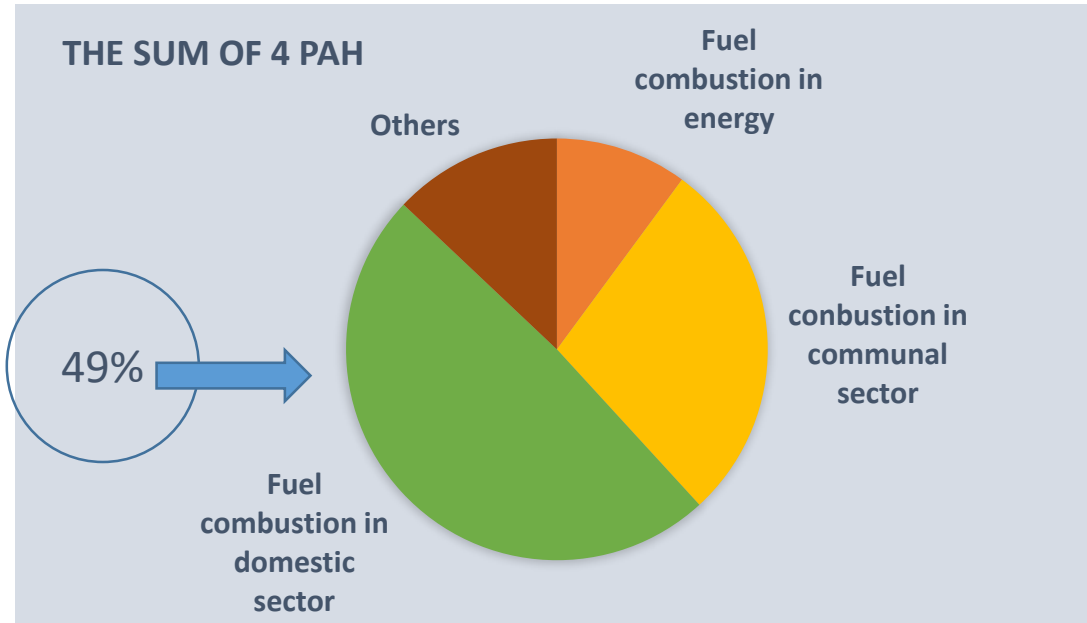
- high contribution of solid fuel combustion in small installation into total pollutants emission;
- diffuse character of emission sources;
- lack of emission control systems and monitoring of emissions/measurements;
- lack of regulatory mechanism and complexity of implementation;
- potential of emission reduction

Code of good practice for solid-fuel burning and small combustion installations based on BAT

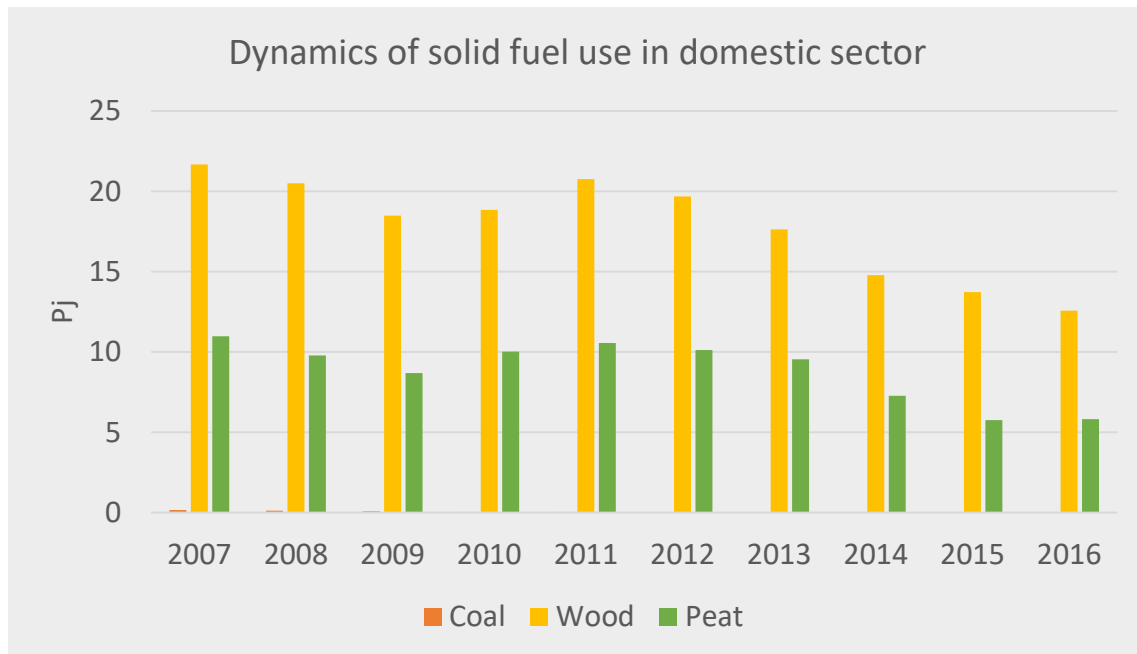
## Included into presentation

- pollutants emission from fuel combustion in domestic sector Belarus;
- solid fuel consumption in domestic sector;
- projection of PM10 and PM2.5 emissions, prevented emissions and costs;
- types of small combustion installations: features of application in Belarus (EECCA)
- emissions and regulation of technical parameters of installations

# Contribution of domestic combustion into total emission

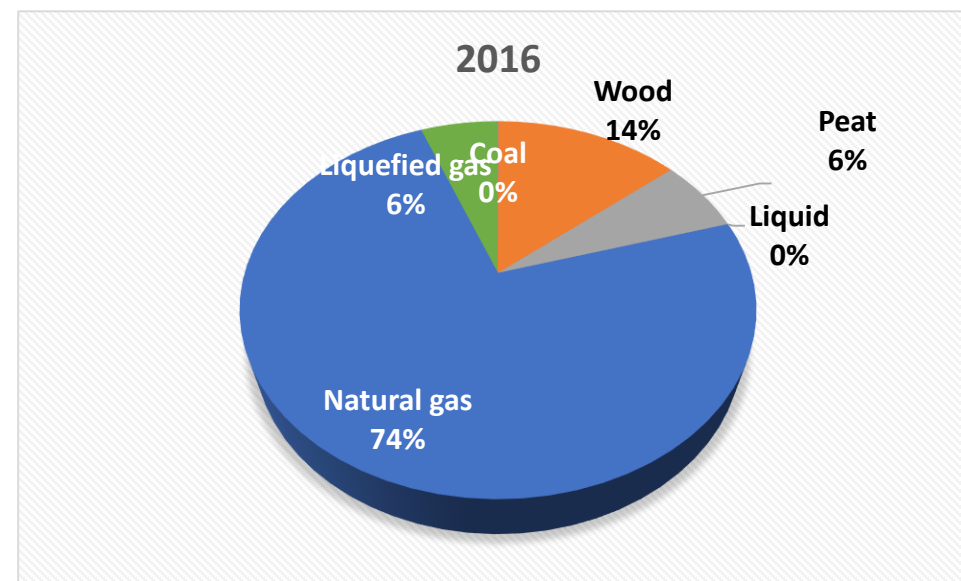
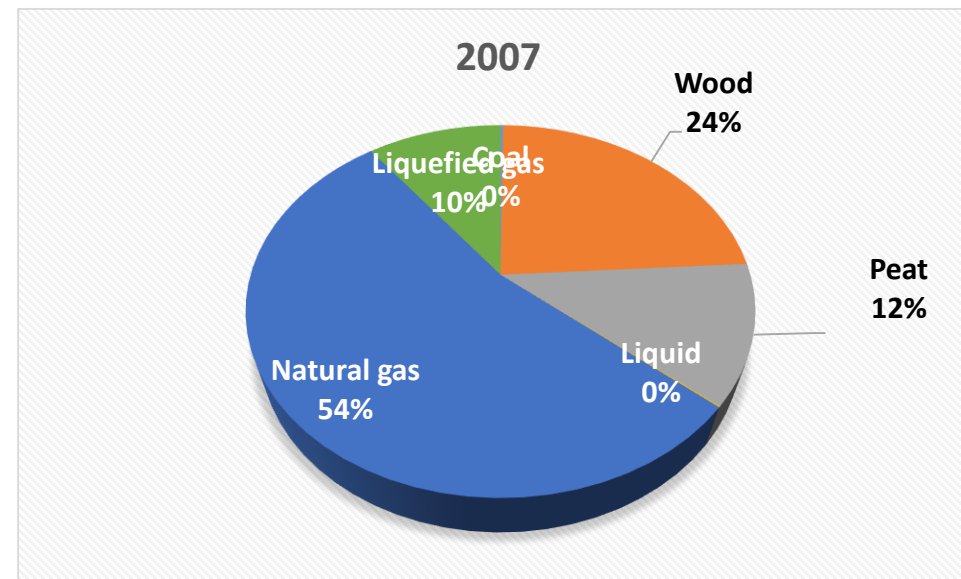


# Dynamics and structure of fuel consumption in domestic sector



In 2016 the share of the domestic sector :

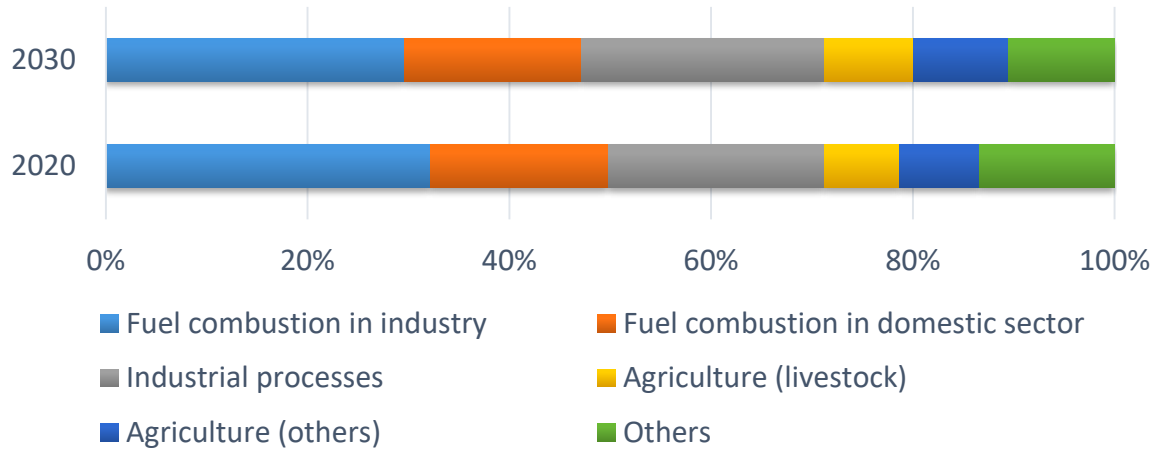
- of the total fuel consumption - 8.8% (90.18 PJ);
- of the solid fuels - 19.6% (18.41 PJ).



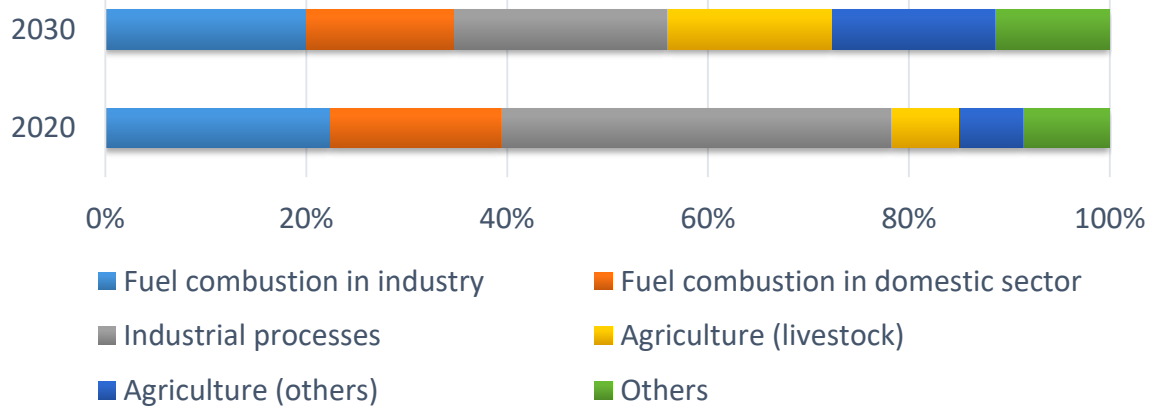
# Projection of PM10 emissions from small combustion

## Scenarios

### Current legislation scenario

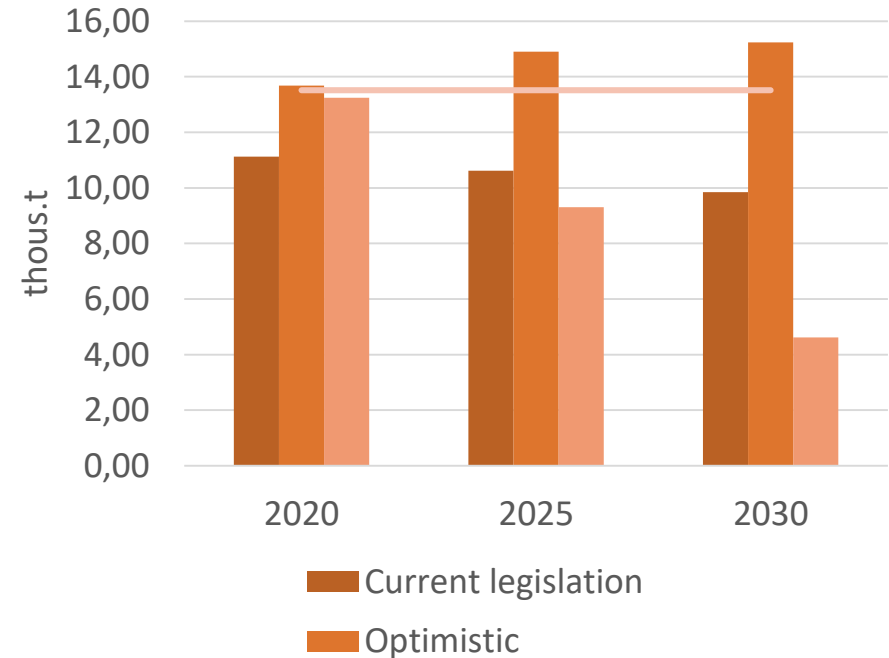


### MTFR scenario



## Emissions

### PM10



PM10 emissions will increase if optimistic scenario will be realized: by 15.2 thous. t in 2030 .

According to the baseline and MTFR scenarios PM10 emission will decrease and will be 10 thous.t and 4.0 thous.t correspondingly in 2030.

# Control strategies for fuel combustion in domestic sector

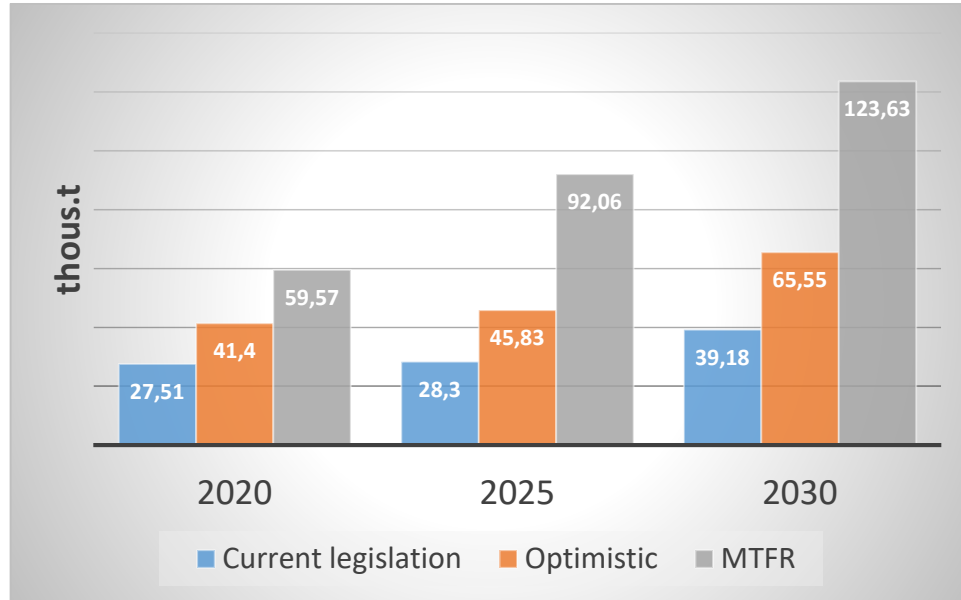
Sector	Technology	Current legislation			MTFR		
		2020	2025	2030	2020	2025	2030
DOM_FPLACE	FP_NEW	0	0	0	30	60	90
DOM_MB_A	MB_HED_A	0	0	0	30	60	90
DOM_MB_M	MB_HED_F	0	0	0	30	60	90
DOM_SHB_M	SHB_PLESP	0	0	0	30	60	90
DOM_STOVE_H	STV_NEW_B	50	50	50	0	0	0
DOM_STOVE_H	STV_PLESP	0	0	0	30	60	90

Current legislation: new stoves (STV\_NEW\_B)

Scenario MTRF: high efficiency of dust filters (MB\_HED), ESP from combustion of pellet fuel (PLESP), new installations (FP\_NEW, STV\_NEW\_B)

# Prevented PM emissions

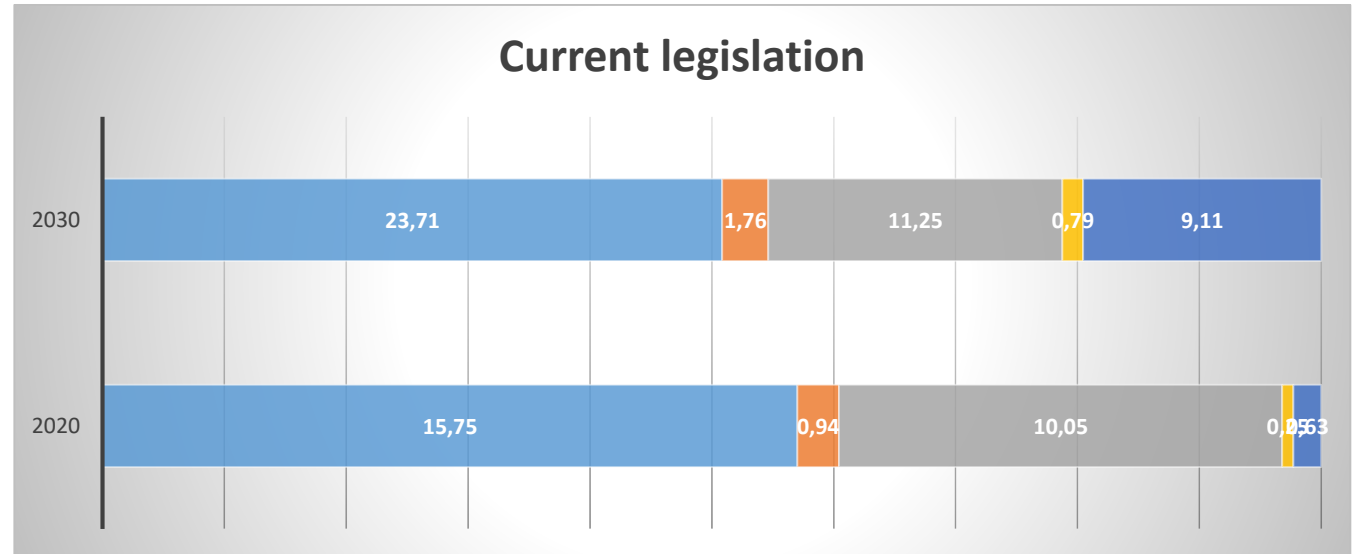
## Emissions



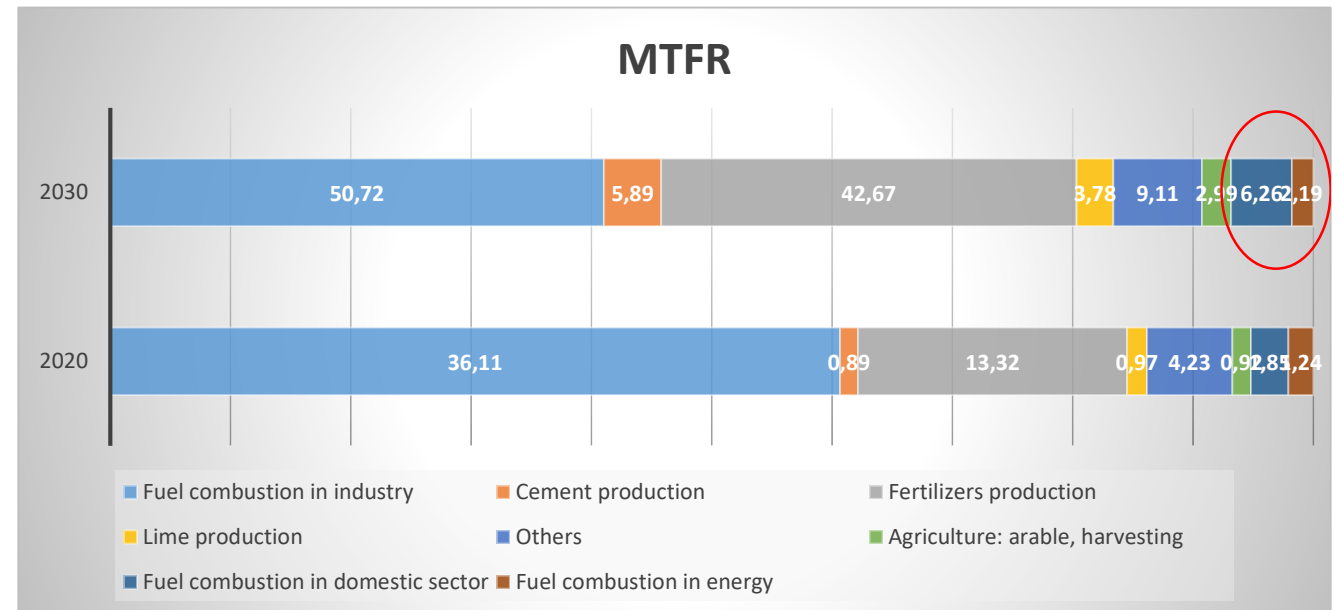
Prevented PM emissions in 2030 will be 39.2-124 thous.t. The main contributors are: fuel combustion in industry and fertilizers production. According to MTR scenario, prevented emission from fuel combustion in domestic sector in 2030 will be 6.3 thous.t.

## Scenarios

### Current legislation



### MTR





## Emissions regulation from solid fuel combustion in small installations

### Emission standards for fuel combustion in boilers up to 0.1 MW\*

Fuel	CO	NO <sub>2</sub>	Particulate matter
Coal	10 000	350	50
Peat	5 000	350	50
Wood	2 000	350	100

\* **Environmental Norms and Rules. Environmental protection and environmental management. Environmental safety Requirements. Resolution of the Ministry of Natural Resources and Protection Environment of the Republic of Belarus. July 18, 2017** (ЭкоНиП 17.01.06-001-2017. Экологические норма и правила. Охрана окружающей среды и природопользование. Требования экологической безопасности. Постановление Министерства природных ресурсов и охраны окружающей среды. 18 июля 2017 г.);

**STB 1626.2-2006. Biomass plant boilers. Emission limits for pollutants. State Standard of the Republic of Belarus.** (СТБ 1626.2-2006. Установки котельные. Установки, работающие на биомассе. Нормы выбросов загрязняющих веществ)

## Some characteristic features of small combustion installations in Belarus (EECCA)

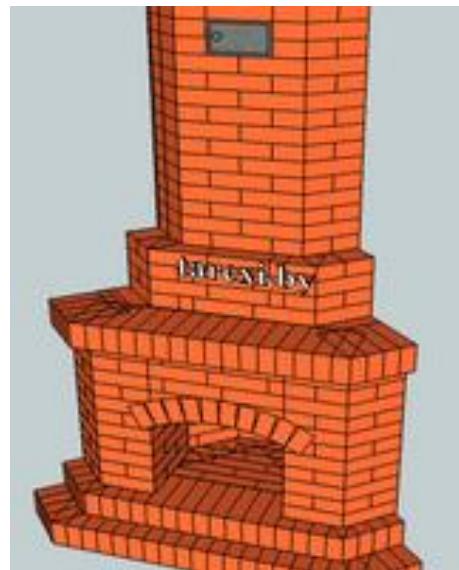
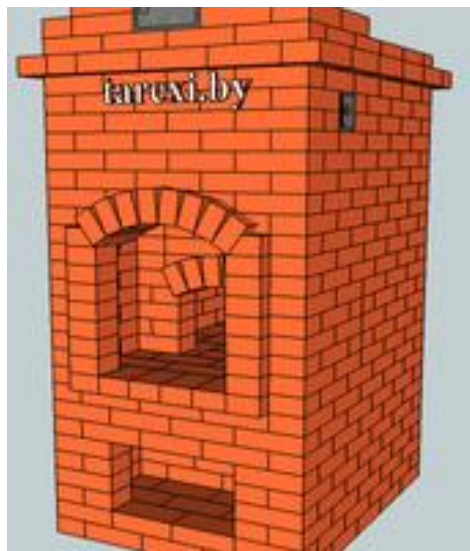
- long usage for heating because of long cold period;
- a wide range of fuel-burning installations: heating, heating and cooking, stoves, bath stoves, fireplaces, boilers, etc .;
- heating furnaces, stoves, fireplaces of non-industrial manufacture (brick);
- pine, birch and spruce as main firewood fuels

# Design of brick small fuel combustion installations



Heating furnaces

Heating and cooking



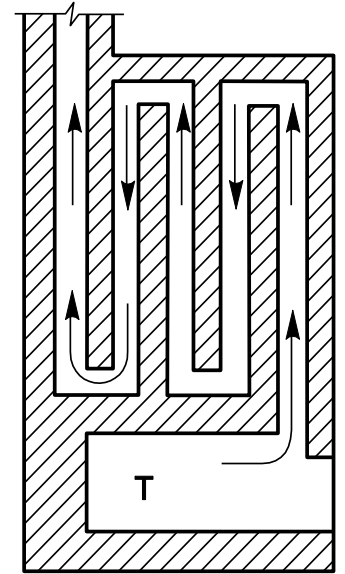
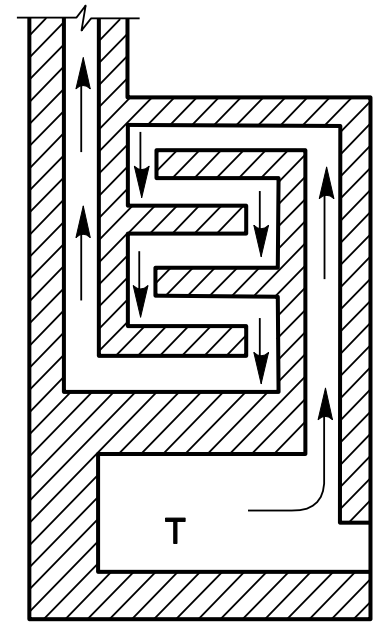
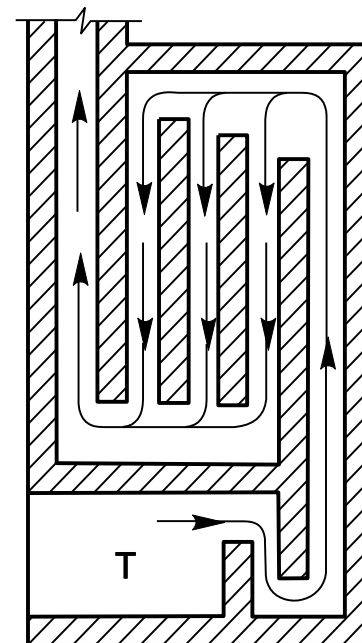
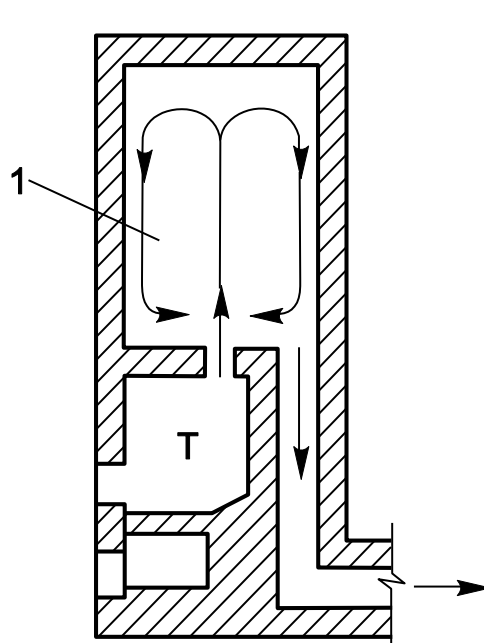
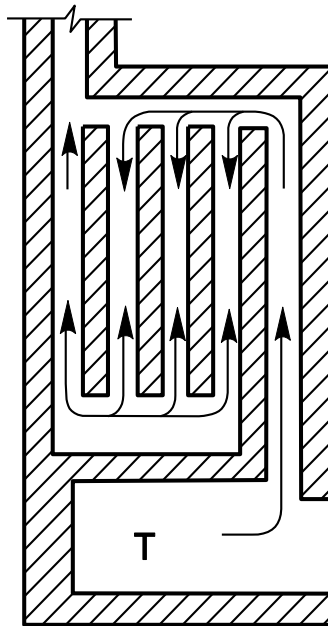
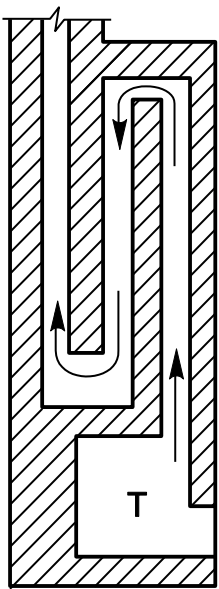
Russian stove  
(mini)

Fireplaces

# Furnaces design and waste gases movement

Furnaces are classified by:

- purpose;
- temperature of the walls;
- the duration of fuel combustion;
- heat capacity;
- scheme of movement of gases in the chimney;
- the method of smoke removal



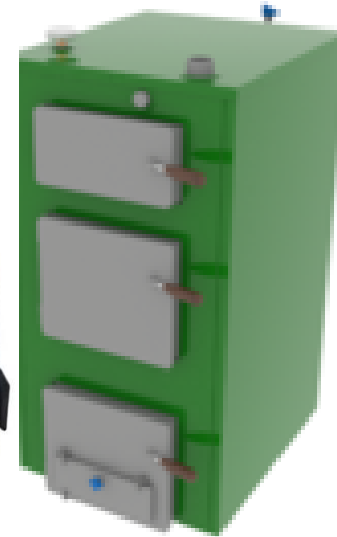
# Design of boilers for solid fuel combustion presented at the market



GTM Master, Poland



Elektromet, Poland



KST, Belarus



Fakel, Belarus

Boilers are different by:

- purposes (for house heating or hot water supply);
- type of fuel loading (manual or automatic) ;
- method of fuel combustion (classic or pyrolysis);
- heat capacity and time of fuel burning;
- efficiency (and cost)

up 4000 US \$



TIS, Belarus  
belkomin.com



TIS PELLET, Belarus

# Fabricated furnaces and fireplaces



up 3500 US \$



# Regulation of small combustion installation use in Belarus (EECCA)

- GOST 33015-2014 (EN 12809:2005) Domestic heating boilers fired by solid fuel nominal heat output up to 50 kW. Requirements and test methods (Котлы бытовые отопительные, работающие на твердом топливе номинальной тепловой мощностью до 50 кВт. Требования и методы испытаний с 01/01/2016)
- GOST 33016-2014 Heating boilers for solid fuels with manual and automatic loading with nominal heat output up to 500 kW. Terminology, requirements, test methods and labeling (Котлы отопительные для твердого топлива с ручной и автоматической загрузкой номинальной тепловой мощностью до 500 кВт. Терминология, требования, методы испытаний и маркировка)
- GOST 33008-2014 (EN 13229:2005) Inset appliances including open fires fired by solid fuels. Requirements and test methods (Камины открытые и каминные вставки, работающие на твердом топливе. Требования и методы испытаний)

- EN 12809:2005 Residential independent boilers fired by solid fuel - Nominal heat output up to 50 kW Requirements and test methods
- EN 303-5:2012 Heating boilers – Part 5: Heating boilers for solid fuels, manually and automatically stocked, nominal heat output of up to 500 kW – Terminology, requirements, testing and automatically stocked
- EN 13229:2005 Inset appliances including open fires fired by solid fuels - Requirements and test methods

For emissions:

- in boilers up to 50 kW: CO content
- in fireplaces and industrial furnaces: the content of carbon monoxide in dry undiluted products of combustion
- in heating and other furnaces (traditional) - no

# Regulation of small combustion installation use in Belarus: technical aspects

- NPB 110-2005 – Standards of fire safety of the Republic of Belarus. Stove heating. Requirements for the device furnaces and their operation. 2005 (НПБ 110-2005 – Нормы пожарной безопасности Республики Беларусь. Печное отопление. Требования к устройству печей и их эксплуатации 2005): (requirements for chimney cleaning and ash removal, inspection, size of wood fuel)
- SNB 4.02.01-03 Heating, ventilation and Air Conditioning. 2004. СНБ 4.02.01-03. Отопление, вентиляция и кондиционирование воздуха. 2004 (chimney height. Cross section, heating area)
- ТКР 45-4.02-99-2008 (02250). Fireplaces and household furnaces Rules for mounting. (ТКП 45-4.02-99-2008 (02250). Каминны и бытовые печи. Правила возведения. 2008

## Example of Recommendations



Proper wood heating  
Save health and save  
money![www.richtigheizen.tirol](http://www.richtigheizen.tirol)



## Instead of conclusion:

- different types of installation - possibilities to choose;
- fabricated furnaces and fireplaces as well as boilers are available;
- availability of high efficiency (boilers for pellets);
- decreasing of size

Thank you very much for your  
attention!