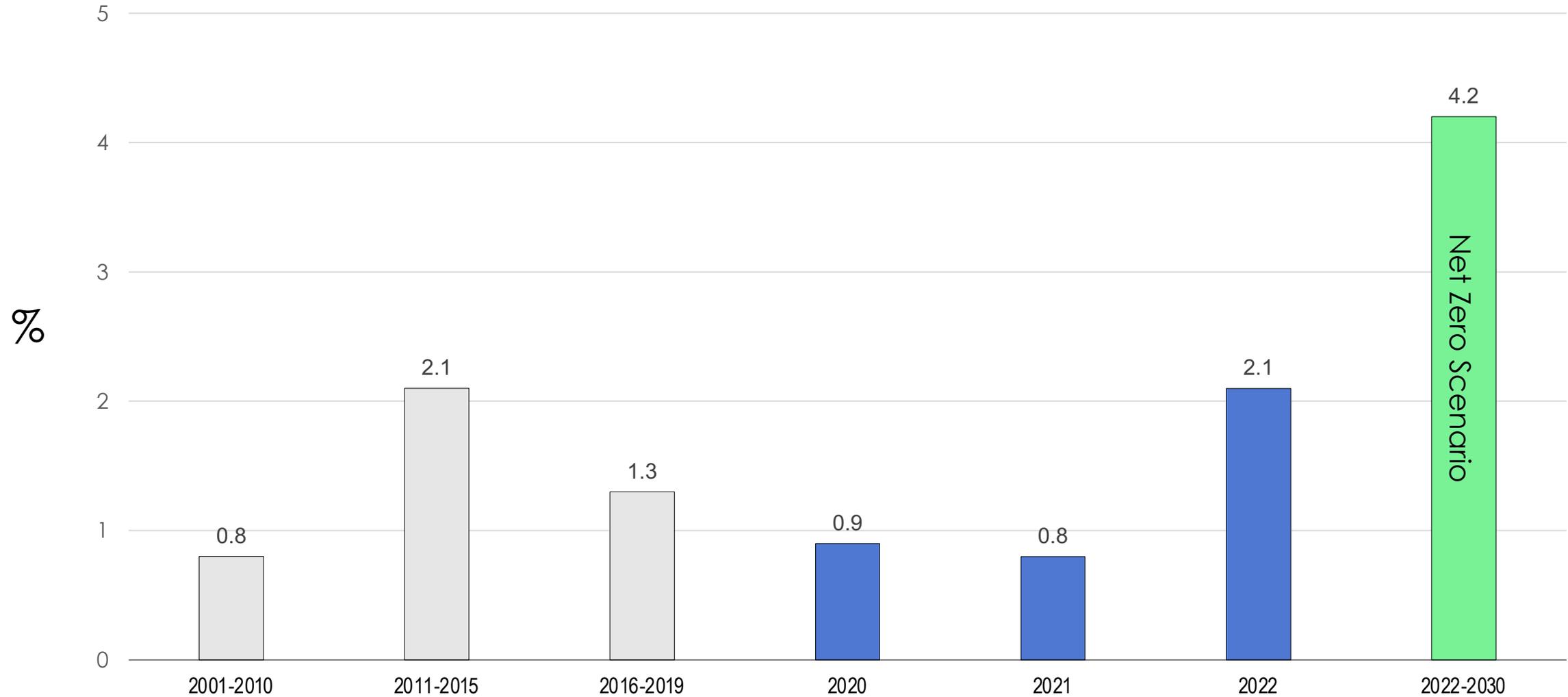


Training workshop: “Studying international practices in implementation of innovative energy efficiency technologies in the electric power industry. Methodology, goal and objectives of electricity and heat consumers energy survey”
SEIT building, 62 Bayram Khan str, Mary, 13-18 March 2024

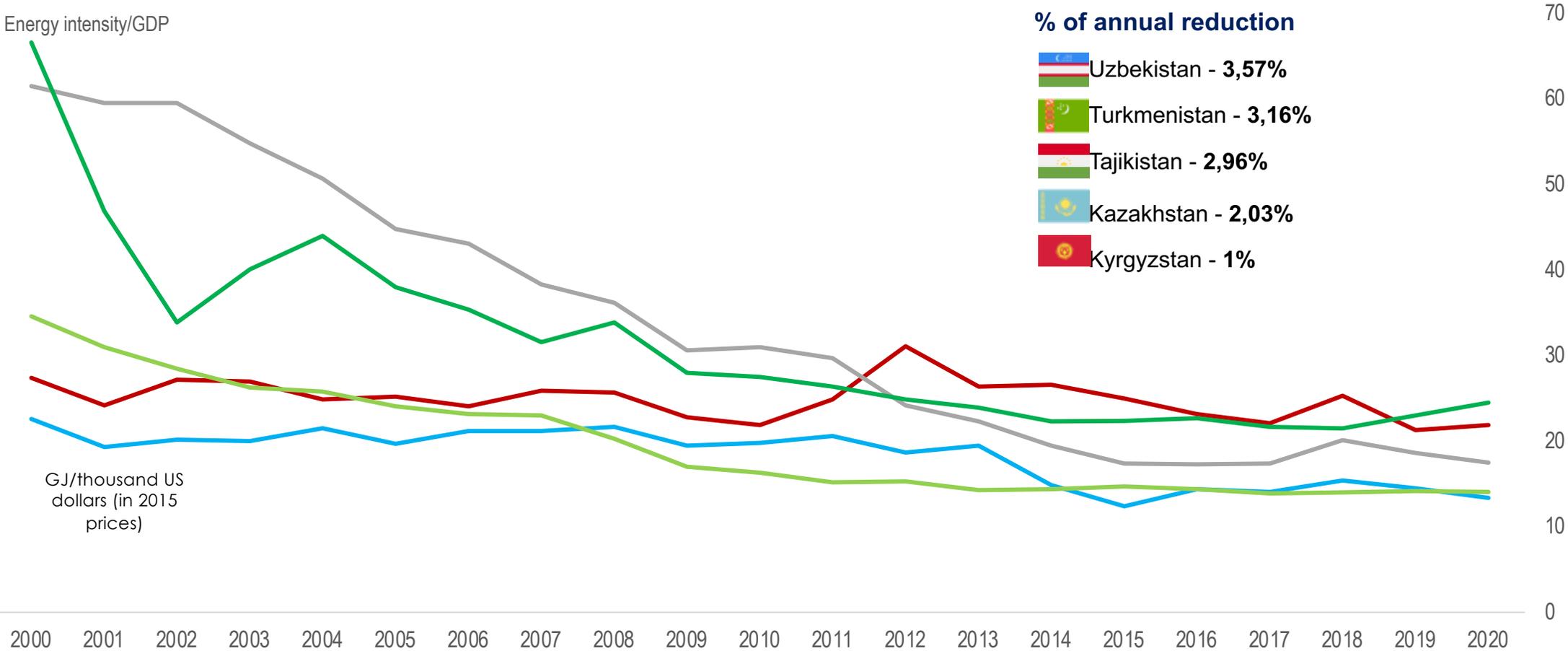
Kazakhstan’s experience in implementing energy efficient measures in residential and public buildings. Achieved results and prospects.

Zhaxylyk Tokayev
International Consultant, SECCA

Global increase in the energy intensity level of primary energy, annual change in carbon neutrality scenario, 2000-2030



ENERGY INTENSITY OF GDP IN CENTRAL ASIA COUNTRIES



— Казахстан

— Кыргызстан

— Узбекистан

— Таджикистан

— Туркменистан



Funded by the European Union

Kazakhstan

Kyrgyzstan

Uzbekistan

Tajikistan

Turkmenistan



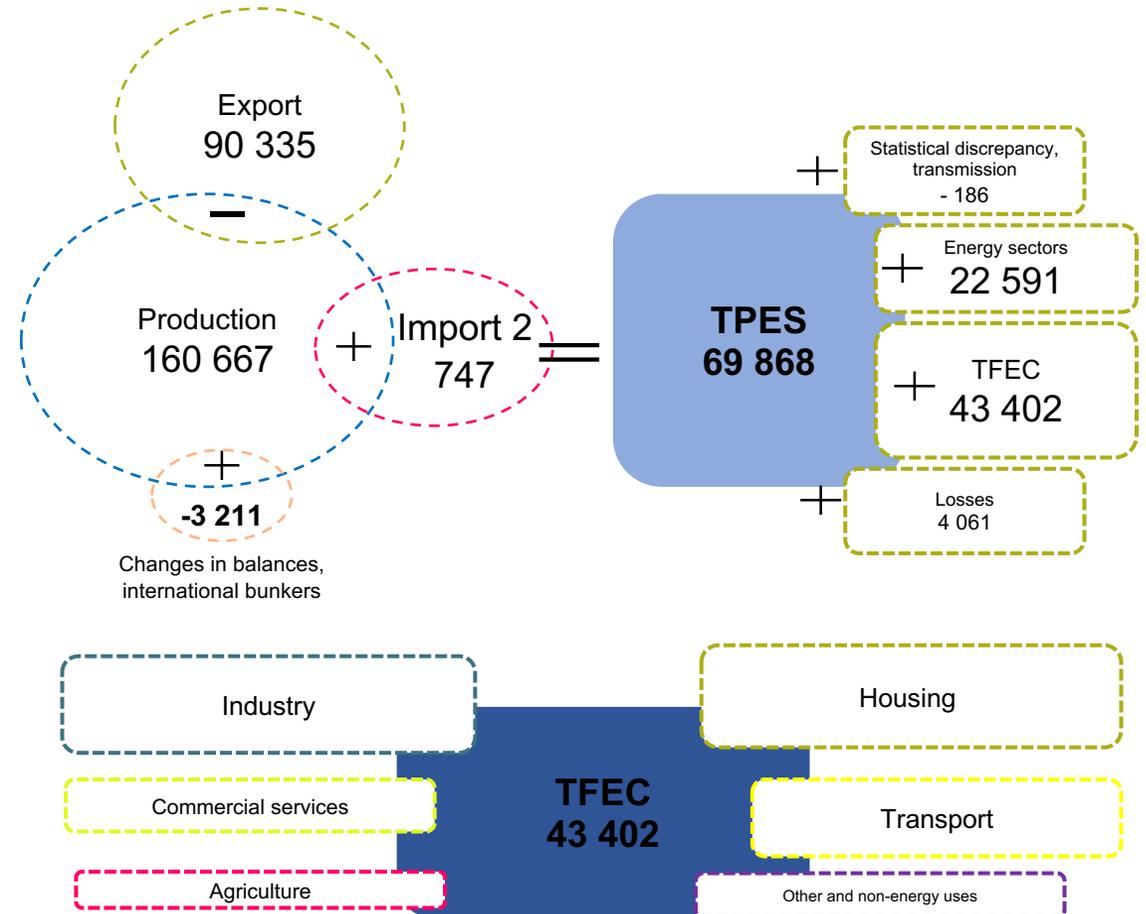
ENERGY SAVING POLICY



OVERVIEW OF THE FUEL AND ENERGY BALANCE IN KAZAKHSTAN

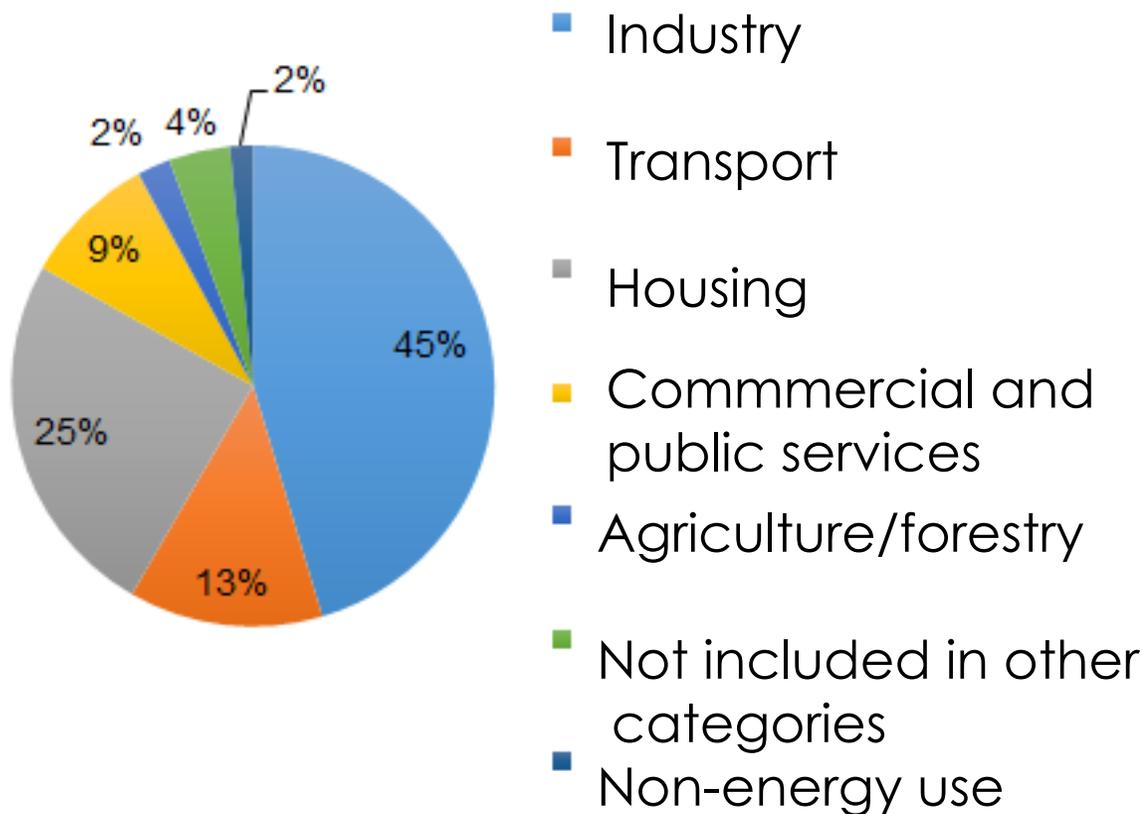
	2014	2022	Percentage change
Production	161 268	160 667	-0,4%
Import	7 472	2 747	-63,2%
Export	-102 989	-90 335	-12,3%
International bunkers	-232	-491	111,6%
Changes in balances*	-373	-2 720	629,2%
Total primary energy supply	65 146	69 868	7,2%
Statistical discrepancy	1 525	-186	-112,2%
Transmission	-	-	-
Energy sectors	20 786	22 591	8,7%
Losses	2 924	4 061	38,9%
Total final energy consumption	39 911	43 402	8,7%
Industry	18 108	12 251	-32,3%
Housing	9 900	13 388	35,2%
Commercial and public services	3 581	6 930	93,5%
Transport	5 184	8 608	66%
Agriculture and fishing	895	1 069	19,4%
Other and non-energy uses	2 243	1 154	-48,6%

Calculation of total primary energy supply (TPES) and total final energy consumption (TFEC), 2020, thousand toe

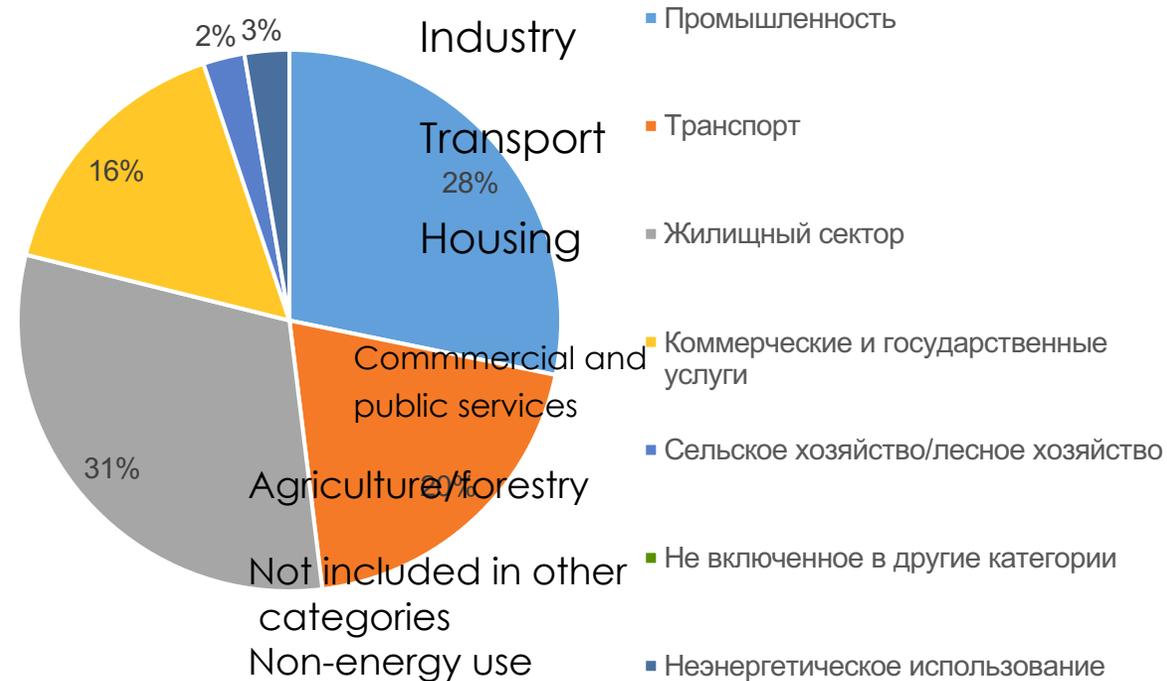


TOTAL FINAL ENERGY CONSUMPTION IN KAZAKHSTAN

By sector in 2014



By sector in 2022
ОКПЭ по секторам в 2022 году



REGULATORY INDICATORS FOR SUSTAINABLE ENERGY (RISE)

2021



2020



2018



2016



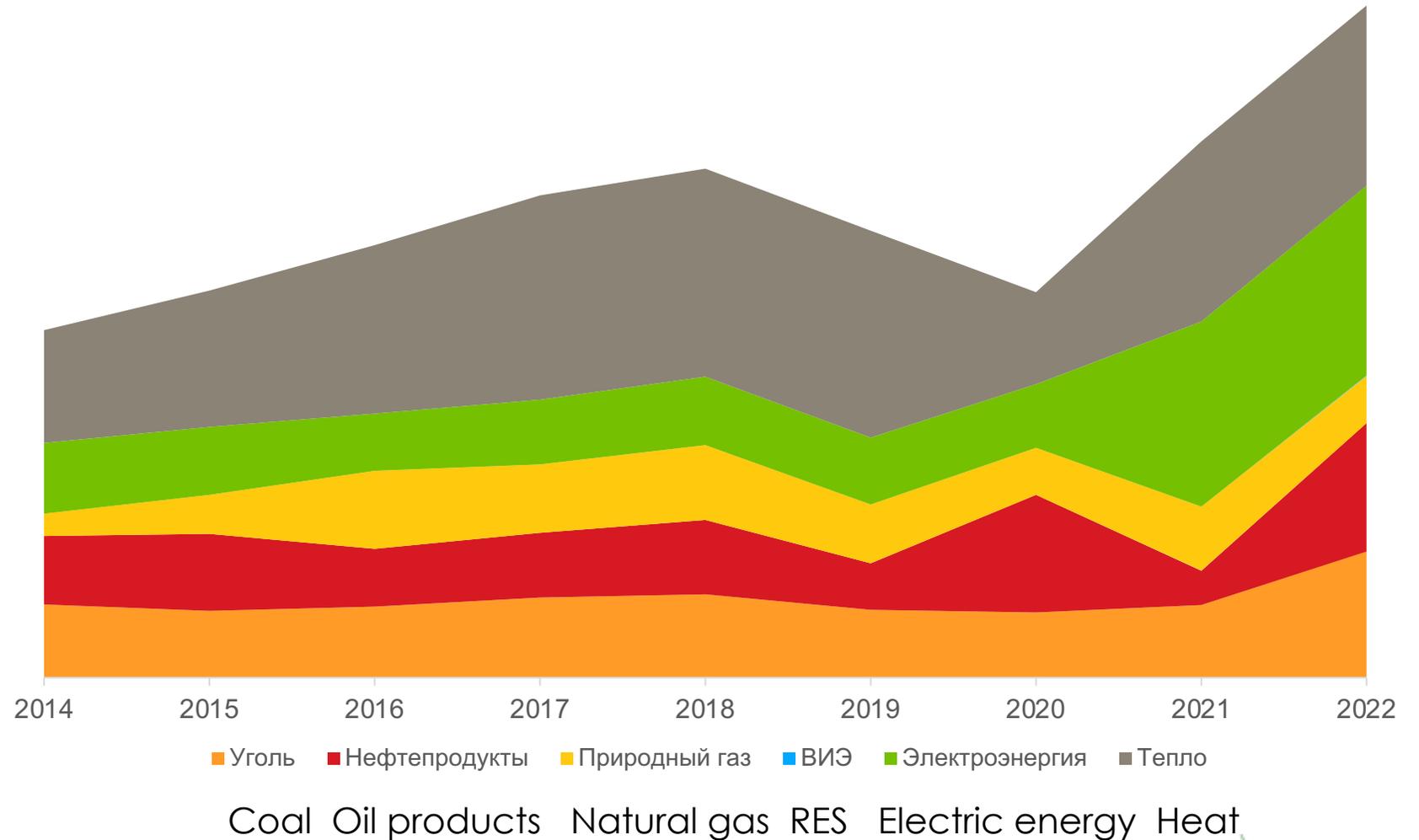
Funded by the European Union

<https://rise.esmap.org/countries>

ENERGY CONSUMPTION IN PUBLIC AND COMMERCIAL SERVICES

by
93%

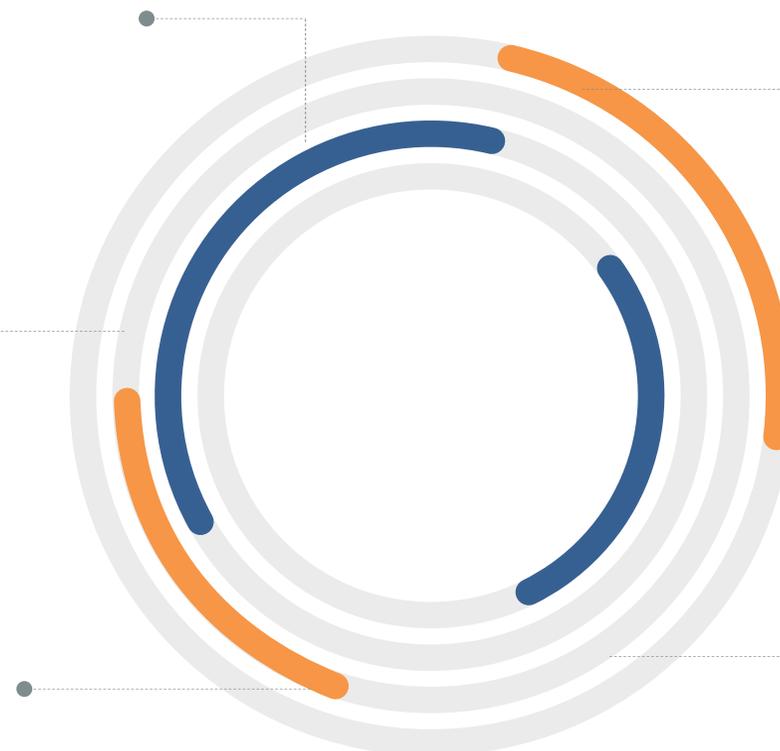
Increase in final consumption in
the sector in 2022 compared to
2014



Public sector and buildings

PROBLEM

- Non-energy efficient light sources
- Irrational use of energy resources
- Inconsistency with actual EE class
- Lack of energy consumption standards
- Non-compliance with building codes and regulations
- Wear and tear of electrical networks and power supply systems



SOLUTION

- Ensuring compliance with energy efficiency requirements at all stages of construction
- Energy audit of buildings
- Thermal modernization
- Tougher administrative liability
- Assigning an energy efficiency class to all buildings
- Energy consumption standards for the public sector
- Updating building codes and regulations on energy efficiency

PUBLIC INSTITUTIONS



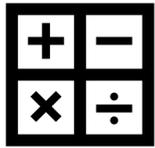
SECONDARY
SCHOOL



GYMNASIUM



COMMUNITY
CENTER



SCHOOL -
LYCEUM



BOARDING SCHOOL



MUSEUM



SPORTS SCHOOL



KINDERGARTEN



HOSPITAL



TRADE
SCHOOL



ADMINISTRATIVE
BUILDINGS



CLINIC



UNIVERSITY



THEATER



SANATORIUM

IF YOU CANNOT MEASURE IT, YOU CANNOT MANAGE IT

monitoring can be held in real time daily, weekly, monthly, quarterly or annually

Law of RK

On Energy Saving and Improving Energy Efficiency

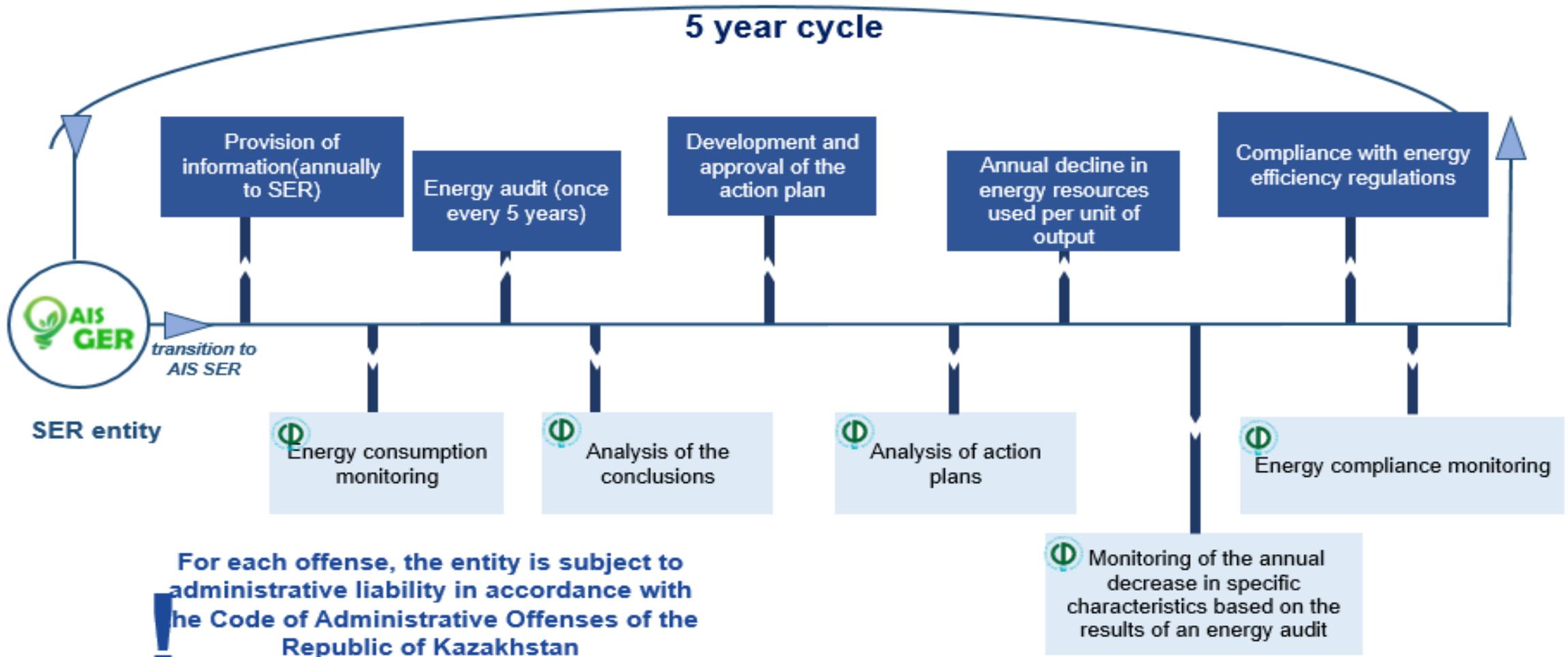
ARTICLE 9 PARAGRAPH 1.1

Information entered into the State energy register in relation to the subjects of the State energy register, which shall be state institutions, shall include:

- 1) business identification number of the legal entity, its postal address, name and main activities;
- 2) the volume of consumption of energy resources and water in physical and monetary terms for one calendar year;
- 3) measures for energy saving and energy efficiency improvement during the reporting period and a copy of the conclusion on energy saving and energy efficiency improvement or technical report (if any);
- 4) sources of heating and consumption of energy resources for heating per unit area of buildings, structures for the reporting period;
- 5) list of power-consuming equipment.

AIS STATE ENERGY REGISTER

5 year cycle



AIS STATE ENERGY REGISTER



SER entities consume 60% of the country's level, or 60.5 million tons of reference fuel



Entities not included in SER - 14%



Housing - 20%



Losses - 6%

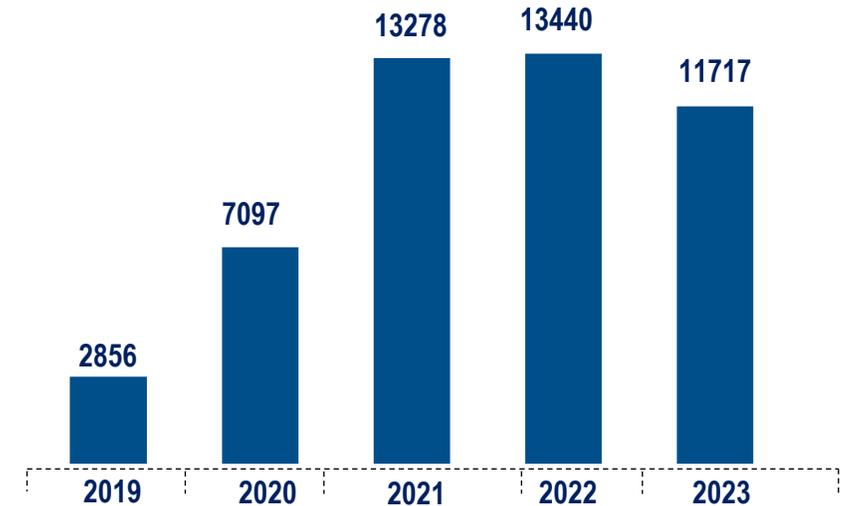
The country's consumption in 2022 amounted to 99,8 million tons of reference fuel

In 2016, the Ministry of Investment and Development of the Republic of Kazakhstan began digitalization of energy efficiency indicators

DIGITALIZATION of the State Energy Register (SER) and reports



Количество государственных учреждений в ГЭР
Number of public institutions in SER



Before 2019, the SER included public institutions with a consumption threshold of **100 or more** tons of reference fuel per year.

After 2019, the consumption threshold was abolished and all public institutions were included in SER.

WHAT IS "A TON OF REFERENCE FUEL"?

Reference fuel – a unit accepted upon technical economic calculations and specified in standards. It is used for correlation of a heat value of different types of fuels

1 TON OF REFERENCE FUEL IS EQUIVALENT TO:

- 7 million kcal
- 1.6 tons of coal;
- 2.45 tons of lignite;
- 8130 kWh of electricity;
- 6.99 Gcal of heat;
- 906 liters of motor gasoline;
- 914 liters of aviation gasoline;
- 840 liters of kerosene;
- 793 liters of diesel fuel
- 0.73 tons of fuel oil;
- 854 m³ of natural gas;
- 869 m³ of associated petroleum gas;
- 7142 m³ of blast furnace gas;
- 636 m³ of stripped gas;
- 1754 m³ of coke oven gas
- 1.57 tons of liquefied gas

1500 T.Y.T

≈ 12 000 000 kWh
WHAT IS ENOUGH TO
PROVIDE ABOUT 7,000
AVERAGE CITY
APARTMENTS PER YEAR
WITH ELECTRICITY

or

≈ 2x

≈ 2400 tons of coal
WHAT IS EQUIVALENT TO
30 COAL WAGONS



AIS STATE ENERGY REGISTER

Energy resource	Measurement unit
Coal	t
Coal briquettes, balls	t
Lignite (brown coal)	t
Crude oil	t
Gas condensate	t
Natural gas	m3
Associated petroleum gas	m3
Coke and semi-coke	t
Sawdust and wood waste	t
Aviation gasoline	l
Motor gasoline	l
Jet fuel gasoline type	l
Kerosene	l
Diesel fuel (Gas oils)	l
Fuel oil	t
Furnace fuel	t
Liquefied gas (propane and butane)	t
Purified gases, including ethylene, propylene, butylene, butadiene and other petroleum gases	t
Stripped gas	m3

Energy resource	Measurement unit
Oil and shale coke	t
Oil and shale bitumen	t
Blast furnace gas	m3
Coke gas	m3
Gas obtained by distillation at oil refineries	m3
Electricity	kWh
Thermal energy	gcal
Anthracite	t
Wood	t
Brown coal (lignite) briquettes and balls	t
Coking coal	t
Coal concentrate	t
Steam coal with high ash content	t
Coal resins	t
Jet fuel kerosene type	l
White spirit	l
Lubricants	l
Charcoal, including agglomerated one	t
Ferroalloy gas	m3

SER FORMS FOR PUBLIC INSTITUTIONS

Раздел 1. Укажите общие сведения об административных зданиях

№ п/п	Количество зданий, строений и сооружений	Год постройки	Наличие автоматизированного теплового пункта (Да/Нет)	Этажность здания, строения и сооружения	Средняя высота этажа, м	Общая площадь здания, строения и сооружения, м ²	Отапливаемая площадь здания, строения и сооружения, м ²	Кол-во сотрудников, работников (по штату)	Количество учащихся, воспитанников	Количество посещений, койко-мест
	1	2	3	4	5	6	7	8	9	10
1										

Раздел 3. Укажите информацию об источнике автономного отопления

№ п/п	Тип источника отопления	Количество источников отопления, штук	Коэффициент полезного действия	Мощность источников отопления, Вт	Год ввода в эксплуатацию
	1	2	3	4	5
1	котёл электрический				
2	котёл угольный				
3	печь электрическая				
4	печь угольная				
5	печь газовая				
6	печь дизельная				
n	прочее				

SER FORMS FOR PUBLIC INSTITUTIONS

Раздел 2. Укажите расчет показателя энергоэффективности и значение					
№ п/п	Вид отопления	Наименование показателя энергоэффективности	Единица измерения используемых коэффициентов энергоэффективности организации	Расчет фактического показателя энергоэффективности	Значение фактического показателя энергоэффективности
	1	2	3	4	5
1	Центральное отопление	удельное теплотребление	Гкал/м ² *		
2	Автономное отопление	расход электроэнергии на отопление	киловатт-час/ м ²		
		расход дизельного топлива на отопление	литр/ м ²		
		расход мазута топочного на отопление	тонна/ м ²		
		расход топлива печного бытового на отопление	тонна/ м ²		
		расход угля каменного на отопление	тонна/ м ²		
		расход природного газа на отопление	м ³ /м ²		
		Прочие расходы энергетических ресурсов на			



SER FORMS FOR PUBLIC INSTITUTIONS

Раздел 4. Укажите информацию об источниках освещения (внутренние и наружные)

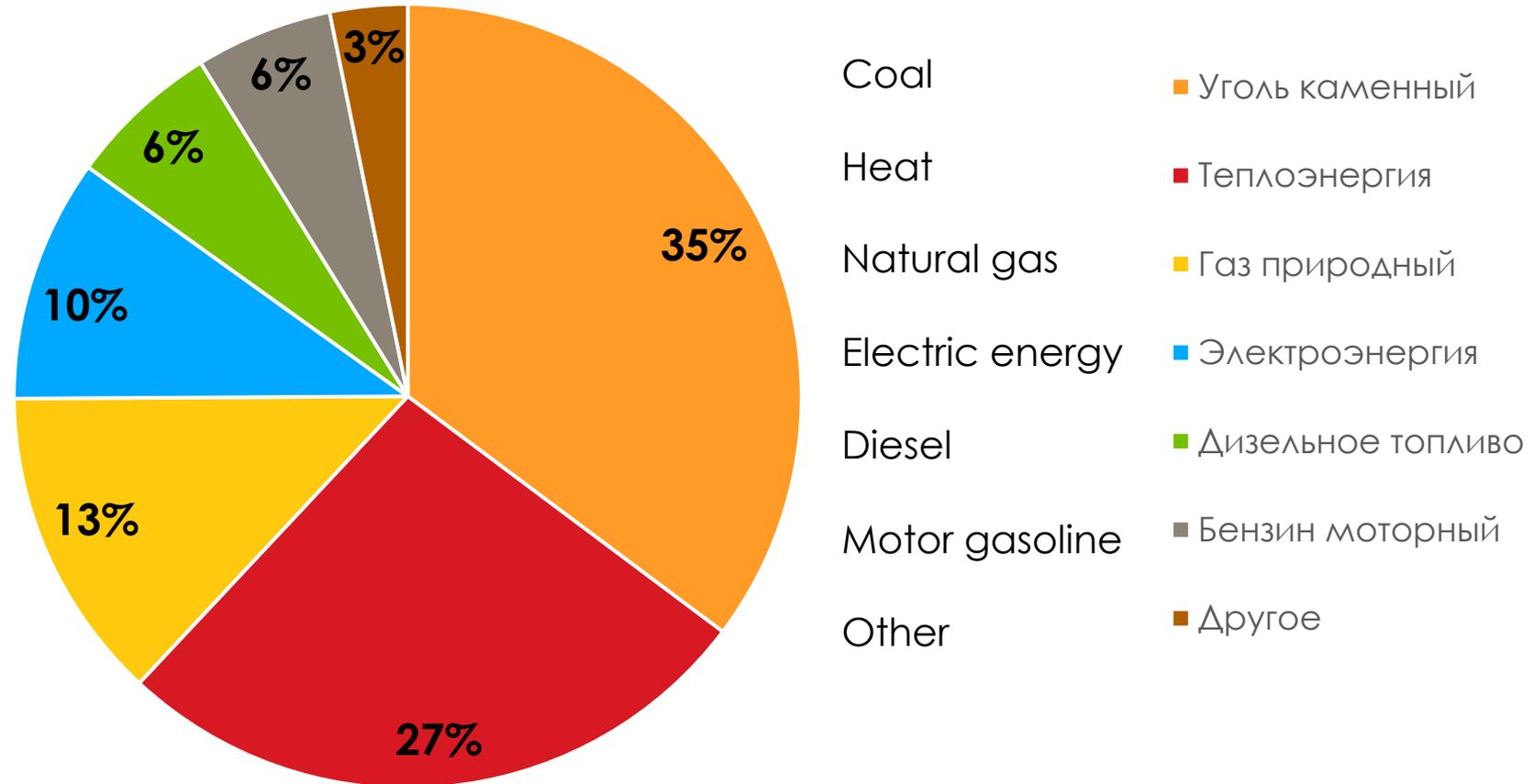
№ п/п	Осветительные приборы	Количество, штук	Мощность, Вт	Время работы в сутки, час			
	1	2	3	4			
1	лампы накаливания						
2	люминесцентные лампы						
3	светодиодные лампы						
n	прочее						

Раздел 5. Укажите информацию по **перечню** энергопотребляющего оборудования

№ п/п	Наименование	Количество, штук	Мощность, Вт	Время работы в сутки, час
	1	2	3	4
1	компьютер			
2	плита электрическая			
3	шкаф духовой электрический			
4	шкаф духовой газовый			
5	кондиционер			
6	холодильник			
n	прочее			

CONSUMPTION OF ENERGY RESOURCES BY SER PUBLIC INSTITUTIONS

2022



PUBLIC SECTOR WITHIN SER

A TOTAL NUMBER OF ENTITES

11 717

SCHOOLS	ADMINISTRATION	CULTURE	KINDERGARTENS	TRADE SCHOOLS	HEALTHCARE
7 098	2 351	354	171	64	52

CONSUMPTION

 **5,3**
million Gcal

3334 central heating

157 installed

automated
heat points

 **3,3**
billion kWh

4 million light points

LED ≈ 35%

ENERGY EFFICIENCY LABEL CURRENTLY IN USE



Energy efficiency class of a building is based on the energy audit results

"Arrow" icon is to be opposite the corresponding letter designation of the energy efficiency class

Month and year when the energy audit report was received

Building address

Year of commissioning

Heated area of the building

B

June 2022



Actual specific consumption of thermal energy for heating and ventilation of the building during the heating period (based on the energy audit results)

INFORMATION ON THE BUILDING

Astana, Yesil district, Uly Dala street, 16/1

Year of commissioning: 2012

Area: 1,000 m²

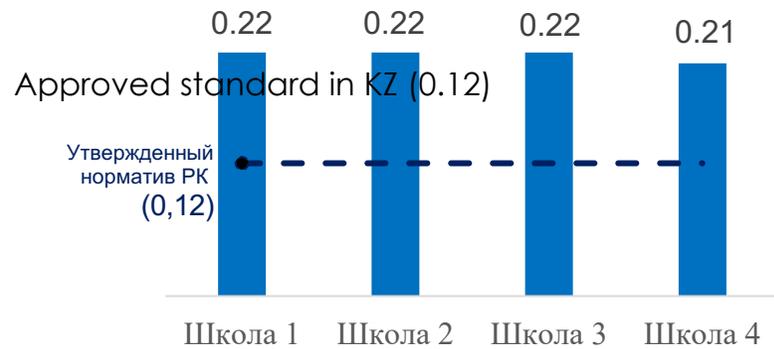
SPECIFIC ENERGY CONSUMPTION

150

kW*h/m²

STRUCTURE OF SPECIFIC ENERGY EFFICIENCY INDICATORS BY CLIMATE ZONES

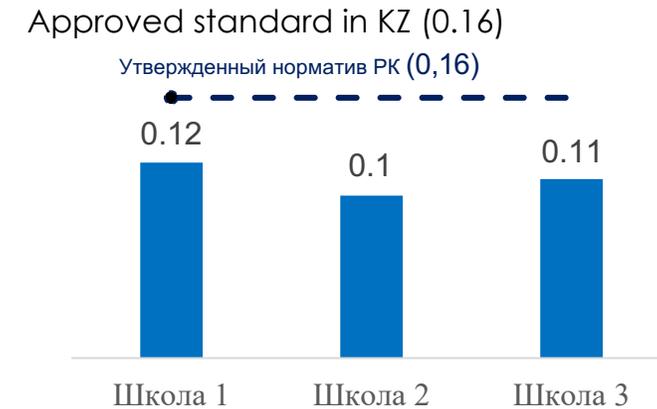
Climate zone 1



General information

#	name	Year of construction	heated area, m2	coal consumption, tons
1	School 1	1988	1337,6	300
2	School 2	2007	1353,1	300
3	School 3	1990	1380,8	300
4	School 4	2013	1342,0	280

Climate zone 2



General information

#	name	Year of construction	heated area, m2	coal consumption, tons
1	School 1	1967	2440,2	300
2	School 2	1982	2861,3	300
3	School 3	2012	3408	300

MONITORING PUBLIC PROCUREMENT OF GOODS, WORKS AND SERVICES

LEGAL FRAMEWORK



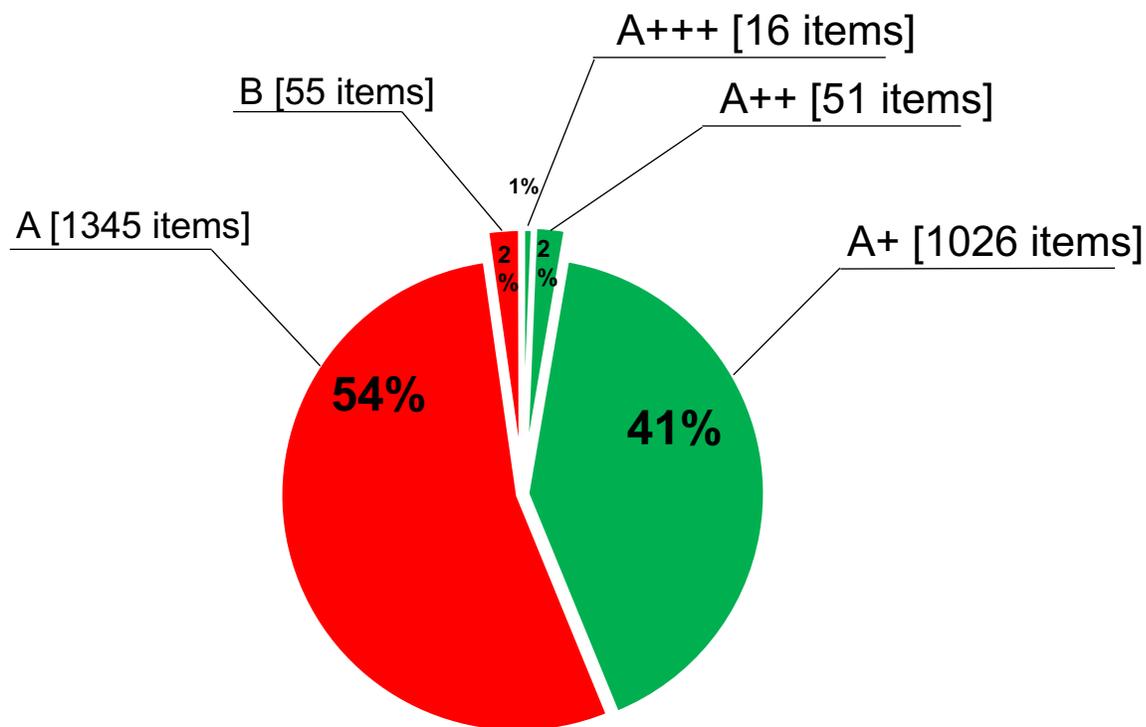
On establishing requirements for energy efficiency of goods, works, services in public procurement and procurement of goods, works, services dated November 11, 2022 No. 627



On approval of the Rules for monitoring public procurement and procurement of goods, works, services in the field of energy saving and improving energy efficiency dated December 1, 2022 No. 673



On establishing requirements for energy efficiency of goods, works, services in public procurement and procurement of goods, works, services dated November 8, 2022 No. 619



■ A+++ ■ A++ ■ A+ ■ A ■ B ■ C

A total number of refrigerators with defined energy efficiency classes

2494

Meeting the established requirements

1093

(from A+ to A+++)

Not meeting the established requirements*

1401

(A, B, C)

* According to the order of the **Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan** dated November 11, 2022 No. 627, household refrigeration appliances must have an energy efficiency class of **at least A+**.



Funded by the European Union

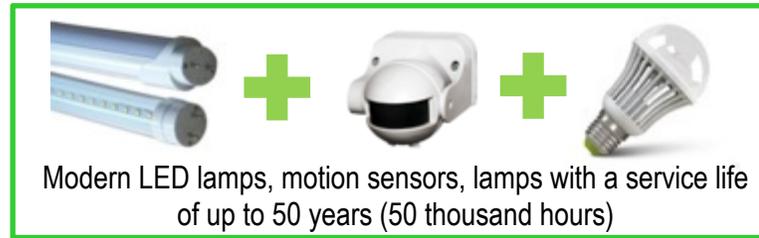
PPP PILOT PROJECT



15%

MODERNIZATION OF THE "TRANSPORT TOWER" LIGHTING SYSTEM IN 2016

Replacing LB18 and LB36 type lamps with LED energy-saving lamps and connecting an automated control system (dimming)



1 747 548 kWh per year

INITIAL DATA

Total quantity: 13,400 lamps
Lamp power: 18 and 36 W
Lamp life: 10.5 hours



TECHNICAL PARAMETERS

Lamp power: 9 and 20 W
Savings: up to 50%
Dimming: 30%
Compliance with SNiP standards

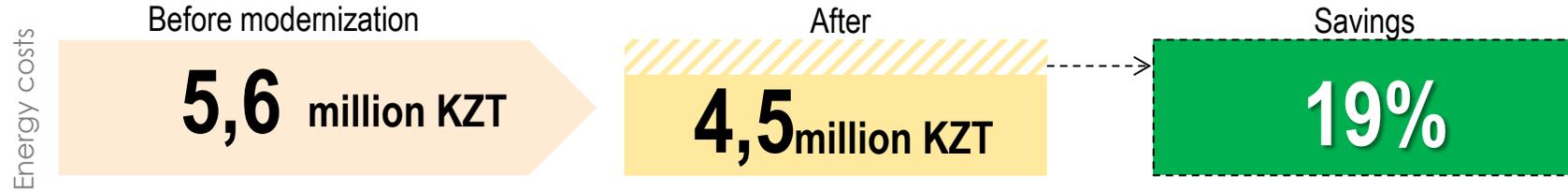
PARAMETERS OF ENERGY SERVICE CONTRACT

Saving 11 million KZT per year
Investments: 70 million KZT
Payback: 3-5 years
Term of the energy service contract: 6 years

1 159 475 kWh per year

WORLD BANK PROJECT “INCREASING ENERGY EFFICIENCY IN KAZAKHSTAN”

Example: KSU secondary school No. 17, Karaganda



SCOPE OF WORK COMPLETED	
Architectural proposal	Heating and ventilation
Seam repair. Panel joints – 2300 m	1 automated heating point installed
Windows – 965.3 m2 Doors – 29.1 m2	Electrical equipment and lighting
Roof – 1500 m2	902 LED lamps

GOAL AND TASKS OF THE ENERGY SAVING CONCEPT OF KAZAKHSTAN

GOAL

ENERGY INTENSITY OF GDP TO BE REDUCED BY

15%

2021

0,32

t.o.e./thousand US dollars

2029

0,27

t.o.e./thousand US dollars

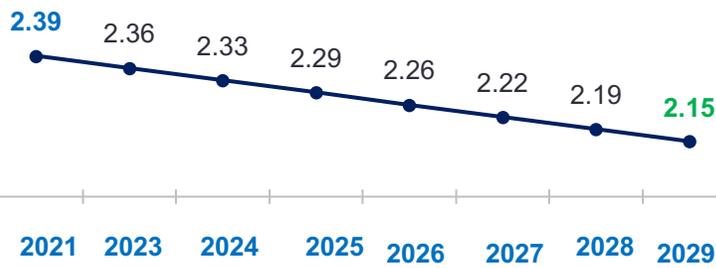
ENERGY CONSUMPTION PER FLOOR AREA TO BE REDUCED



GJ/m²

by **10%**

of the 2021 level



KEY ACTIVITIES



UPDATING BUILDING REGULATIONS ON ENERGY SAVING

Commercial and housing sector



THERMAL MODERNIZATION

Housing sector



COMPLIANCE WITH ENERGY CONSUMPTION STANDARDS

Public sector



MONITORING OF PUBLIC PROCUREMENTS FOR COMPLIANCE WITH ENERGY EFFICIENCY REQUIREMENTS



COMPREHENSIVE MONITORING OF THE PUBLIC SECTOR