SECCA
Sustainable Energy Connectivity in Central Asia

Funded by the European Union

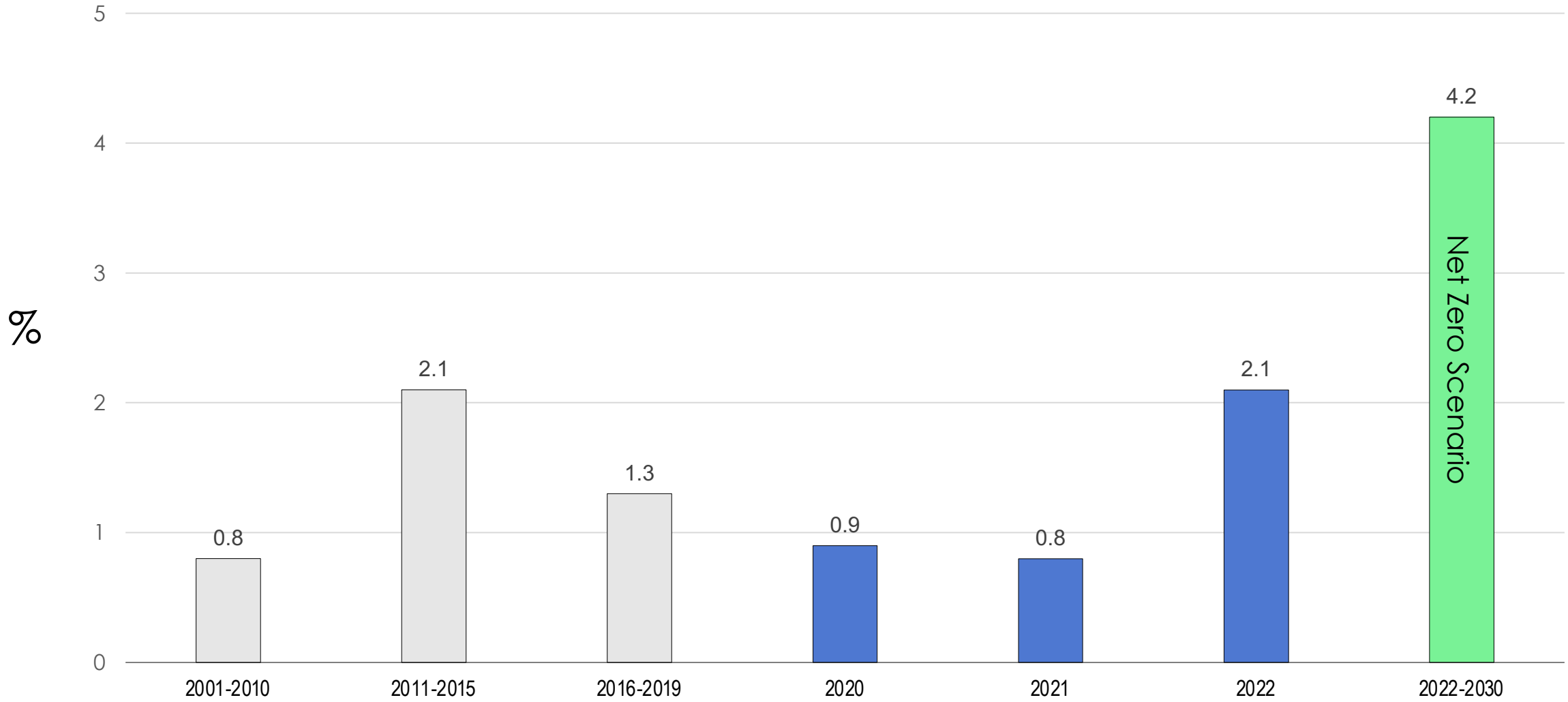
Training workshop: "Studying international practices in implementation of innovative energy efficiency technologies in the electric power industry. Methodology, goal and objectives of electricity and heat consumers energy survey"
SEIT building, 62 Bayram Khan str, Mary, 13-19 March 2024

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

Zhaxylyk Tokayev
International Consultant, SECCA

Stantec | intec | ACTED | European University Institute | Robert Schuman Centre for Advanced Studies | FSR Energy | Florence School of Regulation

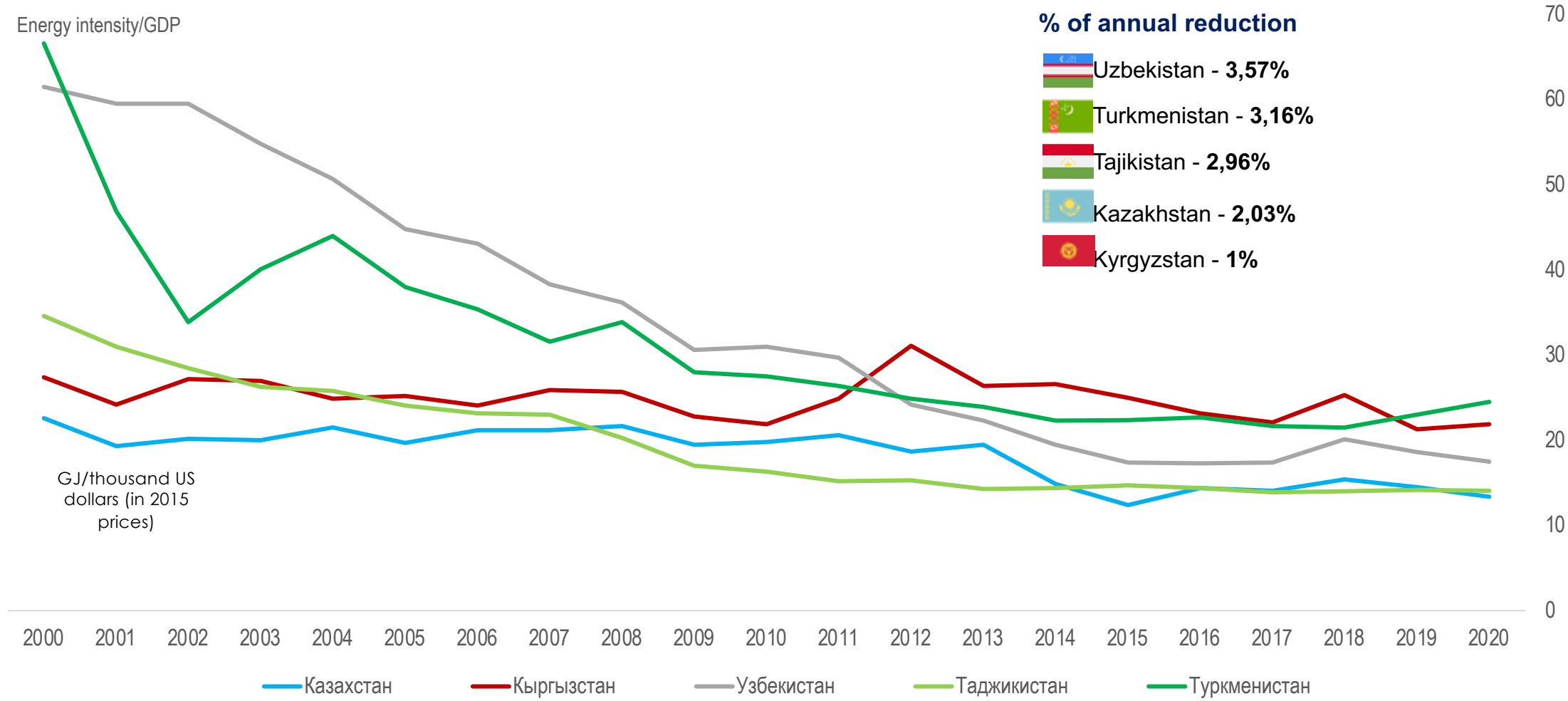
Global increase in the energy intensity level of primary energy, annual change in carbon neutrality scenario, 2000-2030



Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

ENERGY INTENSITY OF GDP IN CENTRAL ASIA COUNTRIES



Funded by the European Union

Kazakhstan Kyrgyzstan Uzbekistan Tajikistan Turkmenistan

SECCA
Sustainable Energy Connectivity in Central Asia

ENERGY SAVING POLICY

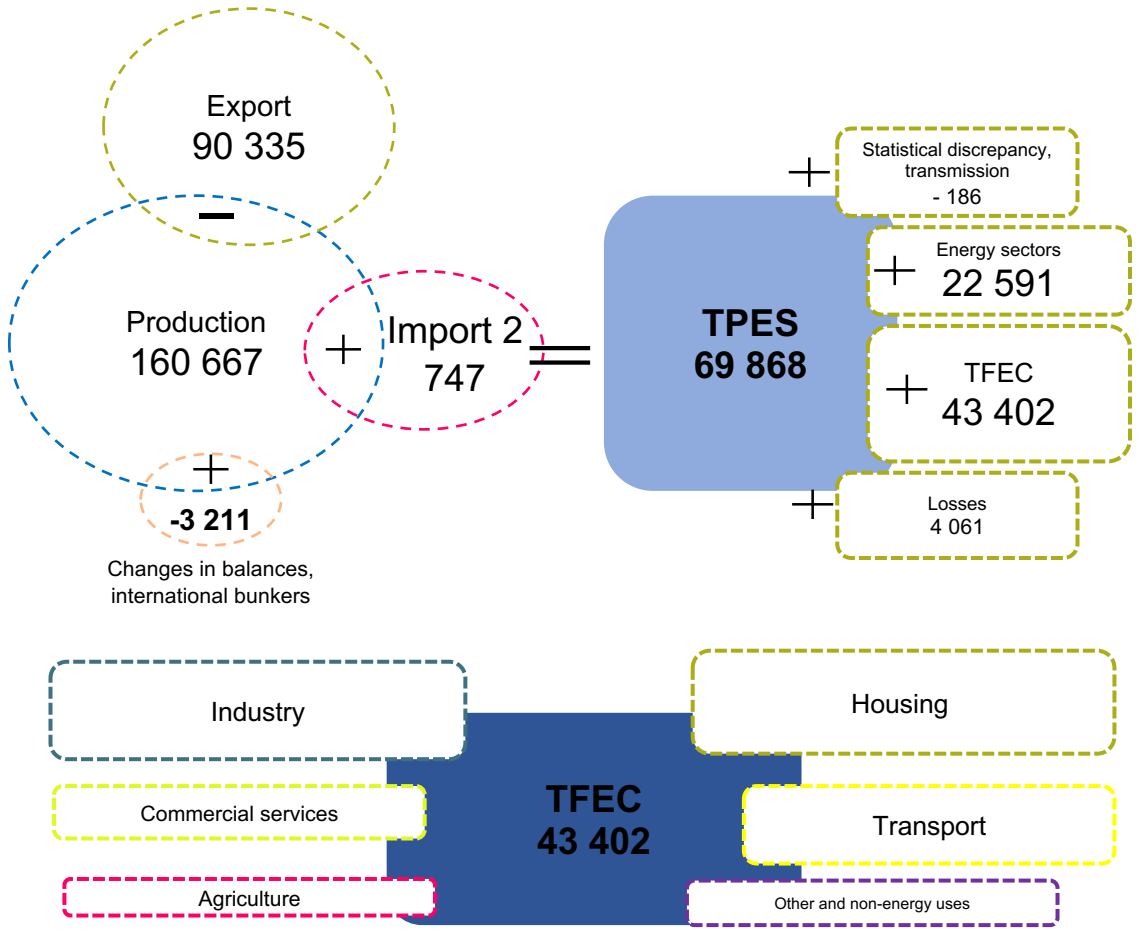
Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

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

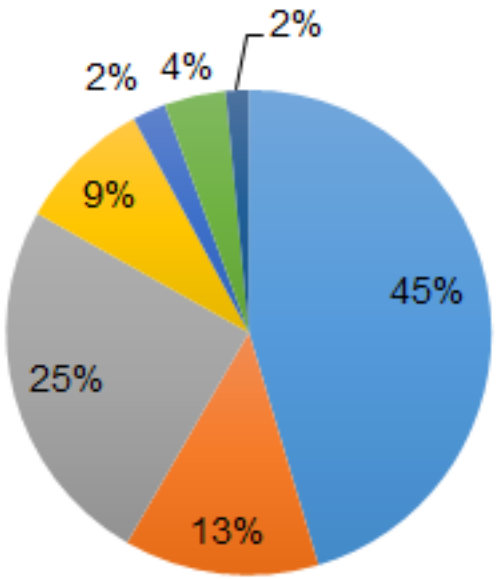


Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

TOTAL FINAL ENERGY CONSUMPTION IN KAZAKHSTAN

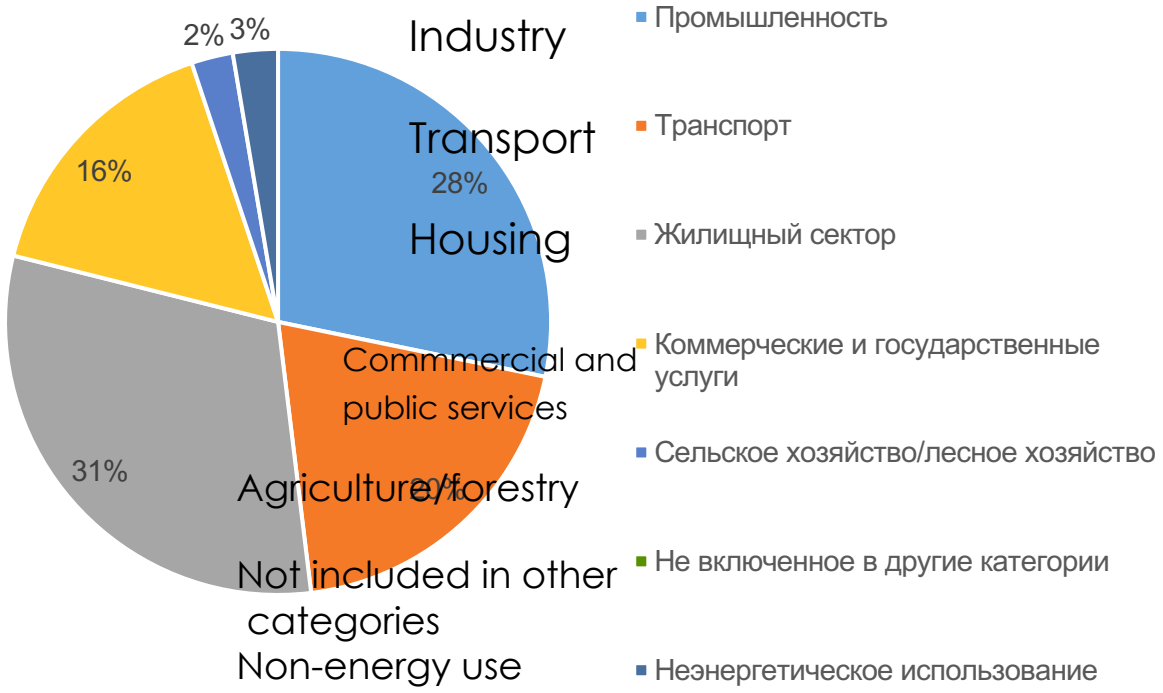
By sector in 2014



- Industry
- Transport
- Housing
- Commmercial and public services
- Agriculture/forestry
- Not included in other categories
- Non-energy use

By sector in 2022

ОКПЭ по секторам в 2022 году



Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

REGULATORY INDICATORS FOR SUSTAINABLE ENERGY (RISE)

2021

2020

2018

2016

Funded by the European Union

https://rise.esmap.org/countries

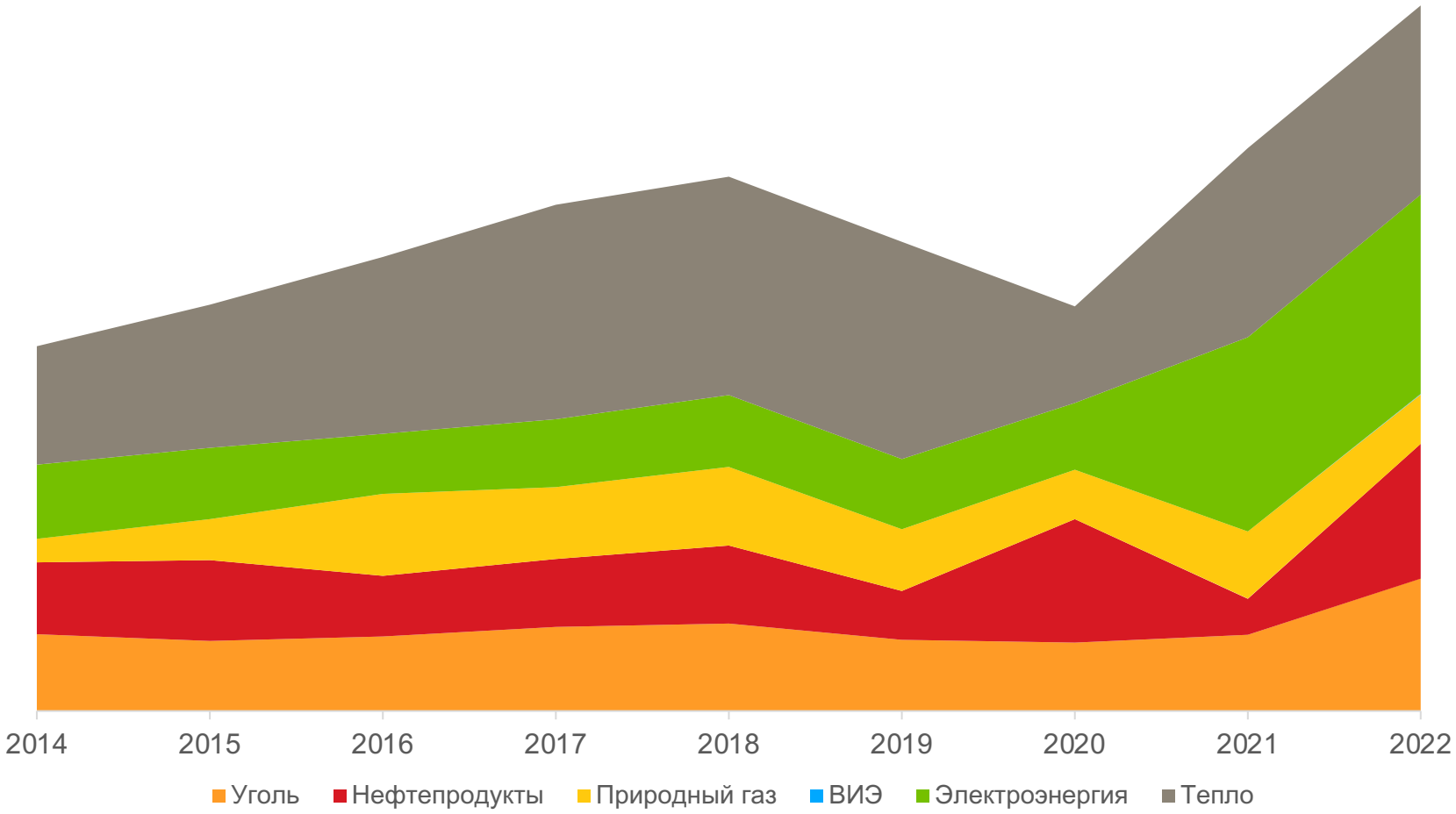
SECCA
Sustainable Energy Connectivity in Central Asia

ENERGY CONSUMPTION IN PUBLIC AND COMMERCIAL SERVICES

by

93%

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



Coal Oil products Natural gas RES Electric energy Heat

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

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

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

PUBLIC INSTITUTIONS

SECONDARY SCHOOL

GYMNASIUM

COMMUNITY CENTER

SCHOOL - LYCEUM

BOARDING SCHOOL

MUSEUM

SPORTS SCHOOL

KINDERGARTEN

HOSPITAL

TRADE SCHOOL

ADMINISTRATIVE BUILDINGS

CLINIC

UNIVERSITY

THEATER

SANATORIUM

Funded by the European Union

IF YOU CANNOT MEASURE IT, YOU CANNOT MANAGE IT

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

Funded by
the European Union

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;

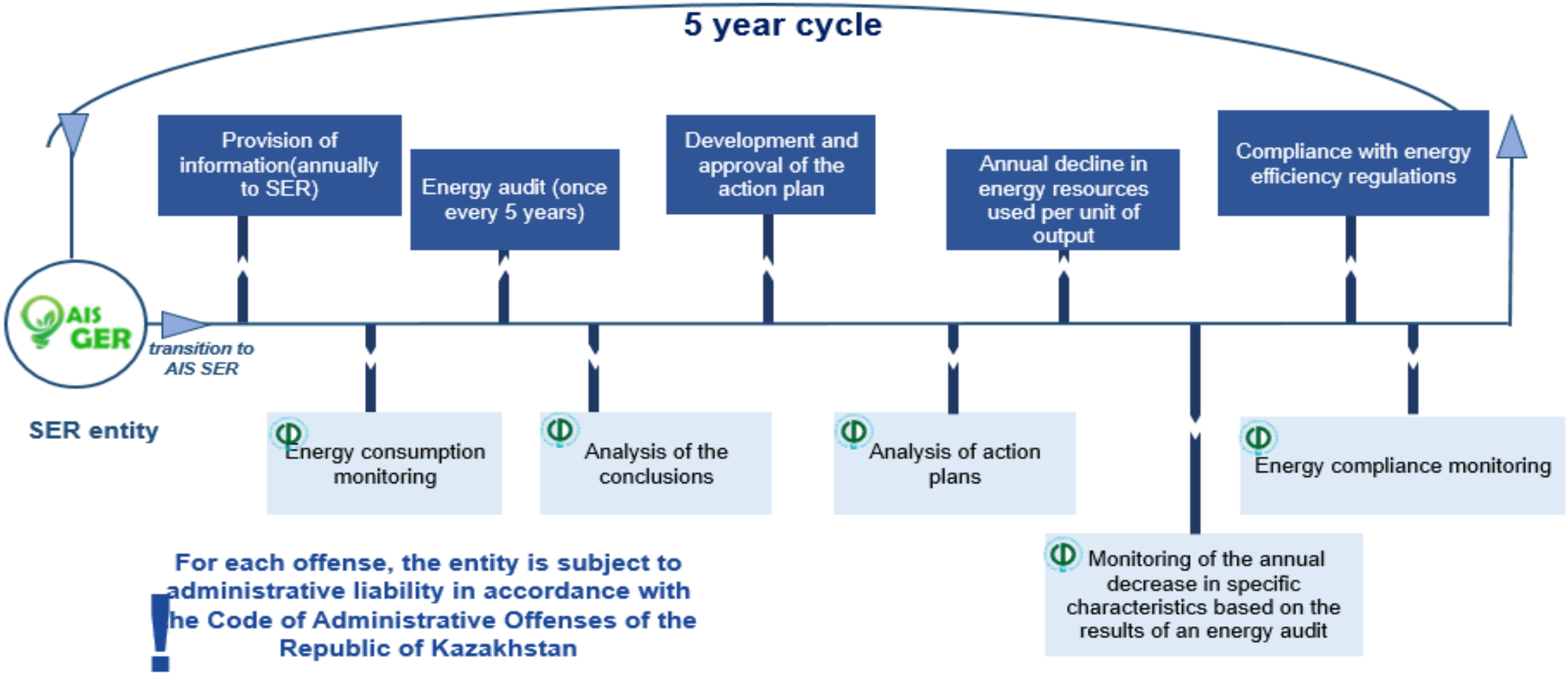
3) measures for energy saving and energy efficiency improvement during the reporting period and a copy of the conclusion on energy saving and energy efficiency improvement or technical report (if any);

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.

Funded by
the European Union

AIS STATE ENERGY REGISTER



Funded by the European Union

www.aisger.kz

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%

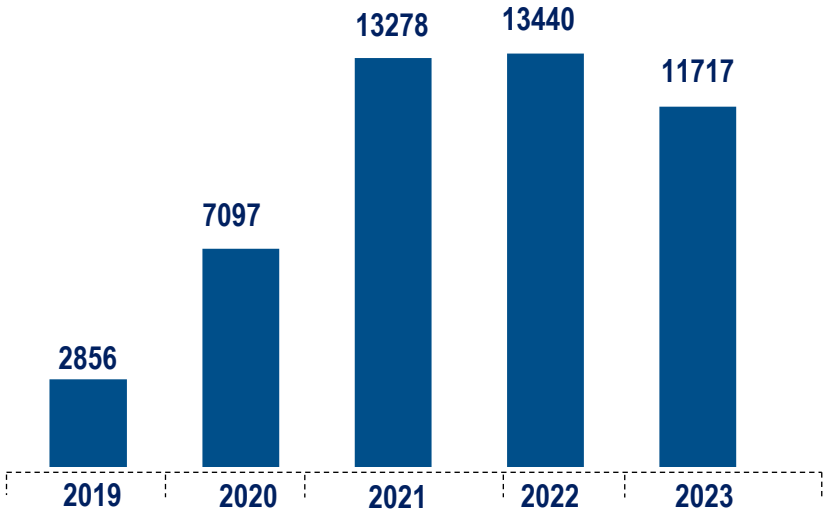
Housing - 20%

Losses - 6%

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

Количество государственных учреждений в ГЭР

Number of public institutions in SER



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

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.

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

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 т.у.т

≈12 000 000 kWh

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

or

≈2400 tons of coal

WHAT IS EQUIVALENT TO 30 COAL WAGONS

≈ 2x

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

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				

Funded by the European Union

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 энерго-эффективности	Значение фактического показателя энерго-эффективности
	1	2	3	4	5
1	Центральное отопление	удельное теплопотребление	Гкал/м^2 *		
2	Автономное отопление	расход электроэнергия 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			

Funded by the European Union

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			

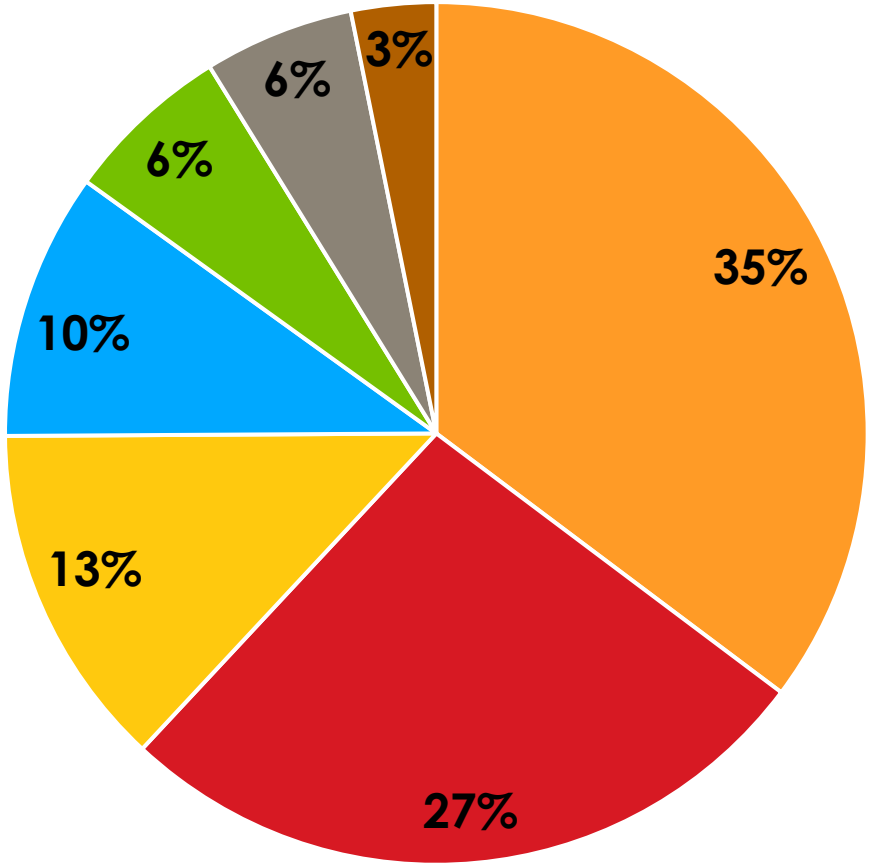
Раздел 5. Укажите информацию по перечню энергопотребляющего оборудования

№ 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			

Funded by the European Union

CONSUMPTION OF ENERGY RESOURCES BY SER PUBLIC INSTITUTIONS

2022



Coal	Уголь каменный
Heat	Теплоэнергия
Natural gas	Газ природный
Electric energy	Электроэнергия
Diesel	Дизельное топливо
Motor gasoline	Бензин моторный
Other	Другое

Funded by the European Union

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

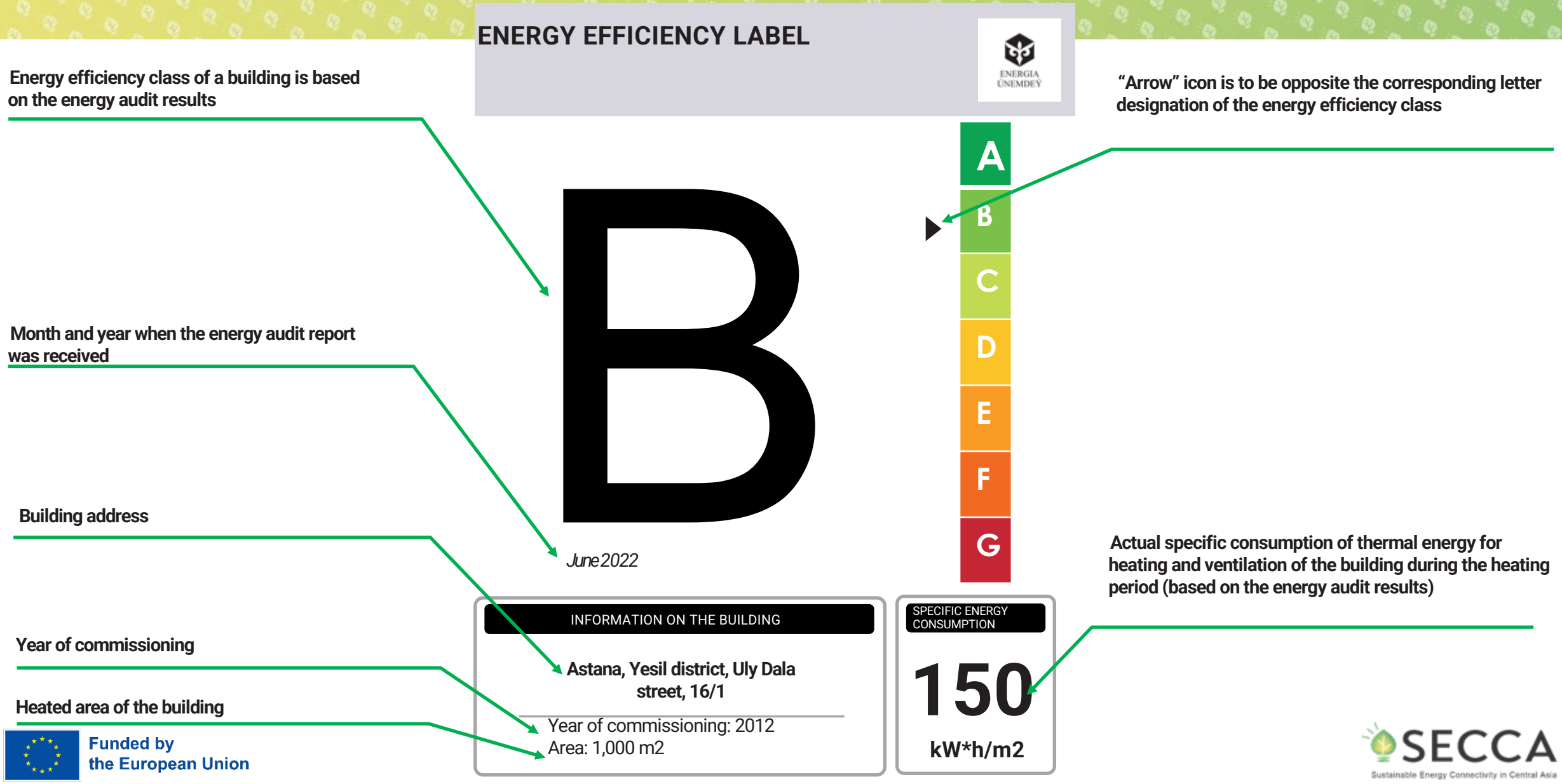
157 installed
automated heat points

3,3
billion kWh

4 **million light points**
LED ≈ 35%

Funded by the European Union

ENERGY EFFICIENCY LABEL CURRENTLY IN USE

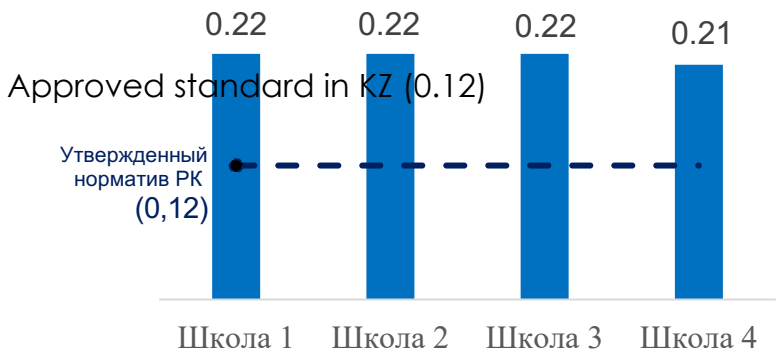


Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia

STRUCTURE OF SPECIFIC ENERGY EFFICIENCY INDICATORS BY CLIMATE ZONES

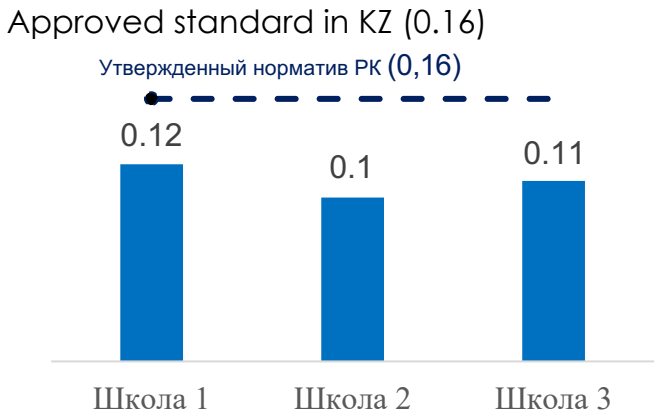
Climate zone 1



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

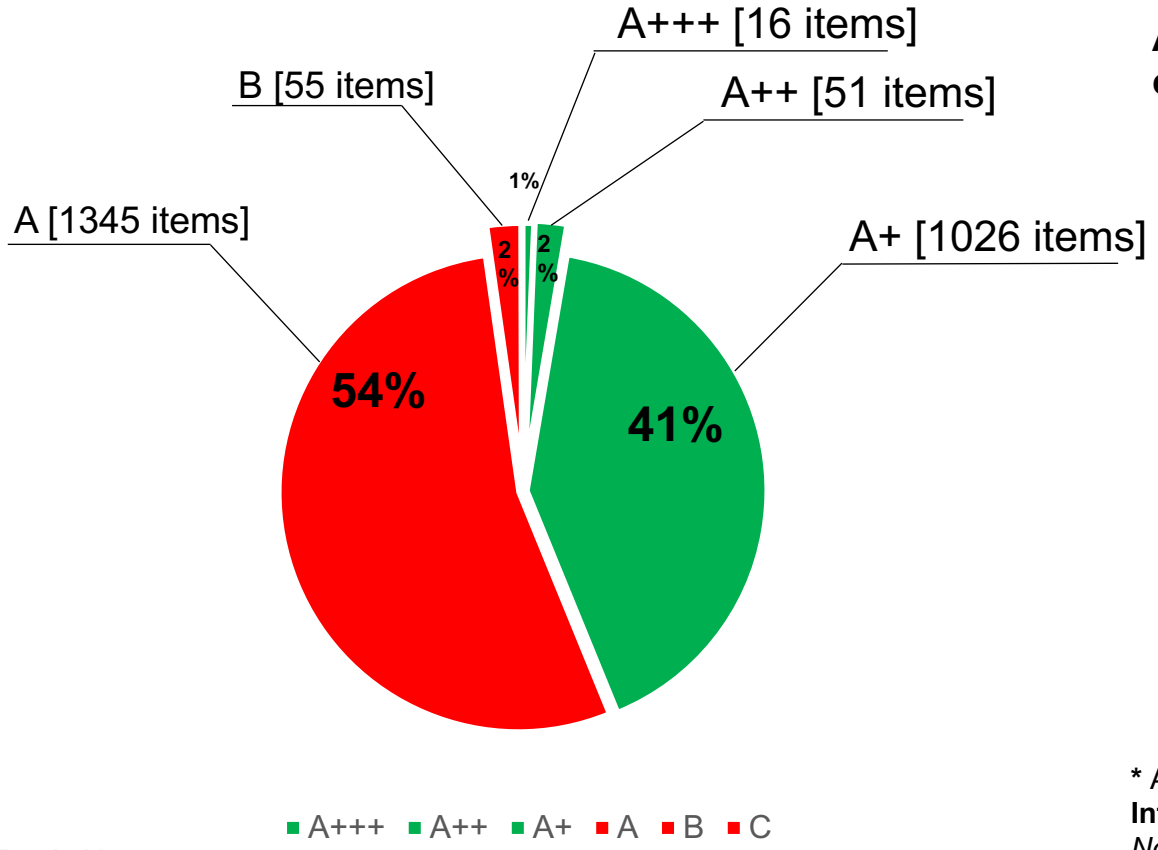
#	name	Year of construction	heated area, m2	coal consumption, tons
1	School 1	1967	2440,2	300
2	School 2	1982	2861,3	300
3	School 3	2012	3408	300

Funded by the European Union

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 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

SECCA Sustainable Energy Connectivity in Central Asia

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)

Modern LED lamps, motion sensors, lamps with a service life of up to 50 years (50 thousand hours)

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

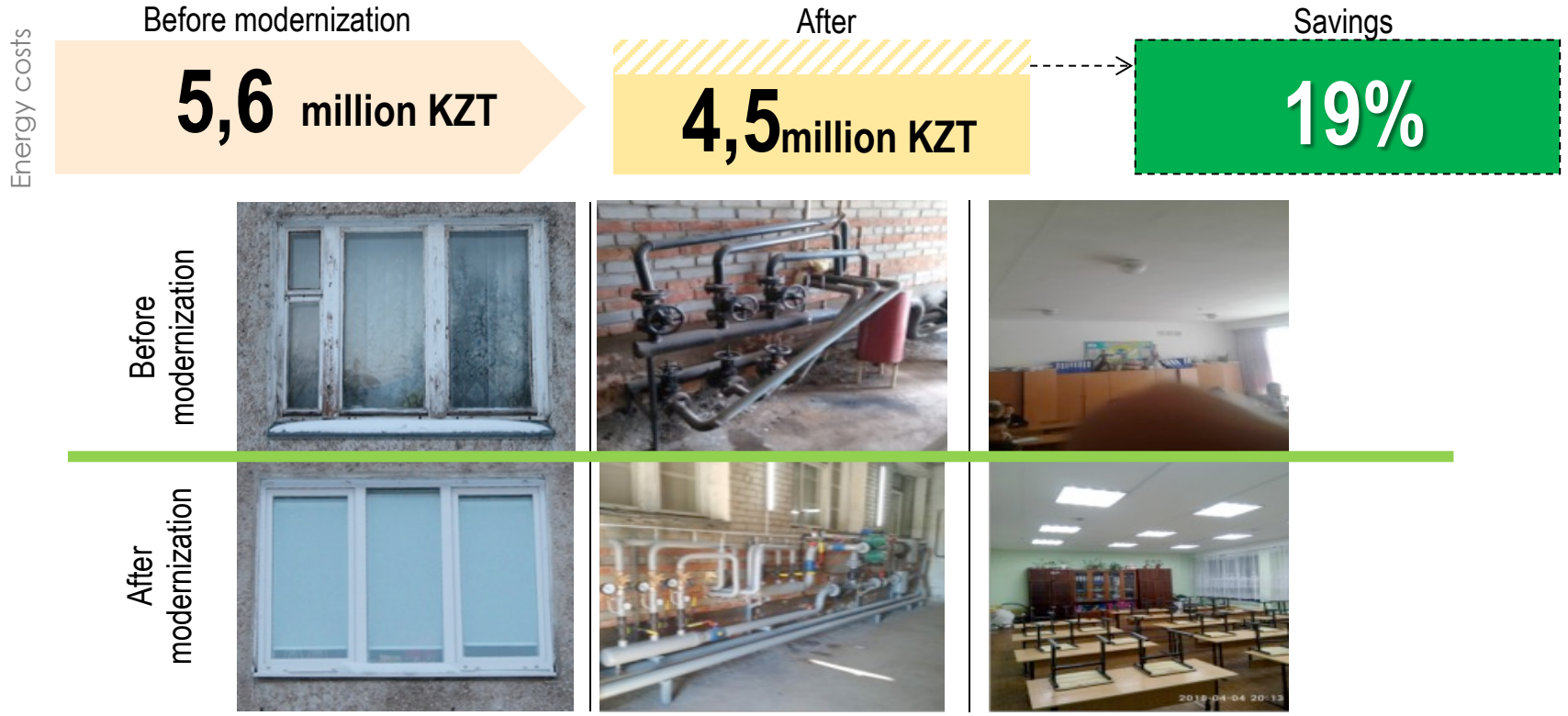
Saving 11 million KZT per year
Investments: 70 million KZT
Payback: 3-5 years
Term of the energy service contract: 6 years

1 159 475 kWh per year

Funded by the European Union

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

Funded by the European Union

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

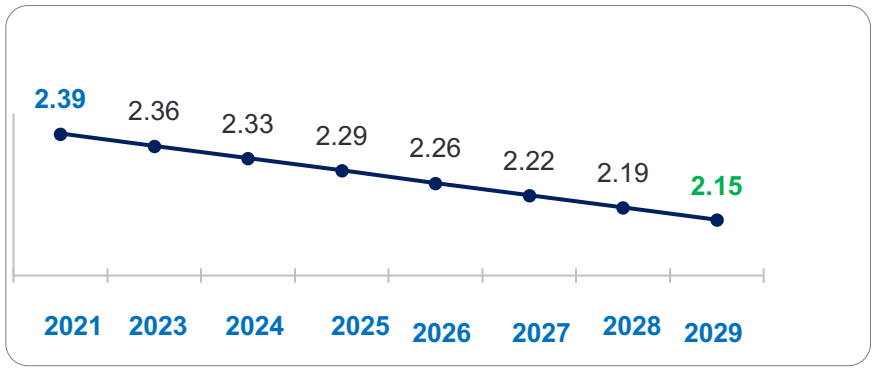
t.o.e./thousand US dollars

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

Funded by the European Union

SECCA
Sustainable Energy Connectivity in Central Asia