

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

Pilot facility energy survey. Goals, objectives, methods of conducting residential and public buildings energy surveys. Methods of energy survey indicators analysis, energy efficiency feasibility study elaboration

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LEGAL FRAMEWORK



2012

Law of the Republic of Kazakhstan “On energy saving and improving energy efficiency”

2012-2015

Rules for conducting an energy audit (August 2012)

Rules for the certification of candidates for energy auditors (November 2015)

Rules for analyzing the conclusion of an energy audit (November 2015)



KEY ACTORS



**Ministry of Industry and
Construction of the Republic
of Kazakhstan**



**Legal entities -
Customers**



Energy auditors



Training centers

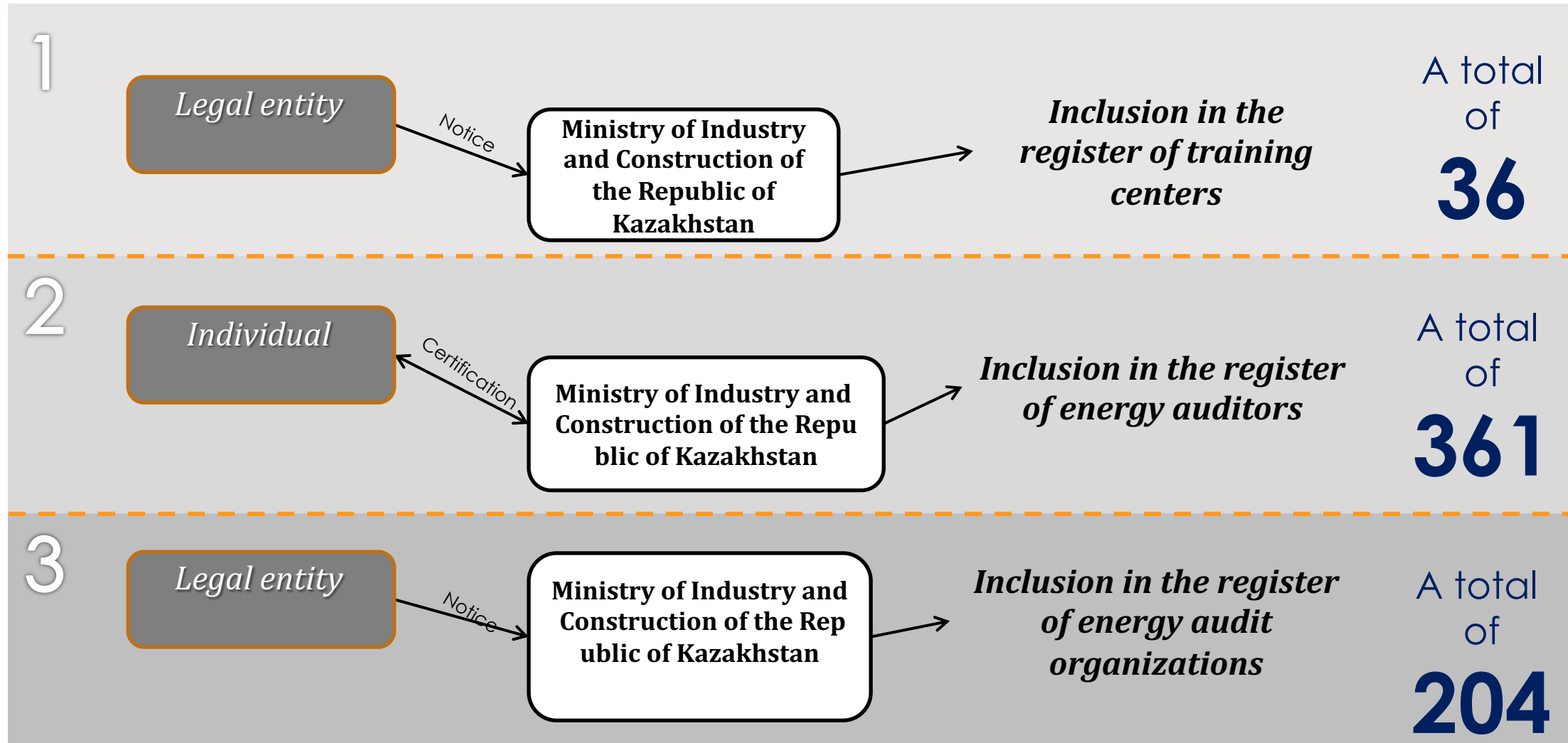


**Electric Power and
Energy Saving Development
Institute (EEDI)**

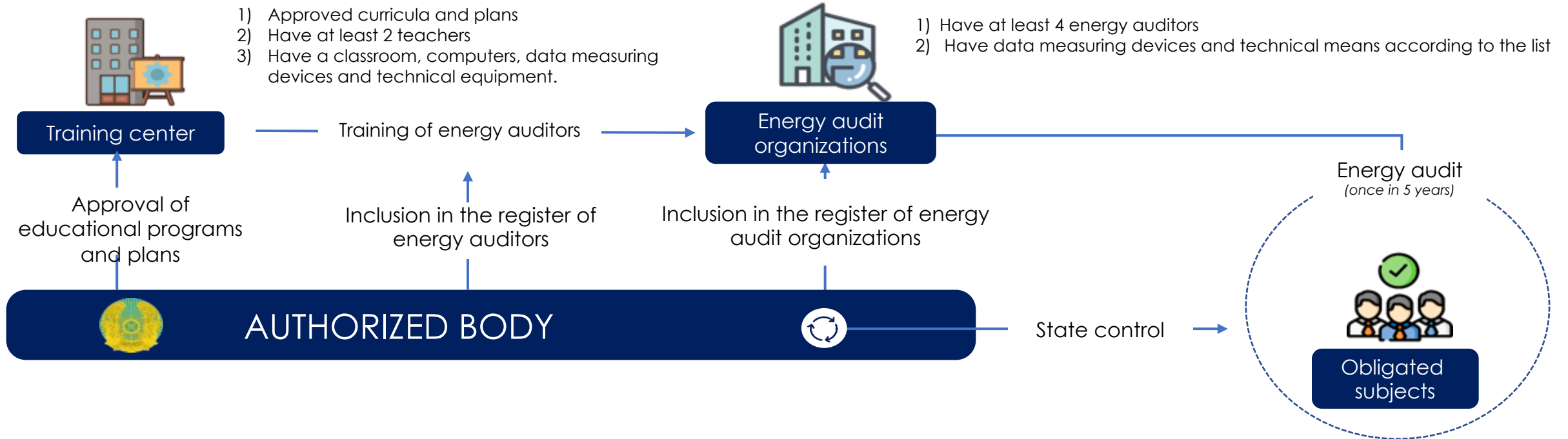


**Association of
Energy Auditors**

INTERACTION WITH THE MINISTRY



INTERACTION WITH THE MINISTRY



CUSTOMERS - LEGAL ENTITIES: ARE OBLIGED



OLD VERSION

IE – 3

Legal entities – **613**

Quasi – **3774**

Total **4390**

100%

NEW VERSION

IE – 3

Legal entities – **613**

Quasi – **274**

Total **890**

97,7%

- **3500**

3,500 quasi-public sector entities consuming from 100 to 1,500 tons of reference fuel - in total, only consumed **2.3%** of all SER entities

The load on the quasi-public sector has been reduced by 80%

CUSTOMERS - LEGAL ENTITIES: ARE NOT OBLIGED



Less than
1500

tons of reference fuel consumed per year



no energy consuming facilities on the balance sheet



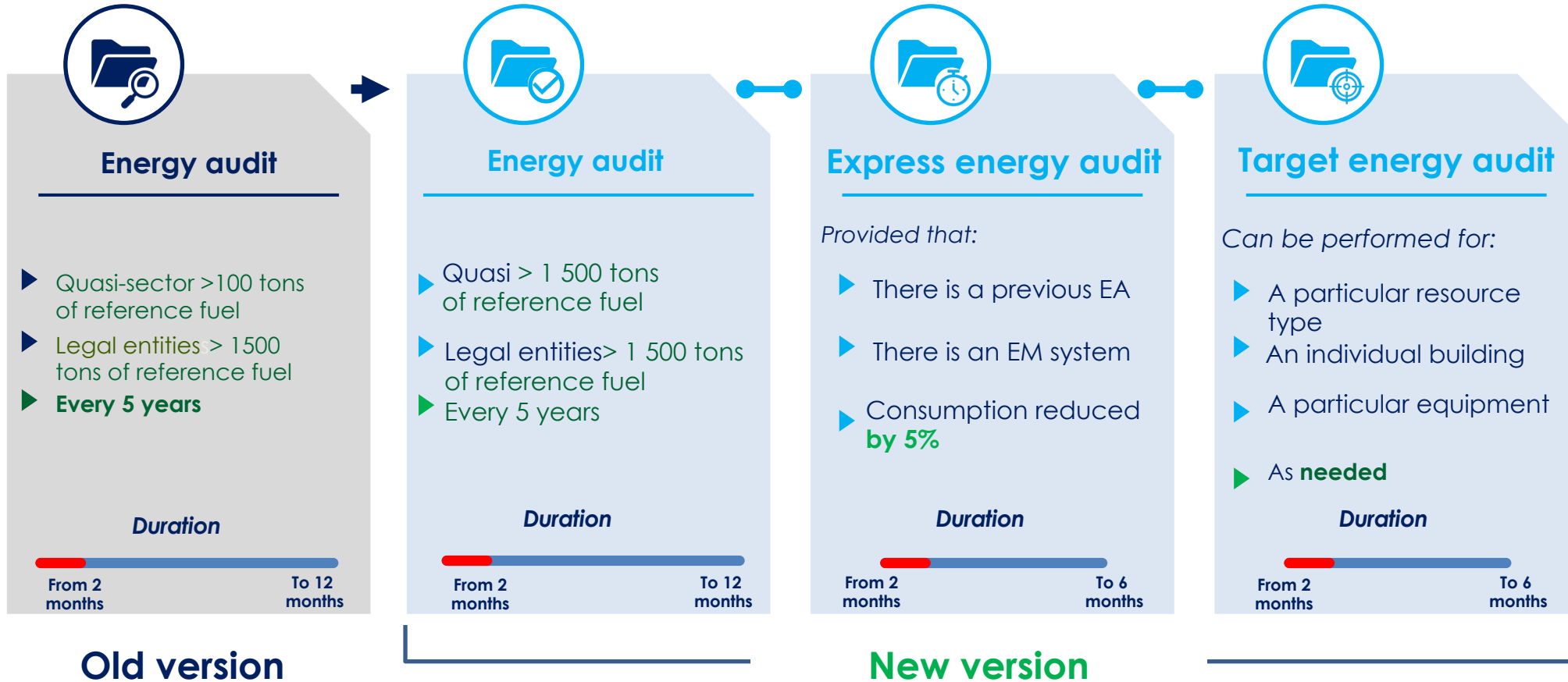
energy consumed only for operating vehicles



on the balance sheet - only objects of historical and cultural heritage or religious buildings and structures.



ENERGY AUDIT



A LIST OF REQUIREMENTS TO AN ENERGY AUDIT ORGANIZATION

2012

Accreditation requirements for an energy audit organization

- 3 Staff** having a degree in Engineering or related technical sciences and work experience of at least 3 years

- 1 Documentation**
Charter or certificates of state. registration

- 2 MTS***
- for industrial enterprises – 14 items
- buildings and structures – 10 items.

- 4 Certificates**
of a training course completion

- 5 Application**

**material and technical support*

2015

Requirements for certification (simple notification)

- 3 Certificate** of an energy audit course completion

Individuals

- 1 Application**

- 2 Diploma**
In Engineering or related technical sciences

A total of **361**

- 4 Proof** Of work experience (no less than 5 years, including at least 1 year for an EA organization)

- 5 Protocol** testing knowledge under electrical safety permit grade III and higher

Legal entities

A total of **204**

Notice of commencement

- 1 Staff** at least 4 energy auditors certified by the authorized body

- 2 MTS** Data measuring systems and technical equipment according to the list approved by the authorised body

Requirements for obtaining an energy auditor certificate

A degree in Engineering or related technical sciences

Having a work experience of at least 5 years, of which at least 1 year in an energy audit organization

Retraining and (or) advanced training of personnel carrying out activities in the field of energy efficiency

Electrical safety permit grade III and higher

Electronic Application certified with digital signature

Obtaining an Energy Auditor Certificate in the field of energy saving and energy efficiency improvement

Requirements for Training Centers for retraining and (or) advanced personnel carrying out activities in the field of energy audit and energy efficiency



1

Copies of educational curricula and plans

2

Copies of diplomas of two teachers, including at least 1 with an academic degree of at least a candidate (master) of technical sciences

3

Copies of documents confirming the presence of two teachers on staff

4

Copies of documents confirming ownership of the classroom and computers

5

Copies of documents confirming ownership of classrooms, computers and data measuring systems and technical means

1

Creation of a Commission for Qualification Testing of Knowledge, created annually by order of the head of the energy organization

2

Training Center
Completion of 72-hour electrical safety training

3

Testing (using computer programs or in writing)

4

Protocol for qualification testing of knowledge

5

Assigning an electrical safety permit grade

BODIES FOR CONFIRMATION OF PERSONNEL COMPLIANCE



Existing regulation

Certification by an authorized body

Requirements for issuing a certificate:

- A degree in Engineering and related technical major;
- Courses in energy audit;
- Experience of at least 5 (five) years;
- Test of knowledge for electrical safety permit grade III and higher;
- Recertification every three years.

Proposed regulation

Certification by bodies for confirmation of personnel compliance

Requirements for issuing a certificate:

- A degree in Engineering and related technical major;
- Courses in energy audit;
- Experience of at least 5 (five) years;
- Test of knowledge for electrical safety permit grade III and higher;
- **confirmation of qualification every three years;**
- **theoretical and practical exam.**



Energy auditor*

An individual who has a certificate of conformity in the field of energy saving and energy efficiency



Certificate of conformity in the field of energy efficiency

A document issued by an accredited body in accordance with the established requirements, certifying the competence of an energy auditor

**The energy auditor carries out his activities only as part of one energy audit organization*



QUALIFICATION REQUIREMENTS according to ST RK 3838-2023

Energy audit. Qualification requirements for an energy auditor



QUALIFICATION REQUIREMENTS



A degree in Engineering or related technical sciences



Work experience (including 1 year in the field of energy efficiency)



Certificate of course completion



Grade of Electric Safety Permit

Experience in conducting energy audits

either



10 entities with buildings, structures and constructions

or



5 industrial entities or those consuming more than 15,000 tons of reference fuel per year

or



5 entities with buildings, structures, constructions and
3 industrial entities or those consuming more than 15,000 tons of reference fuel per year



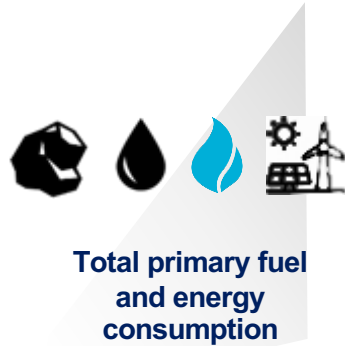
List of data measuring systems and technical means necessary to carry out energy audit activities (for buildings only)!!!



#	Device	Note	Application
1	Thermal imager	Used for inspection of building envelopes and engineering systems.	Constantly
2	Hygrometer	In most cases, a thermohygrometer is used to measure air temperature and humidity in rooms. .	
3	Luxmeter	Used to measure the level of illumination indoors and outdoors.	
4	Power quality analyzer	Used to determine power quality parameters and monitor power consumption	
5	Heat meter or heat flow meter	Used to determine the thermal conductivity of building windows. Use for other purposes is limited by the need to prepare measurement sites, which in most cases is not approved by the Customer	Often
6	Laser rangefinder	It is used along with a tape measure to determine the geometric parameters of building envelopes. .	Rarely
7	Ultrasonic liquid flow meter	An ultrasonic flow meter is used when it is necessary to determine coolant flow. However, most buildings are equipped with metering devices	
8	Current clamps	In most cases, a power quality analyzer is used	Not used
9	Anemometer	Inspection of building ventilation systems is practically not carried out due to the significant amount of work involved and the need to create operating modes, which is not approved by the Customer. In modern facilities, where complex HVAC systems are maintained by specialized organizations, all measurements are carried out by them	
10	Non-contact (infrared) thermometer with a measurement range from 0 to 550 0C	When conducting an instrumental inspection of a building, a thermal imager is usually used for these purposes, despite the error in the measurement results.	
11	Thickness gauge (if the flow meter does not have this function)	Not applicable due to the need to prepare measurement sites and, as a result, non-approval of measurements by the Customer, as well as due to the lack of need to determine values.	
12	Contact thermometer	When conducting instrumental inspections of buildings, a thermal imager is usually used for these purposes, despite the error in the measurement results.	
13	Pressure gauges	Not applicable due to the need to prepare measurement sites and, as a result, non-approval of measurements by the Customer, as well as the presence of their own instruments	
14	Gas analyzer	Not applicable due to the lack of survey objects (boiler houses)	

ENERGY INTENSITY OF GDP IN KAZAKHSTAN

ENERGY INTENSITY OF GDP- indicator used to assess the energy efficiency of national economies



Total primary fuel and energy consumption

Total primary fuel and energy consumption

calculated in tons of oil equivalent

Total	Coal	Crude oil	Natural gas	RES
100%	48,2%	23,5%	26,4%	1,9%
69 868 600 t.o.e	33 682 600	16 438 000	18 453 000	1 295 000

=

GDP



Macroeconomic indicator reflecting the market value of all final goods and services provided

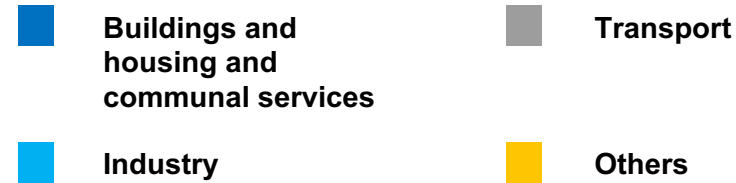
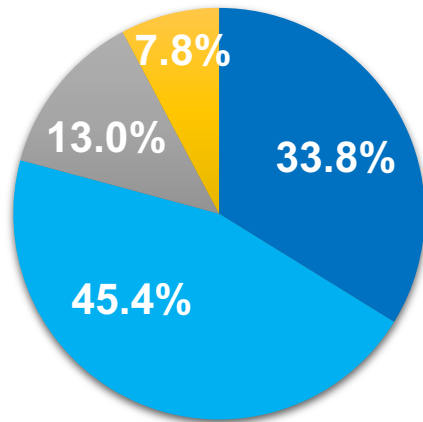
calculated using the production method in thousands of US dollars

Sector	GDP structure, %	
Industry	29,5	Production of goods (40)
Construction	5,3	
Agriculture	5,2	
Transport	6,2	Production of services (52,9)
Trade	16,4	
Public sector	11	
Other services	19,3	
Net taxes on products and imports	7,1	
TOTAL, thousand US dollars	221 549 600	

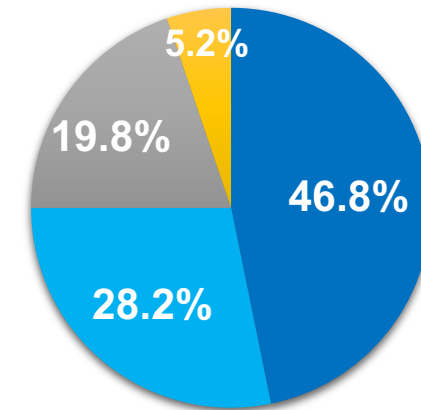
**according to the Office of National Statistics for 2022*

STRUCTURE OF FINAL ENERGY CONSUMPTION

2014



2022



	2014	2015	2016	2017	2018	2019	2020	2021	2022	Percentage of change
1 Total final energy consumption (thousand TOE)	39 912	38 360	38 686	40 028	41 300	41 570	40 267	43 263	43 402	8%
2 Industry	18 109	16 178	16 499	16 615	15 014	13 101	12 518	13 108	12 251	-32%
3 Buildings, housing and communal services	13 481	14 701	14 388	15 906	16 526	19 756	17 443	20 243	20 318	50%
4 Transport	5 184	5 500	5 693	5 529	6 282	5 902	7 440	8 045	8 609	66%
5 Agriculture and fisheries	895	723	733	862	1 652	870	832	971	1 069	19%
6 Other and non-energy use*	2 243	1 258	1 373	1 117	1 826	1 941	2 034	896	1 154	-48%

*in the energy balance the items "not specified in other categories" and "non-energy use"

FINAL ENERGY CONSUMPTION IN KAZAKHSTAN

43,4 million toe

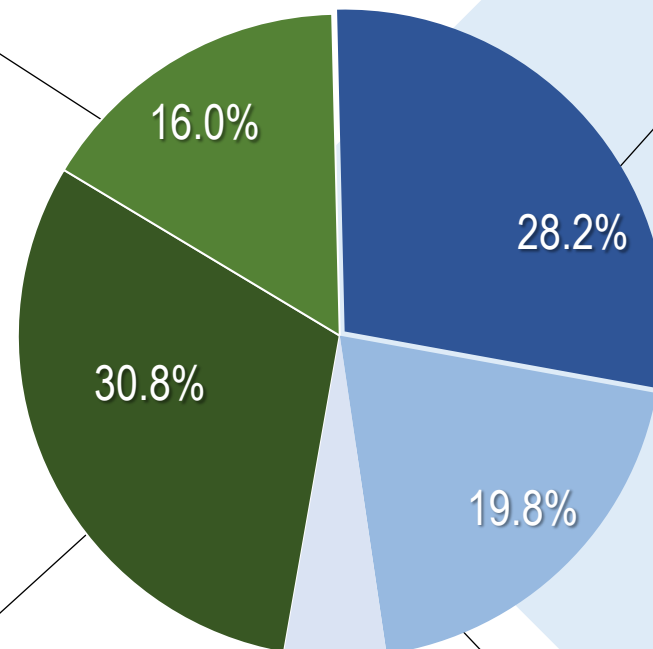
16% PUBLIC AND COMMERCIAL SECTORS

28,2% INDUSTRY

MEASURES IMPLEMENTED UNDER THE LAW ON ENERGY SAVING

- State Energy Register
- Mandatory energy audit
- Obligations to reduce specific indicators
- Target indicators for large energy consumers
- Energy consumption standards
- Responsible persons for energy saving and energy efficiency improvement

➤ Average potential based on energy audit results up to **10%**



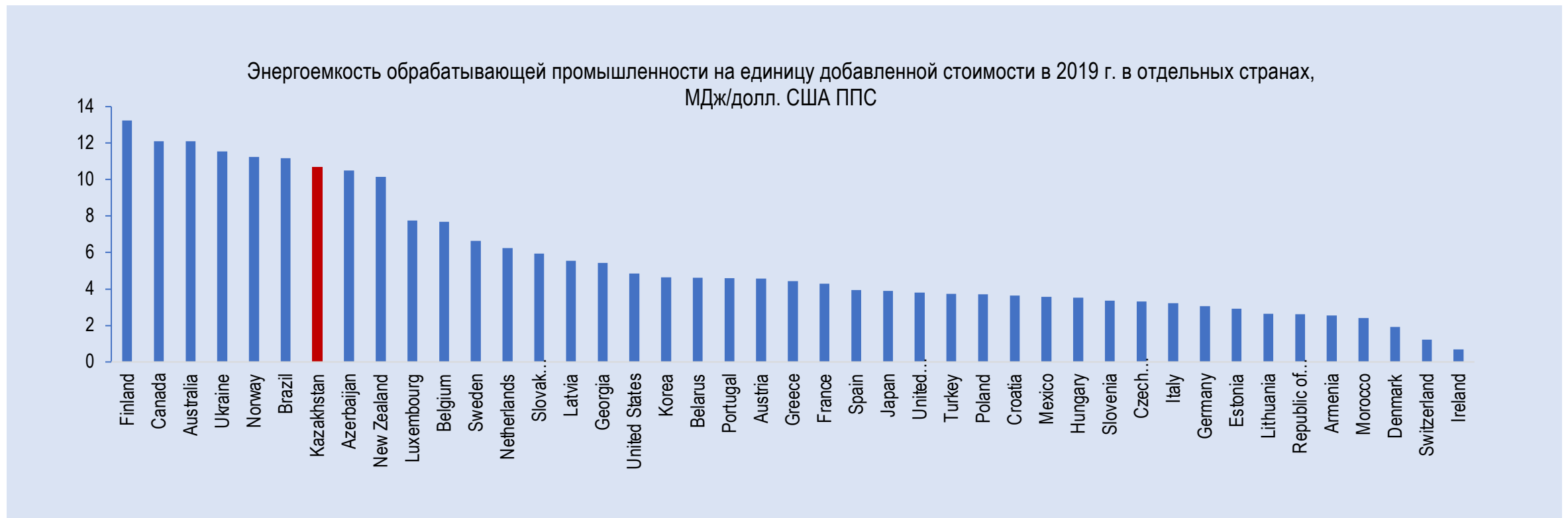
30,8% HOUSING

5,2% OTHERS*

19,8% TRANSPORT

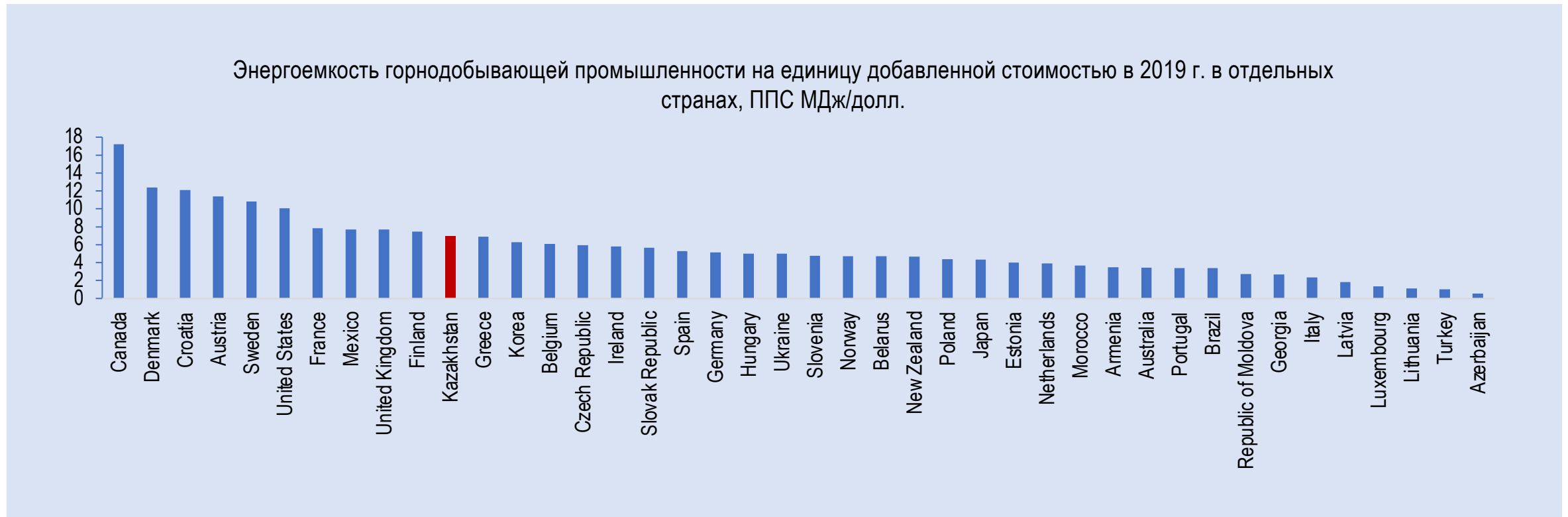
ENERGY INTENSITY OF MANUFACTURING INDUSTRY

Of 43 countries in terms of energy intensity per unit of added value of the manufacturing industry, Kazakhstan took 7th place.



ENERGY INTENSITY OF MINING INDUSTRY

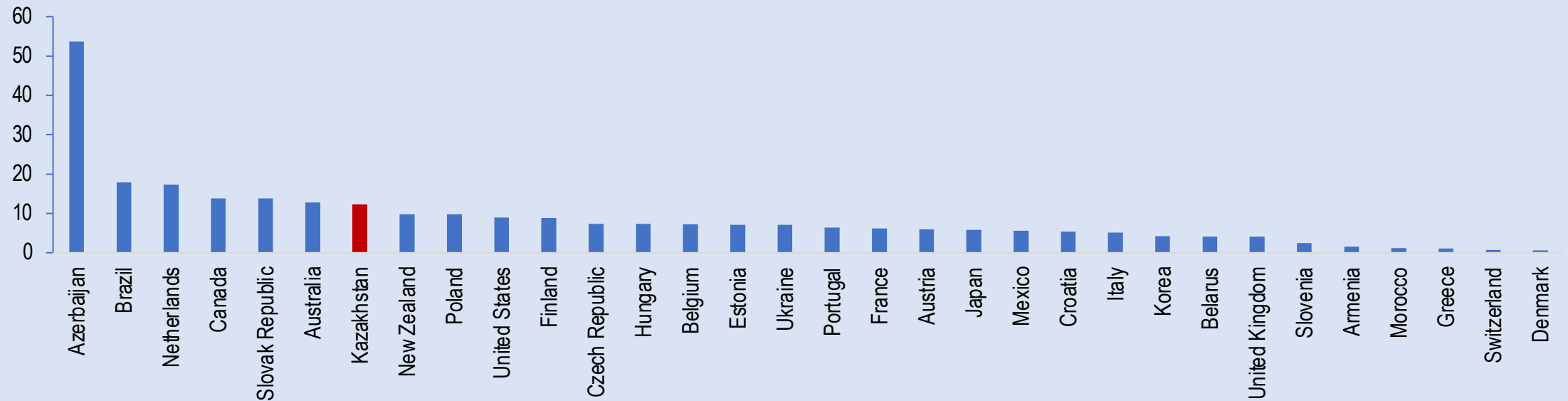
Of 42 countries in terms of energy intensity per unit of added value of the mining industry, Kazakhstan took 11th place.



ENERGY INTENSITY OF CHEMICAL INDUSTRY

Of 32 countries in terms of energy intensity per unit of added value of the chemical (including petrochemical) industry, Kazakhstan took 7th place.

Энергоемкость химической (в т.ч. нефтехимической) промышленности на единицу добавленной стоимости в 2019 году в отдельных странах



ENERGY INTENSITY OF FOOD INDUSTRY

Of 34 countries in terms of energy intensity per unit of added value of the food and tobacco industry, Kazakhstan took 29th place.



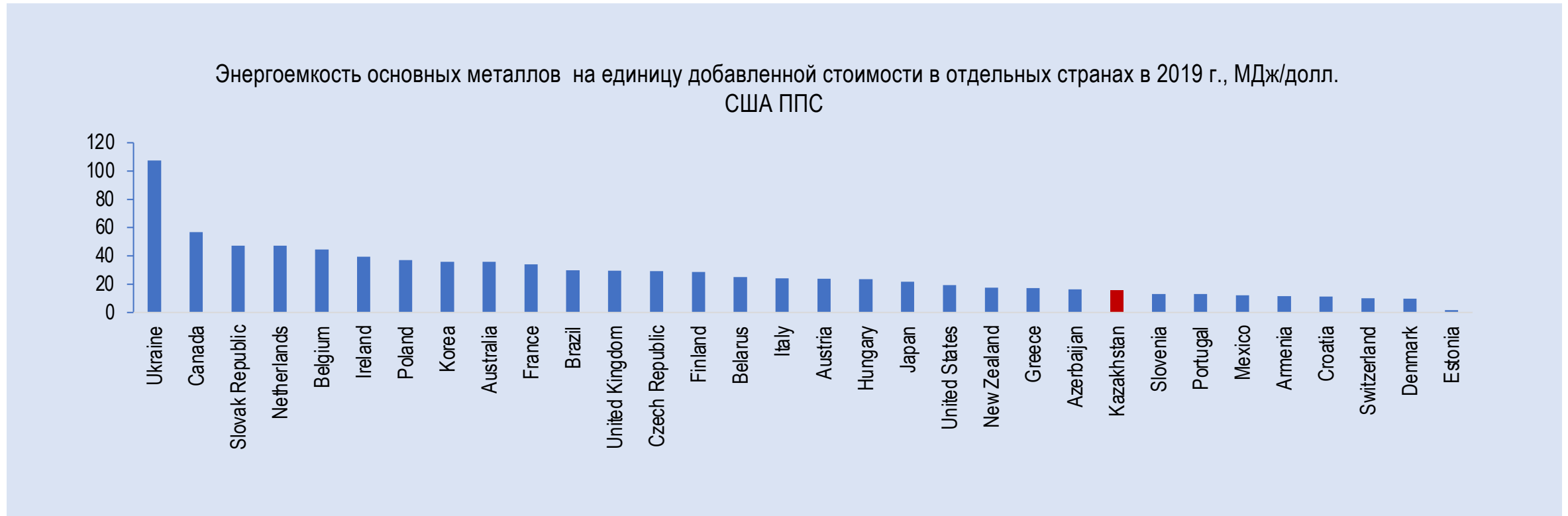
ENERGY INTENSITY OF FERROUS METALLURGY

Of 40 countries in terms of energy intensity per unit of physical output of ferrous metallurgy, Kazakhstan took 6th place.



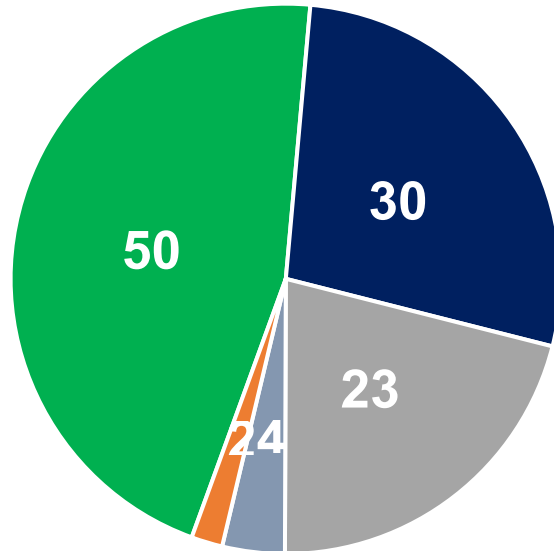
ENERGY INTENSITY OF BASE METALS

Of 32 countries in terms of energy intensity of basic metals per unit of added value, Kazakhstan took 24th place.



MAIN ENERGY CONSUMERS, TOP-109

Top - 109



Status



Target indicators for TOP-109 have been developed



Share of TOP-109 consumption > 50% of the country's consumption

Effect

5%

reducing the energy intensity of GDP by 2029

COMPARISON

878 LARGE ENERGY CONSUMERS

58 MILLION TONS OF REFERENCE FUEL

43 115 KZT/ TON OF REFERENCE FUEL

878 PUBLIC INSTITUTIONS

0,689 MILLION TONS OF REFERENCE FUEL

102 364 KZT/ TON OF REFERENCE FUEL

COMPARISON

Company A



Electricity consumption (2022)
4,8 billion kWh



Potential*:

Investment **32,6 million USD**

Savings **4,2 million USD**

231 million kWh (4,8%)

Released power **26,4**
MW

Company B



Electricity consumption (2022)
12,8 billion kWh



Potential*:

Investment **9,5 million USD**

Savings **4 million USD**

197 million kWh (1,5%)

Released power **22,5**
MW

A total of released power **48,9 MW**

Investments in energy-saving measures that
release power equivalent to

48,9 MW

19 billion KZT



Investments for the construction of thermal power plants with the
capacity

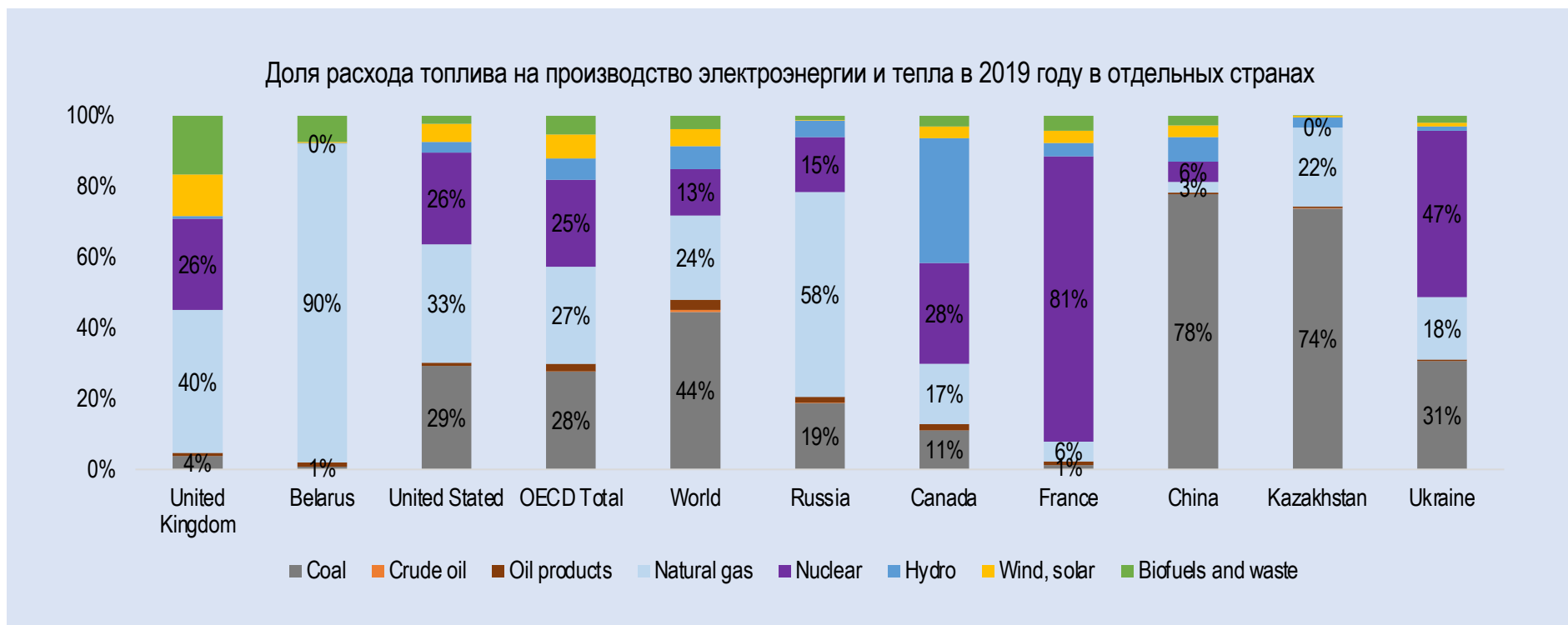
100 MW

60 billion KZT

* based on the results of
energy audits

FUEL CONSUMPTION BY POWER PLANTS

In 2019, Kazakhstan ranked second among individual countries with its share of coal in fuel consumption for heat and power production of 74% in 2019, after China, which had a 78% share of coal. Countries where natural gas had a significant share of total fuel supplies for power and heat production included Belarus (90%), Russia (58%), and the UK (40%).



ENERGY SECTOR EFFICIENCY

In Kazakhstan, energy sector efficiency in 2019 was 57%. The relatively low efficiency of the energy sector (57%) in Kazakhstan can be explained by energy losses during transformation (due to the high share of coal for electricity and heat production), energy losses during transportation and distribution, and the high level of own use in the energy industry.

