

National Company Kazakhstan Temir Zholy JSC

ORGANIZATION STANDARD

**METHODOLOGY OF ENERGY ANALYSIS. GENERAL REQUIREMENTS
FOR THE DESIGN, CONSUMPTION, AND CALCULATION OF ENERGY
ANALYSIS .**

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Introduction

1 DEVELOPED AND INTRODUCED by the Department of Technical Policy of the Joint-Stock Company "National Company" Kazakhstan Temir Zholy"

2 APPROVED AND PUT INTO EFFECT by the Order of the Chief Engineer-Director of the Technical Policy Department of the Joint-Stock Company "National Company" Kazakhstan Temir Zholy " dated 11 September 2024 No. 630-TS.

3 МЕТОДЫ ЭНЕРГЕТИЧЕСКОГО АНАЛИЗА "Methods of Energy Analysis in the Joint-Stock Company "National Company "Kazakhstan Temir Zholy", approved by the Order No. 291-TS of March 17, 2016, was introduced in the DRAFT Law.

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ORGANIZATION STANDARD

METHODOLOGY OF ENERGY ANALYSIS. GENERAL REQUIREMENTS FOR THE DESIGN, CONSUMPTION, AND CALCULATION OF ENERGY ANALYSIS .

Date of introduction _____

1 Scope of application

This standard of the organization is developed taking into account the requirements of the international standard ISO 50001: 2018 and the Guidelines for the energy management system in the Joint-Stock Company "National Company"Kazakhstan Temirip Zholy " and establishes general requirements for the design of energy analysis.

This standard sets out the order of energy analysis and determines the efficient use of energy resources.астоящий стандарт устанавливает порядок проведения энергетического анализа и определяет эффективность использования энергоресурсов.

The provisions of this standard are subject to application by structural divisions of Joint-Stock Company "National Company "Kazakhstan Temirip Zholy" when performingand monitoring the consumption of fuel and energy resources and preparing reports on the results of work for the first quarter, six, nine months and yearда, as well as by specialists of organizations-energy auditors (accredited by the authorized body), performing the following tasks: relevant works on energy survey and analysis of objects of the Joint-stock company "National Company"Kazakhstan Temirip Zholy".

Настоящий This standard is intended as a recommendation for subsidiaries of Joint Stock Company "National Company" KazakhstanTemirip Zholy".

2 Normative references

The following reference documents are required for the application of this standard:

Internationalждународнstandard стандарт ISO 50001: 2018 " Energy management systems. Requirements and guidelines for use";

Law of the Republic of Kazakhstan "On Energy Saving and Energy Efficiency Improvement" dated January 13, 2012 No. 541-IV;

Guidelineson the energy management system in the Joint-Stock Company "National Company"Kazakhstan Temirip Zholy", approved by Order No. 1021-TS dated December 26, 2023;

Note-When using this standard, it is advisable to check the validity of reference standards and classifiers based on the annually published information catalog "Documents on Standardization" as of the current year and the corresponding periodically published information catalog published in the current year. If the reference document is replaced (changed), then when using this standard, you should follow the replaced (changed) document. If a reference document is canceled without replacement, the position in which it is referenced is applied in the part that does not affect this reference.

3 Terms, and definitions

The following terms and definitions are used in this International Standard и определения:

3.1 Energy efficiency provider: Ab is the absolute or specific value of consumption or loss of energy resources for products of any purpose.

3.2 Regional division: A division of the Company whose activities are coordinated by a network-level division in accordance with the regulations on the network-level division.

3.3 Line-level division: a division of the Company that is under the operational control of a regional-level division in accordance with the regulations on a regional-level division.

3.4 Network-level division: a division of the Company that is directly subordinate to the Company's management in accordance with the Company's local act.

3.5 Developer: A structural division, a subsidiary of JSC NCKKTZ, developing the Organization's Standard "Методика Energy Analysis Methodology A" (hereinafter referred to as the Standard).

3.6 Waste offuel and energy resources for operational and production needs: consumption offuel and energy resources by various equipment that provides the necessary conditions for the functioning of the production process.

3.7 Withistema of accounting of energy resources (energy resources): Total number of oвокупность measuring complexes installed at the power facility.

3.8 CStructural divisions: departments, Office, Secretariat and Protocol Services, branches and representative offices of the Company, including those located outside the Republic of Kazakhstan;

3.9 Transformer: A step that provides transformation and accumulation of energy resources.

3.10.10 TTechnological process: Part of the production process that contains purposeful actions to change/determine the state of the object of labor (blanks, products).

3.11 YNatural fuel: Па unit used in technical and economic calculations, regulated in regulations and standards, which serves to compare the thermal value

of various types of organic fuel.

3.12 **Energy conservation:** Implementation of legal, organizational, scientific, industrial, technical and economic measures aimed at efficient use of energy resources and involvement of renewable energy sources in economic turnover.

3.13 **Energy efficiency:** characteristics that reflect the ratio of the useful effect from the use of energy resources to the costs of energy resources produced in order to obtain such an effect, in relation to products, technological processes, legal entities, individual entrepreneurs.

3.14 **Energy baseline:** a quantitative value that is the basis for determining the level of energy efficiency.

3.13.1 **Energetic system (power system):** a set of power plants, electric and thermal networks connected to each other and connected by a common mode in the continuous process of production, conversion, transmission and distribution of electric and thermal energy.

3.13.1 **Energetic resource (energy resource):** a carrier of energy that is used or can be used in the implementation of economic and other activities, as well as the type of energy (atomic, thermal, electric, electromagnetic, etc.).

3.17 **Energy goal:** an established result or achievement of the set goals for the implementation of the Company's energy policy related to improving energy parameters.

3.18 **Energy objectives:** a detailed and quantifiable requirement for energy parameters applicable to the Company or its business units, arising from energy objectives, which must be defined and met in order to achieve these objectives.

3.19 **Energy policy of the Company:** Implementation of the policy of efficient energy consumption at the level of Joint-Stock Company "National Company" Kazakhstan Temir Zholy" and its compliance by all employees.

4. Designations and abbreviations

4.1 **Компания:** Акционерное общество «Национальная компания «Қазақстан темір жолы»».

4.2 **EFFICIENCY:** Efficiency, a characteristic of the efficiency of a system with respect to energy conversion or transmission.

4.3 **Guidelines:** Guidelines for the Company's energy Management system.

4.4 **EnMS:** Energy management system, management tool for energy saving.

4.5 **Стандарт ISO standard:** International standard стандарт стандарт ISO 50001: 2018 " Energy management systems. Requirements and guidelines for

use".

4.6 **TER:** fuel and energy resources, the totality of all natural and converted types of fuel and energy used in economic activities.

4.77 **"KTZ – GP" LLP:** Limited Liability Company "Kazakhstan Temir Zholy" - "Cargo transportation".

4.88 **Ctech:** The structural division responsible for energy conservation and energy efficiency improvement in the Company.

4.99 **EA:**Energy analysis, determining the level of energy efficiency of an organization based on data and other information that allows identifying opportunities for its improvement.

4.1010 **EC:** Energy characteristics, measurable results related to energy efficiency, energy use/utilization, and energy consumption.

5 General requirements for TER

5.1.1 The development of the organization's standard is carried out in accordance with the Company's Energy Policy, the requirements of the Law of the Republic of Kazakhstan "On Energy Saving and Energy Efficiency Improvement", approved areas and boundaries of implementation of the Company's energy management system and energy saving measures approved in accordance with the established procedure.

5.22 The EA of the Company's facilities sets out the solution of the following tasks:

- analysis of energy intensity;
- determination of the amount of energy consumed for operational and production needs;
- determination of the EC of installations and technological processes;
- identification of energy losses and analysis of their causes;
- analysis of energy saving activities;
- expertise of the energy efficiency of fuel and energy consumption;
- reduce the Company's costs.

5.3 Responsible for the organization of the set goals and objectives-Ttech:

- develops, coordinates and communicates methodological guidelines for determining fuel and energy consumption standards for operational and production needs to network - level divisions;

- approves audit approval of fuel and energy consumption standards for production and operation needs and train traction (including TOO maintenance at KTZ – GP);
- brings the approved energy saving and energy efficiency measures to the attention of network-level divisions;
- coordinates the activities of network-level divisions to implement energy saving and energy efficiency measures;
- organizes work on improving the EnMS in the Company in accordance with the requirements of the ISO standard;
- performs periodic monitoring of EA performance in accordance with the current my Standard;

5.44 Responsible for the implementation of the set goals and objectives- structural divisions of the network, regional, and linear levels:

- calculate the fuel and energy consumption for the planned period;
- implement effective actions to manage consumption and reduce energy consumption by implementing measures aimed at efficient and economical use of fuel and energy resources, in order to achieve energy saving targets by energy saving;
- perform regular analysis of EC;
- analyze the indicators of growth or decrease in fuel and energy consumption, identify the factors that influenced the change in consumption, take measures to prevent, prevent and eliminate negative factors that lead to an increase in fuel and energy consumption.

5.55 Those responsible for performing the tasks and actions provided for in the Standard are determined by the management of network, regional and linear divisions by issuing a corresponding local act.

5.6.6 EA is conducted quarterly on an incremental basis in accordance with the procedure established by this Standard and the Guidelines. Based on the results of the EA, a report on the consumption of fuel and energy resources is compiled, which is submitted to the structural unit responsible for energy conservation and energy efficiency improvement.

5.7.7 The energy baseline is set by Management.

5.8.8 Updating or changing the energy baseline is carried out in cases of modernization of power equipment, significant changes in the processes and nature of the use of consumed energy.

5.9.9 The following sequence of actions for conducting EA is established:

- 1) identification of energy sources;
- 2) about the price of energy use/usage and consumption in the past and present;
- 3) analysis of energy application/use and consumption;
- 4) determination of target indicators (indicators) of energy efficiency, значений EC values in relation to the energy baseline;
- 5) an indication of the area of significant use/use of energy;
- 6) limitation of variables (parameters, characteristics) that significantly affect the use/use of energy;
- 7) limiting the current EC associated with the identified significant use/utilization of energy;
- 8) estimation of the future use/use and consumption of energy;
- 9) identification of priority areas in the work to improve the EC and identification of opportunities for improving the EC; выявление, определение приоритетных направлений в работе по улучшению ЭХ и фиксация возможностей улучшения ЭХ;
- 10) organization and conduct of an unscheduled EA;
- 11) revision and refinement of the basic EC values (if necessary);
- 12) fulfillment of energy goals and objectives.

6. Identification of energy sources

6.11 Identification of energy sources is carried out to determine Компании the types of energy resources consumed in the Company, which are subject to measurement, monitoring and analysis.

6.22 The process of identifying energy sources and assessing the nature of energy use is key in identifying areas of significant energy use and identifying opportunities for improving energy efficiency.

6.33 The production activity of railway transport includes the main part – the transportation process and the work of structural divisions serving the transportation process associated with this part.

Потребление Fuel and energy consumption is divided into consumption in train traction and consumption for non-traction needs (maintenance and repair of tracks, transmission of electricity, etc.).

6.44 Consumption of fuel and energy resources (electricity, diesel fuel, coal, gasoline, natural gas) for non-fuel needs is divided into two components: conditionally constant and variable.

6.55 Условно-постоянная The conditional constant component is associated with the availability of equipment, the operating mode of which does not depend on the volume of production or operational work, and is used to provide employees with the necessary working conditions, such as:

- heating;
- ventilation and air conditioning;
- outdoor and indoor lighting;
- automation and telemechanics devices;
- office equipment.
- household electrical appliances and other equipment;
- motor vehicles.

6.6.6 The variable component is determined by the performance of the main type of operational work and depends on its volume.

One of the variable components is the consumption of fuel and energy resources in the following areas of their use:

- electric drive of machines and mechanisms;
- machine tools.
- equipment: forging and pressing, painting and drying, welding and surfacing;
- pumps.
- lifting and transport washing mechanisms;
- motor vehicles (if использования transport is used in technological processes), etc.

6.7.7 And the use of energy resources for non-oil needs in the Company as a whole:

- электроэнергия **electric power** – for electrical equipment (38,5%), lighting (38.9%), heating (22.6%);
- diesel fuel – for специальной equipment (83.1%), motor transport (9.6,6%), heating (6%), diesel generators (1.3%);
- coal -for heating (100%);
- natural gas - for heating (100%);
- gasoline - for mileage-77.1%, for the operation of motor vehicles-22.9%.

6.8.8 The establishment and identification of sources of energy consumption in the Company осуществляется is carried out based on the actual наличие presence of the equipment listed above, as well as the presence of documented contractual relations for energy transmission and consumption.

7. Assessment of energy use/use and consumption in previous years and in the present period

7.1.1 Assessment of the use/user and consumption of energy in previous years and in the current period is carried out on an ongoing basis by all structural divisions (network, regional, linear levels). Based on the results of the assessment, an analysis of energy consumption is carried out in order to identify factors that lead to an improvement in energy efficiency indicators.

7.2.2 Key aspects of the assessment:

- 1) collecting and recording data in reports compiled in the form of appendices to this Standard and Guidelines;
- 2) comparative analysis of energy consumption;
- 3) analysis of EC and their indicators;
- 4) determination of the energy efficiency indicator in relation to the energy baseline.

To assess the EC of buildings and structures, workshops, technological installations and equipment, employees responsible for energy conservation update information on energy consumption.

7.3.3 In accordance with this Standard and the Guidelines, each and its structural divisions establish a system for collecting energy consumption data, which consists of:

- 1) analysis of existing measurement systems of energy resources, their sufficiency and accuracy of measurements. In the absence of accounting by devices, it is determined by the calculation and analytical method;
- 2) providing responsible employees with a monthly report on energy data.

7.4.4 For the conduct of analysis of existing systems The following measuring devices are required for monitoring existing energy supply systems:

- energy metering device by type, place of installation and method of data transmission, etc.;
- energy metering device by type (commercial, technical, shop, aggregate, etc.);
- pressure gauges, thermometers, flowmeters, etc., on the basis of which the required technical parameters of installations, buildings and structures can be determined.

7.5.5 Key steps for data collection:

1) accounting for all sources of energy resources: electricity, coal, natural gas, gasoline, diesel fuel, etc. - in physical terms (thousand kWh, tons, thousand cubic meters, etc.) and in monetary terms;

2) documentation of all energy consumption - collection of meter readings and other data on energy use (Appendices 1, 2 to this Standard);

3) data collection by types of equipment and structures (additional data, such as building dimensions, opening hours, etc., are required to normalize energy consumption and determine its efficiency).

7.6.6 Sources of information on statistics of resources consumed are:

- data on the availability of electrical equipment, lighting installations, fuel-using units, and energy metering devices filled in in accordance with Appendices 3-6 to this Methodology;

- report on fuel and energy consumption for operational and production needs (Appendices 6, 7 to the Manual);

- technical documentation for technological and auxiliary equipment (technological systems, AI specifiers, mode maps, etc.);

- report on the implementation of energy saving measures (Appendix 7 to this Standard).

7.7.7 Employees of regional and line-level divisions responsible for energy conservation and energy efficiency improvement collect information on:

- about the parameters of energy consumption by types of energy resources, units of technological equipment;

- about energy costs;

- about the sources of energy supply (for example, the consumption of electricity from power grids or electricity of its own production);

- about the applied technologies, processes and equipment;

- about fuel consumption (coal, fuel oil, diesel fuel, gasoline, natural gas);

- about electricity consumption;

- about the number and type of technologies used to use alternative energy sources.

7.8.8 For conducting EA in structural divisions, the following statistical data and primary information should be collected:

- the annual (including monthly) volume of fuel and energy consumption for the previous five years and the current year;

- specific energy consumption rates for the output of a single product/service;

- about heat and power supply sources;

- about the availability and condition of energy accounting systems.

7.9.9 When performing assessments and energy and economic indicators, it is determined which energy resources have the most significant share in total consumption. Information on energy consumption should reflect the shared consumption of energy resources and their costs.

7.10.10 Information on energy prices should include information on the prices of energy units or the tariff (if applicable), so that the price components and price differences in individual shipments of fuel can be noted.

When considering energy charges, all factors that determine how much a business unit pays for energy resources should be taken into account: price changes during the year, tariff structure, differentiated tariff rates, penalties, and other payments.

7.11.11 Information on energy resource consumption is presented by network-level divisions in Tsekh both in tabular form (Table a1), and in the form of graphs, the abscissa axis of which indicates time periods (day, month, year), and the ordinate axis indicates the values of energy consumed.

7.12.12 B Column ax of Table 1 of this Standard indicates the values of various types of energy resources X_i , Y_{Yi} ... R_i consumed by month during the year. Based on the results of summing up the monthly values of each type of energy, data on the annual consumption of energy resources $X, Y, \dots, R$ are obtained.

Table 1

Energy consumption in the Company

n /	a Month	Energy				
		Resources electricity, thousand kWh	thermal energy, Gcal	natural gas, thousand m ³		energy resource, R
1	January	X_1	Y_1	Z_1	...	
2	February	X_2	Y_2	Z_2	...	
3	March	X_3	Y_3	Z_3	...	
4	April	X_4	Y_4	Z_4	...	
5	May	X_5	Y_5	Z_5	...	
6	June	X_6	Y_6	Z_6	...	
7	July	X_7	Y_7	Z_7	...	
8	August	X_8	Y_8	Z_8	...	
9	September	X_9	Y_9	Z_9	...	
10	October	X_{10}	Y_{10}	Z_{10}	...	
11	November	X_{11}	Y_{11}	Z_{11}	...	
12	December	X_{12}	Y_{12}	Z_{12}	...	R_{12}
	Year	$X = \sum X_i$	$Y = \sum Y_i$	$Z = \sum Z_i$		$R = \sum R_i$

7.13.13 After filling in Table 1, a temporary (monthly) schedule of consumption of each type of energy resource is constructed. The graph determines the change in energy consumption during the year, namely: whether

the consumption under consideration is uniform throughout the year; whether there are time periods in which consumption is less or more, i.e. whether there is seasonality in energy consumption. For example, in the autumn-winter period, fuel consumption increases due to an increase in heating consumption, in lighting installations in the autumn-winter period, electricity consumption increases due to an increase in the dark time, etc..

7.14.14 To assess energy consumption and costs, a report is prepared in accordance with Appendix 8 to this Standard, in which reflects the consumption of each energy resource as a percentage of the total energy consumption in the structural division.

In order to bring the consumption of energy resources to a single energy-containing equivalent, which is assumed to be t.u. t., in column 5 of Annex 8 to this Standard, the energy content of the unit of each energy resource is indicated - a, b, c, etc. In column 6 of Appendix 8 to this Standard, the energy equivalent of each consumed energy resource is estimated in t. u. t. - X, Y... R by multiplying the amount of actually consumed energy resource by its equivalent.

The total consumption of energy resources in t. u. t. is determined by the formula:

$$\sum_{i=1}^n X+Y+...+R,$$

where X, Y...R. are the energy equivalents of each of the consumed energy resources.

In column 7, enter the share of consumption of each type of energy resource, expressed as a percentage, - X, Y...R and so on. In column 8, the price of each type of energy resource in units and units is indicated. The cost of any of the energy resources may change during the analyzed period, so the indicated price changes are taken into account, determining the weighted average price of the energy resource for the year. In column 9, the total cost of each of the consumed energy resources is determined. Column 10 indicates the percentage of the cost of each of the energy resources.

7.15.15 Based on the information received, a primary analysis of energy consumption and costs is carried out. Here you need to determine the ratio of consumption of various types of energy resources, expressed in a single indicator, namely in tons of conventional fuel (t. u. t.). For conventional fuel, take fuel that has a calorific value equal to 7000 kcal/kg..

8. Analysis of energy use/usage and consumption

8.1.1 Based on the results of analysis of Table 1 of the current Standard,

energy consumption is estimated for a retrospective (past) period of up to 5 years, which will allow us to assess the dynamics of energy-containing indicators and draw conclusions about their growth or decrease.

8.2.2 The total values obtained after filling out the report in the form of Appendix No. 8 to this Standard reflect the highest energy costs consumed in the structural division.

9. Energy efficiency targets (indicators), determination of EC values relative to the baseline

9.11 The main indicator of the effectiveness of energy saving is the specific consumption of fuel and energy resources per unit of production (work). For railway transport, the product is the transportation process, i.e. the work performed by transport to deliver one ton of cargo and one passenger over a distance of one kilometer.

In order to determine the main measures of production activity, efficiency of use and planning of fuel and energy resources, it is necessary to take into account the structure, types and actual volumes of work and services performed in the consumption of fuel and energy resources.

9.2 When calculating energy efficiency indicators, it is necessary to consider all types of fuel and energy complex expenses for the main and auxiliary production processes (actual volumes of work and services performed).

9.3.3 In order to assess the efficiency of the use of fuel and energy resources for the Company as a whole, structural divisions of the network, regional and linear levels should provide information on the consumption of fuel and energy resources in the form of Table 2 of this Standard.

In Table 2, the indicator or indicator of energy efficiency is the absolute or specific value of fuel and energy consumption, and the calculated percentage of energy efficiency indicator fulfillment is an indicator of energy efficiency improvement or deterioration.

The conversion coefficients of fuel and energy resources to tons of equivalent fuel are given in Appendix 9 to this Standard.

Table 2

Report on fuel and energy consumption for operational and production needs in tons of conventional fuel

n/	a Name of the fuel	Units. and energy complex	Reduced	fuel consumption meter (tons of conventional fuel)	Energy efficiency indicator (tons of conventional fuel/led meter)	% of the energy efficien
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	Name of the given meters	Unit of ed.	fact	plan	fact	plan	fact		plan	fact		cy indicat or to the fact N
			N	N	N+1	N+1	N	N+1	N	N	N+1	N+1
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Electricity	thousand kW / h										
1.1	technical units	thousand kW/ technical units										
1.2	heating	thousand kW / Gcal										
1.3	building	ts. kW/m ³										
2	Coal	tonsa										
2.1	Furnace heating	t/ cubic meters										
2.2	heating booths	t/units.										
2.3	boiler	houses t/Gcal										
3	Fuel	oil tonsa										
3.1	heating	t/Gcal										
3.2	etc											
3.3												
4	Gasoline	tonsa										
4.1	motor	transport t / km										
4.2	means of small-scale mechanization	t /mot-hour										
4.3	, etc											
. 5	Diesel fuel	tonsa										
5.1	motor	transport t / km										
5.2	special equipment	t/moto-hour										
5.3	heating	t / Gcal										
6	Natural gas	thousand m³										
7	Total:											

*N – base year.

N+1 – the reporting year.

10. Identifying the area of significant use/use of energy

10.1 As a result of the assessment and analysis of the application/use and consumption of energy, a general idea of fuel and energy consumption and a database are formed, which reflects the following information:

- общая стоимость the total cost of energy costs;
- structure of energy costs;

- seasonal changes in the consumption and cost of energy resources;
- price structure for each energy resource;
- dynamics of energy consumption and energy consumption costs.

10.2.2 On the basis of the information specified in paragraph 42 of this Standard, a general picture of energy consumption is formed in the structural divisions of the network, regional and linear levels, which makes it possible to determine priority areas in further work on EA, monitoring and planning of fuel and energy costs (types of energy resources, structural divisions that significantly affect energy consumption, seasonality in energy consumption, etc.).

10.3.3 The most significant types of energy consumed are those that have a significant share in the total energy consumption and its costs – more than 3% of the total energy consumed in monetary and physical terms.

10.4.4 The main content of the stage of identifying the area of significant energy use is a critical review, critical analysis of the established picture of energy consumption in the structural unit for:

- definitions of irrational, wasteful use of energy resources;
- identification of energy loss sites (shops, boundaries of technological complexes, sites, technological shifts, equipment, buildings, structures, etc.);
- identification of low efficiency of equipment efficiency;
- use of energy or its potential (in transformers, electric motors, electric lighting and other electrical installations, in heat-generating equipment);
- identification of places (technological, energy equipment, buildings, premises, etc.) where regulation of energy resources consumption is not applied when changing the technological modes of equipment operation, changing the conditions of energy consumption;
- establishing the level or method of accounting for energy (data resources (instrument accounting data, archiving data on energy consumption, if there is an automated system - combining accounting tools with computer control systems, calculation and analytical method);
- establishing the correspondence of energy expenditure centers (personnel who manage energy-consuming equipment, shift managers, site managers, workshops) to the centers responsible for energy consumption and costs (personnel who are responsible for electricity consumption);
- determination of the adequacy of the level of rationing, planning of energy consumption, taking into account a differentiated approach;
- determining the reliability, accuracy, and timeliness of energy consumption reports and taking into account the level of energy efficiency.

10.5.5 When performing an analysis of energy consumption and identifying areas of significant use of energy resources, a comparative assessment is carried out:

- actual indicators of energy consumption, energy efficiency with normal, planned indicators;
- achievements in regulating energy consumption processes with world-leading achievements.

10.6.6 Based on comparative assessments, the results are summarized to determine the main ways to realize the potential of energy saving and energy efficiency improvement.

11. Determination of variables (parameters, characteristics) that significantly affect the use/use of energy

11.1.1 For an objective assessment of EC targets на стадии ЭА проводится определение, variables that have a significant impact on energy use are identified at the EA stage использование энергии. As variables, changes in energy consumption are taken into account, which are related to the indicators of economic and economic activity of structural divisions of the network, regional and linear levels and significantly affect the volume of energy consumption.

11.2.2 Determination of variables (regular, random) is carried out by analyzing the monthly and annual volumes of energy consumption, consumed in previous years. This takes into account the influence of external conditions (outdoor air temperature), internal production conditions (connection of loads, repair of energy-intensive main and auxiliary equipment, modernization, etc.). The identified random variables (emergency shutdown of power equipment, groups of electric receivers, holidays, etc.) are excluded from the analysis as non-indicative and one-time, and natural factors are taken into account in further calculations as comparable conditions.

11.3.3 Factors influencing the Company's energy consumption Компании:

- changes in the volume of cargo and passengers transported;
- commissioning of new land plots, new equipment, decommissioning of equipment;
- implementation of measures for modernization and reconstruction of fixed assets;
- changing the operating time of the equipment.
- change in the amount of heat energy released, etc.

11.4.4 При выявлении в процессе ЭА If variables that have a significant

impact on energy consumption are identified during the EA process, they should be taken into account and taken into account when calculating the fuel and energy consumption for the planned period in accordance with the regulatory framework for calculation reflected in the Guidelines.

12. Determination of current EC values associated with identified significant energy use/utilization

12.1.1 Quantification of current значений EC values is performed at the stage of data collection and comparison.

12.2.2 The main source for determining the current EC values is the energy consumption report completed in accordance with the form of Appendices 6 and 7 to the Guidelinesy отчет о потреблении энергоресурсов (the report is compiled monthly). It is not allowed to use financial documents on purchasese/paymentsof energy resources for this purpose, as they do not always reflect their actual use.

12.3.3 In the absenceя of technical accounting, for moredetailedro determinationя of current EC values ЭХseparately for buildings, structures, equipment units, systems, processes, it is necessary to use the calculationand analytical method for determining consumption, guided by the regulatory framework for calculation reflected in the Guidelines.

12.4.4 Those responsiblex for keeping records of energy consumption and calculating current EC values are appointedr from among the staff of network, regional and linear divisions by issuing an appropriate local act.

13. Assessment of future energy use/usage and consumption

13.1.1 The future use/use and consumption of energy is estimated by forecastingя consumption before the end of the year and for the next year against the energy baseline established by Management. The determination of progressive levels of energy resources use is carried out by the calculation and analytical method.

For absolute values, the value of progressive energy consumption is determined by the formula:

$$N_{ni}=N_{ot.(b)I}- \Delta N_i,$$

where N_{ni} is the progressive level of consumption of the i-th type of energy resource;

$N_{ot. (b)I}$ – the volume of consumption of the i-th typeof energy resource in the reporting (base) year;

П N_i - the amount of the reserve for saving *the i-th* type of energy resource in the planned year, revealed as a result of energy saving measures энергосбережения..

For specific (relative) values, the value of the progressive indicator of energy consumption is determined by the formula:

$$H_{nij} = \Delta W_{ij} / N_{\text{from}(b)j},$$

где H_{nij} - progressive specific value ЭХЕС of consumption *of the i-th* type of energy resource for the production *of the j-th* type of product (electricity generation, heat supply, etc.);

ΔW_{ij} – the EC value ЭХ of consumption *of the i-th* type of energy resource, revealed as a result of the implementation по энергосбережению of energy saving measures, affecting the specific value for *the j-th* type of product (electricity generation, heat supply, etc.);

$N_{\text{from}(b)j}$ is the annual output *of the j-th* type of product (electricity generation, heat supply, etc.) in the reporting (base) year.

13.2.2 Based on the specific value of the progressive indicator, you can determine the absolute progressive value by multiplying the first one by the planned relative indicator (the planned volume of electricity generation, the volume of heat supply, the volume of additional products, etc.). Additionally, you can determine the use/use and consumption of energy resources in the future, taking into account the energy saving plan and the planned amount of work (electricity generation, heat supply, etc.).

14. Identification and identification of priority areas in work to improve EC and identification of opportunities for improving EC **Выявление, определение приоритетных направлений в работе по улучшению ЭХ и фиксация возможностей улучшения ЭХ**

14.1.1 The main criteria for determining priority areas of work to improve EC are:

- the amount of energy resources consumed;
- cost of energy resources;
- economic efficiency of actions and activities, carried out to improve EC;
- other criteria, including quantitative ones, defined by the legislation and regulatory legal acts of the Republic of Kazakhstan, local acts of the Company.

14.2.2 Procedure for identifying and identifying priority areas for EC improvement:

- the volume of consumption of each energy resource is determined;

- determine the cost of each energy resource and the share of its cost in total energy consumption costs;
- determine the fuel and energy consumption in t. u. t. (Appendix 9 to this my Standard);
- the cost of a unit of energy equivalent of each type of energy resource is determined;
- identify the most expensive energy resources;
- determines the priority of the energy resource.

14.3.3 Every year, based on the EA, the priority of EC improvement is fixed and in accordance with the approved energy saving measures, possible ways to improve EC, actions and measures for energy saving are determined.

14.4.4 The results of the work carried out to assess and analyze the current state of energy consumption, identify areas of significant use/use of energy resources, and identify opportunities for improving energy efficiency are:

- allocation of resource consumption by types of energy carriers, fuel, production halls, sites, etc.;
- sharing its experience in the implementation of energy saving measures, their dissemination and implementation;
- limiting the worst results of implementing energy saving measures in structural divisions;
- development of long-term plans and solutions to improve the implementation of energy saving measures;
- setting target, system and local indicators based on the best achievements.

15. Organization and implementation of unscheduled EA, revision and refinement of basic EC values

15.1.1 Unscheduled EA can be performed both in the Company as a whole and locally, i.e.e. for certain buildings, structures, equipment, systems, processes, divisions, and personnel.

15.2.2 In the plan, unscheduled (extraordinary) EA is conducted by direct order of the Company's managers in the following cases:

- any changes or improvements to buildings, structures, equipment, systems or processes;
- checking and correcting ECS, their absolute values and indicators;
- the need for local analysis of the implemented energy-saving measure (project) in order to track the planned economic effect.

15.3.3 According to the ISO standard, a revision of the base

values is performed if:

- energy efficiency indicators do not correspond to the nature of use and the amount of energy, consumed in the organization.
- there have been significant changes in the process, operating procedures, or power system.

15.44 Revision and establishment of the values of the basic EC may be possible in the event of new legislative documents that specify, define a different period or other basic values of indicators.

16. Meeting energy goals and objectives

Based on the approved plan of measures for energy saving of the Company, in order to fulfill the goals and objectives of the grid-level division, schedules for the implementation of energy saving measures are approved, indicating the time limit and the person responsible for implementing these measures (Appendix 10 to this Standard).

Appendix 1
to the order of the Chief Engineer-
Director of the Technical Policy
Department
National Company Joint-Stock Company
«Қазақстан темір жолы»
from _____ 202__ year no.
_____ --

**Actual consumption of fuel and energy resources for operational and production needs
for the reporting year and the previous 5 years**

for 202__ year

(business unit)

(the amount is indicated with
VAT)

Fuel type	Unit of measurement	Fact of previous years					Fact of the reporting year
		202__ year	202__ year	202__ year	202__ year	202__ year	202__ year
Electrical energy	Electricity thous. kWh						
	thousand tenge						
Thermal energy	Gcal						
	thousand tenge						
Coal	ton						
	thousand tenge						
Natural gas	thousand tenge m ³						
	thousand tenge						
Gasoline	ton						

	thousand tenge						
Diesel fuel	ton						
	thousand tenge						
Total	thousand tenge						

Appendix 2
to the order of the Chief Engineer-
Director of the Technical Policy
Department
National Company Joint-Stock Company
«Қазақстан темір жолы»
from _____ 202 year no. _____
—

Monthly consumption of fuel and energy resources for operational and production needs

_____ 202__ year
(business unit)

(the amount and price are indicated with
VAT)

Month	Electricity			Thermal energy			Coal			Natural Gas			Gasoline			Diesel Fuel		
January	ths kWh	thousand tenge	price	Gcal	thousand tenge	price	tons	thousand tenge	price	thousand ^{m3}	thousand tenge	price	tons	thousand tenge	price	tons	thousand tenge	price
February																		
March																		
April																		
May																		
June																		

July																		
August																		
September																		
October																		
November																		
December																		

Appendix 3

to the order of the Chief Engineer-
Director of the Technical Policy
Department

National Company Joint-Stock Company

«Қазақстан темір жолы»

from _____ 202__ year no.

_____ --

List of power electrical equipment

for 202__ year

(business unit)

n /	a Name of the building	Name of the subdivision (shop, site)	Electric receiver (type, brand)	Direction of electricity (use (technological or auxiliary)	Year of equipment commissioning put it into operation	Quantity, piece	Phasicity Phasing (single-or three- phase)	Total power, kW	Number of operating hours of the equipment per day	Note
1	2	3	4	5	6	7	8	9	10	11

Appendix 4
to the order of the Chief Engineer-
Director of the Technical Policy
Department
National Company Joint-Stock Company
«Қазақстан темір жолы»
from _____ 202__ year no.
_____ -

Information about lighting installations

_____ for 202__ year
(business unit)

n /	a Name of	Name of the	Luminaire	Lamp type	Number-of	. Number-of	. Installed power, kW	Number of	Note
-----	-----------	-------------	-----------	-----------	-----------	-------------	-----------------------	-----------	------

	the building	subdivision (shop, site)	(type, brand)		lamps, pcs	lamps, pcs	of the luminaire	lamp	operating hours of equipment per day, hour	(availability of automatic control system for motion sensors , etc.)
holder 1	2	3	4	5	6	7	8	9	10	11

Appendix 5
to the order of the Chief Engineer-
Director of the Technical Policy
Department
National Company Joint-Stock Company
«Қазақстан темір жолы»
from _____ 202__ year no.
_____ -

Characteristics of units that use fuel

_____ for 202__ year
(business unit)

n /	a Purpose, direction of use	Unit name, type, brand, parameters, year of commissioning	Quantity, pcs	Performance		Specific fuel			consumption Note
				units izmer.	number	of units. izmer.	Fact.consumption for 202_year	Consumption rate (summer / winter)	
1	2	3	4	5	6	7	8	9	10

Appendix 6
to the order of the Chief Engineer-
Director of the Technical Policy
Department
National Company Joint-Stock Company
«Қазақстан темір жолы»
from _____ 202 year no.
_____ -

Characteristics of energy metering devices

_____ for 202__ year
(business unit)

n /	a Device type	Certificate of acceptance of the device for operation	Place of installation	Measured value	Unit of measurement	Parameters of the measured medium	Measurement limits	Accuracy class	Date of the next state verification	Note
1	2	3	4	5	6	7	8	9	10	11

Appendix 7
to the order of the Chief Engineer-Director of the Technical Policy Department
National Company Joint-Stock Company «Қазақстан темір жолы»
from _____ 202__ year no. _____

Report on the implementation of energy saving measures
_____ **for 202__ year**
(business unit)

n / a Measures	Type of savings	Units	Units of measurement	Plan 202__ year						Fact 202__ year			
				plan			Economic effect			plan		Economic effect	
				Qty	Amount of costs, thousand tenge	Source	of financing QtyBo, in nat.in thousand kWh, ton	amount , thousand tenge		quantity	cost amount, thousand tenge	КолQty, in kind. inyr., thousand kWh, ton	amou nt, thousa nd tenge.

Appendix 8
to the order of the Chief Engineer-Director of the Technical Policy Department
National Company Joint-Stock Company «Қазақстан темір жолы»
from _____ 202 year no. _____

Estimation of energy consumption volumes and financial costs of energy consumption
_____ for 202__ year
(business unit)

№ n / a	Name of energy	Unit of measure ment	Consumpti on for the year	Transferable equivalent	Consump tion, t. u. t.	Share of energy in total energy consumption, %	Price per unit of energy, tenge	Стоимость Cost of energy, thousand tenge	Доля Share of energy cost, %	Cost of a unit of energy equivalent, thousand tenge / t.u.t.
1	2	3	4	5	6	7	8	9	10	11
	Electric- power	t hous. k WkWh h	X $=\sum X_i$	$a=0,1$ 23	X= $X*a$	$x = \frac{X * 100}{\sum 1}$	a_1	$\frac{Y_1}{0-3^{-3}}$ $=a_1 * X * 1$	$Y1 = \frac{Y1 * 100}{\sum 2}$	
	Thermal energy	G cal	Y $=\sum Y_i$	$b=0.14$ 3	Y'= $Y*b$	$Y = \frac{Y * 100}{\sum 1}$	a_2	$\frac{Y_2}{0-3^{-3}}$ $=a_2 * X * 1$	$Y2 = \frac{Y2 * 100}{\sum 2}$	
	Natural gas	t housand m3 ³	Z $=\sum Z_i$	$c=1,17$ 0	Z'= $Z*c$	$Z = \frac{Z * 100}{\sum 1}$	a_3	$\frac{a3}{*10-3^{-3}}$ $Y_3=a_3 * X$	$Z3$ $= \frac{Z3 ** 100}{\sum 2}$	
.....										

.....										
	EnergyResource, R		$R = \sum R_i$	x	$R' = R * x$	$R = \frac{R * 100}{\sum 1}$	a_n	$\frac{Y_n}{= a_n * R}$	$\frac{Yn}{= \frac{Yn * 100}{\sum 2}}$	
	Total:				$\sum 1 = X + Y + ... R$	100		$\sum 2 = Y_1 + Y_2 + ... Y_n$	100	

Appendix 9
to the order of the Chief Engineer-Director of the Technical Policy Department
National Company Joint-Stock Company

«Қазақстан темір жолы»

from _____ 202 year no.

_____ -

Conversion coefficients of natural fuel to conventional

No n/	a Name of fuel	and energy complex Unit of measurement	Conversion coefficient to conventional fuel
1	Coal	ton	0.626
2	Gasoline	ton	1.490
3	Diesel fuel	ton	1.450
4	Natural gas gas	thousand m ³	1.170
5	Electricenergy	thousand kW	0.123
6	Heating oil	ton	1.379
7	Heatenergy	Gcal	0.143

Conversion from full-scale fuel to conventional fuel is performed by multiplying two values.

Appendix 10

to the order of the Chief Engineer-
Director of the Technical Policy
Department

National Company Joint-Stock Company

«Қазақстан темір жолы»
from _____ 202 year no.
_____ -

Schedule of implementation of energy saving measures

_____ for 202__ year
(business unit)

n	/-a	Event Implemen tation date	Responsibl e person	January	February	March	April	May	June	July	August	September	October	Novembe r	December
	Task 1														
1.1															
1.2															
	Task 2														
2.1. 1															
2.2															