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METHODOLOGICAL APPROACHES TO ANALYSIS AND ASSESSMENT OF IMPLEMENTATIONENERGY SAVING POTENTIAL OF REAL ESTATE PROPERTIES AT THE CITY LEVEL: FORM, TECHNOLOGY, RESOURCES

Akhrorova S.T*; Pulatov Sh.A**

*Teacher,
Department"Cost Engineering and Real Estate Examination,
UZBEKISTAN
Email id: Messiolimjon1212@gmail.com

**Teacher,
Department" Cost Engineering and Real Estate Examination,
UZBEKISTAN
Email id: shaxron.pulatov.90@mail.ru

ABSTRACT

In many countries of Europe, Asia and the United States, innovative energy-saving technologies are already widely used, allowing for energy-efficient construction, modernization and reconstruction and minimizing energy consumption when operating real estate objects, and all these activities are actively developed with direct support at the state level. In terms of technology, Uzbekistan is far behind the so-called "civilized world "in many respects. Energy-efficient technologies are no exception. The main constraint in the construction of new types of industrial and non-industrial real estate was previously considered to be their relative high cost. According to the calculations of design organizations, today the cost of building 1 m2 of energy-efficient real estate for industrial and non-industrial purposes is almost equal to the same indicator for conventional real estate for industrial use.

KEYWORDS: *Economic Efficiency, Economically Justified, Practical Minimum.*

INTRODUCTION

Energy efficiency of real estate objects is an integral and necessary component of the economic efficiency of the functioning of these objects and the activities of economic entities in whose administration these objects are located.

There are several approaches to determining energy efficiency:

- Energy efficiency as the achievement of economically justified efficiency in the use of fuel and energy resources at the current level of development of technology and technology and compliance with the requirements for environmental protection;

- energy efficiency as the use of less energy in order to provide the same level of energy supply for buildings or technological processes in production[1] [1].

In general, energy efficiency is a set of characteristics that reflect the ratio of the beneficial effect from the use of energy resources to the costs of energy resources produced in order to obtain such an effect, in relation to the housing stock, in particular to multi-apartment real estate for industrial and non-industrial purposes.

In accordance with the level of specific energy consumption for the production of a unit of products, works or services, several categories of energy efficiency can be distinguished:

Theoretical minimum, defined as the minimum possible, in accordance with the laws of thermodynamics, specific energy consumption required to perform a certain work or transform materials;

- practical minimum, determined by the best and practically achieved in the world indicators of specific energy consumption using technologies that have proven their effectiveness;

- Real consumption abroad, determined by the average or most common indicators of specific energy consumption in other countries;

- Average consumption in Uzbekistan, determined by the average indicators of specific energy consumption in Uzbekistan;

- The best regional indicators, determined by the best practically achieved in the region indicators of specific energy consumption;

- The average regional indicator, determined by the average statistical value of the specific energy consumption in the region. This indicator was used to assess the potential for energy efficiency improvements;

- The worst regional indicator, determined consumption and energy intensity of equipment, process, facility with the worst performance indicators in the region according to statistical reporting.

Main part

The energy saving potential of a property in each sector is defined as the product of the level of economic activity in this sector by the difference between the actual (regional average) specific energy consumption for the production of a unit of production, work or service for the base year and the "practical minimum" - the value of the specific consumption for the most energy efficient technologies, technical means or buildings used in the production of similar products, works or services.

Of all the components of the energy saving potential, three main ones can be distinguished for a property:

- technical or technological - evaluated on the assumption that all equipment is instantly replaced with the best samples corresponding to the "practical minimum" specific consumption; This component of the energy saving potential of the property shows only hypothetical energy saving possibilities without taking into account the costs and other restrictions on the realization of this potential. It can be judged as a result of "shaving off" the red zone (low score) or the red and yellow zones (high score). To assess the technical potential of energy saving of the property, information was used only on already practically tested technologies;

- economic - arising from the technical potential, and that part of it that is most economically attractive when using public criteria for making investment decisions: discount rate%, imputed energy price (export price of natural gas), environmental and other additional costs (for example, carbon prices). The implementation of this component of the energy saving potential of a property requires time, determined by the speed of replacement of the main energy-consuming equipment;

- market - resulting from the economic component of the energy saving potential, the consideration of which is economically expedient when applying particular criteria for making investment decisions in real market conditions (actual prices for equipment and energy carriers, taxes, etc.)

Let us characterize three main differences in assessing economic and market potentials:

1. the procedure for making investment decisions - centralized or decentralized (due to this difference in a planned economy, all other things being equal, energy intensity is always two or more times higher than in a market economy); discount rates - value of money and perception of risk (12% for industry and 33-50% for households);
2. the composition of the effects - real rather than imputed prices, accounting for taxes and benefits, the inclusion of additional environmental and other costs (the higher opportunity cost of capital for households is due to a number of reasons: households, as a rule, are less willing to take risks associated with investments in energy saving measures);
3. the implementation of significant capital investments requires credit injections at interest rates set for private borrowers; or, in the presence of free funds, they have more important (in their eyes) areas for investment.

An important component of the methodology for assessing the energy saving potential of a real estate object and the costs necessary for its implementation is the way of accounting for the latter.

A radical increase in the energy efficiency of the Uzbekistan and regional economies is possible only if a significant part of the accumulated fixed assets is modernized and renewed. However, the main task of their modernization and renovation is not only to improve energy efficiency, but also (to a greater extent) to maintain operability, increase the reliability and overall productivity of fixed assets, generate additional income and reduce costs and harmful environmental impacts. Improving energy efficiency and reducing energy costs is only one of the effects of modernization and renovation. Therefore, the concept of incremental capital costs is used in project costing.

When justifying many energy efficiency projects, not incremental, but full capital costs are estimated, since the cost of equipment is not broken down into parts that make it possible to continue or increase the production of goods and services and give the effect of reducing energy consumption. Therefore, the cost of projects to improve energy efficiency is often overestimated by 2-4 times, and only the cost of saving energy is assessed as an effect.

Incremental capital costs are calculated as the difference between the cost of equipment for an energy-saving project, the characteristics of which correspond to high energy efficiency classes or the best foreign technologies, and the capital costs of installing new equipment with an average or low level of energy efficiency, comparable to the efficiency of equipment that is currently in operation. In Uzbekistan (for example, the difference in the cost of a high-efficiency electric motor and an electric motor of the middle efficiency class). In some cases, when the only investment goal is to improve energy efficiency, for example, when installing a variable speed drive or metering devices, the full capital costs were used in the calculation.

To assess the economic and market potentials, the average Uzbekistan data on specific incremental capital investments were taken, which were estimated as part of the development of the State Program "Energy Saving and Energy Efficiency Improvement in the Uzbekistan Federation for the Period up to 2020".

To determine the economic and market potential, the cost of energy savings (CSE) was estimated using the following formula:

$$CSE = (CRF \times Cc + Cop) / ASE \quad (1)$$

where: Cc - incremental capital costs for the implementation of the measure; Cop - change in operating costs or additional effects (output growth, quality improvement, etc.); ASE - annual savings of final energy; CRF - capital investment reduction factor (standard capital efficiency factor). attachments), which is calculated by the formula:

CRF = dr /? 1- (1 + dr)? ^ (- n) (2)

where: dr - discount rate; n - equipment service life.

When assessing the economic potential, a discount rate of 6% was used, and when calculating the market potential - 12% for all investments. Each type of equipment has its own service life[2]...

Additional Costs or Benefits (Cop) may include annual changes in operating costs, elimination of the need for capital investments, or elimination of external factors relevant to a specific energy efficiency project. Benefits (for example, increased product output due to increased reliability and reduced maintenance downtime, reduced repair and recovery costs, reduced scrap rates due to automation and improved working conditions, etc.) are reflected as negative costs in Cop.

For each event, the scale of the final energy savings was assessed. By ranking measures by cost, you can build an energy saving curve. In fact, two curves are plotted: for public and private discount rates. The intersection of the first one with the imputed energy price (natural gas price) gives an estimate of the economic potential, and the second one with the average energy price - the market one. Obviously, both potentials increase as energy prices rise.

Estimating the additional costs and benefits (Cop) is extremely important for estimating the energy saving cost curve (SES), although it is quite complex. In a special study evaluating the additional effects from the implementation of 81 energy-saving projects in the United States, it was concluded that they increase the effect from the implementation of projects by an average of 44% and reduce the payback period of such projects to 1 year. It is the presence of such effects that can lead to the fact that the cost of saving energy can be negative.

Special attention needs to be paid to justifying additional costs and benefits. Their assessment for energy efficient technologies in industry (according to the list of energy-intensive products produced in three regions), as well as in other sectors, is shown in Table. 1.

There are the following principles for increasing energy efficiency[3]: [1].

1. Wise use of energy resources

2. Stimulating energy saving

3. Energy saving design

TABLE 1 ESTIMATES OF ADDITIONAL EFFECTS AND COSTS FROM THE IMPLEMENTATION OF MEASURES TO IMPROVE ENERGY EFFICIENCY

Production of a product, service, or work	Additional effect rubs. / Here	Additional costs	Notes (edit)
Power engineering			
Power generation			An additional effect is determined by a decrease in expenses for capital and current repairs of equipment and an increase in electricity generation by reducing emergency and repair downtime of equipment and a corresponding increase in its operating capacity
Electricity transmission (transportation)	12127	79	An additional effect is determined by a reduction in operating costs for routine maintenance and repairs of electrical networks, transformer substations and substations. Additional costs are determined by the need for servicing AIMSKUE, dispatching systems and operational power supply

Production of a product, service, or work	Additional effect rubs. / Here	Additional costs	Notes (edit)
			management.
Heat power engineering			
Heat production in boiler houses			An additional effect is determined by a decrease in the cost of capital and current repairs of equipment and an increase in heat production due to a decrease in emergency and repair downtime of equipment
Heat energy transport			An additional effect is determined by a decrease in expenses for capital and current repairs of equipment of heating networks and an increase in the supply of heat energy by reducing emergency and repair interruptions in heat supply
Industry			
Iron reproduction	496		An additional effect is determined by an increase in the production of iron ore (iron ore concentrate) during the modernization and / or reconstruction of technological production
Production of iron ore pellets	299		An additional effect is determined by an increase in the production of iron ore pellets during the modernization and / or reconstruction of technological production
Sinter production (sinter production)	2100	1084	An additional effect is determined by an increase in sinter output during the modernization and / or reconstruction of sinter production. Additional costs are due to the need to purchase iron ore concentrate (ore) to

Production of a product, service, or work	Additional effect rubs. / Here	Additional costs	Notes (edit)
			provide additional sinter production
Coke production	1156	724	An additional effect is determined by an increase in coke output during the modernization and / or reconstruction of coke-chemical plants. Additional costs are due to the need to purchase coal to provide additional volume of coke production
Pig iron production (blast furnace production)	1333		An additional effect is determined by an increase in the production of pig iron during the modernization and / or reconstruction of blast furnaces. Reconstruction of blast furnaces with the installation of bell-less charging devices allows to increase the technological capacity of blast furnace production by an average of 10-25% and does not require an additional increase in coke consumption for pig iron production
BOF steel production	27695	16023	An additional effect is determined by an increase in steel output during the modernization and / or reconstruction of converters. Additional costs are due to the need to purchase (produce) pig iron to ensure additional production of BOF steel
Electric steel production	35778	8178	An additional effect is determined by an increase in steel output during the modernization and / or

Production of a product, service, or work	Additional effect rubs. / Here	Additional costs	Notes (edit)
			reconstruction of electric furnaces. Additional costs are due to the need to purchase scrap metal to provide additional steel production
Production of rolled ferrous metals	257	-	An additional effect is determined by an increase in the output of rolled ferrous metals during the modernization and / or reconstruction of rolling mills.
Aluminum production	1825		An additional effect is determined by the following factors: 1. An increase in the production of aluminum during the modernization and / or reconstruction of technological production; 2. Reducing the consumption of anodes in the production of aluminum
Cardboard production	1884	-	An additional effect is determined by an increase in the output of cardboard during the modernization and / or reconstruction of technological production (cardboard machines - CDM).
Paper production	2569	-	An additional effect is determined by an increase in paper output during the modernization and / or reconstruction of technological production (paper machines - PM).
Housing sector			
Modernization of lighting systems	3160		Savings on the purchase of lamps due to the significantly longer service life of compact fluorescent lamps compared to incandescent lamps

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