

## **Indicators for Energy Efficiency in Buildings**

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## **What is understood by Energy Efficient Buildings / Homes**

Properties of buildings / homes and their engineering systems which use a limited level of heat energy to provide an optimal indoor micro-climate in rooms

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## **Increasing energy efficiency of buildings / homes**

Overall norms, organizational, technical, administrative and other measures to increase the effectiveness of energy use while protecting the environment

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## **What decisions have already been taken in Russia to increase energy efficiency in buildings?**

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## **Energy Efficiency and Energy Savings**

were chosen as one of the five key directions need to focus on to radically restructure the Russian economy by the President of the RF 18/06/2009

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## **Presidential Decree of June 2008: Reduce Russia's energy intensity of GDP by 40% by 2020 (vs 2007 levels) including in the construction and residential sectors**

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**To implement the Presidential Decree a  
Federal Law was drafted  
“on Energy Efficiency and the Increase  
in Effective use of Energy”  
Now in 2nd reading in the Federal Duma**

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## **Key points of this draft Law for energy efficiency in buildings**

**Article 4. Measures of government  
regulation in energy savings and increasing  
energy efficiency**

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**State regulation is carried out by means  
of an establishment of requirements on:**

- **Energy effectiveness of buildings**
- **Carrying out obligatory power inspection of buildings**
- **Energy passports for buildings**
- **Maintenance of a State energy registry**
- **Creation and maintenance of a system of state supply with information in the field of energy efficiency**

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## **Article 8. Requirements for Buildings, Structures and Equipment**

- **Part 2. Requirements on energy efficiency should include the indicators describing the energy use (costs) in a building,...**
- **Part 2. Every five years, as of January 1st 2010, the specified indicators should be reduced by 20 % of the standard specific consumption of energy resources.**

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- **Part 4. Not allow the commissioning of buildings built, refurbished or completely renovated if they do not meet the requirements of energy efficiency buildings or do not have devices/meters to monitor energy consumption.**
- **Part 5. In the design documentation of buildings..., a separate section on “ Energy efficiency ” should be included.**

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- **Part 6. Acknowledgement of the conformity of a building put into operation..., to the requirements of energy efficient buildings to be made by a Supervisory body responsible for State buildings’ supervision. Data on the conformity...should include... requirements for energy efficient buildings (norms and actual values)**
- **Part 7. Proprietors of buildings..., are obliged to ensure conformity to the established requirements on energy efficient buildings and on related metering devices**

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- **Part 8.**  
Proprietors of buildings..., have the right to demand from the builder the elimination of any discrepancy with the norms which are found – free of charge – or to be compensated for any costs made by them to deal with the discrepancy

## Article 9. Energy Efficiency Requirements and Energy Efficiency Improvements in Existing Building Stock

- **Part 1.**  
For the Supervisory body over State buildings to establish classes of energy efficient buildings for constructed, refurbished, and completely renovated apartment blocs
- **Part 2**  
For owners of apartment blocs to advertise (hang out on the face of the building) the ranking or class of energy efficiency of the building based on the actual energy-efficient indicators of the building

## Article 12. Requirements on carrying out Energy Inspections

### Part 1

The basic purpose of energy inspections are:

- to obtain objective data on the level of energy consumed;
- to determine the indicators of energy efficiency;
- to determine potential areas for energy efficiency and savings;
- to develop actions to increase the energy efficiency of the building.

**Part 4.** Based on results of energy inspections, energy passports are made.

**Energy passports must include information:**

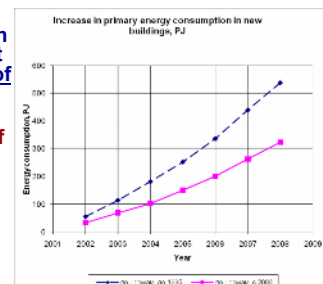
- on metering equipment and devices;
- on the level and volume of energy consumed;
- about indicators of energy efficiency;
- on potential energy savings and ways to increase energy efficiency.

## What has Russia already accomplished with respect to energy efficiency in buildings?

Over the past 10 years, energy consumption in buildings has decreased by about 40%.

## Calculation of the Energy Efficiency Effect to 2008: Based on 360 million m<sup>2</sup> of buildings built using energy efficiency norms (representing 12 % of Russia's residential stock)

- The energy saving effect in terms of TPES between 2002-2008 is estimated at **770 Petajoules (27.7 MT of coal equivalent)** (Peta=10<sup>15</sup>)
- This equates to a total reduction in emissions of CO<sub>2</sub> by 2010 relative to 2002 levels of 106 Million tonnes.



## Standard Heating Requirement W·h/(m<sup>2</sup>·Degree-Day), does not depend on climate.

Example, Moscow 20 x 4943=100 kW·h/m<sup>2</sup>

Type	Number of Floors					
	1-3	4-5	6-7	8-9	10-11	12 or more
Residential	33	24	22	21	20	19.5

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## Classes of Energy Efficient Buildings

Letter and Graphic Class Name	Name of Class	Level of Deviation from standard level, %	Recommended actions by administrations of Subjects of the Federation
<i>Для новых и реконструируемых зданий</i>			
A	Very High	Less than minus 51	Economic stimulus
B	High	From + 10 to minus 50	Economic stimulus
C	Normal	From + 5 to minus 9	-
<i>For Existing Buildings</i>			
D	Low	From + 6 to + 75	Recommend reconstruction of the building
E	Very Low	More than 76	Necessary heating of the building as soon as possible

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## Classification of Buildings with respect to energy efficiency

Has provided an opportunity to erect buildings with higher energy efficiency without changing the level of specifications/standards.

For instance, to specify in the design phase of building project as Class B with 20% decrease from the standard specific energy consumption for heating, which is already stipulated in the requirements for high-rise buildings in Moscow

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## Energy Passports which monitor the actual and required parameters with the help of:

- Justification of the requirements, helping investors and building owners to assess the value of energy efficiency
- Documentation of actual energy efficiencies through more accurate assessment of energy consumption (ГОСТ (GOST)31168-03)
- Allowing investors to establish actual levels of energy savings

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## Graphic Representation of Classes of Energy Passports СНиП (SNiP) 23-02

Описание: таблица В.3

Класс энергетической эффективности (классовый, кВт/м <sup>2</sup> ·°C·сут)	Установленный класс (кВт/м <sup>2</sup> ·°C·сут)	Рекомендация
<i>Новые и реконструируемые здания</i>		
A	Очень высокий	экономическое стимулирование
B	Высокий	то же
C	Нормальный	-
<i>Существующие здания</i>		
D	Низкий	Желательна реконструкция
E	Очень низкий	Необходима реконструкция в ближайшее время

Указания по повышению энергетической эффективности

41	Рисование:	
42	Паспорт здания	
	Организация	
	Адрес и телефон	
	Ответственный исполнитель	

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## What Impact Does the Increase in Energy Use have on the Environment and Climate Change?

- The main impact on climate change is the increase in the concentration of greenhouse gases, in particular CO<sub>2</sub>
- The increase in energy consumption means an increase in the growth of CO<sub>2</sub> in the atmosphere

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## Energy Efficiency Indicators in Buildings

Can be divided into three groups:

**Basic Indicators**

**Auxiliary Indicators**

Control / monitoring of the conformity to established standards / norms

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## Basic Indicators

- Indicators of the indoor micro-climate
- Indicators of the outside climate
- Energy indicators: calculated and estimated
- Indicators based on the environment
- Estimated indicators should be recalculated to the design conditions for comparison with calculated indicators
- Economic indicators
- Indicators of statistical reporting
- Sources of heat supply
- Consumption of primary energy sources

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Auxiliary indicators are those needed to define basic indicators

- Overall building parameters
- Number of buildings
- Actual climatic indicators and indoor air
- Thermal and technical characteristics of building envelopes and materials
- Indicators of heat emissions (people, equipment, appliances, etc.)
- Indicators of solar radiation penetrating the building
- Characteristics of the material
- Air circulation and indicators of ventilation, recuperation and air conditioning

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## There are Three Basic Indicators for Buildings:

Specific annual energy consumption of the building;

Specific energy use for heating and cooling of the building;

Specific annual fuel consumption.

The first two indicators are characterized as end-use energy, while the third indicator is characterized as primary energy consumption

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Specific energy consumption per year per building ( $Q$ ) includes heating / cooling, water heating and lighting

It is defined per  $m^2$  or  $m^3$  and depends on climate,  $kW \cdot h/m^2$ ,  $kW \cdot h/m^3$

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Specific consumption of energy ( $q$ ) for heating / cooling purposes in a building

Is defined per  $m^2$  or  $m^3$  and degree-days of heat / cooling period and does not depend on the climate,

$W \cdot h/(m^2 \cdot ^\circ C \cdot \text{day})$  or

$W \cdot h/(m^3 \cdot ^\circ C \cdot \text{day})$

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**Specific fuel consumption per year is determined at the source that turns fuel into energy**

**It is determined per m<sup>2</sup> or m<sup>3</sup> and depends on climate, kg c.e./m<sup>2</sup> or kg c.e./m<sup>3</sup>**

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**In Total about 80 indicators are examined which impact on the energy efficiency of buildings**

**When developing indicators, Guidelines to assess energy efficiency of new buildings (ISO 23045:2008) were taken into account**

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## **Publications**

[http://www.cenef.ru/art\\_11288\\_193.htm](http://www.cenef.ru/art_11288_193.htm)

<http://www.zodchii.ws/reviews/info-2.html>

**Thank you for your attention!  
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