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Capacity and Environmental Impact of Energy Efficiency

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Content

- Energy conservation policy and Stages of implementation of goal achievement
- Some Challenges in Energy Sector of Mongolia
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Stages of Development for Energy conservation Policy

First stage. 1960-1975. Rational use of fuel and energy. The goal of the policy is conserving fossil fuels such as coal and oil.

Next stage. 1975-1995. Decrease production and maintenance costs by saving fuel and energy. Setting norm and reduce energy consumption per unit of production.

Current stage. Reducing adverse effects on the environment such as greenhouse gas emissions by saving energy.

Acts of Energy Conservation Policy since 2010

State policy in Energy, 2015-2030. In order to increase energy efficiency, to reduce GHG emissions per Gcal of heat production to 0.49 tons of CO2-eq in 2023 and 0.47 tons of CO2-eq in 2030, to reduce building thermal heat loss by 20% in 2023 and 40% in 2030, respectively. set a goal.

The Law of Energy Conservation. This law regulates the relations concerning energy conservation and efficient use of energy. This law has been effectively and successfully implemented.

National Energy Conservation Program. The goal of the program is to reduce greenhouse gas emissions and mitigate the effects of climate change by ensuring integrated management of energy conservation and efficient use, as well as by introducing advanced energy-saving technologies.

Thermal and electrical energy indicators, 2020

Sources: 1. Statistics of Energy Sector, ERC, 2020

2. Energy Sector Greenhouse Gas Emissions Methodology and Research Report, ERA, 2021

Heat Energy

CHPP by cities	Specific fuel consumption, in coal equivalent kg/Gcal	Heat tariff, MNT/Gcal	Emissions of CO2 per unit of energy, kg of CO2/GJ
Ulaanbaatar	174.4	30420.0	87.0
Erdenet	186.5	32818.0	126.3
Darkhan	185.7	26835.0	126.7

Electricity Energy

Electricity Generator	Specific fuel consumption, in coal equivalent, g/kWh	Electricity tariff MNT/kWh	Emissions of CO2 per unit of energy, kg of CO2 / kWh
CRIPG	315.0	183.5	0.75
DorCHPP	633.0	155.9	1.72

Scope of energy saving activities

Energy saving **is** a very broad concept for every citizen and entity, includes energy losses occur in energy generators, transmission networks and consumers.

Various mechanisms such as legal, organizational, economic and **technological** measures are needed to reduce energy losses.

The goal of reducing greenhouse gas emissions coincides with energy conservation concept due to low levels of energy production efficiency in Mongolia.

Efficiency of Energy saving activities

Greenhouse gas emissions would be reduced

Greenhouse gas emissions would be reduced

Some Issues Relavant Improving Efficiency on Energy Sector in Mongolia

In this report, I will focus only on technical and technological issues and will try to summarize the results of research on the efficient use of heat energy from fuel combustion and the potential for further improvement.

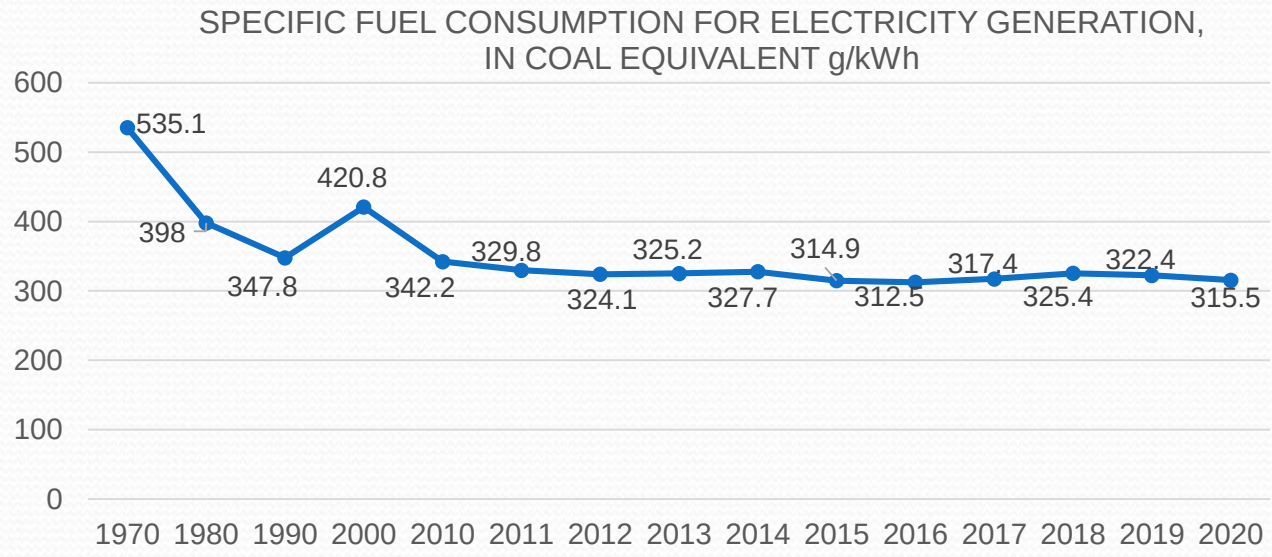
Today, the following three issues are considered very important for improving the efficiency on energy sector in Mongolia.

- **The structure of the central region integrated power grid** generator affects the specific fuel consumption for electricity generation, in coal equivalent and the possibility of reducing it;
- **Effectiveness of power plants and heat only boilers** on the impact of coal consumption and ways to increase it;

- Reduce **thermal heat loss of existing buildings**

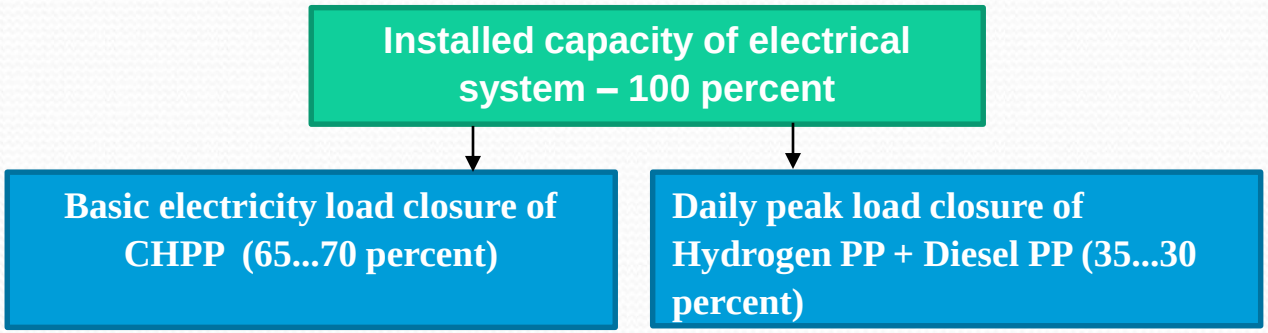
Possibilities to reduce coal consumption by creating a convenient structure for the power plant of central region integrated power system

Due to the fact that CHPPs share of the participation of sources in energy production about 90 percent of the total installed capacity of Central region integrated power system, these plants are forced to operate in condensation mode for a long time in accordance with the system load schedule.



Convenient structure of the Central region integrated power system, taking into account the climatic conditions in Mongolia

The results of a number of studies carried out to determine the optimal structure of the Central region integrated power system in the climatic conditions of our country are shown in the figure.



In the future development policy of the power system, it is very important to plan and implement the power factor of the generator as described here.

If the design of the Central region integrated power system had the mentioned ratio, the specific consumption of equivalent fuel for the CHPP would be 50 g.e.f or 100 g.coal/kWh less than the current actual value (2020), which would save 650.0 thousand tons of coal on CO2 greenhouse gas emissions can be reduced by 16 percent or 870.0 thousand tons per year.

Possibilities to increase the efficiency indicator of CHPP and heat only boilers and it is reduce coal consumption

The operation of medium heat supply systems, built in 1970-1980, is far behind the current level of scientific and technological development and greatly pollutes the environment.

In the near future to rectify this situation to take the following:

1. Install and upgrade efficient, environment friendly, advanced technology and high-tech boilers to replace the currently operating mid-range boilers;
2. Heat distribution and consumption payment made by heat meters;
3. Avoid using low efficient and low pressure boilers in ger district od town and aimag centers;

Benefits of technological modernization of CHP plants and heat only boilers

Today, the average heat load in aimag centers is 15-20MW, and the efficiency indicator is 65 percent for CHPP and 40-45 percent for low-power boilers.

- On average, 20,000-28,000 tons of coal are used for heat supply in one aimag center, and if the efficiency of the boilers can be increased to at least 75 percent, this will reduce 25,000 ... 32,000 tons of CO2 per year in one aimag, and 600.0 thousand tons in all aimags.
- The introduction of heat meters will increase consumer interest in energy savings and increase savings by at least 20 percent..

Increasing Efficiency and Reducing heat consumption by Insulating existing buildings

In 2020, the Global Green Growth Institute (GGGI) executed a study to determine the actual thermal heat loss in apartment buildings built in 1970-1990, and shown in table the results.

Resistance of thermal transmittance of existing building envelopes, R, $m^2\ ^oC/W$.

Type of Buildings	External wall	Roof	Basement Floor	Window	Heat demand per square meter of conditioned space, kWh/m^2 a
Precast concrete 5 story buildings	1.1	0.7	0.65	0.3	374.0
Precast concrete 9 story buildings	0.9	0.42	0.6	0.3	392.0
Precast concrete 12 story buildings	0.84	0.54	0.6	0.3	347.0

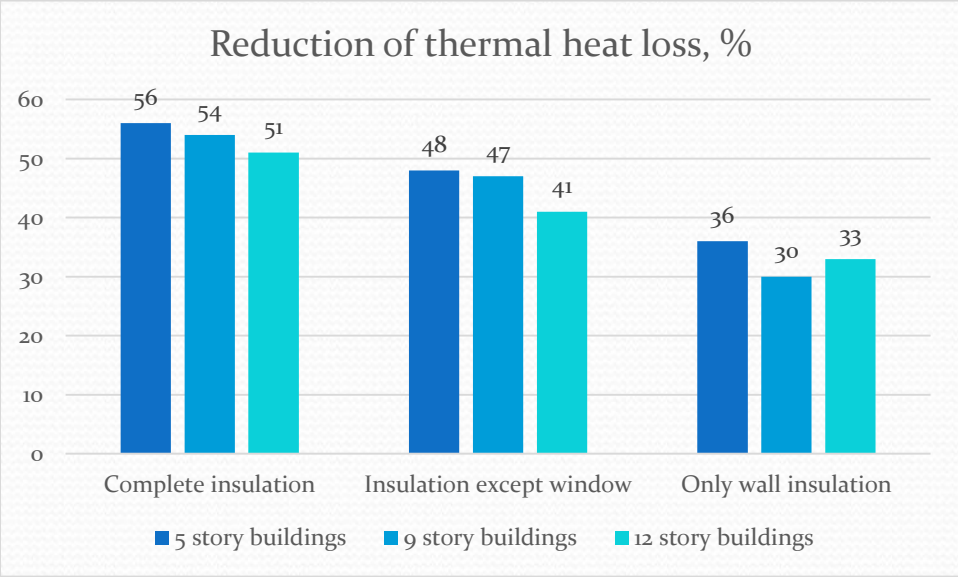
The resistance of thermal transmittance of existing building is too lower than the value of the code “Thermal performance of buildings BNbD 25-01-20.

Building insulation options

The study was carried out in three types of the buildings, for instance, (walls, windows, roof, basement), with exception of windows, and only the walls were insulated.

Resistance of thermal transmittance of envelolepes, R, m^2 $^oC/W$

Insulation area	External wall	Roof	Basement floor	Window
Full Insulation	3.5	5.5	5.6	1.6
Wall, roof, basement	3.5	5.5	5.6	0.3
Wall only	3.5	0.54	0.6	0.3



Benefits and Experiences of building thermal insulation.

- Renovation and improvement of heating system of insulated building.
- Frequently operate mixing loop sabstation with automated control system
- Use heat meters

Output of thermal insulation

The table shows reduced CO_2 emissions and saved energy consumption, depending insulation options.

Thermal heat savings and CO2 reduction,
after insulation of precast reinforced concrete apartment (per building)

Type of Buildings	Wall, roof, basement insulation, replace window		Wall, roof, basement insulation		Wall only insulation	
	Saving MWh	Reduction of CO2, tn	Saving MWh	Reduction of CO2, tn	Saving MWh	Reduction of CO2, tn
Precast 5 story building	1560.0	645.0	1332.0	598.0	996.0	413.0
Precast 9 story building	953.0	395.0	955.0	396.0	557.0	213.0
Precast 12 story building	363.0	150.00	277.0	115.0	220.0	92.3

Annual heat consumption for insulated buildings is likely to be reduced by 51-56 percent for full insulation, 41…48 percent for wall, roof and basement insulation, and 30…36 percent for wall insulation alone.

Conclusions & Recommendations

a. Due to extra thermal insulation of existing buildings, heat consumption per square meter will be reduced 2.3 times and 160.0 kWh/m^2a.
b. Development of large capacity power generation needs to coordinate in order to create a convenient structure for the Central region integrated power system;
c. Use heat meters for payment of heat consumption in urban area;
d. Report statistic information of CO_2 emission from energy production and consumption in urban area;
e. Create incentives system for entities and citizens who have achieved results in building thermal insulation.

Investments required to insulate existing buildings, rates in 2020

Insulation options	5 story buildings	9 story buildings	12 story buildings
Wall, roof, basement, window	544.0	997.0	484.0
Wall, roof, basement	389.0	383.0	215.0
Wall only	314.0	337.0	205.0

Investment per household, on average

Full insulation 9.5 million tugrug

Wall, roof, and basement – 6.4 million tugrug

Only wall insulation -4.8 tugrug

THANK YOU FOR YOUR ATTENTION

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