

The 2nd Japan – Ukraine Energy Seminar
Kyiv, 01.10.2015

Possible Directions and Resource Potential for Replacing Natural Gas with Solid Fuel in Ukraine

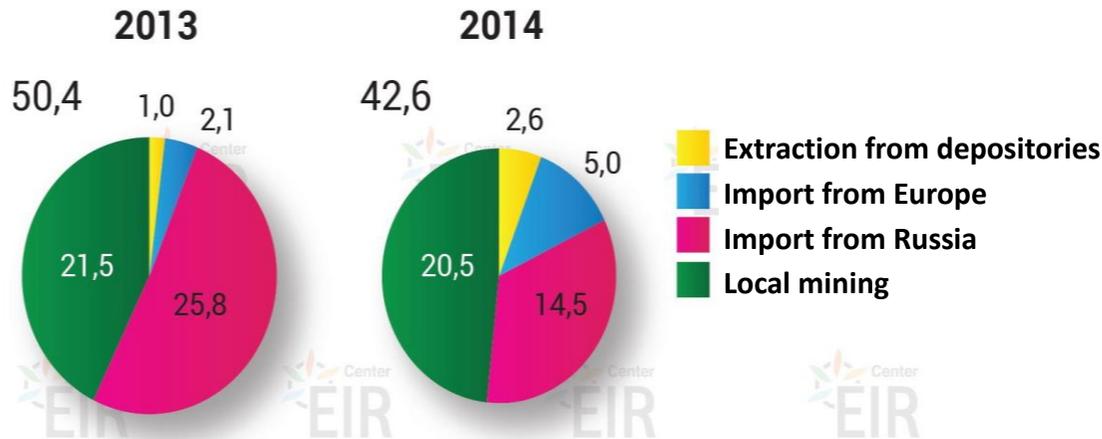
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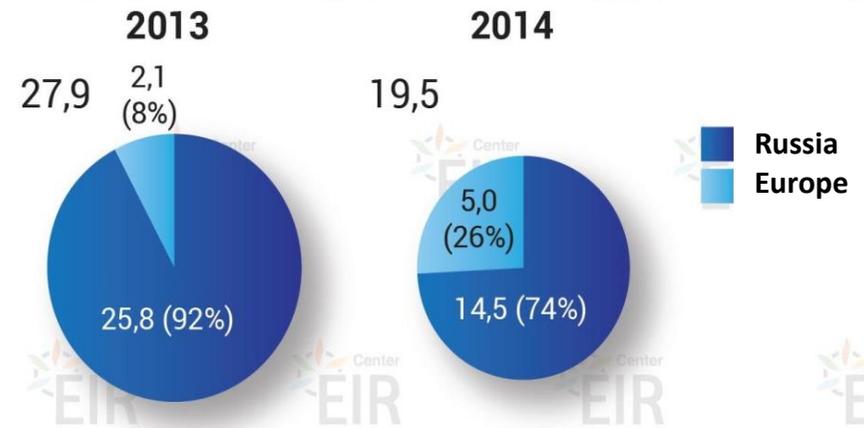
Coal Energy Technology Institute of NAS of Ukraine

Structure of gas sources in Ukraine in 2013-2015

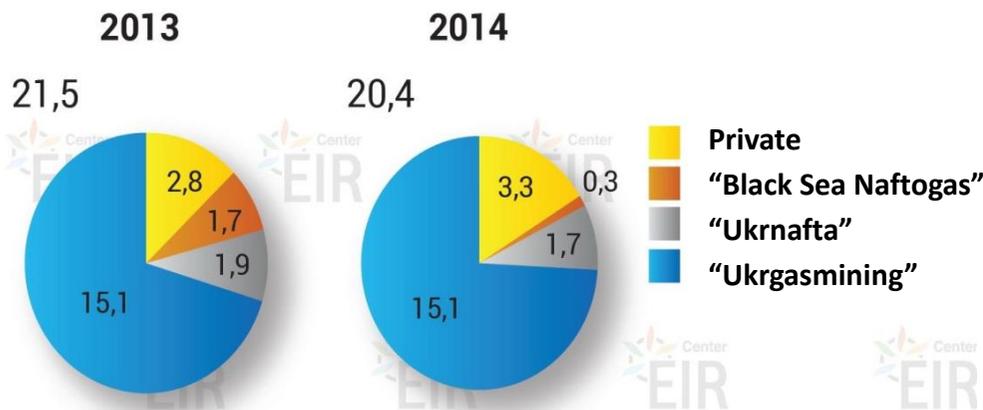
The use of gas from sources, billion cubic meters



Gas import to Ukraine, billion cubic meters



Gas mining in Ukraine, billion cubic meters



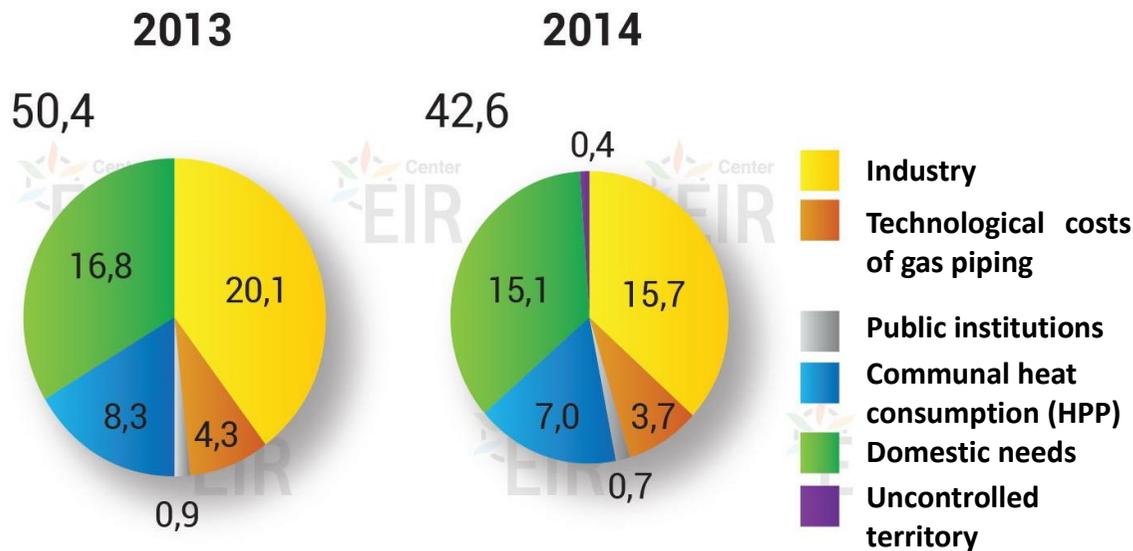
In 2015 it was planned:

- mining in Ukraine - 19.5 billion cubic meters
- import - 26.0 billion cubic meters
- extraction from depositories - 8.7 billion cubic meters
- pumping to depositories - 13.9 billion cubic meters

Total for consumption - 40.3 billion cubic meters

The structure of gas consumption in Ukraine in 2013-2015

Using gas per branches, million cubic meters



In 2015 it is planned:

- industry - 13.1 billion cubic meters
- technological costs of gas piping - 3.4 billion cubic meters
- public institutions - 0.7 billion cubic meters
- communal heat consumption - 8.7 billion cubic meters
- population domestic needs - 14.0 billion cubic meters
- uncontrolled territory - 0.4 billion cubic meters

Total consumption - 40.3 billion cubic meters

The main consumers of gas:

- industry
- domestic needs
- heat & power plants (HPP) and heating boilers (communal heat consumption)

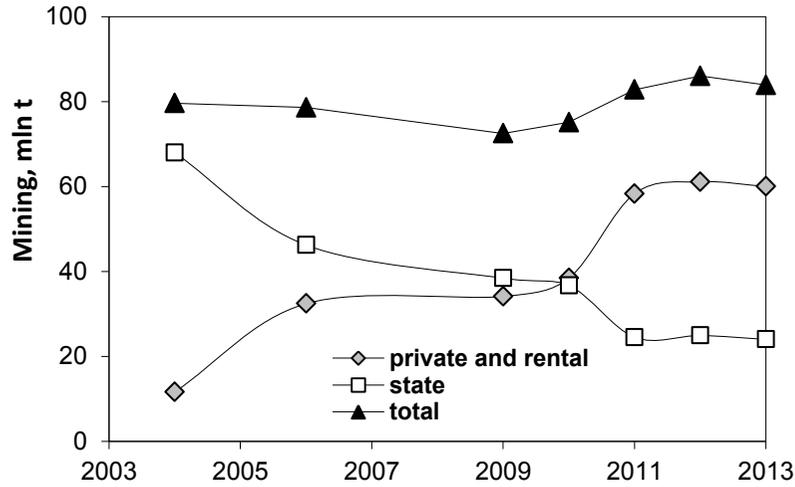
The main ways to reduce gas consumption:

- reducing thermal losses in district heating and local heating systems
- partial replacement of gas for heating with electricity from nuclear power plants
- partial substitution of gas to local solid fuel (crop residues, biogas, coal) industry, for HPPs and for domestic use in rural areas

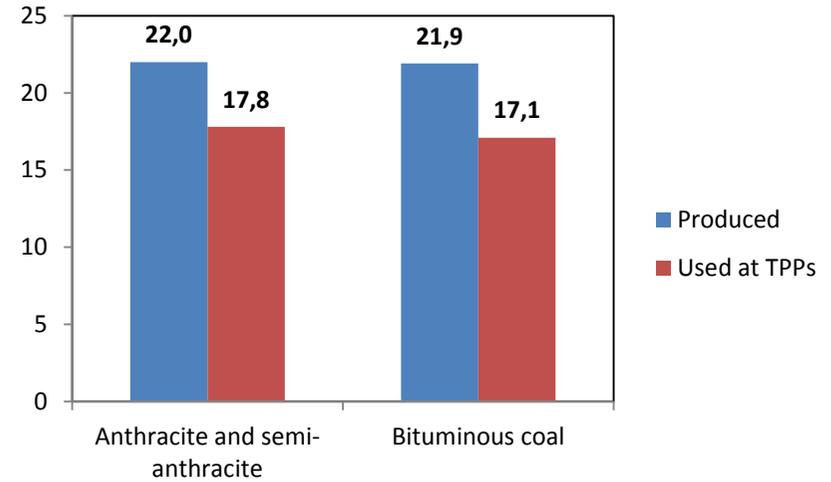
The annual capacity of **straw and other crop residues** reaches 25-30 million tons of coal equivalent (7000 kcal/kg) per year, of which up to 8 million tons of coal equivalent per year are suitable for use. At this time, due to the high fuel preparation costs and less caloric value, the cost of biofuel in energy equivalent exceeds the cost of thermal coal.

Possibilities of substitution of gas to local coal (view before 2014)

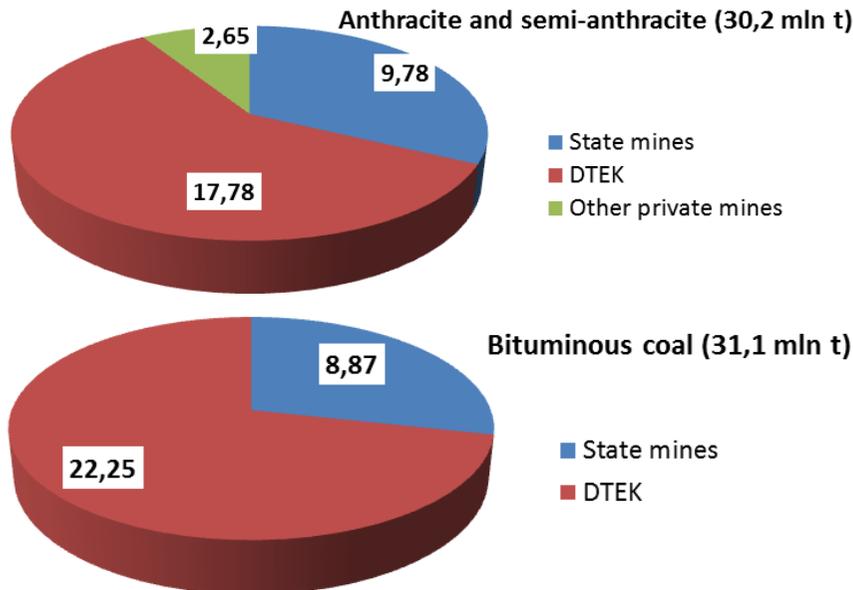
Raw coal mining in Ukraine on various forms of ownership



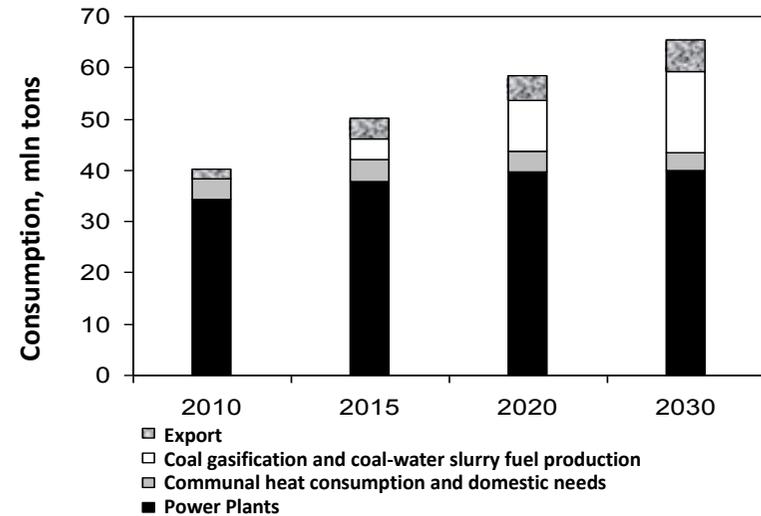
Consumption of energy coal in 2013



Raw coal mining in 2013, mln tons

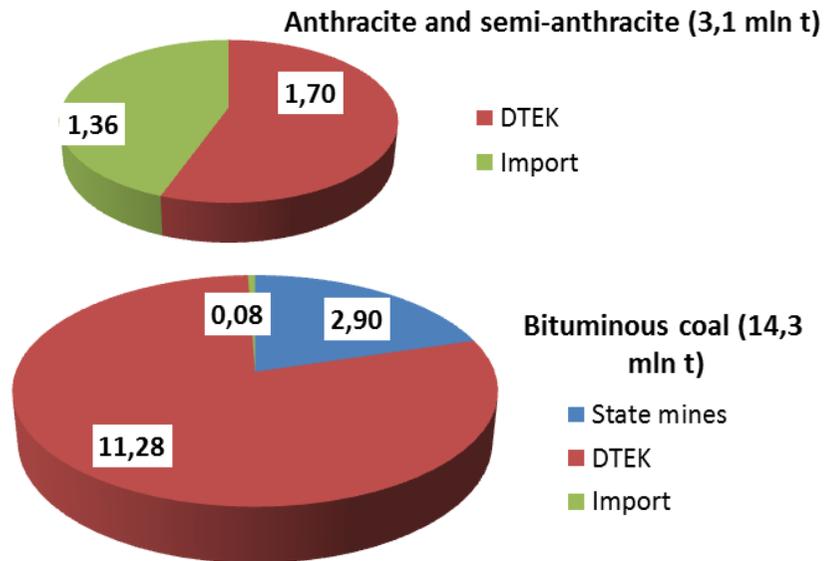


Forecasted consumption of energy coal according to the Ministry of Power & Coal draft "Coal Industry Development Program up to 2030"

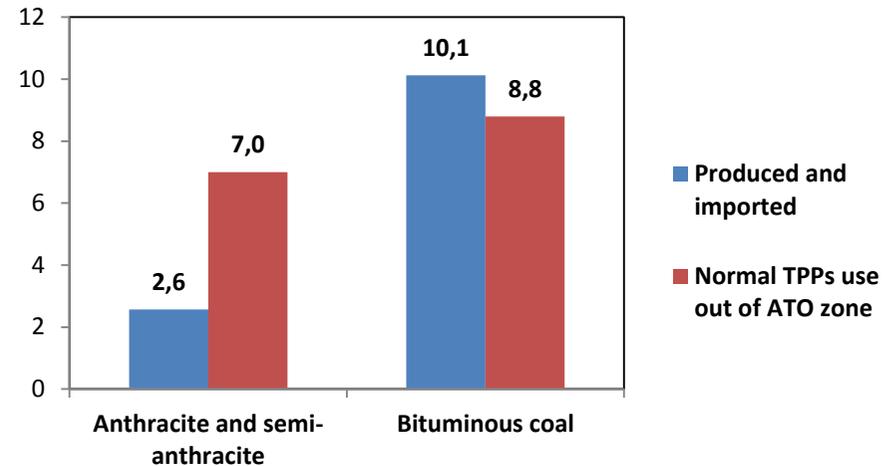


Possibilities of substitution of gas to local coal (view in 2015 p.)

Energy coal income in the first half of 2015, mln t



The balance of income and consumption of energy coal in the first half of 2015, mln t



At today's balance of production and consumption, coal sources for natural gas substitution in Ukraine do not remain

Structure of electricity production in the United Power System of Ukraine in the first half of 2014 and 2015

Виробники	1-st half 2014, mln kW·h	1-st half 2014, of total production, %	1-st half 2015, mln kW·h	1-st half 2015, of total production, %
Nuclear power plants	42 638,4	45,2	44 441,6	54,8
Thermal power plants	36 605,2	38,8	25 438,6	31,3
Central heat & power plants	3 970,7	4,2	3 384,8	4,2
Hydro power plants	5 478,8	5,8	3 908,2	4,8
Communal and industrial HPPs	4 753,1	5,0	3 144,8	3,9
Renewable	875,6	0,9	834,3	1,0
Total	94 321,8	100,0	81 152,3	100,0

The main causes for reducing production of energy coal	Comments
<ul style="list-style-type: none"> • Much of mines and coal preparing plants, including all that produce anthracite and semi-anthracite, remained in Donbass part uncontrolled by Ukraine. 	<ul style="list-style-type: none"> • Despite the fact that most of these mines is registered and pays taxes in Ukraine (40% - the state, 40% - DTEK, the rest - private and leasing of other firms), up to March 2015 coal supply from ATO zone considered as contraband. By this time in the leadership of the country there is no united view on the admissibility of supply of Ukrainian coal mines located in ATO zone.
<ul style="list-style-type: none"> • Power generating companies have no funds for the purchase of coal. 	<ul style="list-style-type: none"> • The debt of State Enterprise "Energy Market" to generating companies on 01.06.2015 exceeded 8.3 billion UAH, including 7 billion UAH to DTEK.
<ul style="list-style-type: none"> • In 2015 the state mines were obliged to sell coal only through an intermediary - State Enterprise "Coal of Ukraine". 	<ul style="list-style-type: none"> • State Enterprise "Coal of Ukraine" directs revenue from coal with the few profitable mines to cover losses of other mines, that leaves the profitable mines without development opportunities.
<ul style="list-style-type: none"> • Guidance National energy regulating committee and Ministry of Power & Coal keep artificially low tariff for electricity from thermal power plants, which making it impossible to purchase coal of actually more cost in conditions of rejection of state support of the government mines. 	<ul style="list-style-type: none"> • The tariff for electricity from thermal power plants was about UAH 0.8/(kW·h) up to June 2015, now it is about UAH 1.0/(kW·h). When fuel component in the electricity cost is 75%, it corresponds to the economically reasonable cost of coal (with 5200 kcal/kg LHV, excluding VAT and transport) not more than 920 and 1150 UAH/t, respectively. Cost of DTEK coal is 1100-1300 UAH/t, of state mines is 1700-2300 UAH /t, the price proposals of imported coal of the same LHV at the border or after unloading at the port - 1200-1500 UAH/t. According to this tariff, coal energy in Ukraine becomes not competitive at all.

Before 2014 the foreign aid in question of gas substitution with coal was the most helpful towards implementation of gasification technology, but at present – more to help reduce the cost of production of local coal and to produce enough coal of good quality and of competitive price.

Arguments against the replacement of local coal with imported:

- Energy independence of the country
- The undesirability of orientation on cheap Kuzbass coal in view of the political uncertainties in relations with Russia
- Limited capacity of port terminals, additional costs for ships passing the Bosphorus Strait
- The half of existing TPP boilers are designed for anthracite and semi-anthracite combustion, whose share in the global coal market is only 5-10%
- Large cost of mines conservation or closure
- Significant social problems of miners' employment

Actual directions of promoting the replacement of natural gas to local solid fuel in Ukraine

The increase in mining capacity and competitiveness of local coal	Municipal and industrial HPPs and boilers (up to 3 billion m ³ per year)	Industrial gas use (up to 5 billion m ³ per year)	Gas use for domestic needs (up to 4 billion m ³ per year)
<ul style="list-style-type: none"> • The introduction of modern mining technologies with a decrease in the cost of raw coal • Introduction of modern technologies of "dry" rock removal with a decrease in the cost of coal enrichment and reduction of logistics costs of transport to enrichment plants • Methodical help to Ministry of Power & Coal in the development of economically reasonable principles of pricing in the local coal and electricity • The technical and economic assessment of the feasibility of mines revival • Participation in privatization of state coal enterprises 	<ul style="list-style-type: none"> • Transfer HPPs consuming gas in the mode of heat generation only • Implementation of highly economical technologies for gas boilers • Implementation of environmentally friendly technologies for coal burning at HPPs and boilers (CFB, water-coal fuel, high-efficiency desulphurization, reducing the generation of NO_x) • Introduction of technologies using captured ash 	<ul style="list-style-type: none"> • Optimize existing "gas" technologies to increase efficiency and decrease in gas use • Implementation of gasification technologies with their integration in the processes of chemical synthesis • Introduction of technologies replacing natural gas with coal in cement kilns, in limestone roasting and in other thermal processes • Utilization of waste heat from industrial processes 	<ul style="list-style-type: none"> • Installation of solar systems for individual heating and hot water generation • Implementation of modern systems of individual heating and hot water on solid fuel • Organization of cheap fuel briquettes production from brown coal, peat, crop residues

Thanks for your attention

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