

Dual problem of the coal sector development *Case study with TIMES-Ukraine Model*

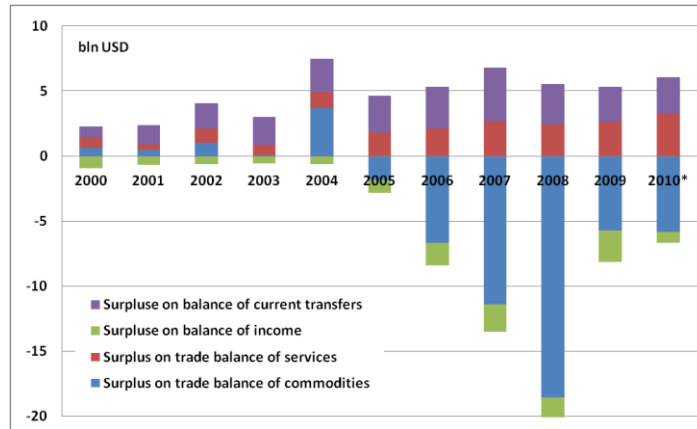
Roman Podolets, Ph.D. Economics
Oleksandr Diachuk, Ph.D. Engineering

ETSAP Workshop
Stockholm 2010

Structure of Presentation

1. Agenda of the Ukrainian coal sector development
2. Introduction of the TIMES-Ukraine Model
3. Scenario assumptions and results
4. Conclusions

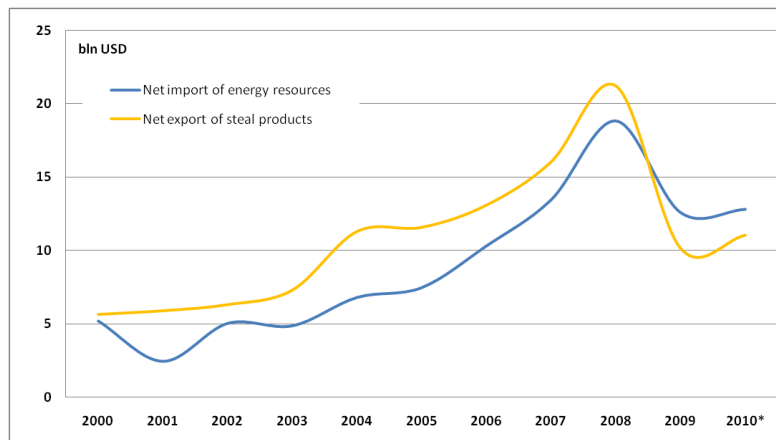
Deficit of the current account balance



Deficit of commodity balance, growing rapidly because of imbalance in domestic market of consumer goods, became a main factor that determined dynamics of current account balance.

3

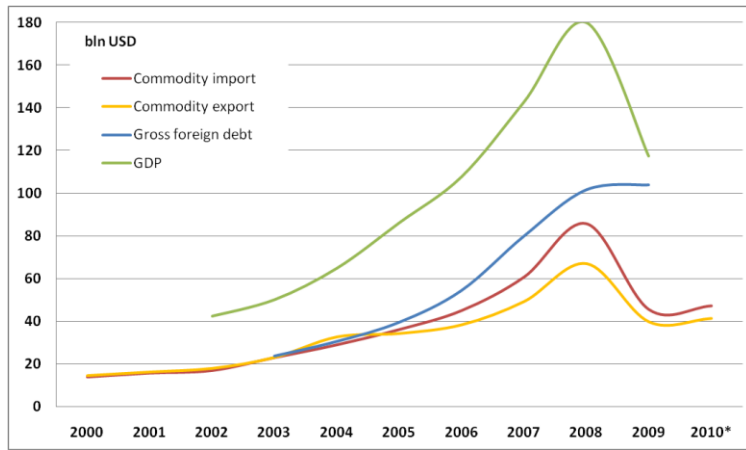
Critical dependences of the economy



As a result, equilibrium of the formed economic model appeared to be in double critical dependence on sales of metallurgical and chemical industries (48-51% of total exports) and on significant external supply of energy resources (26-35% of imports).

4

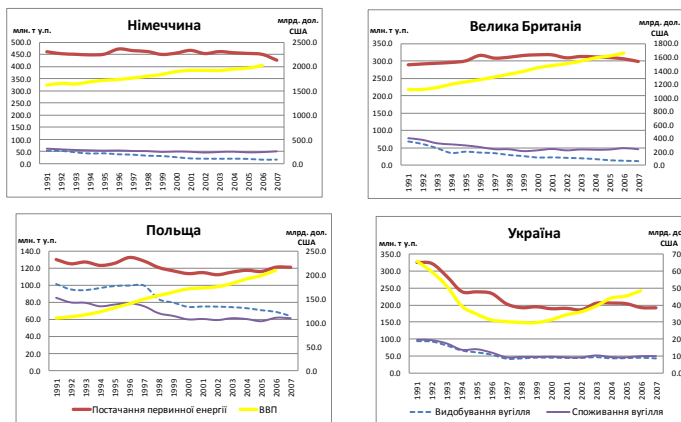
Global economic crisis effects



Actions of the government aimed at ensuring stability of supply and acceptable cost of energy, i.e. neutralization of one critical dependence, were aligned by the other one, namely by uncontrollable dependence on conditions of global markets

5

Nature of the reduction of coal consumption



Overall reduction of the energy intensity and, in particular, reduction of the use of coal, which took place in the framework of the purposeful policy of diversification energy consumption, had absolutely different nature in Ukraine

6

Prospects of coal sector: extensive development or EU reforms?

- after stabilizing of world economy we should expect restoration of pre-crisis amounts of energy-intensive products export and, consequently, of domestic energy demand
- amid the shortage of the domestic oil and gas production, coal seems to be the most reliable energy resource in the Ukrainian energy balance. Naturally that in the Energy Strategy of Ukraine till 2030 the scenario of the extended coal consumption is considered as the most preferable. Expected level of coal consumption is 130 mln tones
- consideration of Ukrainian coal resources as the biggest potential source of hydrogen for the Western Europe (REACCESS project)
- restructuring of the Ukrainian coal sector in the spirit of the EU reforms that were aimed at radical greening of economy and rehabilitation of regression coal regions (like in UK, Germany or Poland)

7

TIMES-Ukraine Model

The work on "TIMES-Ukraine" model started at IEF in 2006 in the framework of special research projects of Ukrainian National Academy of Sciences. Only in 2009 after joining SYNENERGY project and with contribution from IRG and CRES experts the initial "TIMES-Ukraine" model was finished.

TIMES-Ukraine could be classified as NEEDS style model:

- energy system is represented as the single region and is divided into seven sectors, 12 timeslices are presented
- model structure is alike NEEDS models and was designed considering existing statistical classifiers (NACE and CPA) and based on the primary statistical forms of the National Statistic Committee
- NEEDS database of new technologies is used, as well as national data was also considered
- comparing to NEEDS models, TIMES-Ukraine is more disaggregated, and special features were used (accessory demand technologies, intersectoral heat exchange, storage technologies, international material trade, presenting power generation sector by real companies etc.)

8

Scenario of expanded usage of coal (Reference)

Reference Scenario provides for the state stimulating coal consumption mainly for electricity and heat production. Coal-burning units on large TPPs will be switched entirely to the basic operation mode, while gas-and-oil burning units on TPPs and CHPs will be used only to cover the peak loads.

The share of coal in the TPP fuel mix will increase from 70 to 93% that can be achieved owing to the better quality of coal concentrate.

Modernization of existing and installation of new coal-fired power plants will have cost advantages over the other technologies for electricity production because of the state budget subventions. Switching the boilers from gas to coal is also assumed, but it will not be significant.

The increase of coking coal consumption will be determined by the world steel prices and will be limited to the existing capacities of the production of coke (20-30% more than in 2008).

State subsidies to metallurgical sector (10% discount on electricity and gas prices) will be annulled in the mid-term period, as it is assumed that the production level of other sectors will ensure the surplus of trade balance.

9

Scenario of the coal sector development in the spirit of EU reforms

EU reform scenario envisages decommissioning of unprofitable mines, that must reduce pressure on the state budget, but it can also lead to a significant shortage of coal in the domestic market, especially for the steam coal.

Lack of technological flexibility will not allow consumers to quickly switch to alternative fuels, while the growth of coal imports will be possible only after a much larger increase in capacity of Ukrainian sea harbors.

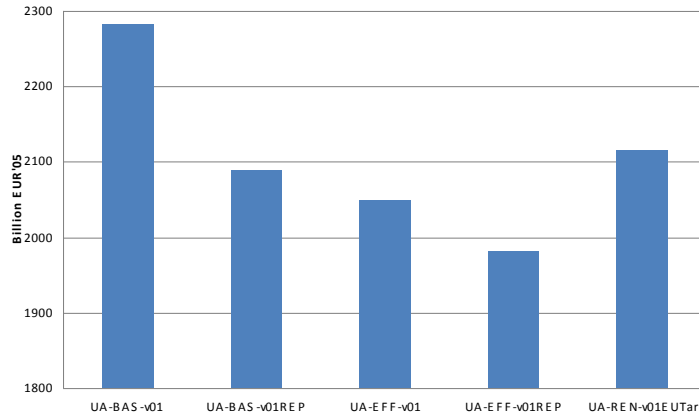
Growing energy demand thus must be covered by the existing and new capacities (including renewable sources), and also by performing energy efficiency measures.

Thus, while maintaining the existing macroeconomic proportions and technological structure, economic development with the focus on existing domestic energy resources may lead in the near future to the formal replacement of natural gas imports from Russia to import coal and coke, which in the absence of sufficient transport infrastructure can lead to significant additional cost.

However, clearly a coal promotion scenario has implications for emissions that was not considered in this study.

10

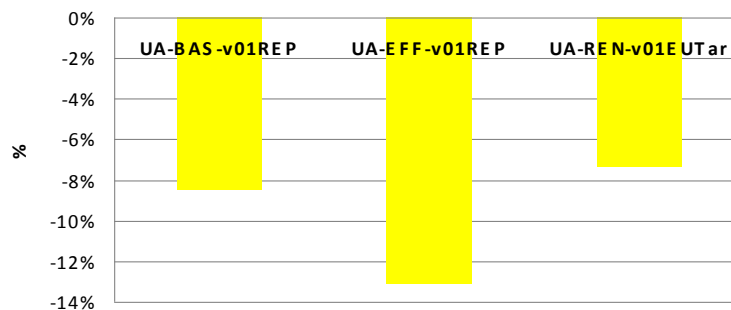
Total Discounted System Cost



11

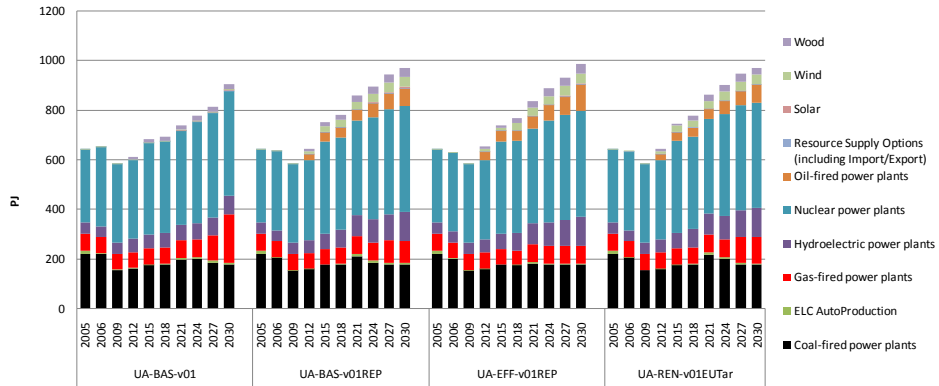
Change in Total Discounted System Cost

- Energy System cost under Renewable potential scenario decreases by 8.5% because of installation of the new technologies that use renewable energy and refusal from the old inefficient technologies.
- Under the scenario of Renewable plus Energy Efficiency the previous decreasing of System cost is supported by the higher penetration of new efficient technologies, first of all in the "Building sectors" (Residential, budget and commercial sectors) by mean of the implementation of the higher building standards and modernization of the heating plants (boilers with efficiency >90%, insulation technologies); also in industry (direct iron techs in metallurgy) and in transport.
- Under the third scenario renewable potential was supplemented with the specific targets – 13% of RE in final energy consumption, including 10% of biofuel in transport sector



12

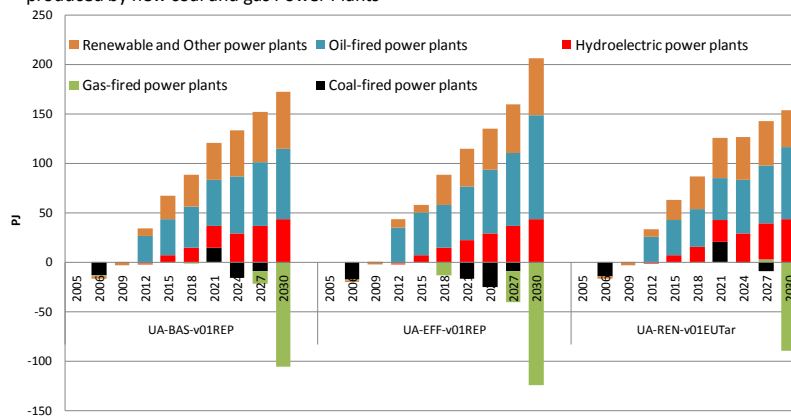
Electric Generation by Power Plants + Imports



13

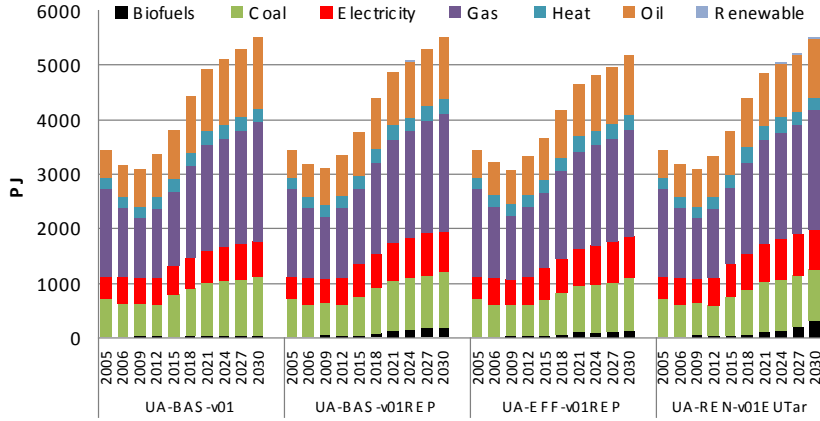
Impact on power generation system

- In all alternative scenarios electricity generation is increasing by 10-15% comparing to the reference scenario because of the higher efficiency of electric end use devices. The structure of new electricity generation capacities mostly consists of Hydropower Plants, Renewable (mostly Wind Power plants), and also small oil-fired Cogeneration Plants.
- These new capacities totally cover the demand for electricity, that under the Base scenario was produced by new coal and gas Power Plants



14

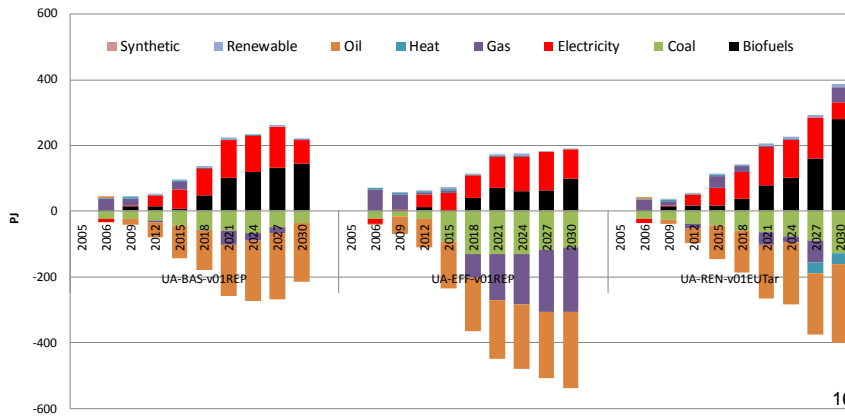
Energy Balance - Final Energy by Fuel



15

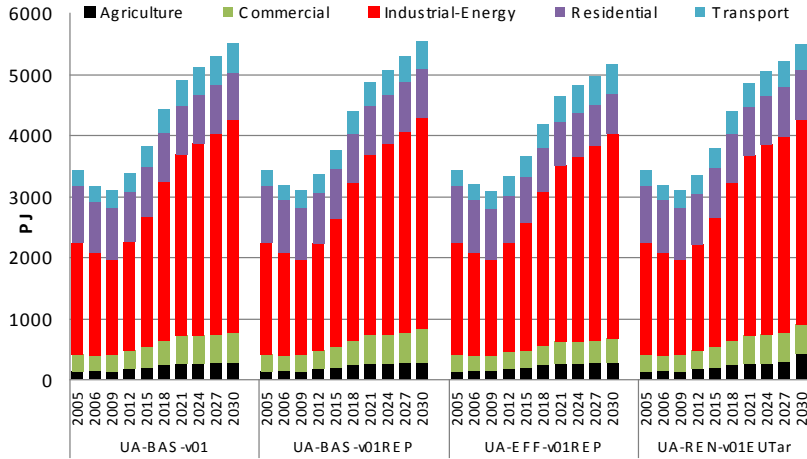
Change in final energy consumption

- Under the scenario that involves intensive use of renewable energy and introduction of new or significantly improved technologies we can expect for significant reduction of the use of oil products, coal and gas and instead the increase of electricity and biofuel consumption.
- Such demand is driven by the increases of electricity consumption in industry, particularly in the steel industry with the introduction of new technologies of iron and steel production, in commercial sector for heating, cooling and lighting, and also in agriculture sector, where consumers may partly switch from traditional oil products to biofuel.



16

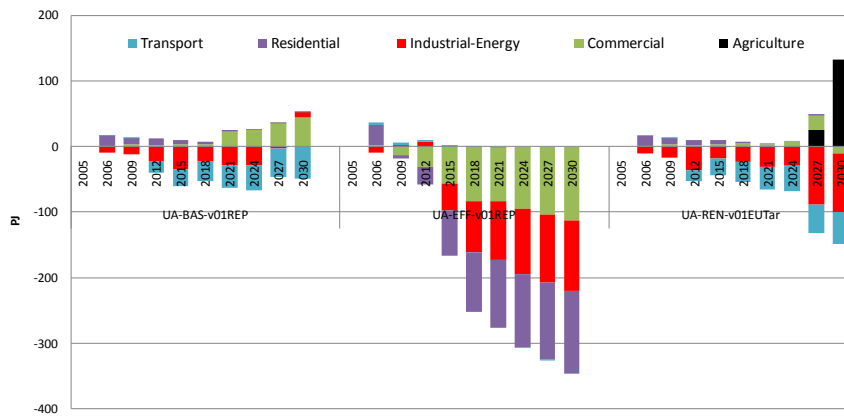
Energy Balance - Final Energy by Sector



17

Sectoral reductions in final energy

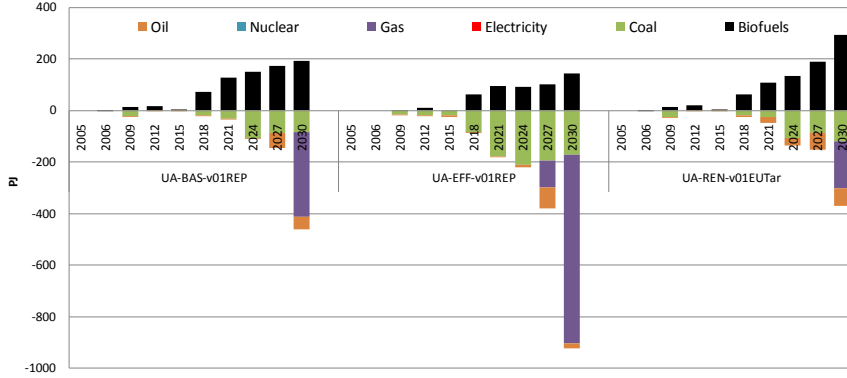
- With the use of renewable potential and performing energy efficiency measures first of all in residential, commercial and public sector, as well as in industry Ukraine may achieve reduction of energy intensity to 30% in 2020 and 40% by 2030 relative to 2005.



18

Changes in primary energy

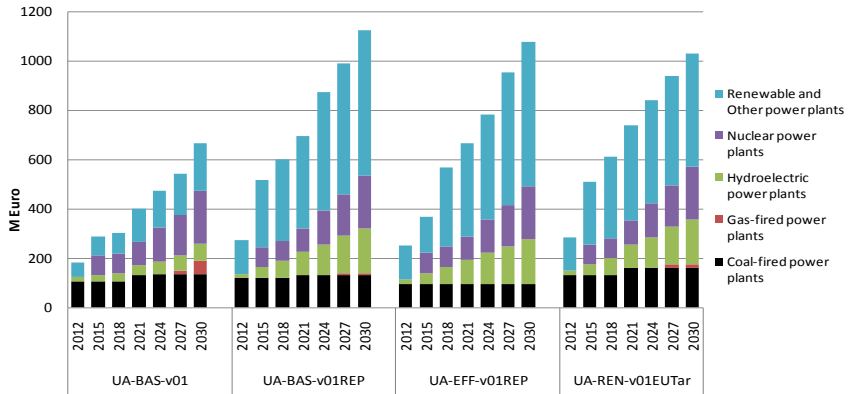
- Overall reduction of the energy use due to energy efficiency and renewable energy policy in 2030 may reach 10% of total primary energy supply comparing to 2005, while we suppose that GDP will double during this time.



19

Change in Expenditure

- As all our scenarios assume the increasing of the use of renewable energy sources and increasing their share in the energy balance, it is normal that most of investments in the energy sector are mainly directed to these measures.



20

Conclusions

- Under the Reference (expanded coal usage) scenario till 2015 it is possible to cover the growing demand for coal with a help of existing mines. After 2015 new extracting capacities will be needed only for anthracite and steam coal. For the coking coal there would be even enough the capacities of the privatized and profitable state-owned mines
- Meanwhile expected level of consumption under Energy strategy of Ukraine till 2030 (130 mln tones) is overestimated – under Reference scenario we do not expected more then 91 mln tones of coal with almost constant level of import
- Target of the energy intensity according to the Energy Strategy (50% decreasing till 2030) can not be achieved according to the assumptions made for our base and alternative scenarios
- Import is expected to increase only for coking coal (from 6,9 to 11,5 mln tones with an overall consumption of 37,3 mln tones), thus the capacity of the transport infrastructure would be the real constrain, as the overall import of coal and coke would not exceed existing capacities
- Demand for coke also would not exceed the existing capacities of a coke production, also taking into account the decreasing import of coke
- Share of electricity produced by coal TPPs under Reference scenario will increase from 26,8% to 34,9%, share of heat – from 1,2% to 9,4%
- Although under EU reforms scenario we expect for very moderate increasing of electricity and heat production from coal (from 26,8% to 27,9% and from 1,2% to 1,7%), economically grounded penetration of renewable resources and implementation of energy efficiency projects would not allow to refuse from the import of coal and non-profitable coal mines completely. We expect for reduction of demand for anthracite by 8%, 29% reduction for coking coal and 11% for steam coal. Overall reduction for coal thus will reduce on 16%.

21

THANK YOU!

QUESTIONS?