Global Economy and Global Energy

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Problems

Current situation

Forecasts
Challenges on the road to 2050

- Demography: from 7 to 9.5 billion people, aging North, shift to Asia etc.
- Energy poverty and energy for growth
- Economic growth: industrialization for all...
- New Technologies and Irreversibility of Fixed Assets — Time costs and Capital costs
- Transformation of societies — and middle class consumption and life style
- Political risks of supplies along the road
- Climate change prevention — taking it seriously!
- Post Great Recession Syndrome — uncertainties of growth in EU, in China, in Russia — all styles
- Sources of Financing — Energy Investment Share in GDP
Solutions on the Road to the Future

- Sustainable development in the broad terms: social, ecology, climate
- Investing in the Future — technologies, transformation, «clean industrialization»?
- More Energy will come from: MENA + North America + Latin America + Russia + ... Reserves and prices
- Coal economy and «golden gas bridge»...
- Financing energy: 1.5% GDP globally, 6% GDP - Russia
- Energy Subsidies — problem of definition and use
- Credit Crunch, «cheap money» and infrastructure investments to catch up with long-term objectives
- No simultaneous solution to all problems without better global cooperation and common priorities
Plan

Problems

Current situation

Forecasts
GDP growth


% change y/y

Source: IMF

World

Advanced economies

Emerging and developing economies
Industrial production

2000–2013, by country

May 2008=100

Source: World Bank

- United Kingdom
- Germany
- Russia
- United States
- Brazil
- India
Energy intensity of GDP


Source: World Bank, BP
## GDP and primary energy consumption

### Average annual growth rate, 1986–2012, %

Source: BP, World Bank, IMF, OECD

*Russian economic growth since 1990

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### Energy consumption-to-GDP elasticity

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## Oil and gas consumption

**average annual growth rate, 1986–2012, %**

Source: BP, World Bank, IMF, OECD

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### Oil/gas consumption-to-GDP elasticity

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Coal consumption & electricity generation

average annual growth rate, 1986–2012, %

Source: BP, World Bank, IMF, OECD

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*Coal/electricity-to-GDP elasticity*

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Post Recession growth

- Elasticity is high as before Recession
- OECD with flat oil consumption
- Surge in coal consumption
- Surge in gas consumption
- EU is importing coal, CO2 reduction is stepping aside in the face of depression and American competition
Global energy prices

2000–2012, $ per boe

USD / boe

Source: BP

- Coal, Northwest Europe
- Coal, Japan steam coal import cif
- Gas, LNG Japan cif
- Gas, US Henry Hub
- Coal, US Central Appalachian spot
- Oil, Brent
- Gas, EU average cif

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Global CO2 emission

1990–2012, by country/region

billion tonnes carbon dioxide

Source: BP

China
USA
OECD (exc. USA)
Russia
Non-OECD (exc. China and Russia)
European carbon price (EUA) and price of gas/coal switching for power stations

2006–2013

Source: Thomson Reuters, AC estimates

- Price of gas/coal switching
- EUA Spot
Gas-to-Coal Switching in European Union

Consumption, mtoe

% of total energy consumption

Source: BP

Gas, mtoe

Gas, %

Coal, mtoe

Coal, %
RES-based (incl. hydro) electricity generation in Europe (OECD)

by source, th. GWh, and share of RES in total generation, %

Source: IEA
Coal-based electricity generation in Europe (OECD)

2012, share of gross generation, %

- **0%-10%**
- **10%-20%**
- **20%-30%**
- **30%-50%**
- **50%-70%**
- **70%-100%**

Blue bars represent 2010 (%) and grey bars represent 2012 (%).

Source: IEA
Shares of coal and gas in electricity generation in Europe (OECD)


% of gross electricity generation

Source: IEA

- Coal
- Natural Gas
Plan

Problems

Current situation

Forecasts
Co-authors:

- The Energy Research Institute of The Russian Academy of Sciences
  www.eriras.ru

- Analytical Center for the Government of the Russian Federation
  www.ac.gov.ru
Average rates of GDP growth and level of per capita GDP

Annual average rate, 1980–2012, developed countries only

GDP growth rate

Source: Analytical Center

<10: 3.0
10–15: 3.4
15–20: 2.8
20–25: 3.0
25–30: 2.1
30–35: 2.5
35–40: 1.7
>40: 2.4

th. 2005 US dollars (PPP-based) per capita
Average rates of GDP growth and level of per capita GDP

Annual average rate, 1980–2012, Asian countries only

GDP growth rate

Source: Analytical Center

First critical level of potential growth deceleration

Second critical level of potential growth deceleration

2005 US dollars (PPP-based) per capita

- Developed Asian Countries
- Developing Asian Countries
Background of Forecast

- Growth without major depressions or conflicts
- Growth cycles and possible recessions along stages of industrializations
- No perfect theories or regulations (or regulators) to prevent all financial shocks or stoppages
- China will succeed in transformation from 36% share of personal consumption in GDP up...
- USA will be reasonably healthy in spite of its domestic pessimism
- Climate change prevention – in doubt!
- Social issues or conversion of development levels were not in the focus but «in mind»
Timeline of possible (not dated!) economic crises


World GDP growth rate

Source: Analytical Center
Growth in USA and China (with imaginable crises)


Source: Analytical Center
World GDP growth

Annual average rate, 2000–2010 and forecast for 2010–2040

Source: Analytical Center
Contributions of regions to global GDP growth

Annual average rate, 2000–2010 and forecast for 2010–2040

GDP growth rate

Source: Analytical Center
Primary energy consumption forecast

baseline scenario of ERI RAS / AC, by region, mtoe

Source: ERI RAS
Primary energy consumption forecast

Baseline scenario of ERI RAS / AC, by fuel, mtoe

Source: ERI RAS
Primary energy consumption forecast

baseline scenario of ERI RAS / AC, by fuel, % of total

Source: ERI RAS
Comparison of IEA and AC growth forecasts

until 2035, by region, average annual rate, %

Source: Analytical Center, IEA World Energy Outlook 2013

OECD America 2.5 2.3
European Union 1.6 1.6
OECD Pacific 1.8 1.6
Russia 3.4 3.3
Developing Asia 5.6 5.2
China 5.7 5.5
India 6.3 5.7
Middle East 3.7 3.5
Africa 4.0 5.5
Latin America 3.3 3.1
World 3.6 3.5

Problems and realities

- Mankind can not easily solve all the energy related problems
- IEA Outlook — good input for policy makers but not a set of coordinated recipes
- Political rivalries and uncertainties lead to overinvestments in some points and underinvestment in many others
- Financing of energy infrastructure on major scale will be difficult due to uncertainties
- 1.5% of Global GDP upon for decades will not be sufficient for solutions of the full set of Global problems. Global cooperation is required!
Thank you for your attention!