



Increasing Energy Efficiency for Secure Energy Supplies

UNECE, June 3-5, 2009



Oil and gas in a modern world

Source: Korzhubaev,
presentation at RAEN,
April 2008



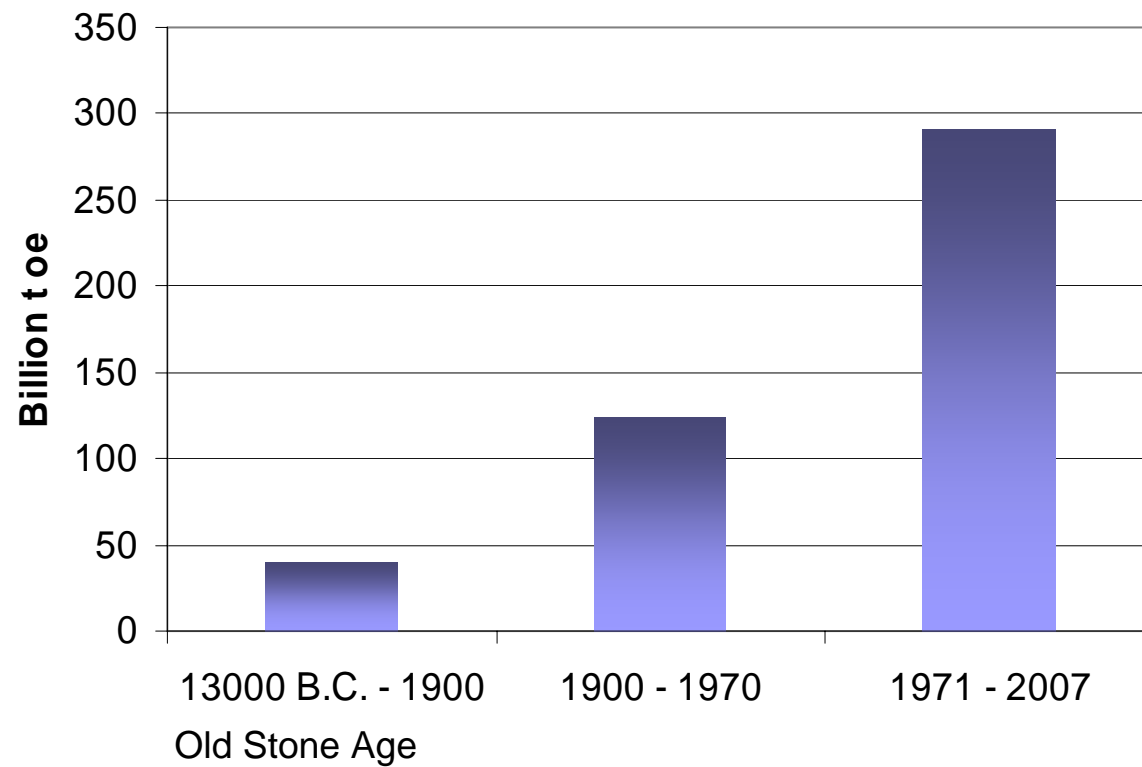
International character of the oil and gas supply

- More than 75 % of oil and 40 % gas cross international borders
- Russia: more than 70 % of oil production and 30 % of gas production are delivered to the world market



Global energy consumption

Global energy consumption

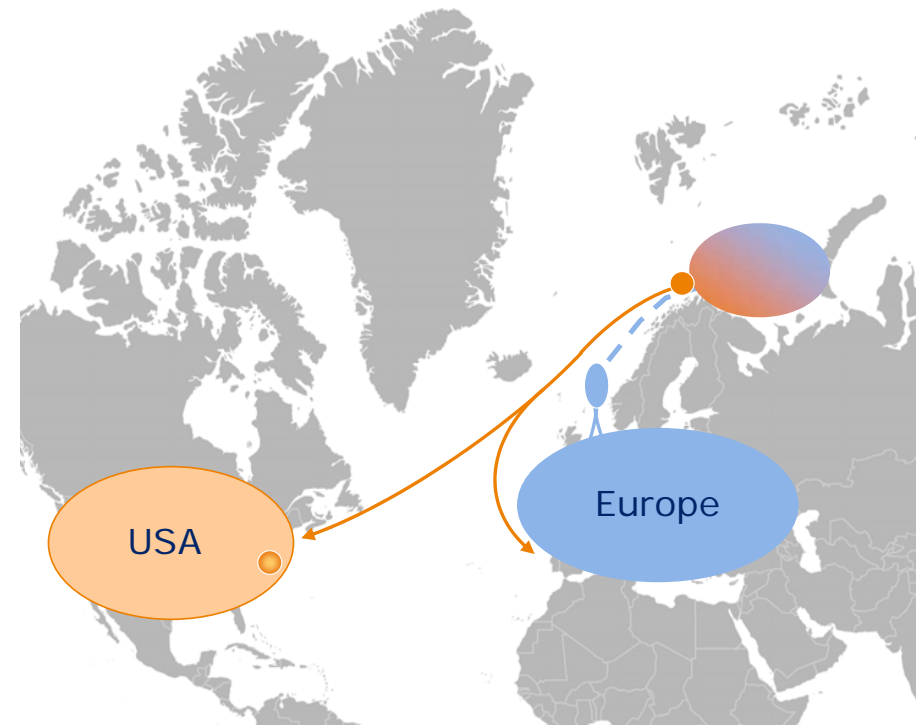
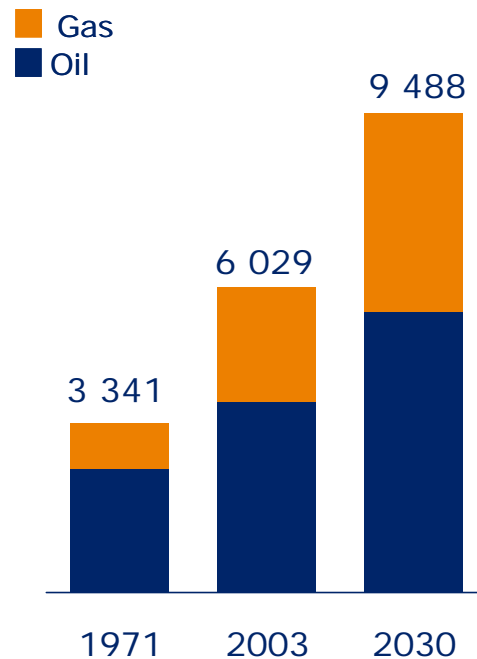


Source: Korzhubaev,
presentation at RAEN,
April 2008



Growth of the global energy demand

Global demand
(mill tonn o.e.)



Source: IEA WEO 2005, base scenario



Energy security challenge: Global Consumption

- Governments face the challenge of making long-term decisions and investments in a time of great uncertainty that is only exacerbated by the financial crisis
- For businesses, any disruption to the power supply can be hugely damaging—one need only look at the blackout of 2003 that brought chaos to several states of the US for a very real example of the potential risks
- Consumers are also increasingly aware of what energy security means to them, in terms of what they spend on their fuel bills and how much it costs them to fill up at the gas station
- Physical security: how vulnerable are local supplies to interruptions? Do we have adequate diversity, back-up, storage and emergency planning?

Source: Energy security forums,
Kuala Lumpur, London, New York
2008

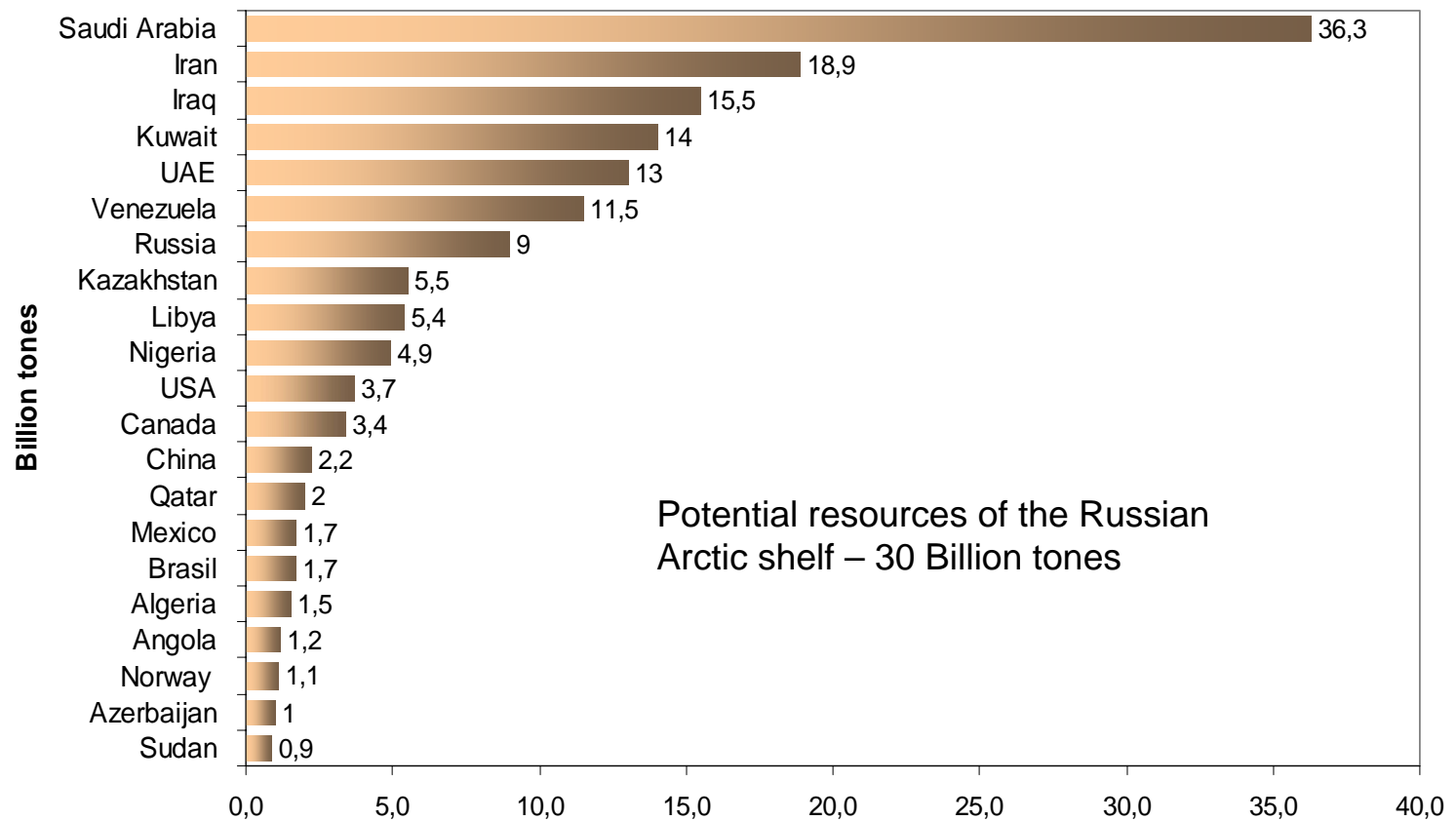


Global Oil and Gas Reserve Base



Global Oil Reserves

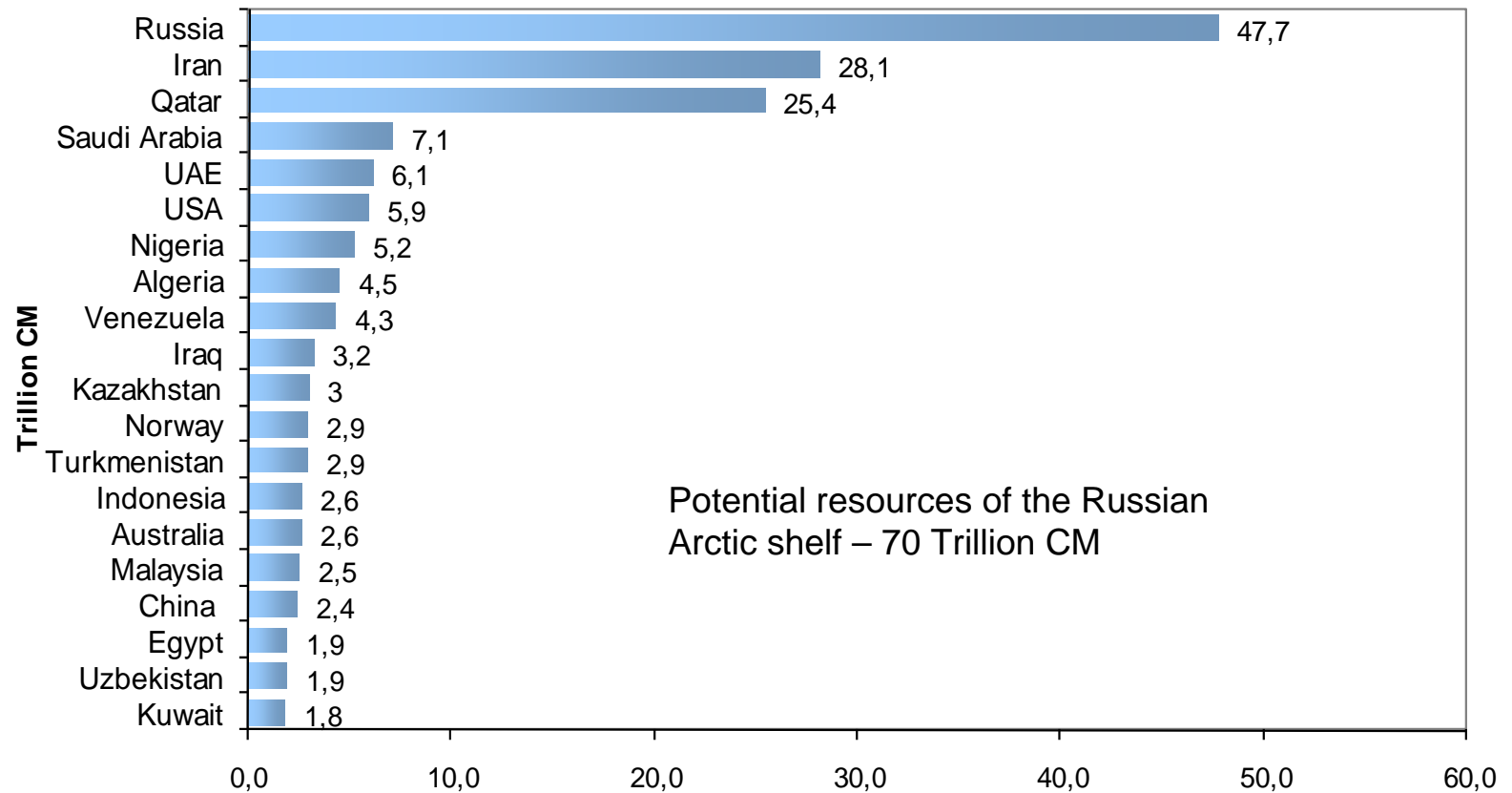
Global oil reserves





Global Gas Reserves

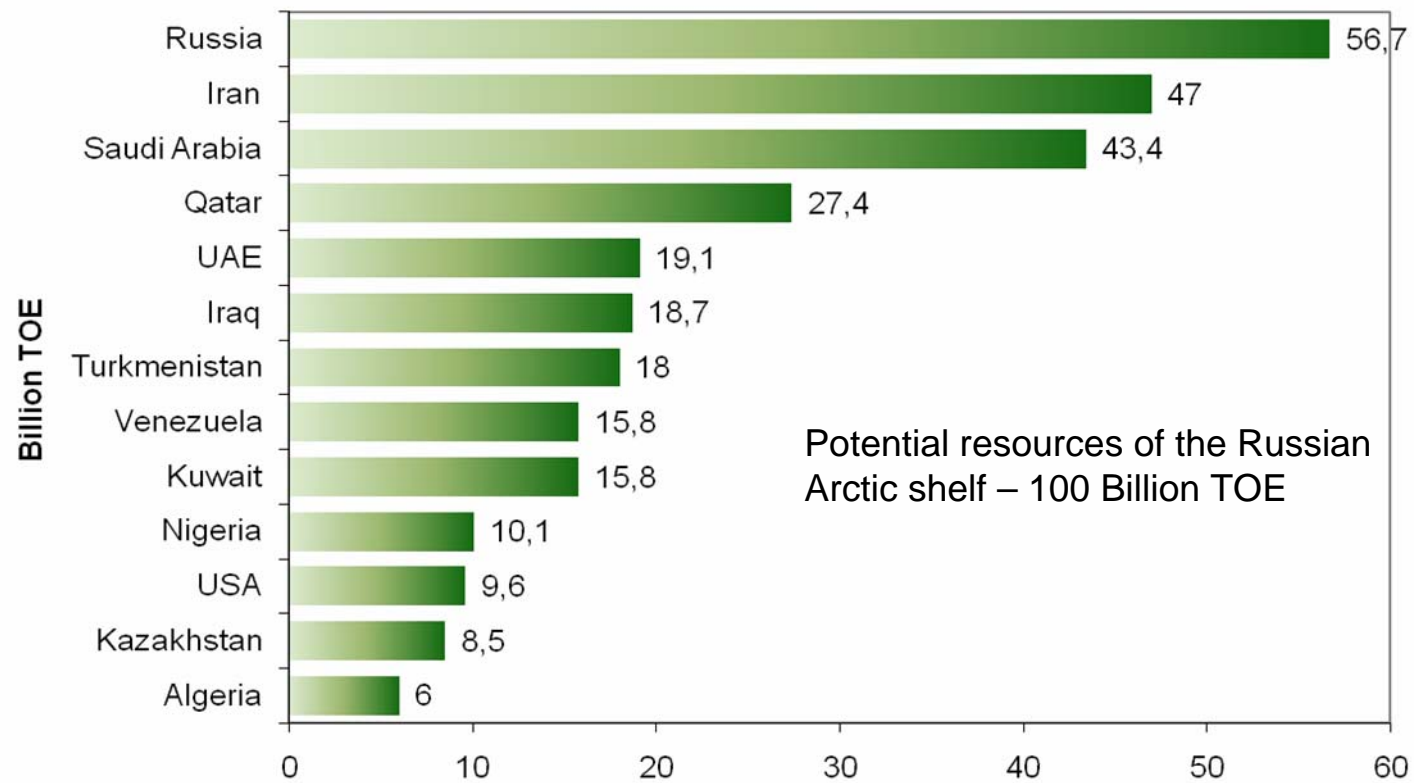
Global gas reserves





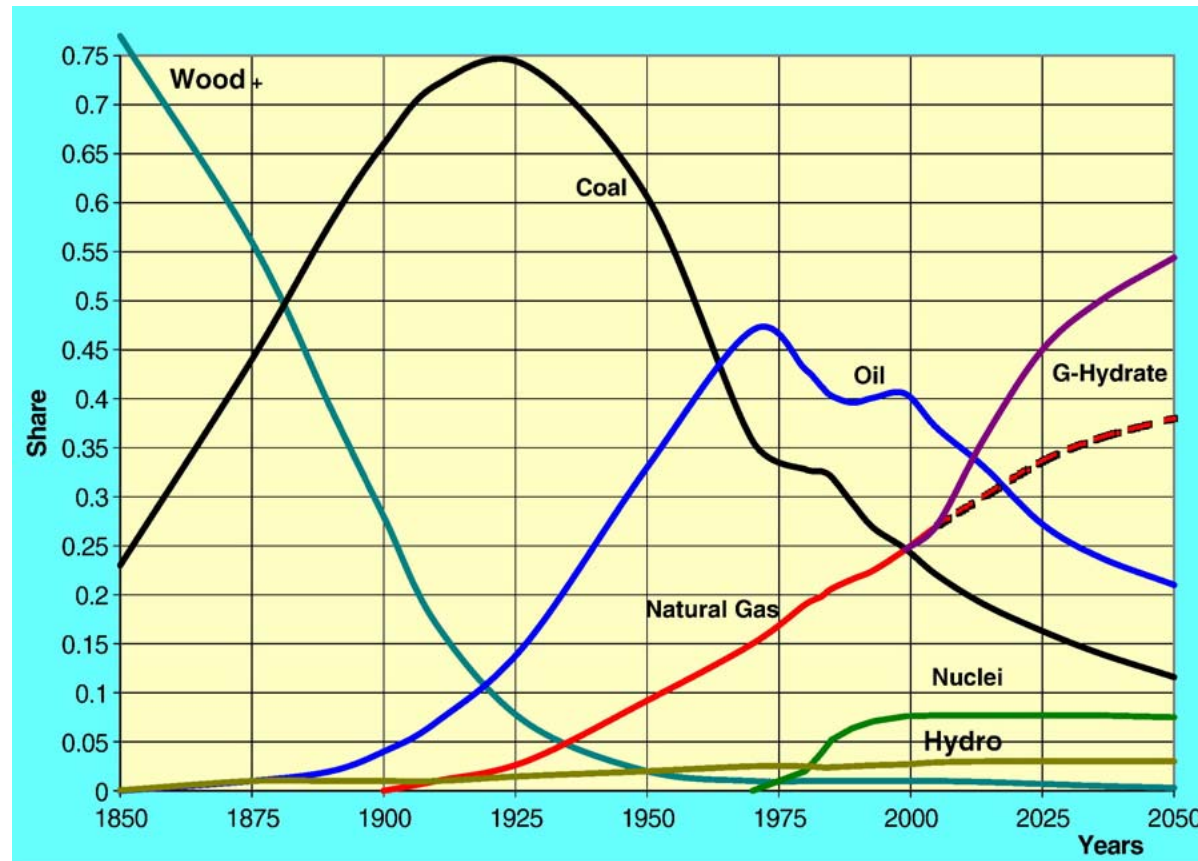
Global Petroleum Reserves

Global Oil and Gas reserves





World Primary Energy Substitution

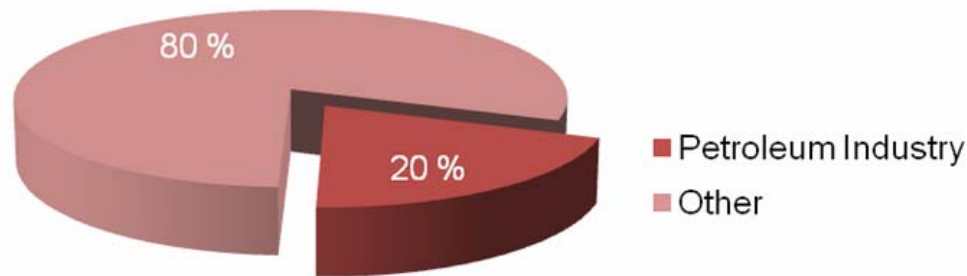


Source: Y. Makogon, Journal of Petroleum Science and Engineering, 56 (2007)



Russia: petroleum Industry – a leading sector of the economics

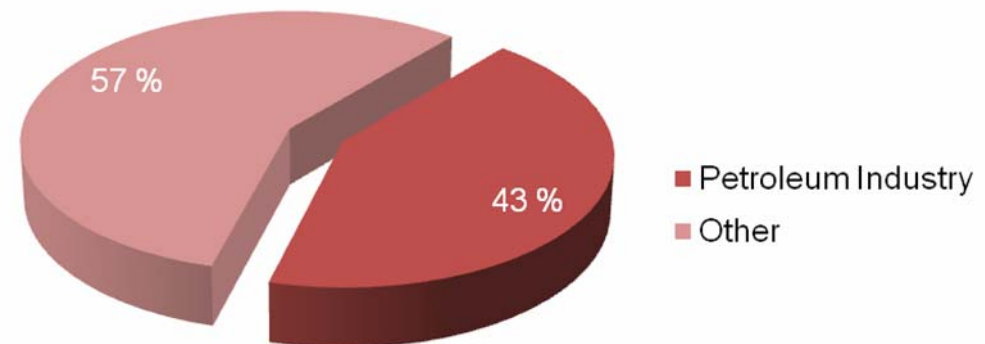
Russia's GDP



Petroleum Industry:

- Biggest part of GDP
- Highest return on investment

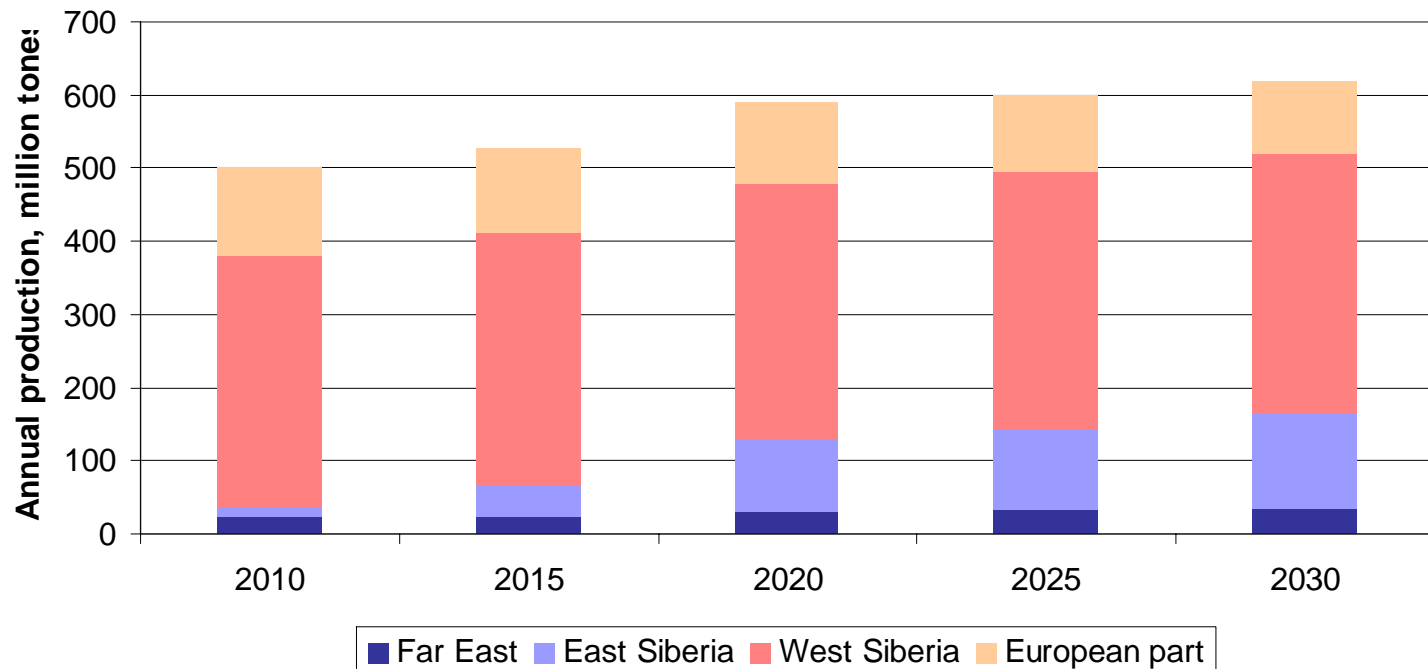
Budget revenue





Russia's oil production until 2030 by regions

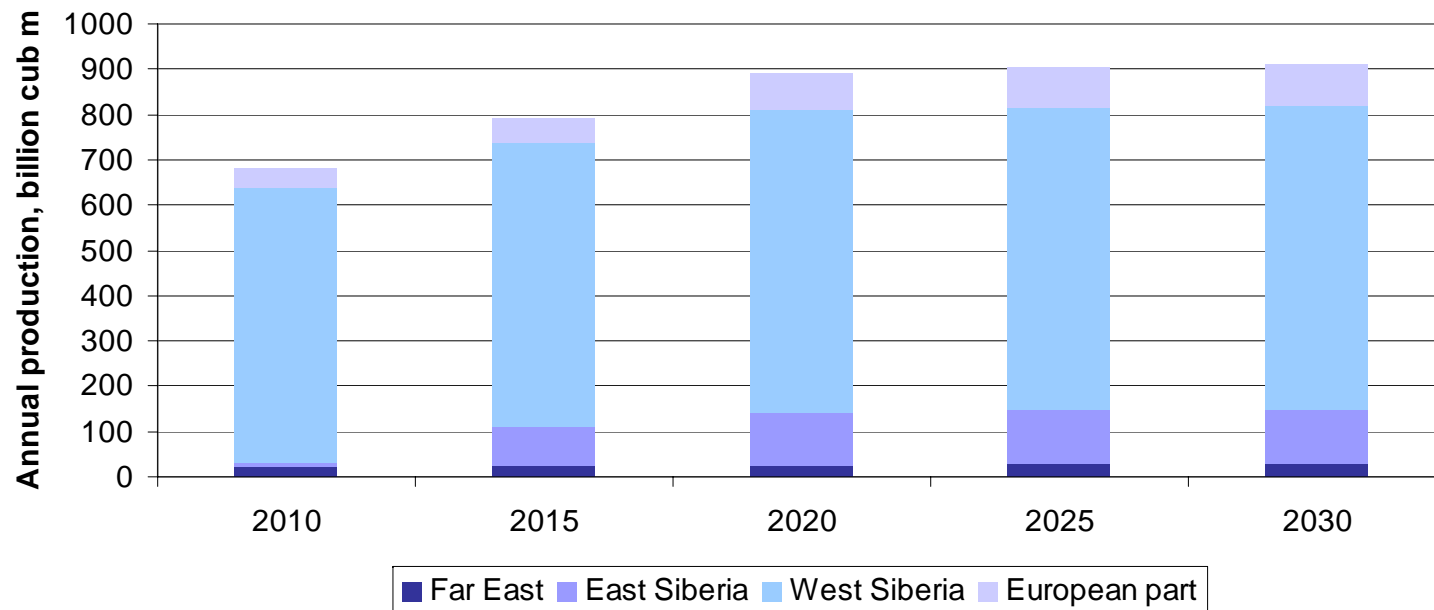
Russia's oil production forecast





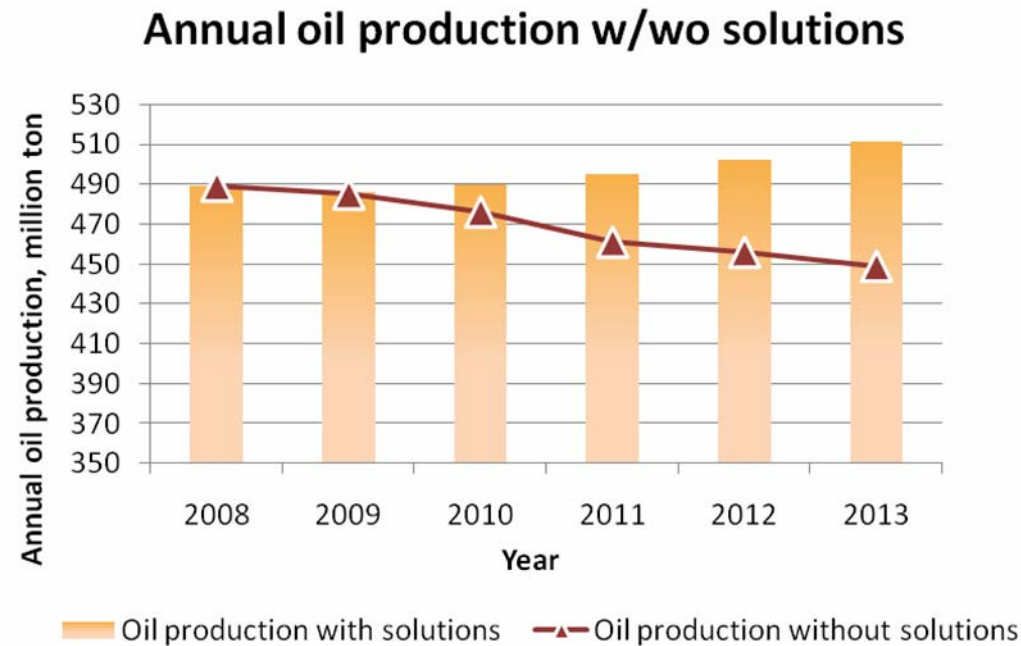
Russia's gas production until 2030 by regions

Russia's gas production forecast





Stagnation of the industry due to lack of investment potential



Two possible developments during the next 5-years (2009-2013):

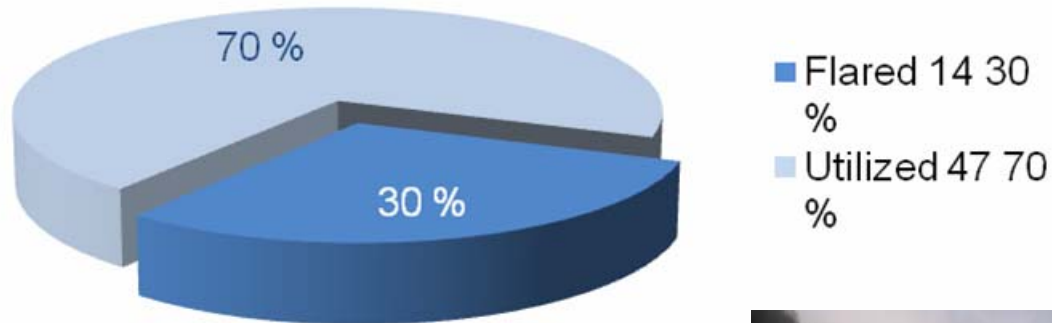
- No solutions to the investment challenges: oil production falls down to 450 million ton by 2013 (5-year plan)
- With solutions: oil production growth up to 511 million ton by 2013

Source: Ministry of Energy, Rosneft



Rational use of associated gas – need for a state policy in increasing energy efficiency

Utilized and flared associated gas, billion m³



Explanations

- Limited access to gas transport system
- Undeveloped infrastructure for utilization of associated gas

Annual economic loss due to associated gas flaring amount to \$ 750 million (gas price \$50/1000 m³)





New regions – challenges in project development

Arctic offshore fields

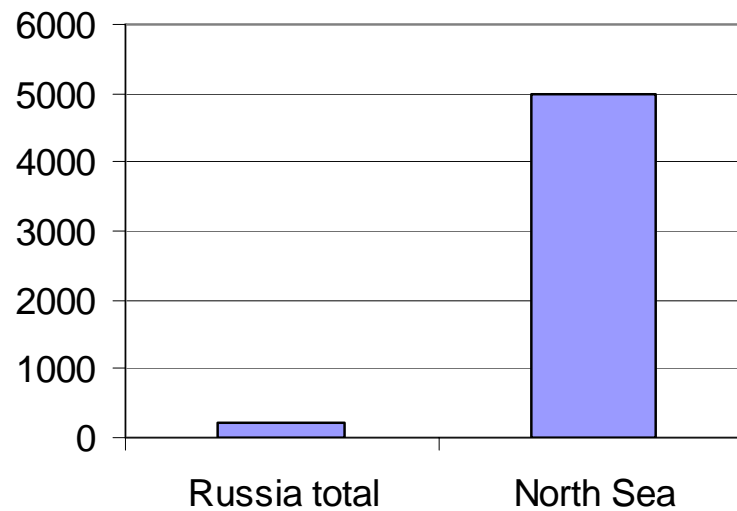


- Severe climate conditions
- Presence of ice
- High cost
- Long distance export of oil and gas – additional heavy cost
- Lack of technology, competence and experience in offshore field development
- Deficit of qualified personnel
- Environmental risks, not yet fully understood
- Emergency response time

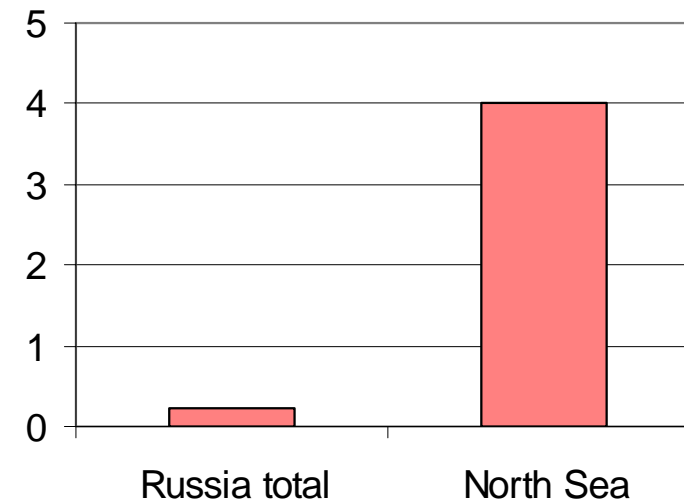


Russian Arctic Offshore – Exploration status

Number of exploration wells



Exploration coverage, km/km²





Keeping the energy balance: RRR

Why exploration program is so important?

Two important indicators:

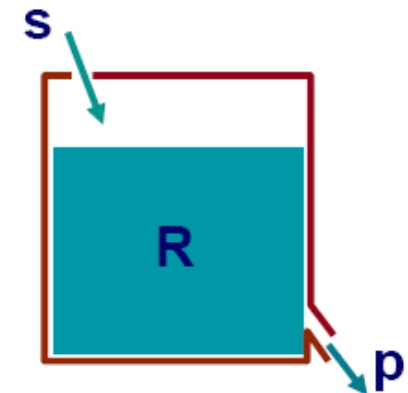
1. Annual production
2. Reserves base

Production is always constrained: $p=k \cdot R$

However, we are interested in production growth: $p_n=(1+a) \cdot p_{n-1}$

Then **Reserves Replacement Ratio (RRR)** is:

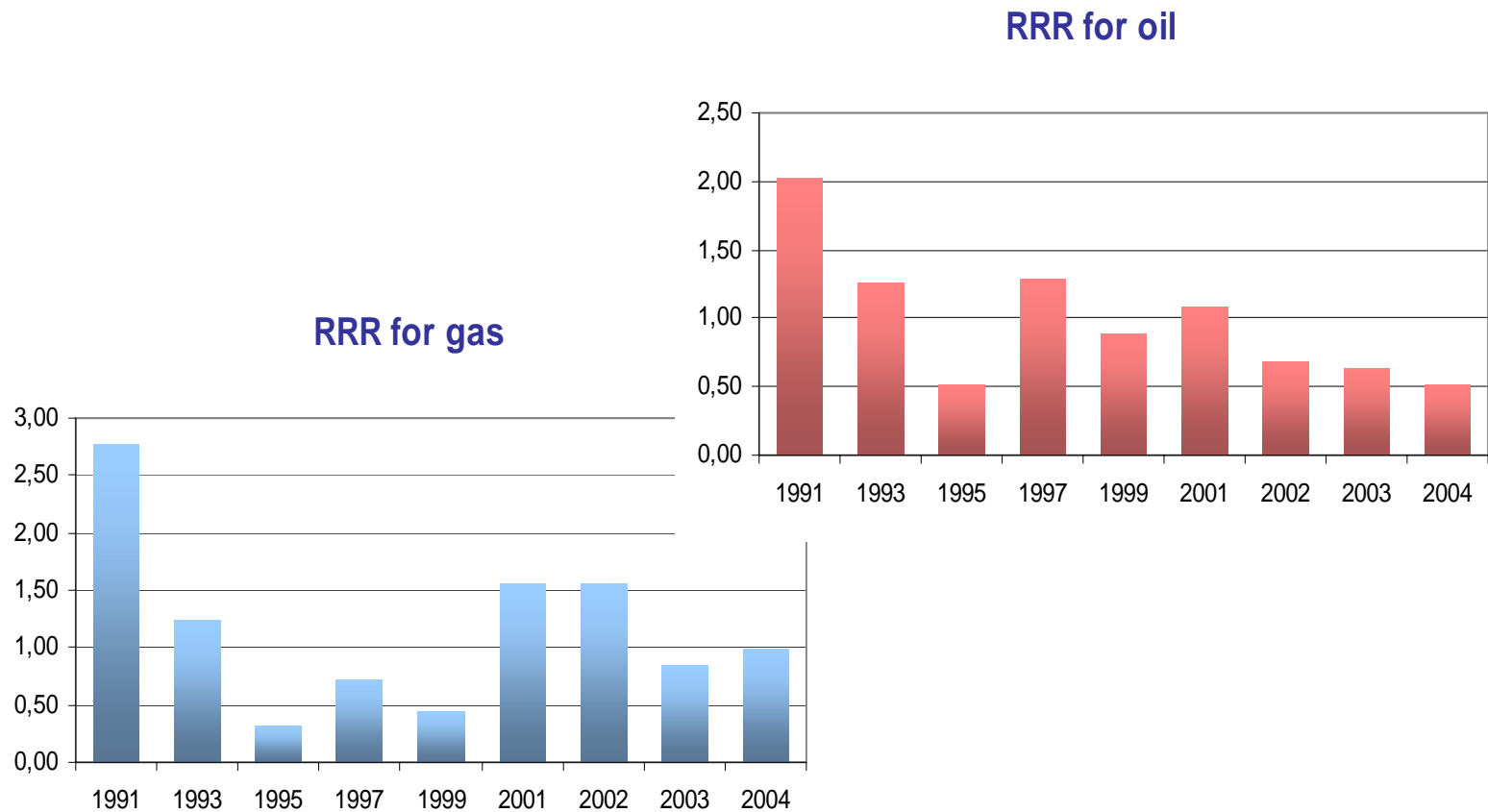
$$RRR = S/P = 1+a/[k \cdot (1+a)] \approx 1+a/k$$





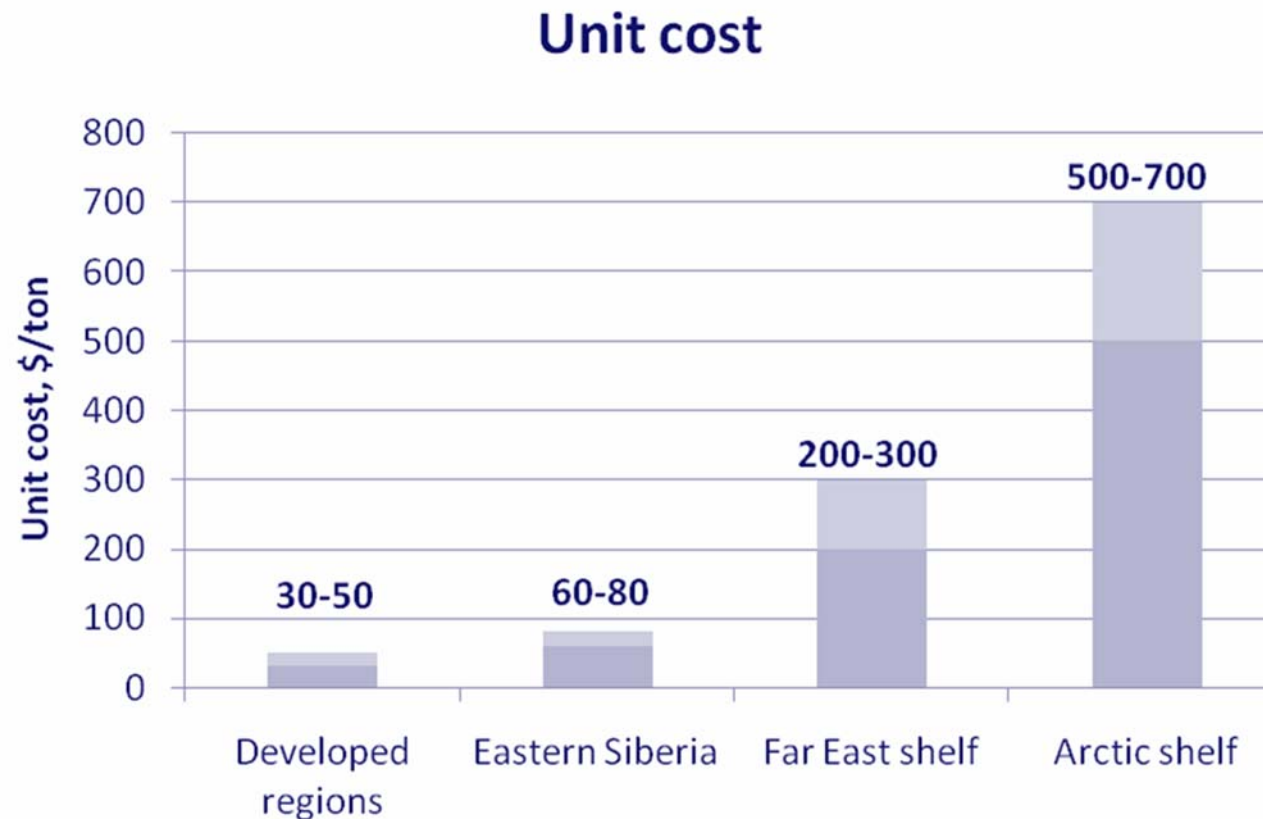
Keeping the energy balance: RRR

Reserves Replacement Ratio for oil and gas (Russia)





Arctic shelf development – a long term strategic task



Source: Rosneft



Russian Arctic Offshore – investment requirements

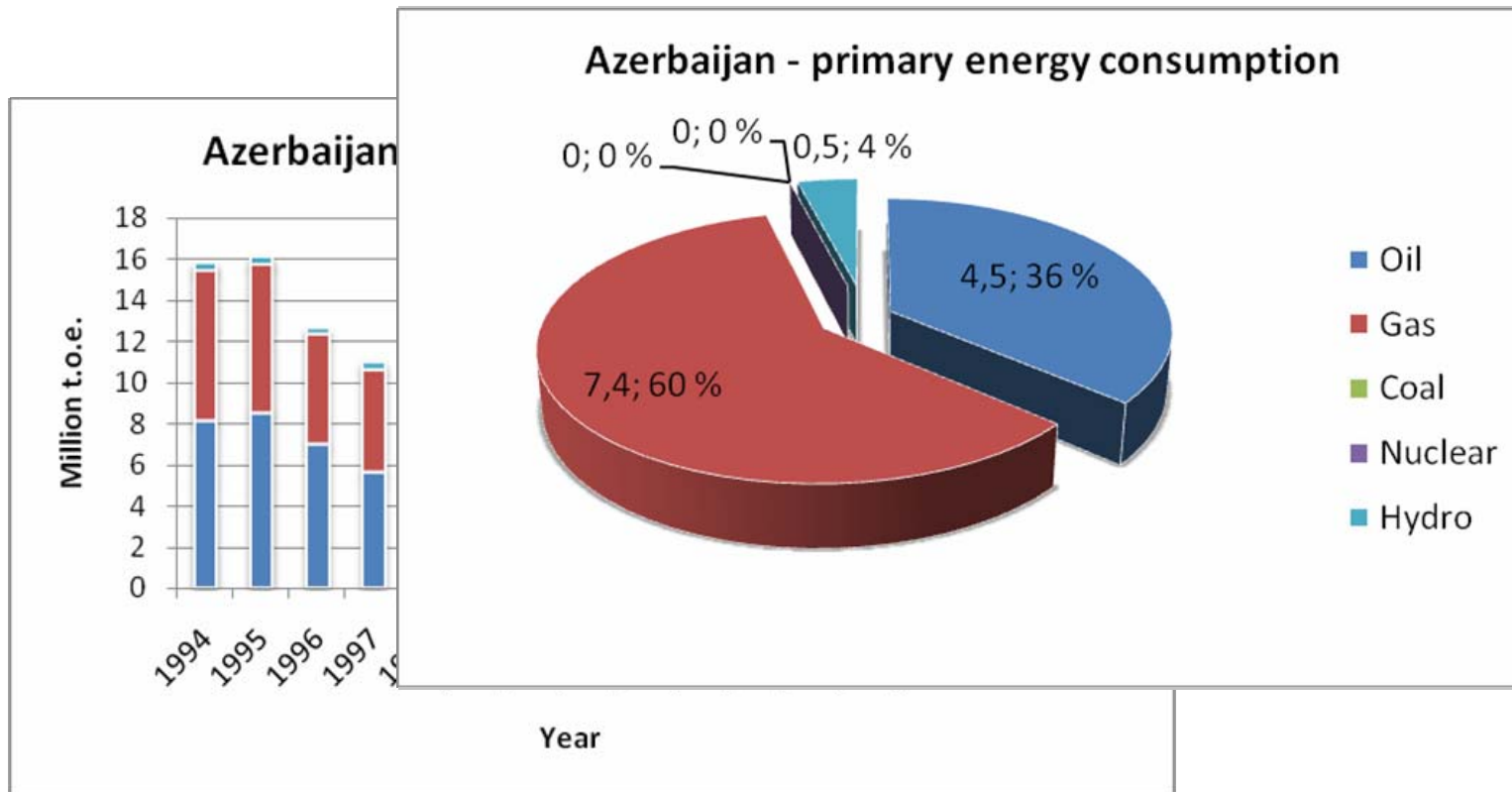
- *[Kommersant, April 21, 2008]*. Rosneft ... is to develop Russian shelf together with Gazprom, has estimated the required investments: they will run to \$ 2.64 trillion until 2050.
- This is 2.5 times Russia's 2007 GDP.
- Bogdanchikov (Rosneft CEO) says \$ 680 billion will have to be invested in geological prospecting, and \$ 1.96 trillion in development.



Primary Energy Consumption

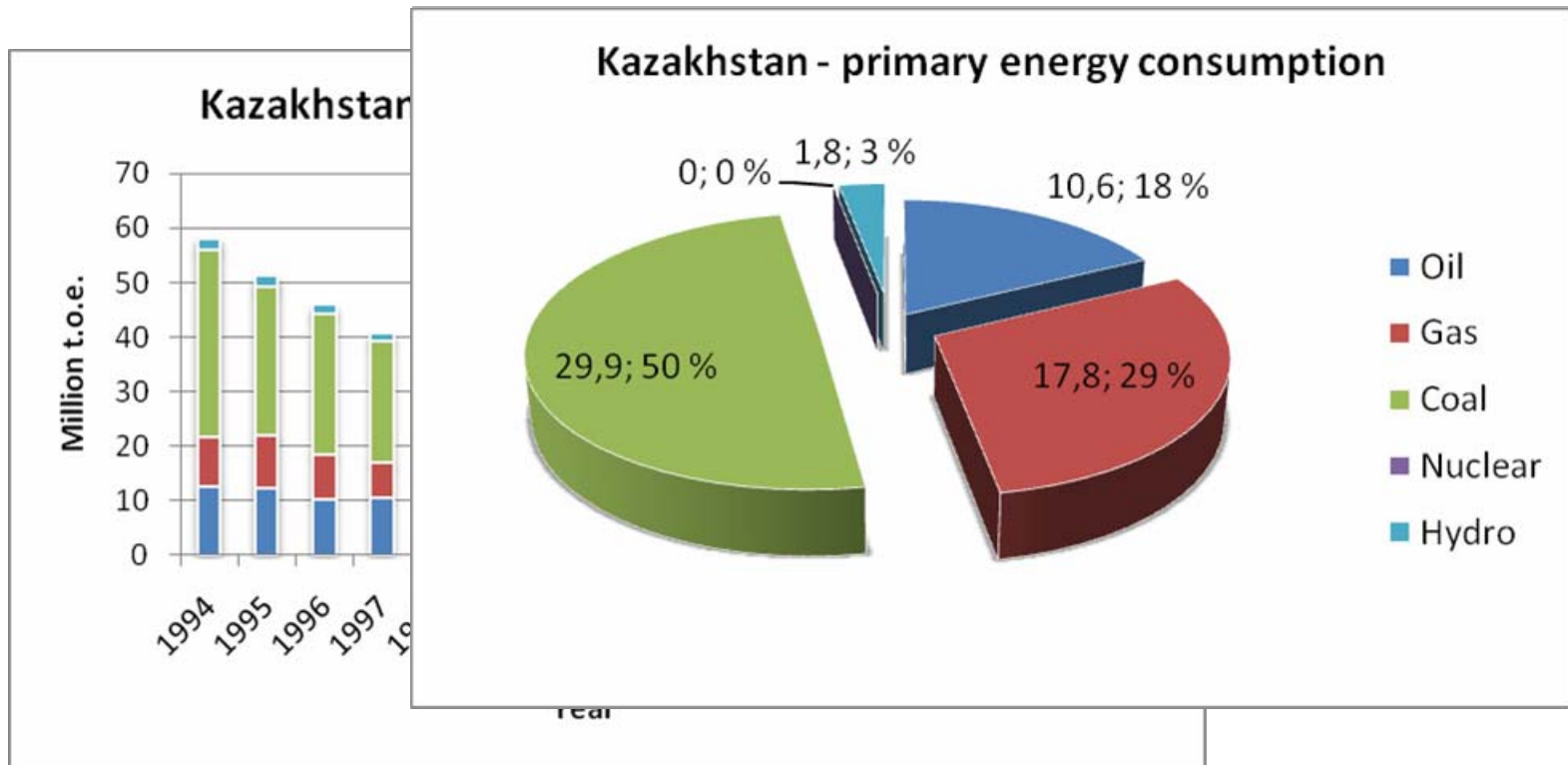


Primary Energy Consumption



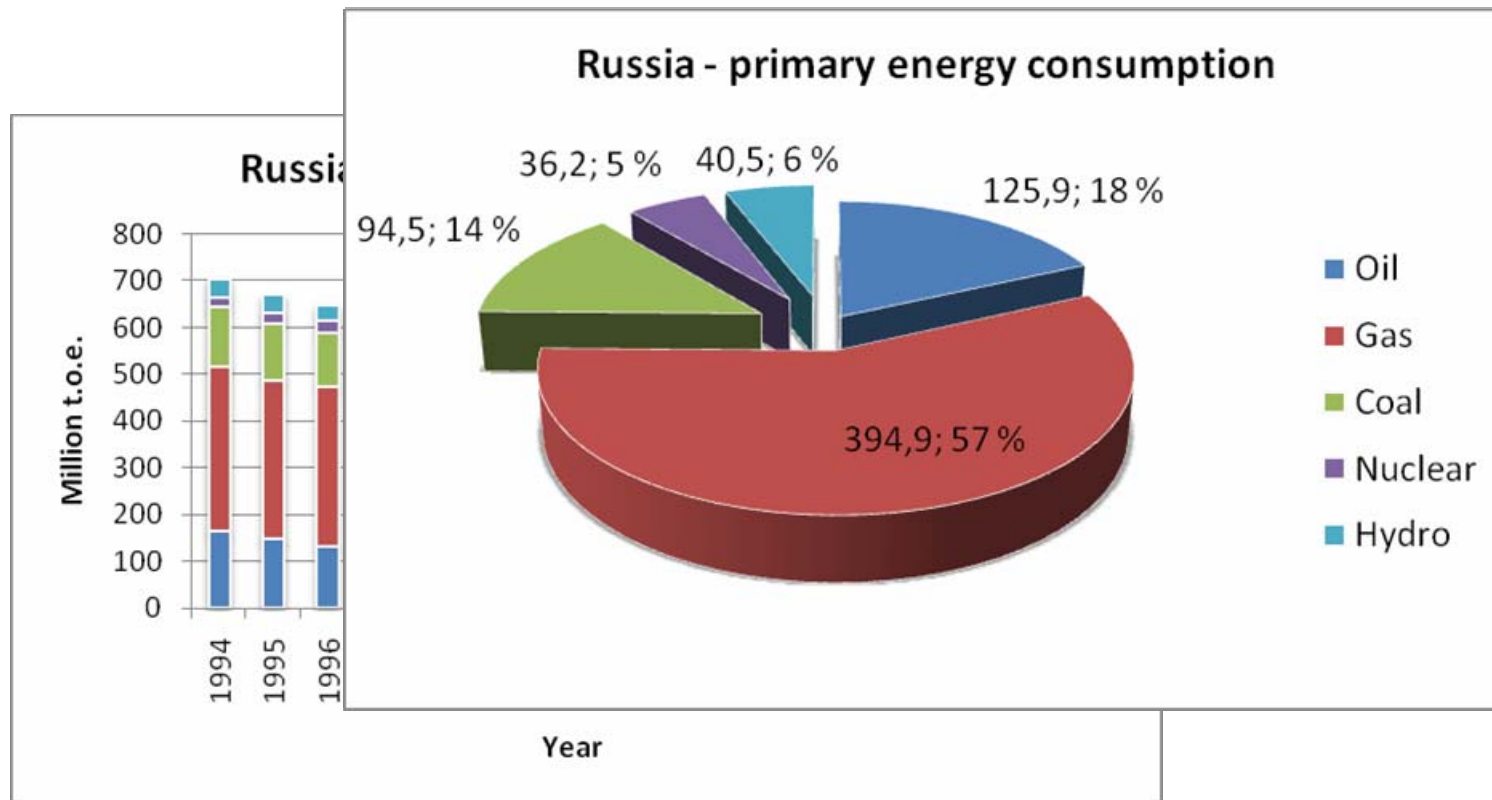


Primary Energy Consumption



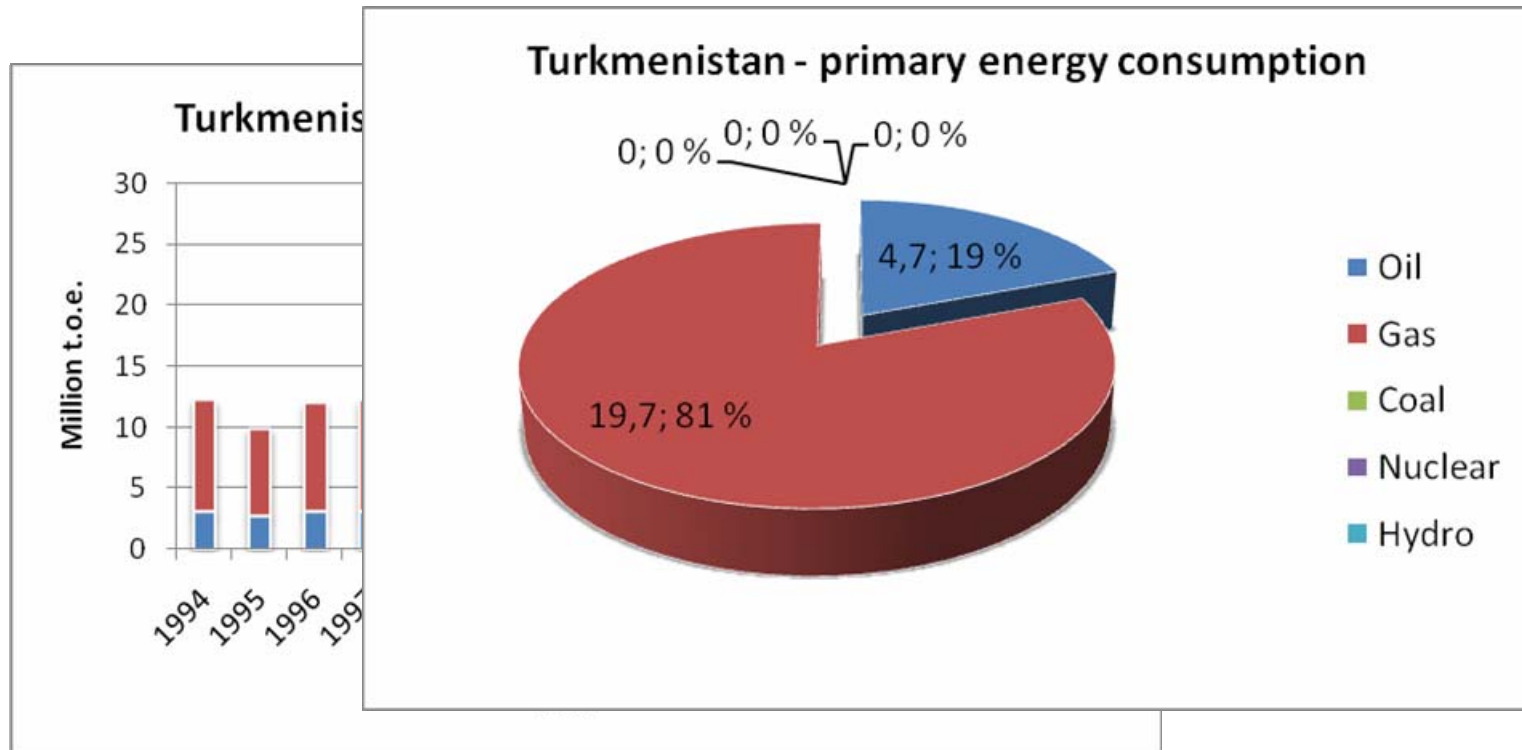


Primary Energy Consumption



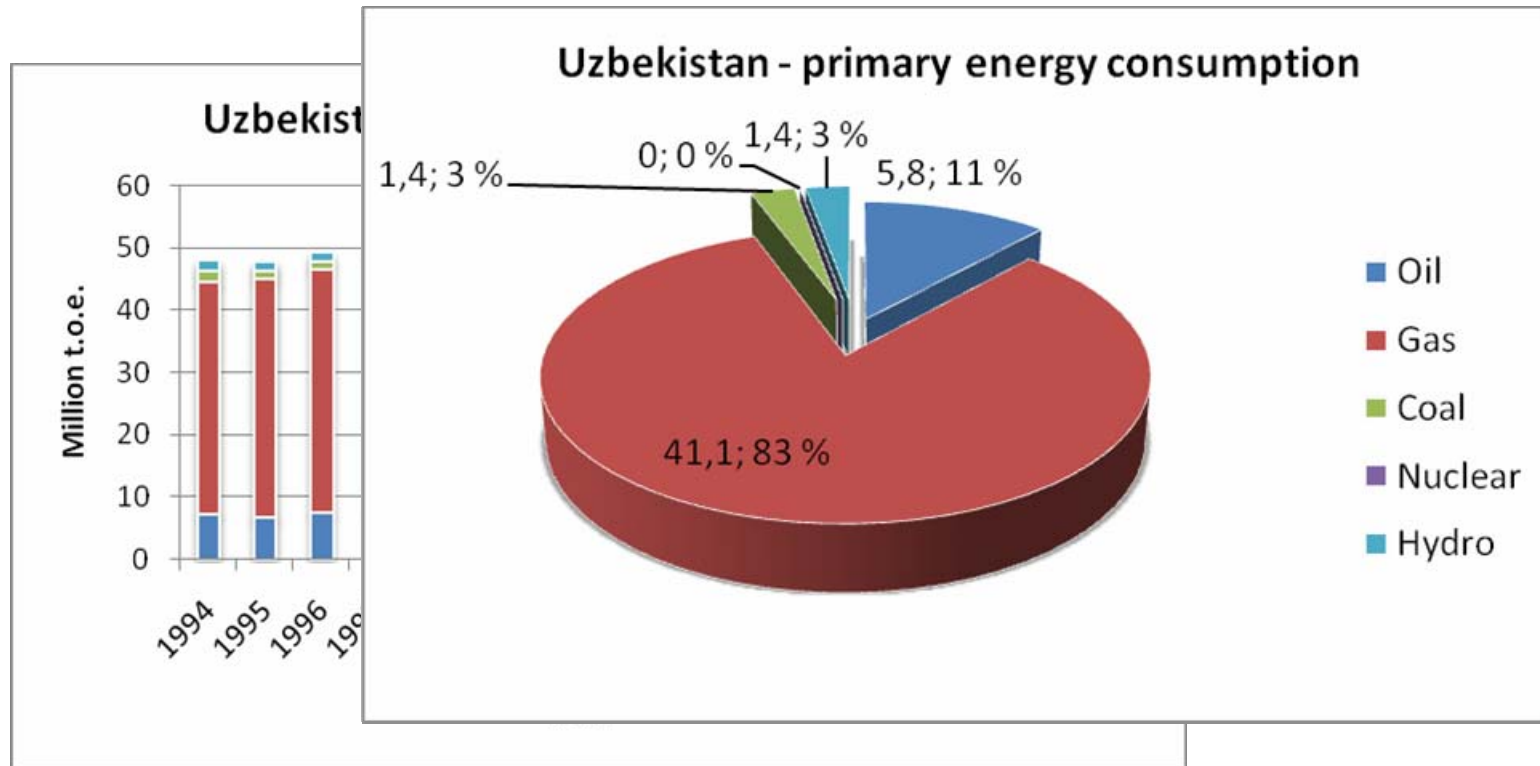


Primary Energy Consumption



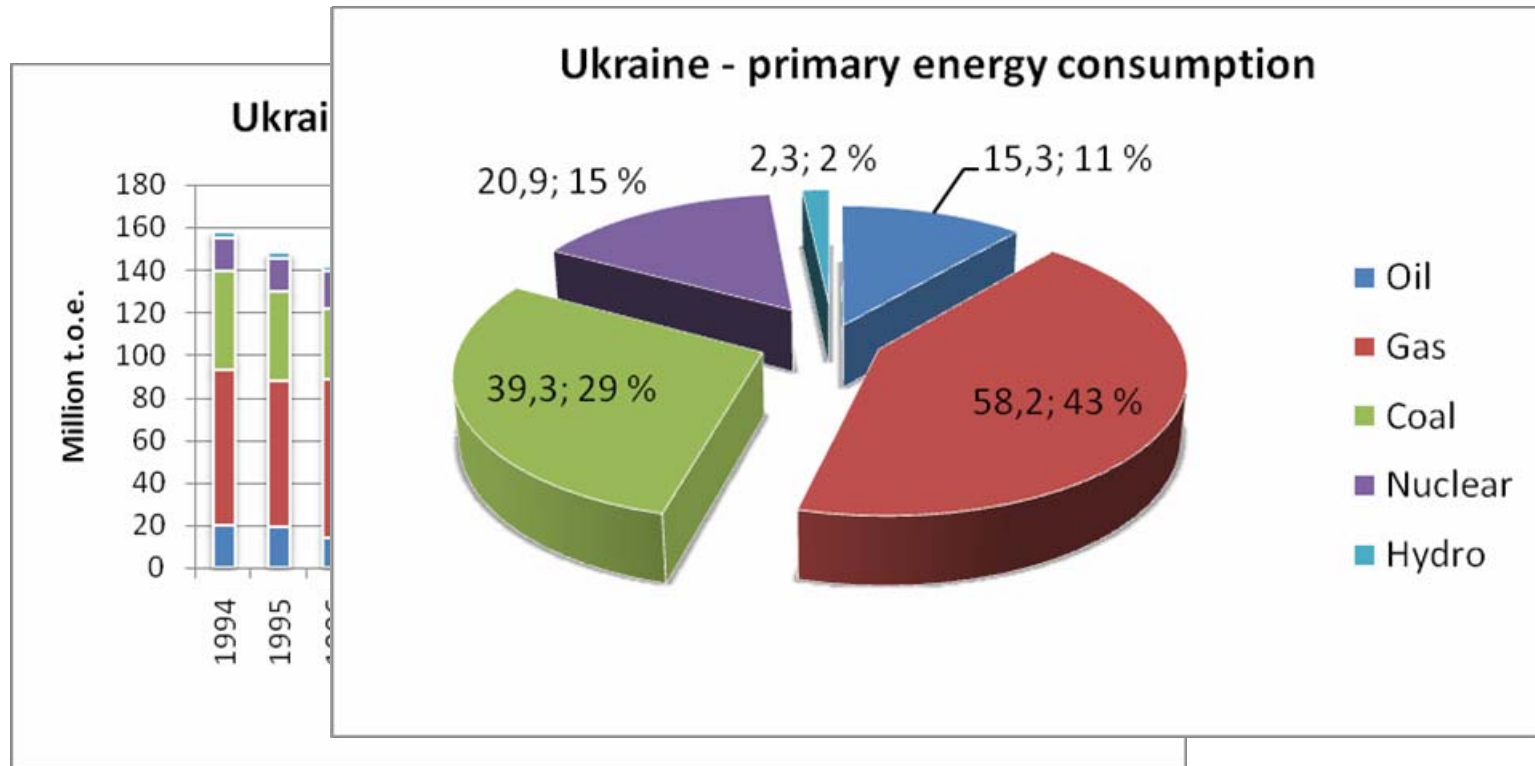


Primary Energy Consumption



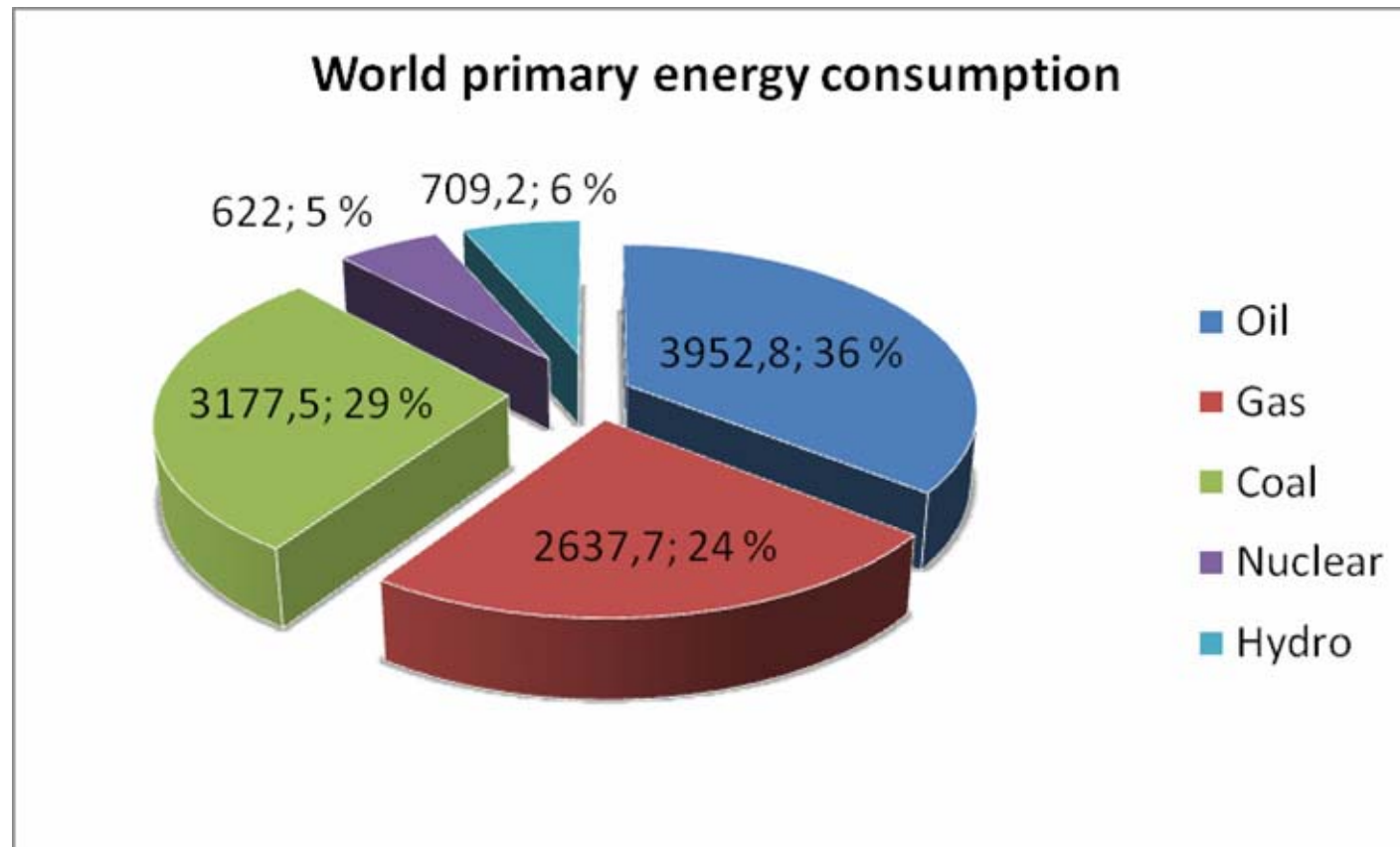


Primary Energy Consumption





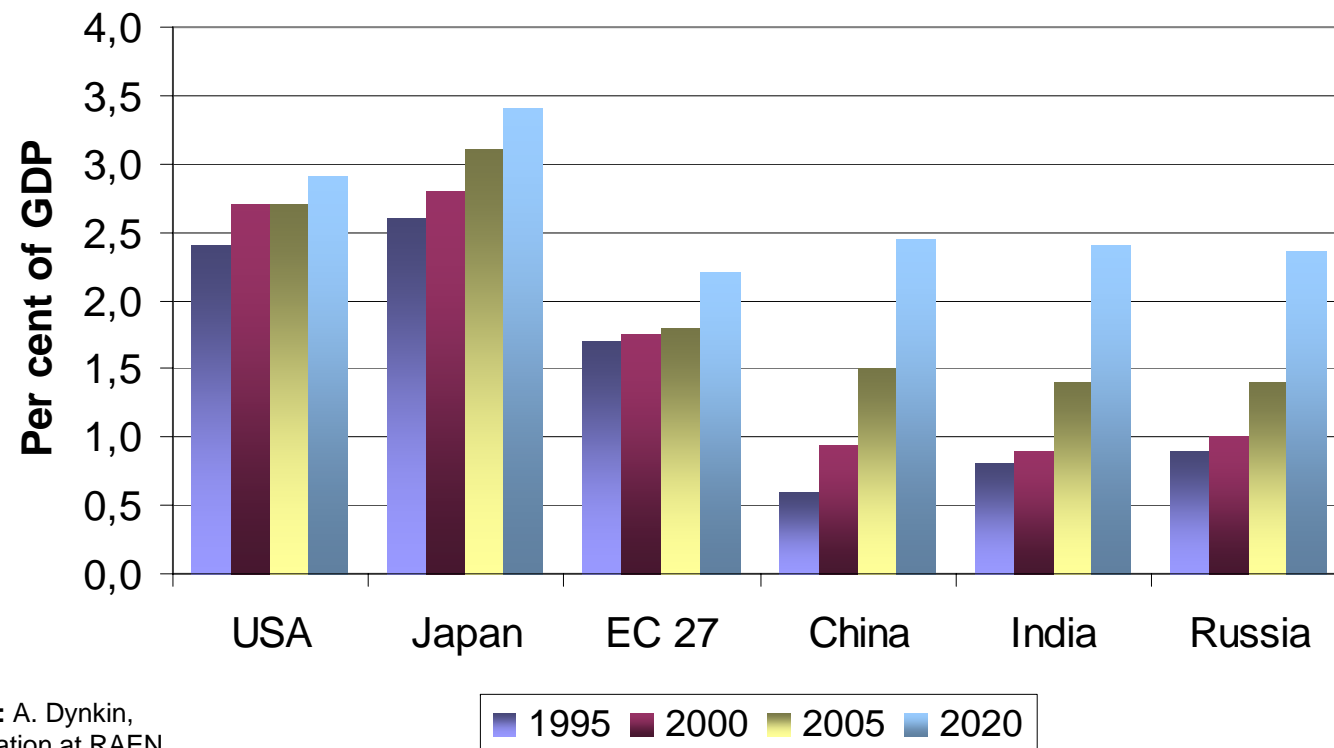
World Primary Energy Consumption





Forecast of the financial support of R&D activities (per cent of GDP)

R&D financing, % of GDP



Source: A. Dynkin,
presentation at RAEN,
April 2008



Investments in Upstream R&D by oil majors

Company	Investments in R&D, \$ million	Investments in Upstream R&D, \$ million	% of total R&D investments	Part of R&D of cost of oil and gas production, \$/t.o.e. (2005)
ExxonMobil	712	214	30	1,04
BP	502	251	50	1,25
RD Shell	588	294	50	1,67
ConocoPhillips	125	63	50	0,79
Chevron	316	158	50	1,24
TOTAL	841	421	50	3,44
ENI	254	127	50	1,46
Statoil	165	149	90	2,58
Repsol	78	71	90	1,26
Petrobras	399	359	90	3,22
PetroChina	396	198	50	1,42
Sinopec	278	139	50	3,20
CNOOC	50	50	100	2,35
Rosneft	16	14	90	0,17
Lukoil	22	20	90	0,20
TNK-BP	18	16	90	0,20



Energy Efficiency

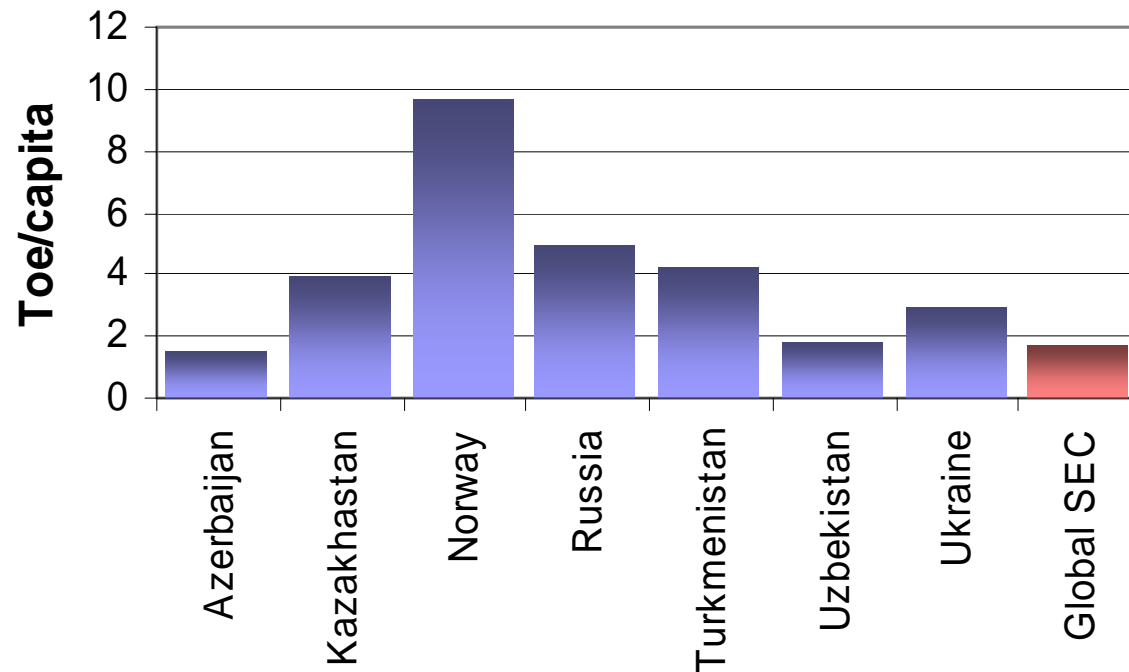
Energy Consumption (Key Performance) Indicators and Sustainable Development

- Specific Energy Consumption
- Energy Consumption per GDP
- Human Development Index



World Primary Energy Consumption

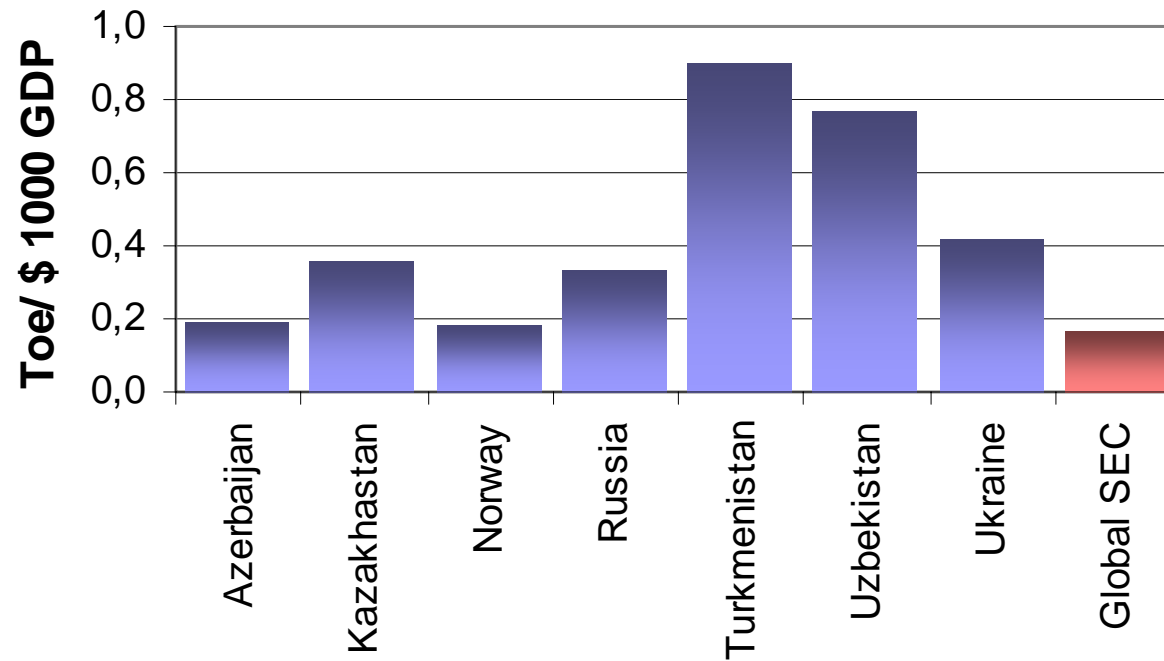
Specific Energy Consumption





World Primary Energy Consumption

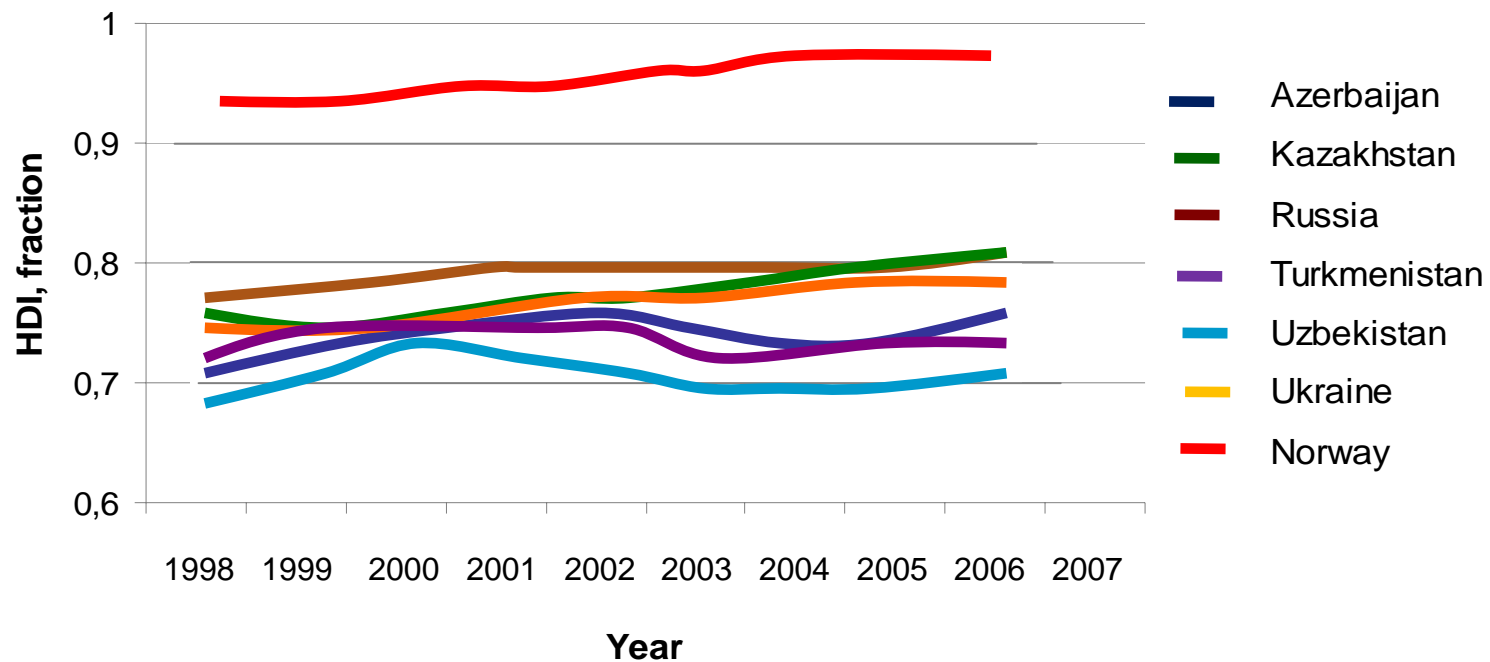
Specific Energy Consumption





World Primary Energy Consumption

Human Development Index as Complex KPI





Conclusions

- Fossil fuels (oil, gas and coal) will continue to play a key role in global primary energy consumption in a long term forecast
- Reserve base should be maintained to ensure sustainable production, energy supply and energy consumption
- Stable and predictable laws and regulations to attract foreign participants / investors
- Transfer of international competence and experience to local subcontractors
- Stable access to market outlets



Conclusions

- Where to invest?
 - Upstream: exploration
 - Upstream: technology development
 - Downstream: energy efficiency
- UN Economic Commission for Europe (UNECE) should have a closer look into the energy efficiency in oil and gas projects
- More meaningful KPIs
- A better (more attractive) investment climate should be established to engage investors into the energy efficiency R&D projects
- International policy for increasing the energy efficiency



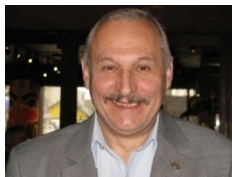
Our Common Task

To conduct a sustainable development that
”meets the needs of the present generation
without compromising the ability of the future
generations to meet their own needs”

(Brundtland Commission report, 1987)



Thank you!



Prof. Anatoly Zolotukhin
E-mail: zolotukhin.a@gubkin.ru
Phone/Fax: +7 499 135 75 16