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is funded principally
through a grant of the

SPE FOUNDATION

The Society gratefully acknowledges
those companies that support the program
by allowing their professionals
to participate as Lecturers.

And special thanks to The American Institute of Mining, Metallurgical,
and Petroleum Engineers (AIME) for their contribution to the program.
Russia's Recent Past and Future in Oil & Gas Production

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Summary

• Russia is capable of increasing its oil production to 12 mln bbls per day over the next 7 to 10 years.
• This will require about 12 bln $ per year in oilfield CAPEX.
• The Russian resource base is much larger than it is commonly believed, at least over 150 bln bbls of oil (not just BOE)
Recent past and the future

- Oil production in Russia has grown from 6 to almost 9.4 mmbopd the last 7 years. Exports: 3.7 mmbopd (1H 2005).

- My estimate is that Russian oil production will peak at about 12-12.5 mmbopd (historical maximum of the USSR) during the decade of 2010 to 2020. Available for export 6.7 mmbopd.
Major producing areas and Exploration maturity

From Dr. Raymond C. Leonard presentation
Future of Russian Oil

• During 2010-2020 the decline of Western Siberian production will be compensated by the development of the new oil fields in Eastern Siberia (available for export 1.1 mmbopd in the Pacific), Timan-Pechora and Russian Arctic offshore (available for export 1.0 mmbopd in the Atlantic).

• After 2020 the decline of Western Siberia will not be compensated completely, and it will result in a gentle annual decline of approximately 5%.
Historical production (to 2004) and forecast of oil production in the Russian Federation
Exploration maturity

From Dr. Raymond C. Leonard presentation.
Cumulative discoveries of oil reserves and “creaming-curve” prediction of ultimate reserves

Cum. oil reserves discovered, Bln bbl

Time, years

Total discoveries
Reserves life, years

- Exxon: 12.9 years
- BP: 11.3 years
- Conoco: 7.5 years
- Chevro: 8.9 years
- Shell: 10.3 years
- LUKOIL: 33.2 years
- Sibneft (2003): 20.8 years
- Sibneft (2004): 19.3 years
- Slavneft: 16.1 years

companies
Oil and gas resources and exploration activities in 1995-2003

- No major discoveries in the recent years. Exploration activities not matched by exploration potential;
- 25% oil and gas resources are in the Arctic shelf (P.Grini, OG21).
Oil and gas reservoirs found in the interval from Ordovician to Triassic.

185 oil and gas fields discovered.

Total oil and gas resources (in place volumes) are estimated:
- in Timan Pechora and Barents and Karskoe sea at 36 bln tons of OE, 260 bln BOE,
- in land - about 8.5 bln tons of OE, 60 bln BOE.

Reserves 1.32 bln tons, 10 bln bbl, gas – 1000 bcm, 35000 bcf.

Available for export at the plateau 1-1.2 mmbopd
East Siberia Oil Potential

Proven Reserves (C1) 431 MMT

Probable (C2) 789 x 0.50
395 MMT

Identified Prospects (C3) 2238 x 0.25
560 MMT

Resources (D1) 9197 x 0.10
920 MMT

Risked Recoverable Reserves
2306 MMT
(16.6 Billion Barrels)

Production plateau 2.5-3.0 mmbopd
Available for export 1-1.25 mmbopd

From Dr. Raymond C. Leonard
Major prospective oil and gas basins of Russian arctic offshore

- Chuckchee Sea
- East Siberian Sea
- Laptev Sea
- Barents Sea
- Karskoe Sea
Estimated oil and gas resources of Russian arctic offshore

From Okeangeologia Institute, 1993
Extensions of onshore tends
Barents, Pechora and Karskoe Sea

The north-eastern region of the Barents Sea
SHTOKMANOVSKOE

Yamal offshore
Antipautinskaya
Kamennomysskoe
Aderpautinskaya

Ob and Taz bays
Varandei-more
Prirazlomnoe
Dolginskoe
Kharasaveiskoe
Leningradskoe
Rusanovskoe
Ledovoe
Ludlovskoe

The Pechora Sea

North-eastern region
Ledovoe

Ob and Taz bays
Factors Needed for Continued Growth of the Russian Oil Industry

- Technology evolution of the upstream of the entire Russian oil industry (from the best examples of Yukos, Sibneft, TNK-BP)
- Competitive, clear and transparent licensing rules that would open the Barents Sea and Timan-Pechora, East Siberia and the Russian Arctic offshore for exploration and production
- Construction of major pipelines to Murmansk and the Far East
How much money will the growth cost?

- Extrapolating from today’s performance of the best operators it will take about $12 bln per year
- Total CAPEX 2003 Yukos, Sibneft and Slavneft was about $2 bln
- However the development of Eastern Siberia will require larger investments
Why is it relatively inexpensive?

• New strategy for field development
• Fewer wells and better wells (stimulations and horizontals)
• Well targets defined by advanced reservoir modeling
• Produce every well up to its full potential
Sibneft Upstream overview of operations
Comparison of Oil Rates

From J.M. Mach
23.5% of Sibneft oil production comes from 2.4% of wells (all HW)

Oil Production from vertical wells

Total Oil Production

1-st Horizontal

Horizontal Well Stock

Oil Production, tons/day

Q_v = 18 tons/day
Q_h = 218 tons/day
Typical Vertical Well Development - Actual
Horizontal Well Development – In Place
Resource Triangle

- Few of high quality
- Most (all) found developed and produced
- Abundance of lower quality
- Need modern technology and good oil prices to develop
Fracturing in Sibneft

• About 1150 producers fractured after 1999 are producing now.
• Daily production is about or 240 thousand bopd, 37% of Sibneft production.
• 83% of stimulated wells produce from less that 5 md reservoirs, and 35% produce from less than 1 md reservoirs.
Ratio of productivity improvement
Jd post frac / Jd pre frac
Percentage of daily production and average production rate
The Production Activation Index

- The Production Activation Index, $I_p$, is an indicator of the required investment to add one new barrel of oil in daily production in a given petroleum province.
- For example, a typical West Texas well that may cost $500,000 but produces only 50 STB/d has an activation index equal to $10,000/STB/d.
- Excellent infrastructure and work force, good and non-corrupted management practices reduce the activation index.

\[ I_p = 365 * P * CFAT * \left[ \frac{1}{1+i} + \frac{1}{1-d} \sum_{j=2}^{n} \left( \frac{1-d}{1+i} \right)^{j} \right] / (1+i)^{k} \]

From M. Economides and C. Ehlig-Economides
Relationship between activation index and equilibrium oil price
Comparison between activation indexes in different areas

Activation index, thousand $/BOPD

- US GOM Conventional
- W. Africa Shallow Water
- Venezuela East
- North Kuweit
- Venezuela West
- Saudi Aramco
- Western Siberia Russia
- Iraq
- Eastern Siberia, Russia
- US GOM Deep Water
- West Texas
- Pechora and Barents Sea, Russia
- Volga-Urals Russia
Доказанные запасы нефти и газа основных энергетических компаний мира

млрд. баррелей н.э.

Газпром: 108,1
ExxonMobil: 21,5
BP: 18,3
Petrochina: 17,8
RD/Shell: 15,4
ChevTex: 12,0
Total: 11,4

на 01.01.2004
Natural Gas Production Growth

- 2001: 512
- 2002: 521,9
- 2003: 540,2
- 2004: 545,1
- 2005: 547,0
- 2020: 580-590
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