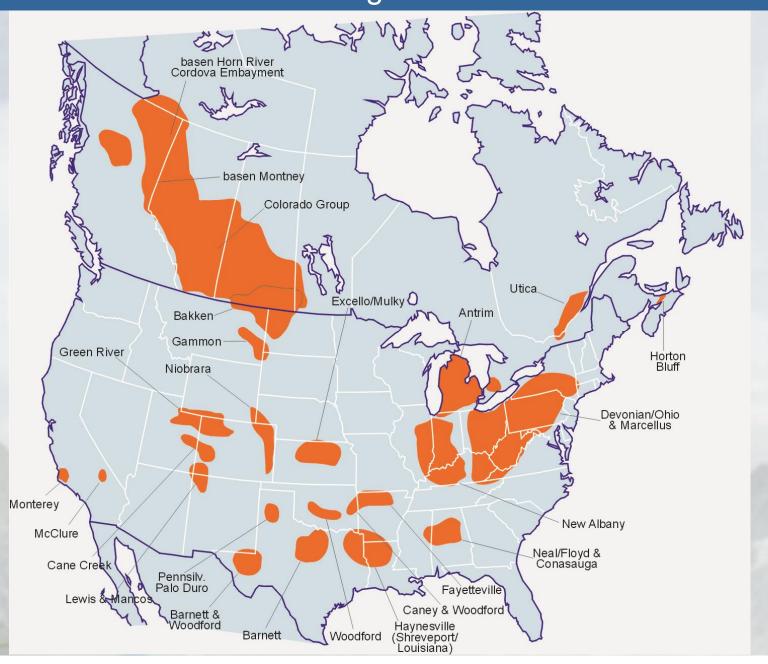
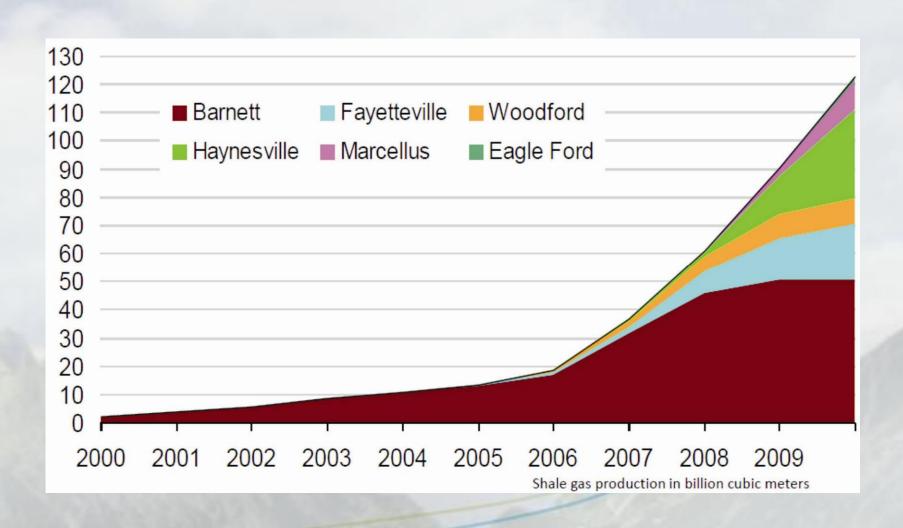
shale gas do economics and regulation change at the German-Polish border Paweł Poprawa Polish Geological Institute **BSEC, Berlin, 01.12.20011**

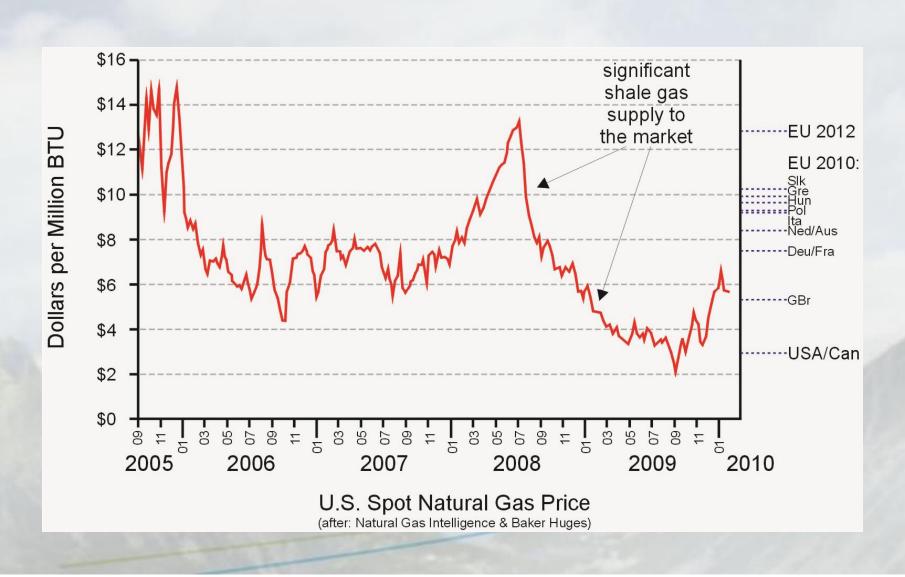
North America gas shale basins



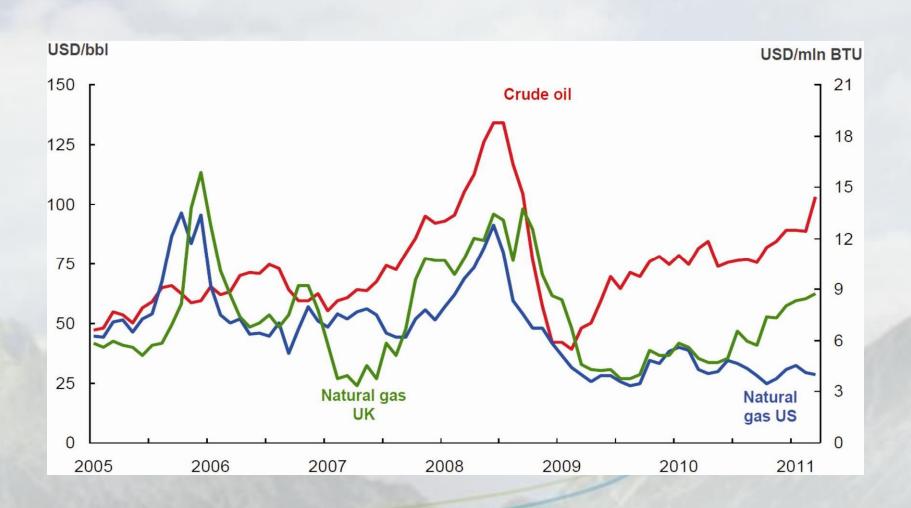
increase of shale gas supply to the market



decrease of gas price in USA due to increase of shale gas supply to the market



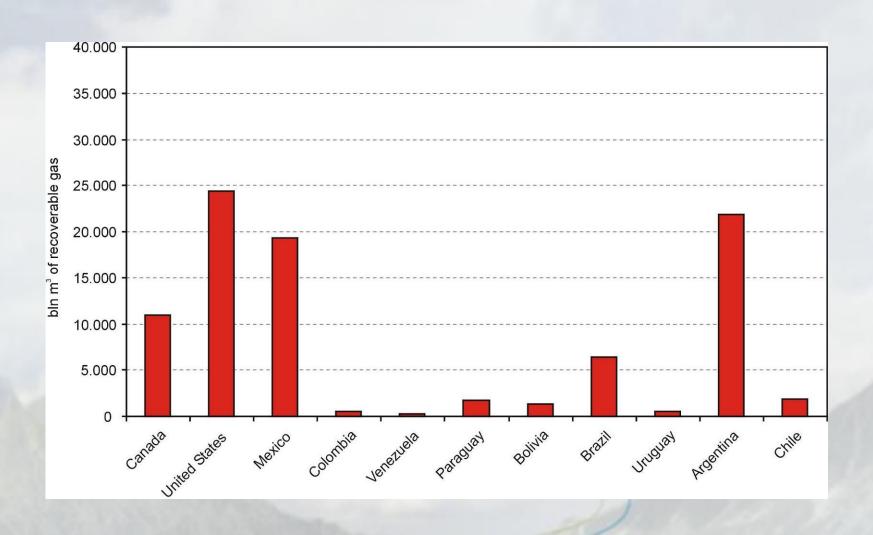
since 2009 split of prices of oil and gas



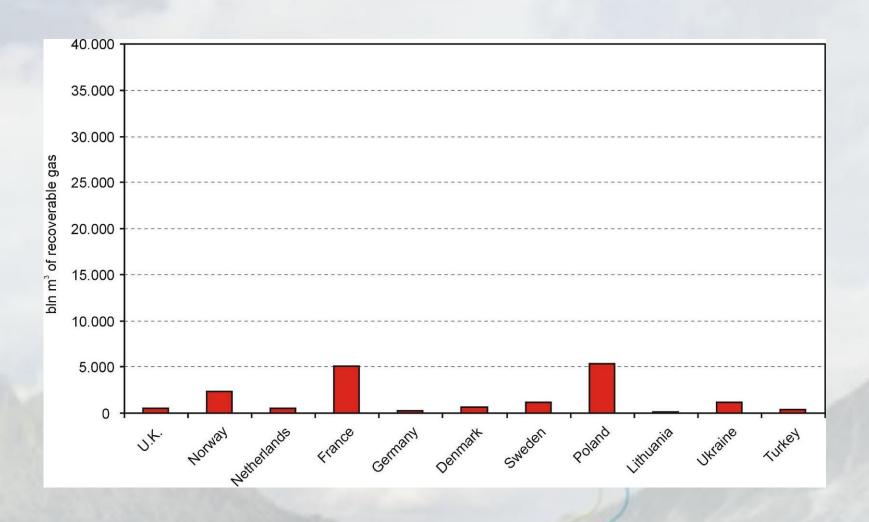
shale gas impact on US economy

- recently shale gas stands for ~ 25 % US gas production
- cumulative shale gas investments in US ~80 bln USD/year
- US limited gas import export of LNG gas; US become the biggest gas producer in the World
- decrease of gas price in USA in 2008-2009 bigger nominal profit than all federal support to US economy
- cheap gas in USA attracts gas consuming industry;
 US chemical industry turning back to US form China
- investment of 1 mln USD/year creates 14 jobs (direct 4, indirect 4,5, induced 5,5)
- example: investment of Encana in British Columbia (W Canada) created 80.000 jobs

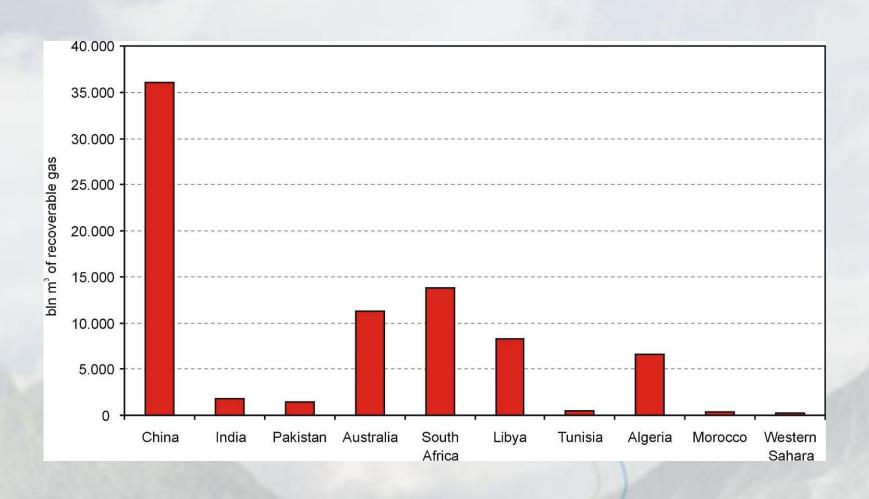
shale gas resources – N & S America (EIA report)



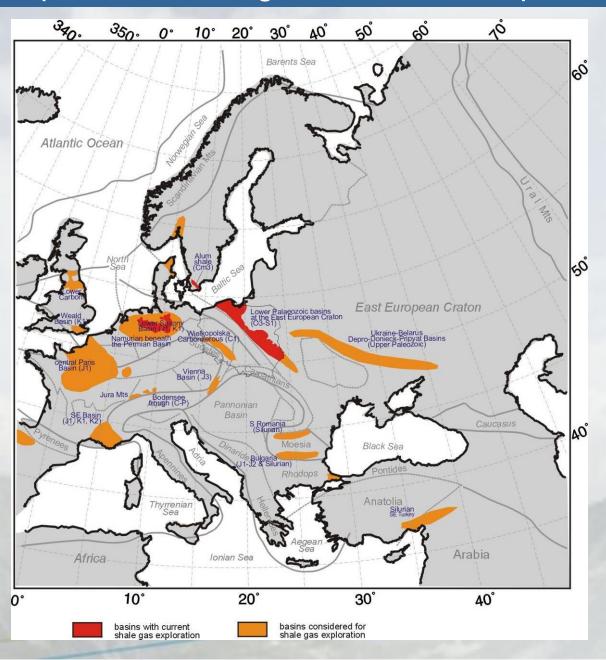
shale gas resources – Europe (EIA report)



shale gas resources – Asia & Africa (EIA report)



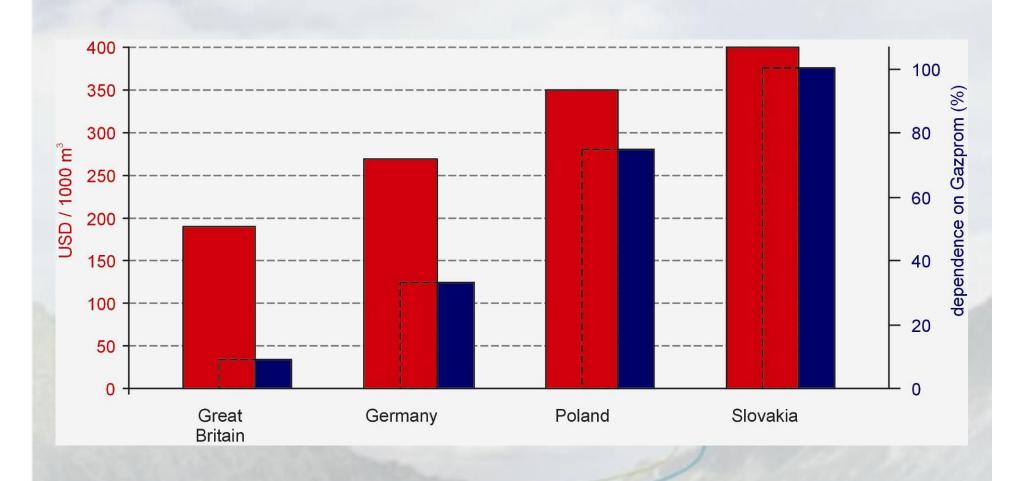
potential shale gas basins in Europe

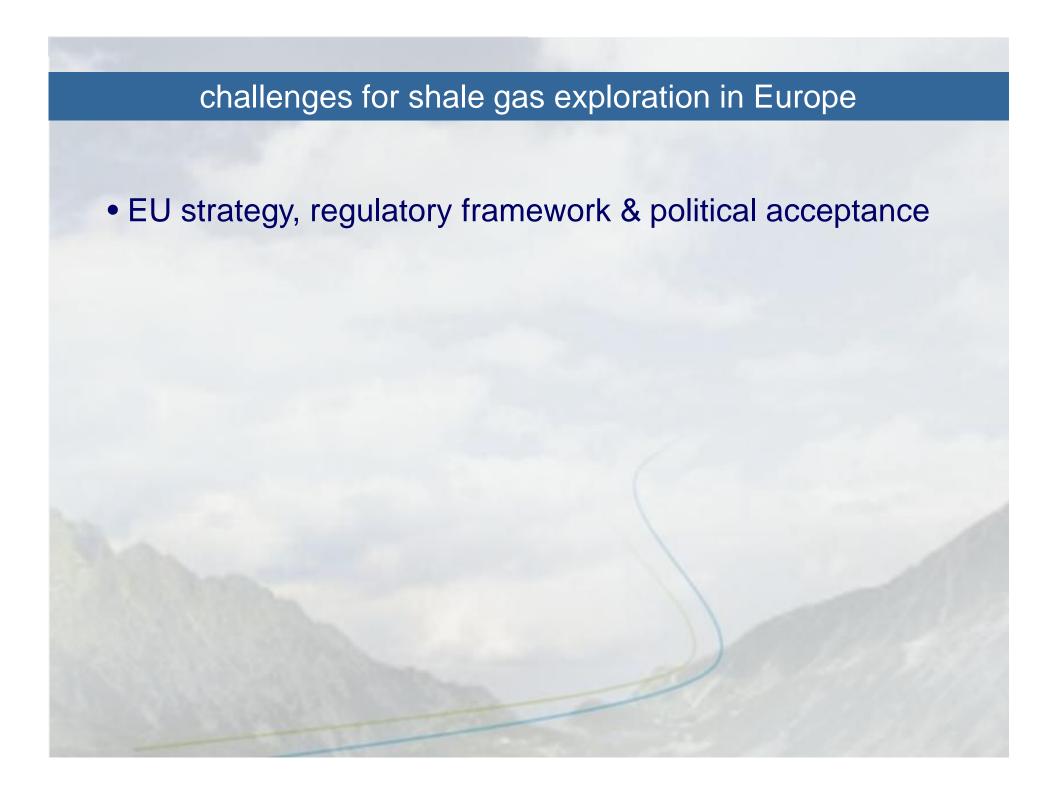


shale gas in Europe – pro vs contra

- breaks the historical division into less developed, unreliable exporters vs developed consumers – different geographic distribution of resources
- challenges existing structure of gas supplies (e.g. Gasprom, Northstream, North Africa)
- competition with other energy producers nuclear power plants (France), renewable energy (Germany/EU), coal (Poland)
- local communities & green activist, in some countries also politicians, concerns about environment impact
- for countries with high coal & lignite position in energy mix a realistic alternative allowing for reduction of CO₂ emission
- countries dependent on monopolistic gas supplier desire alternative (Central & Eastern Europe)

economic cost of dependence on monopoly







- EU strategy, regulatory framework & political acceptance
- technology and know-how transfer from North America

technology & know-how transfer from North America





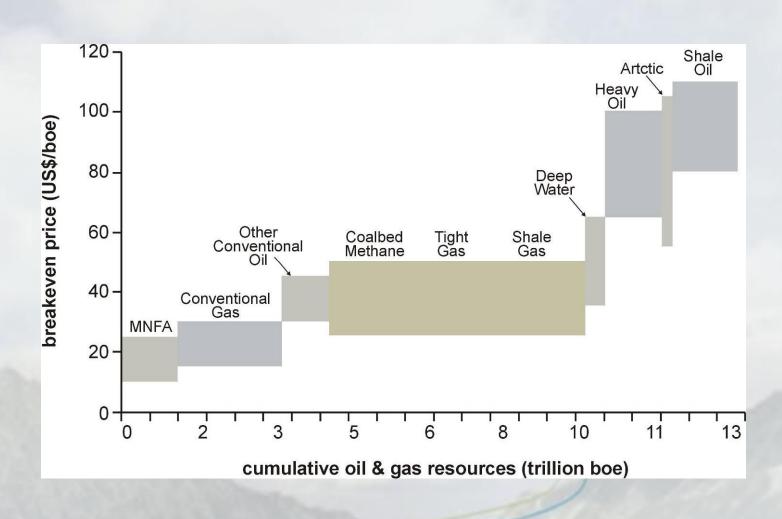




- EU strategy, regulatory framework & political acceptance
- technology and know-how transfer from North America
- availability of drilling & seismic service (protected market)
- recent lack of drilling, seismic and other service
 ~150-200 rigs in Europe vs ~1500 in US

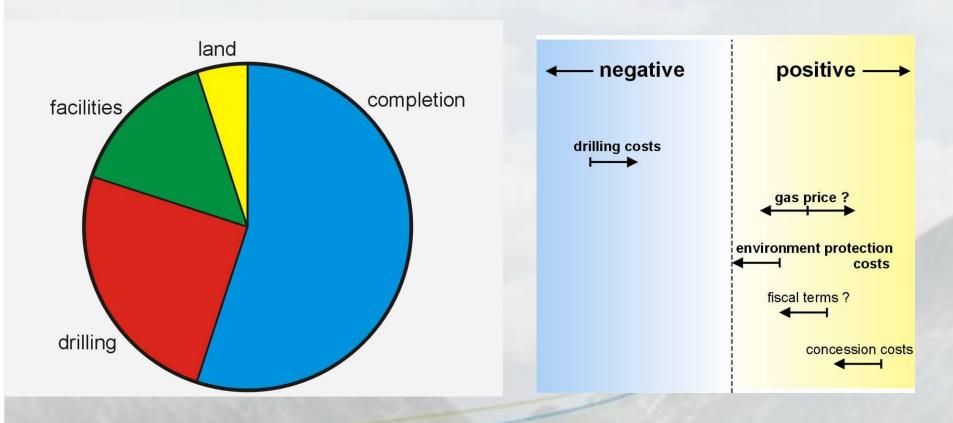
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- drilling costs (Poland 10-15 MM \$ vs USA 3-10 MM \$);
 production cost (Poland ~300 \$/1000m3 vs US 120-150)

breakeven cost vs resources (globally)



shale gas production costs

- estimated breakeven cost of shale gas production in Poland ~300 \$/1000m³; 9 \$/MMBtu
- drilling costs in Poland 10-15 MM \$; drilling costs in w USA 3-10 MM \$



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- environmental concerns

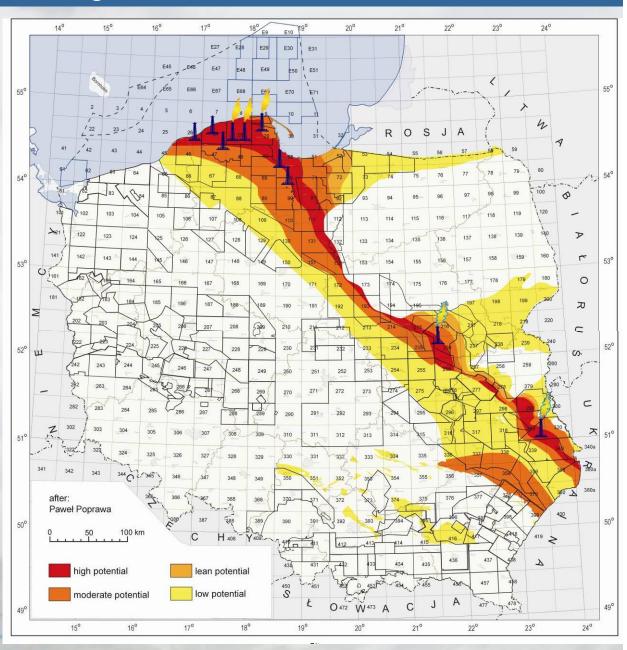
environmental concerns – which one really matters?

- methane emissions?
- water consumption for hydraulic fracturing?
- aquifer pollution by frack fluid or methane?
- uncontrolled composition of chemical additives?
- flow back fraction of frack fluid utilization?
- radiogenic trace of solid waste?
- landscape footprint of drilling and other infrastructure?
- earth tremors?
- disturbance of local societies with transport & drilling?
- density of population?

shale gas in Poland

Poland – an
European natural
lab for environment
impact analysis of
gas and oil production
from shale and tight
reservoirs

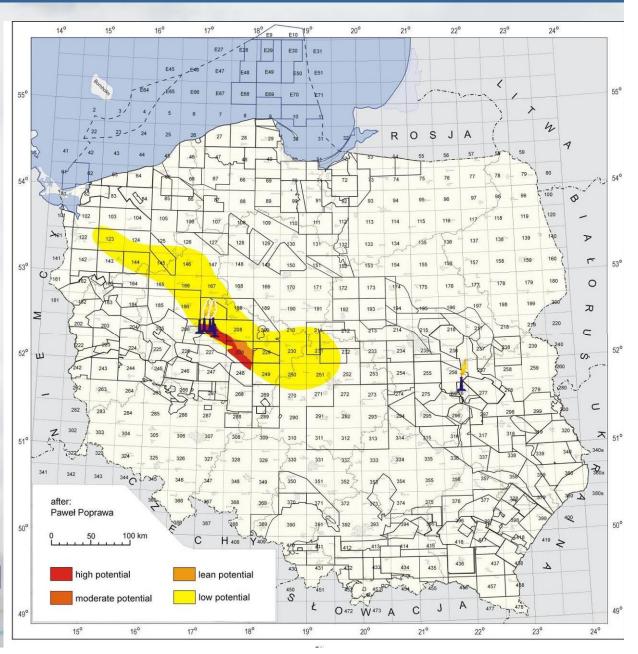
- shale gas:10 wells drilled(5 completed)
- tight gas:6 wells drilled(3 completed)
- coming 2-3 years up to 200 wells drilled and completed



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first shale gas drilling pad in Poland (Łebień LE-1 well)

