



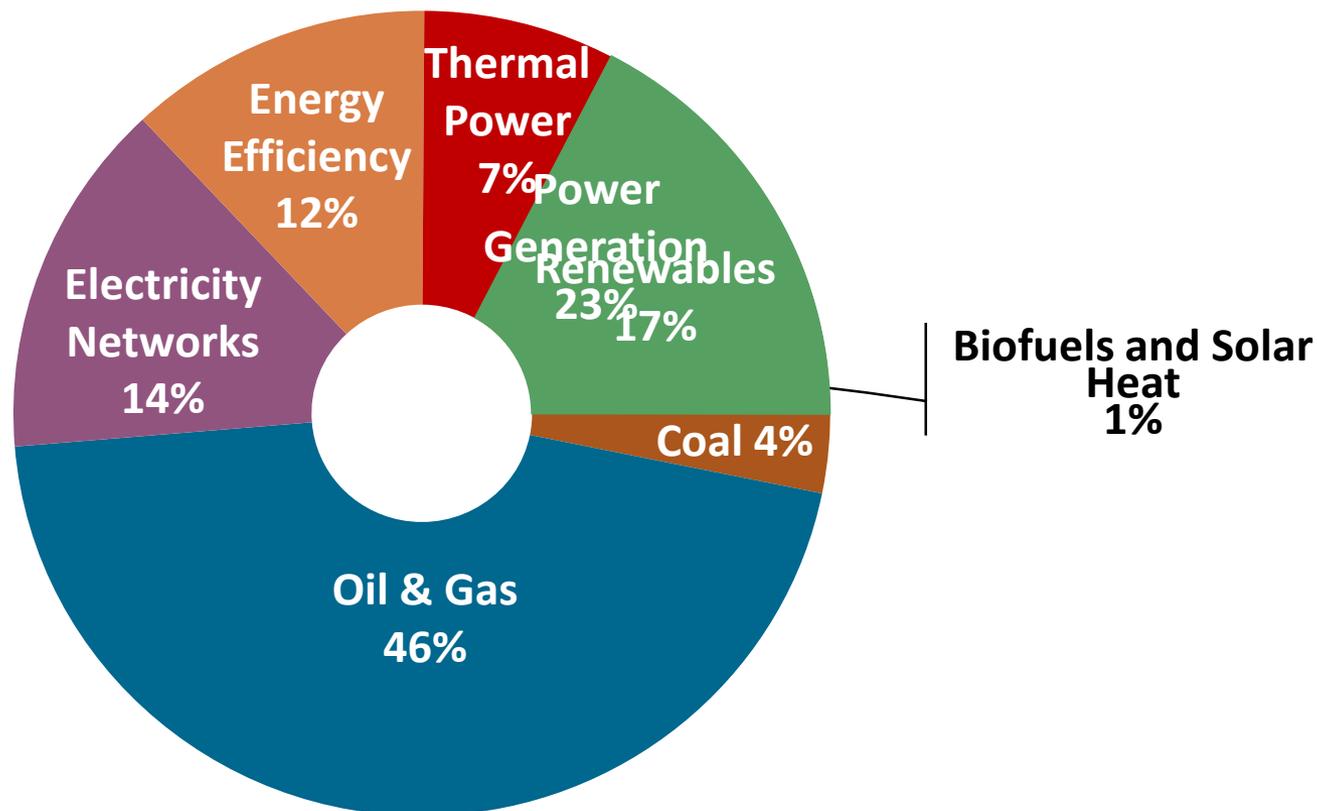
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# World Energy Investment | 2016

Oil and gas producers in a period of low oil prices

## Global Energy Investment, 2015

USD 1.8 trillion



*An 8% reduction in 2015 global energy investment results from a \$200 billion decline in fossil fuels, while the share of renewables, networks and efficiency expands*

# Energy efficiency and low fossil fuel prices

The three



in America in 2015



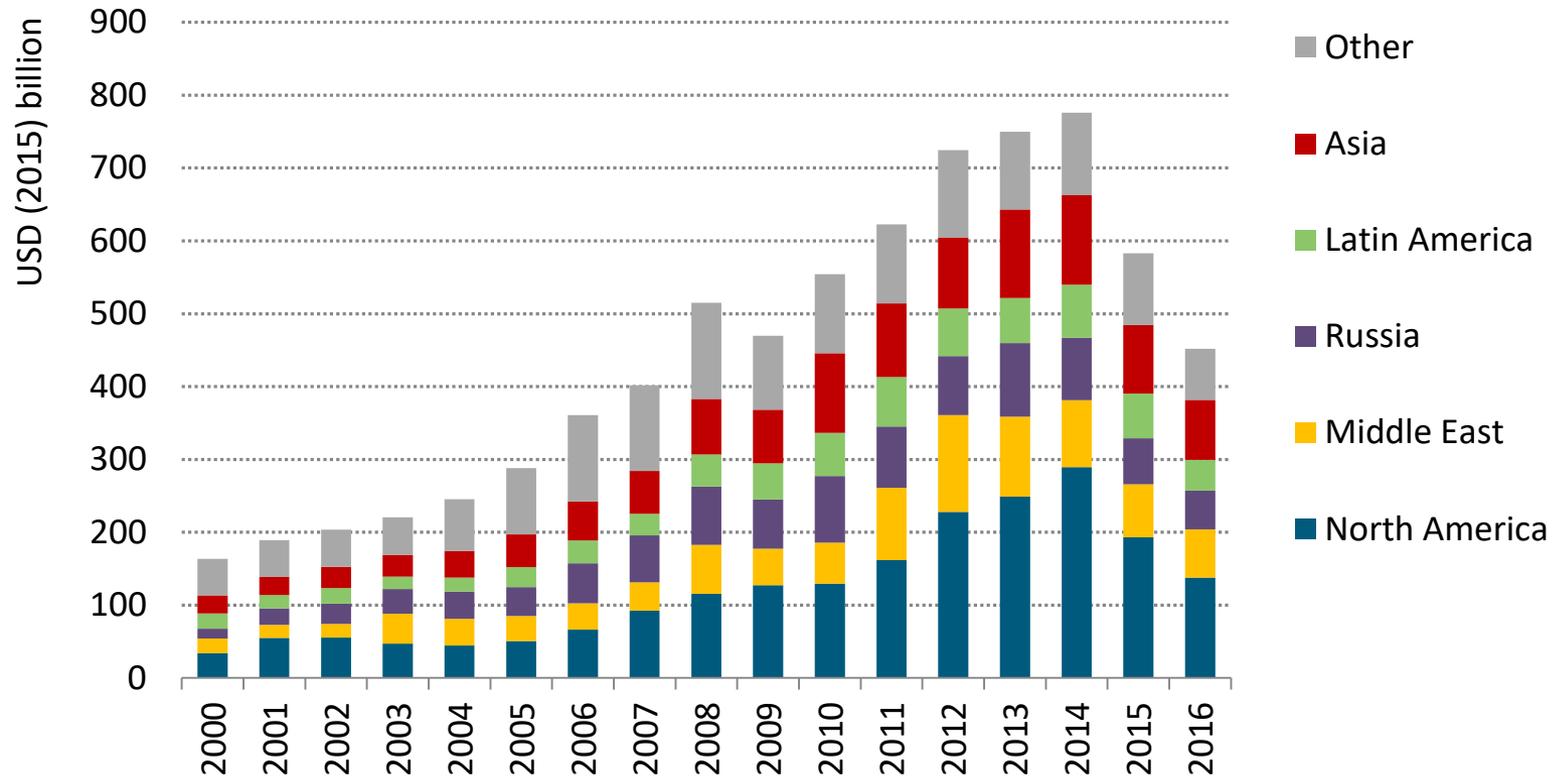
Appliance standards lock in efficiency improvements despite declining electricity prices

# New technologies have an asymmetric impact on oil and gas producers



*Electric cars generate consumer excitement, but displaced only 0.01% of oil production last year*  
*Current wind and solar investment is equivalent to over 1% of global gas production not burned in CCGTs*

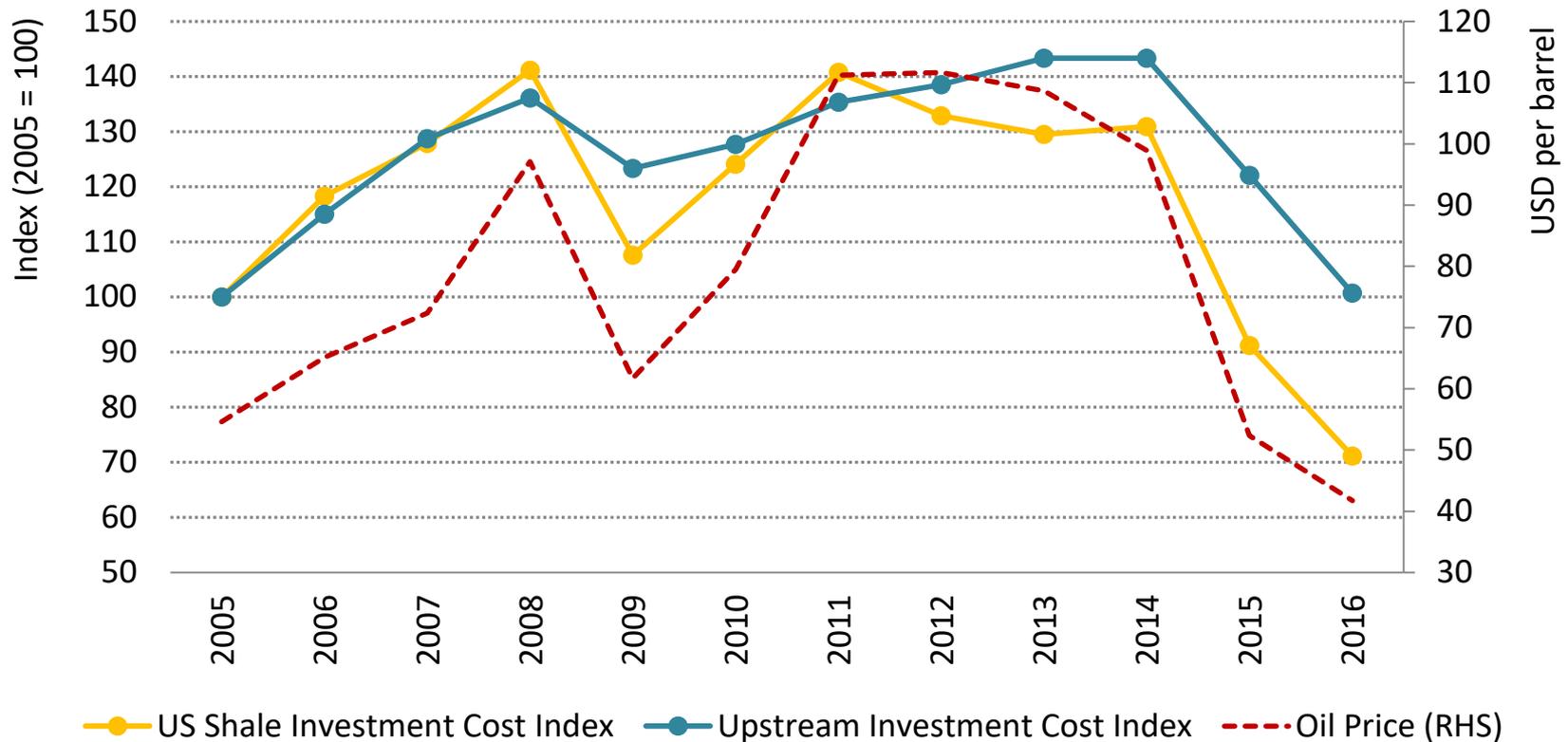
## Upstream investment in key regions, 2000-2016



***North America covers almost half of the world's decline in upstream investment, while the Middle East and Russia emerge as the most resilient regions.***

# Upstream costs back to levels of 10 years ago, serving as key contributor to investment plunge

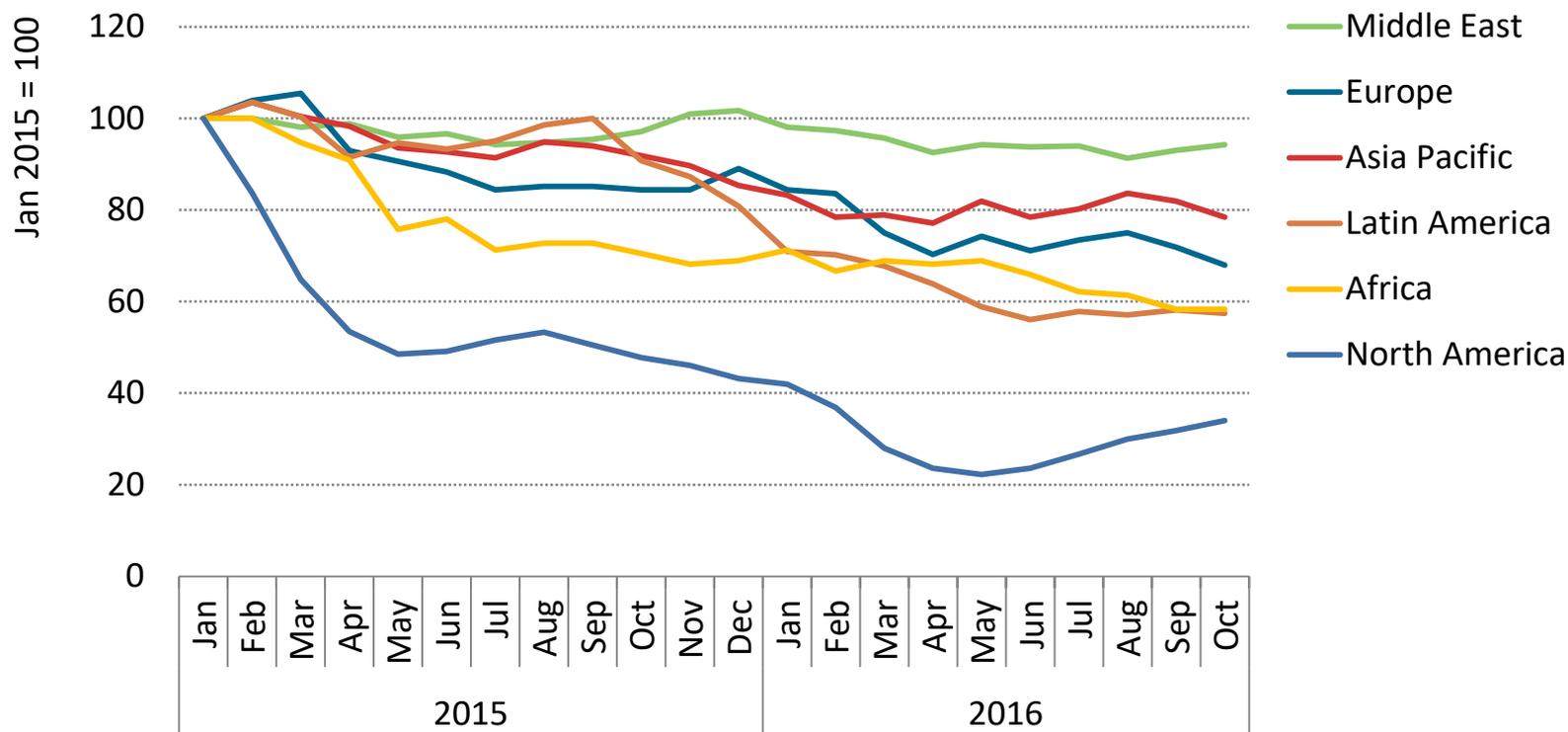
## Investment Cost Indexes, 2005-2016



**Lower costs accounted for just less than two-thirds of the total fall in upstream investment between 2014 and 2016**

# Rig count in the Middle East remain close to record levels

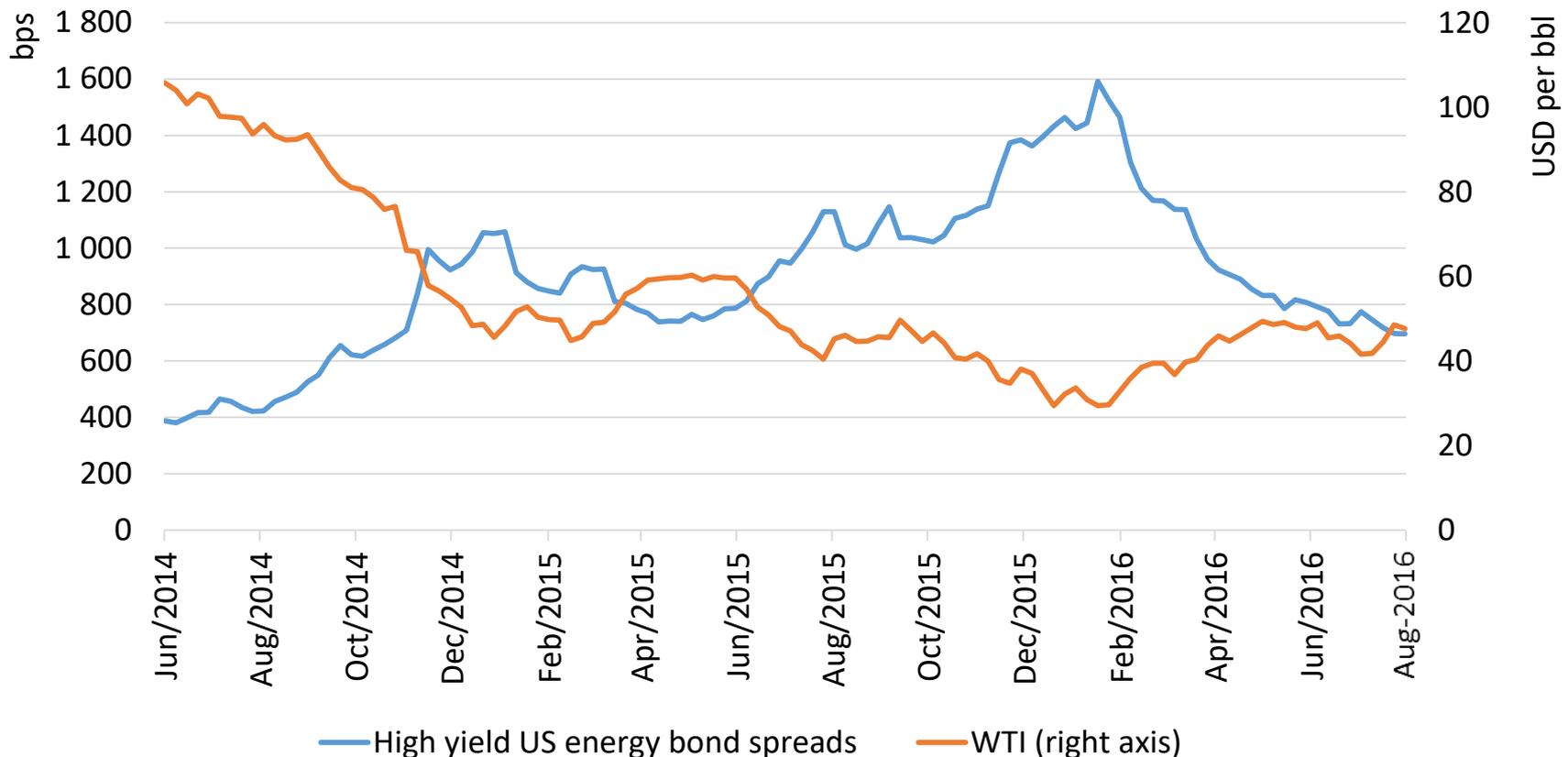
## Total rig count index, 2015-2016



***Recent uptick in the oil price has raised the economic case for an increase in rig counts in North America and recovery in activity is tangible since June***

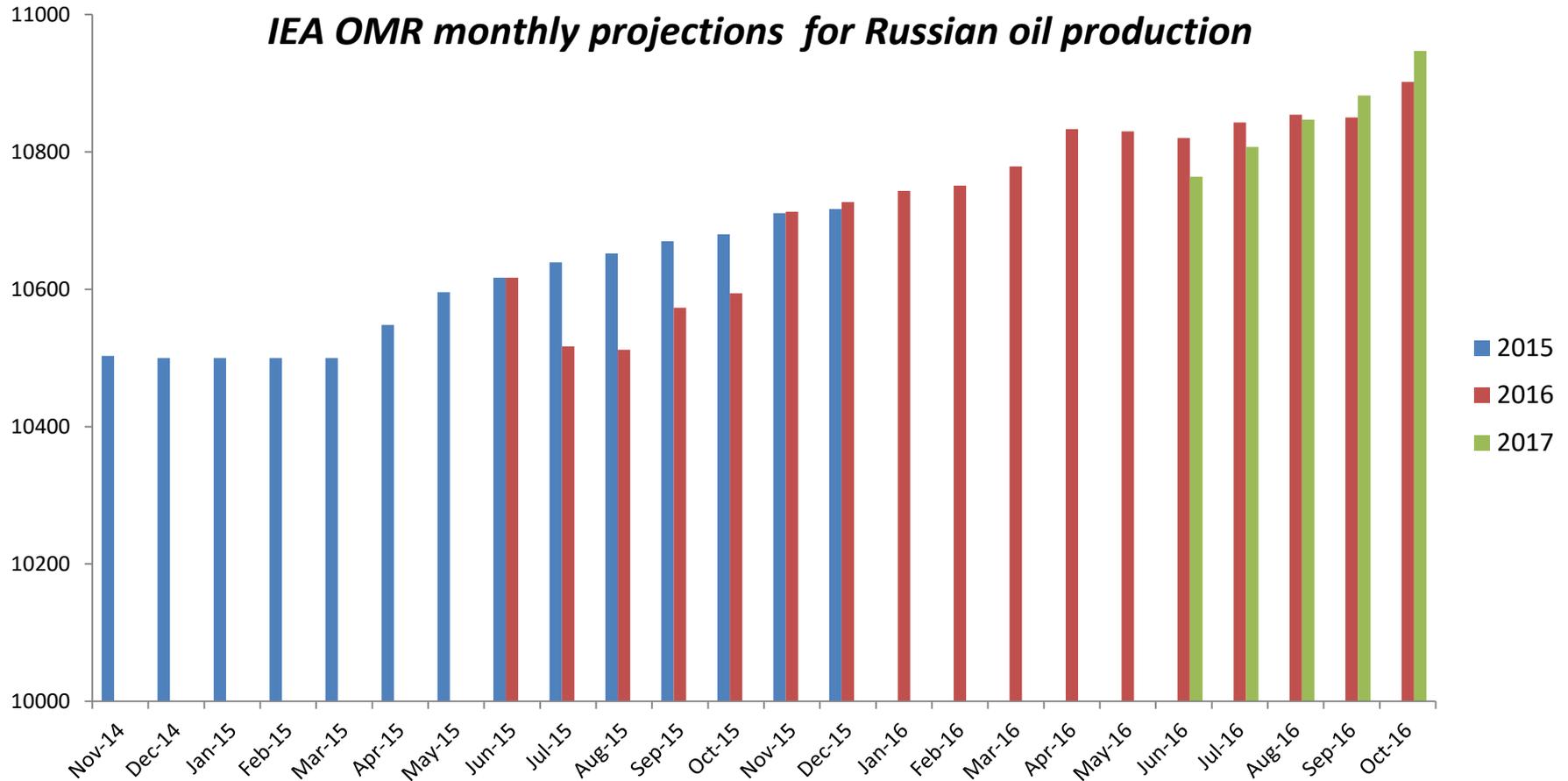
# US shale leveraged business model increases investment volatility

## Bond spreads vs. Oil prices, Jun 2014 – Aug 2016



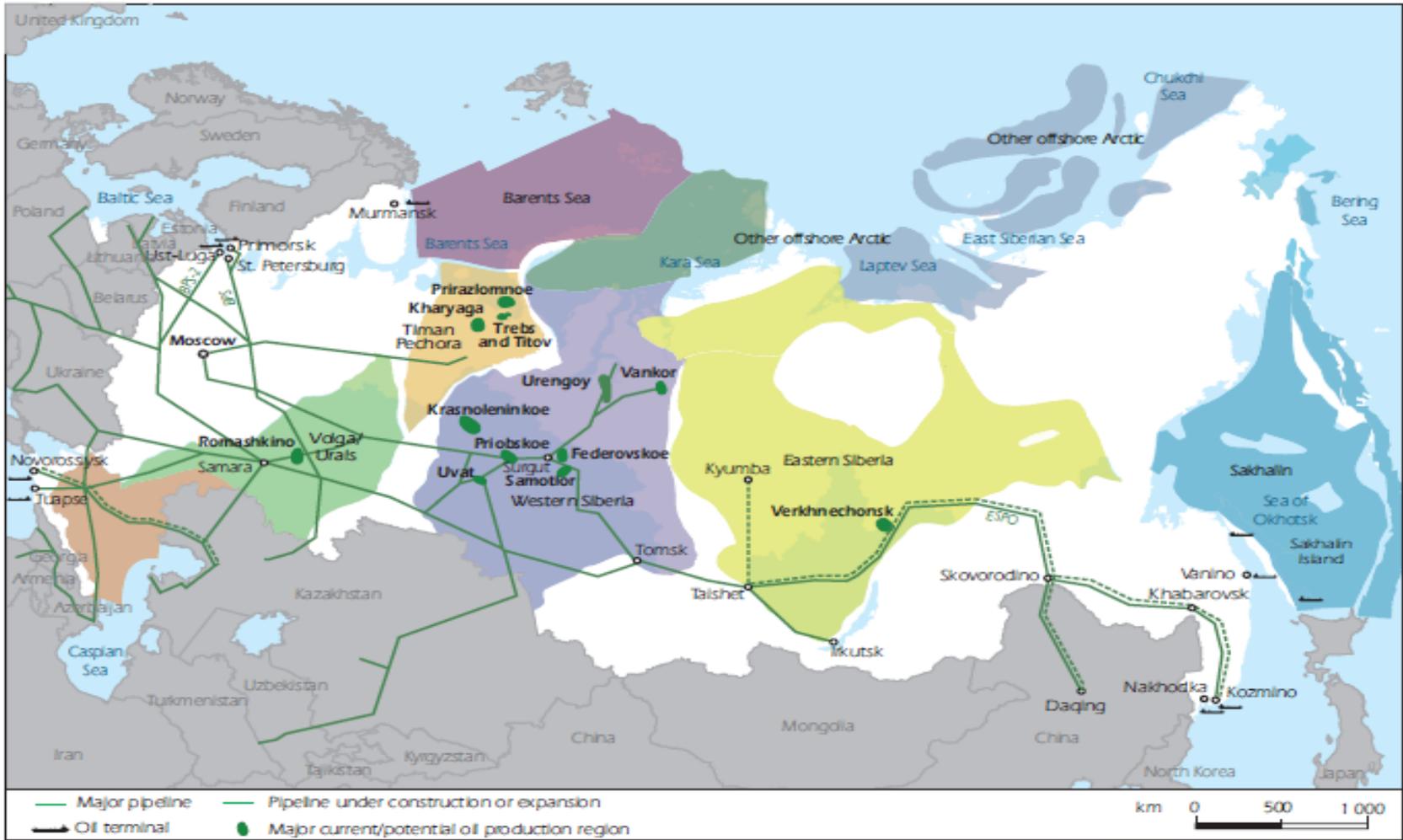
***Debt costs soared for leveraged US shale companies as oil prices fell, resulting in bankruptcies; more resilient operators, with the majority of production, now remain***

# Russian oil upstream keeps defying expectations



■ 2015  
■ 2016  
■ 2017

# Russia: large and dispersed resource base

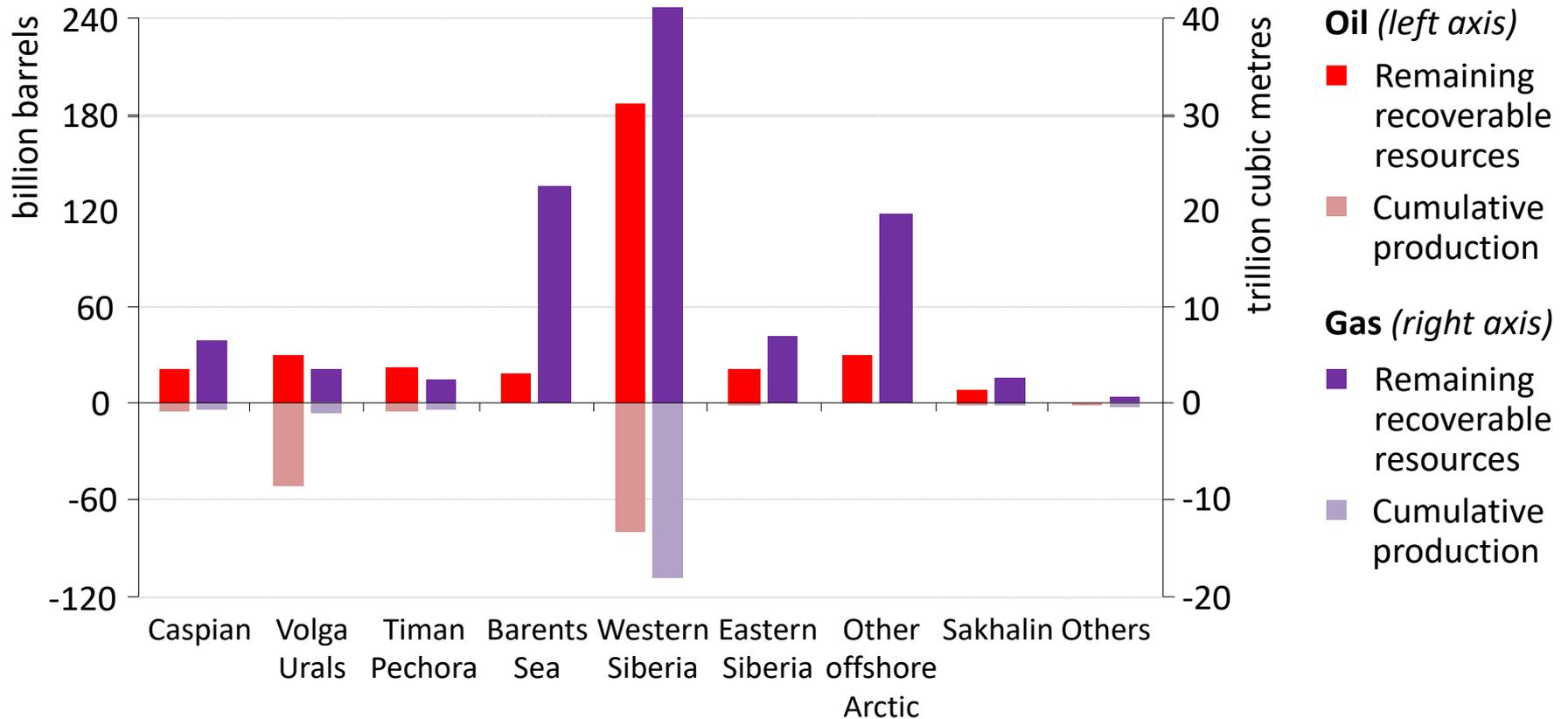


This map is without prejudice to the status of or sovereignty over any territory to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

***Legacy infrastructure was built up to supply the Western regions and European exports***

# West Siberia remains dominant with arctic offshore as a frontier resource

Conventional oil and gas resources in various Russian regions



**The bulk of Russia's resources are in the core producing region of Western Siberia, arctic offshore is on hold due to sanctions and oil prices**

# Arctic offshore: What a difference three years make



- Sanctions constrain investment and technology transfer
- But similar projects became unviable in Alaska and Canada as well
- And the IOCs are cutting capex anyway

***Arctic offshore developments are likely to be on hold in the foreseeable future***

# Light tight oil in the Bazhenov



- ✓ Horizontal drilling and fracking is routinely used for EOR
- ✓ Decent field service industry
- ✓ No anti fracking lobby
- ✓ Legacy infrastructure
- ✗ Lack of mid size independents
- ✗ Access to geological data
- ✗ High end service capabilities (pressure pumping, 3D seismic)

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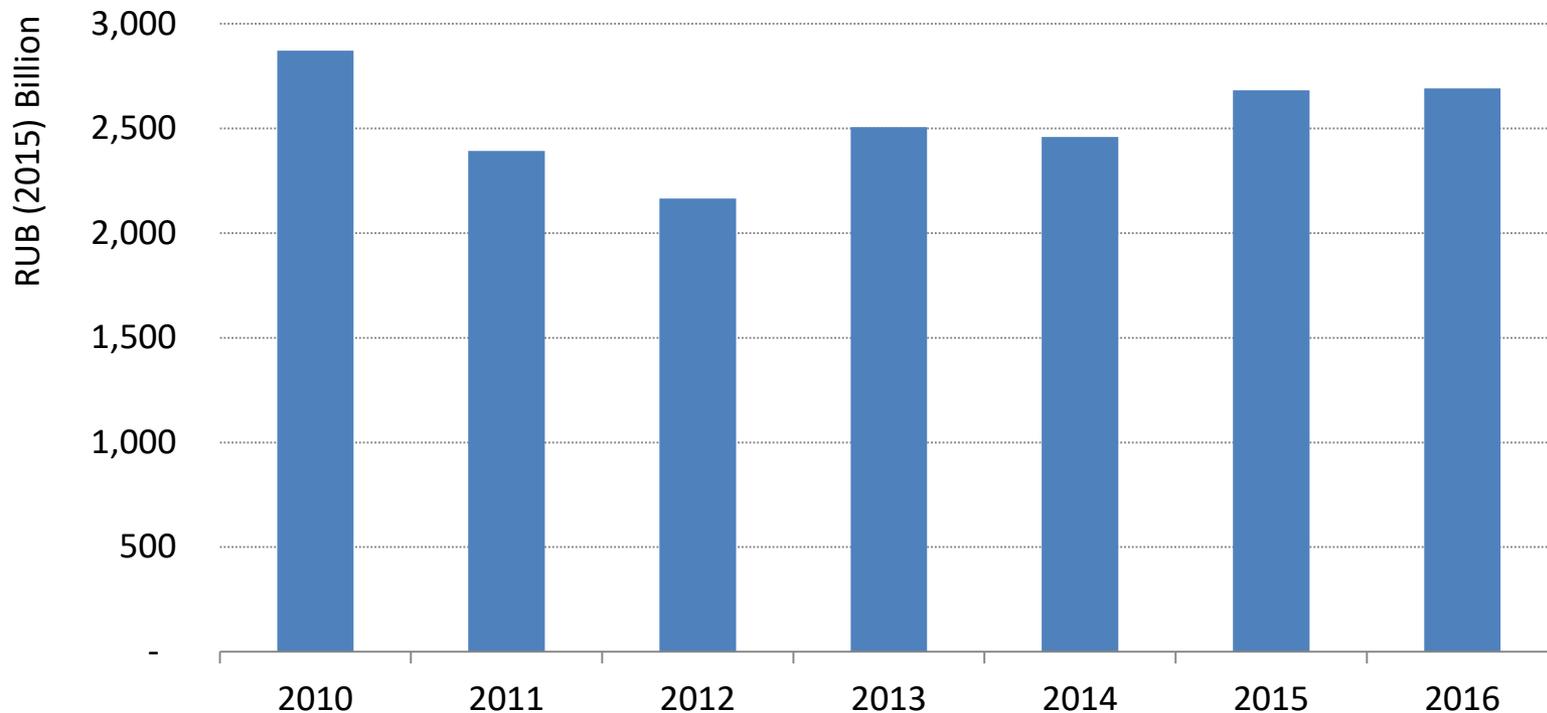
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Halliburton partners with Russian university for development of unconventional resources

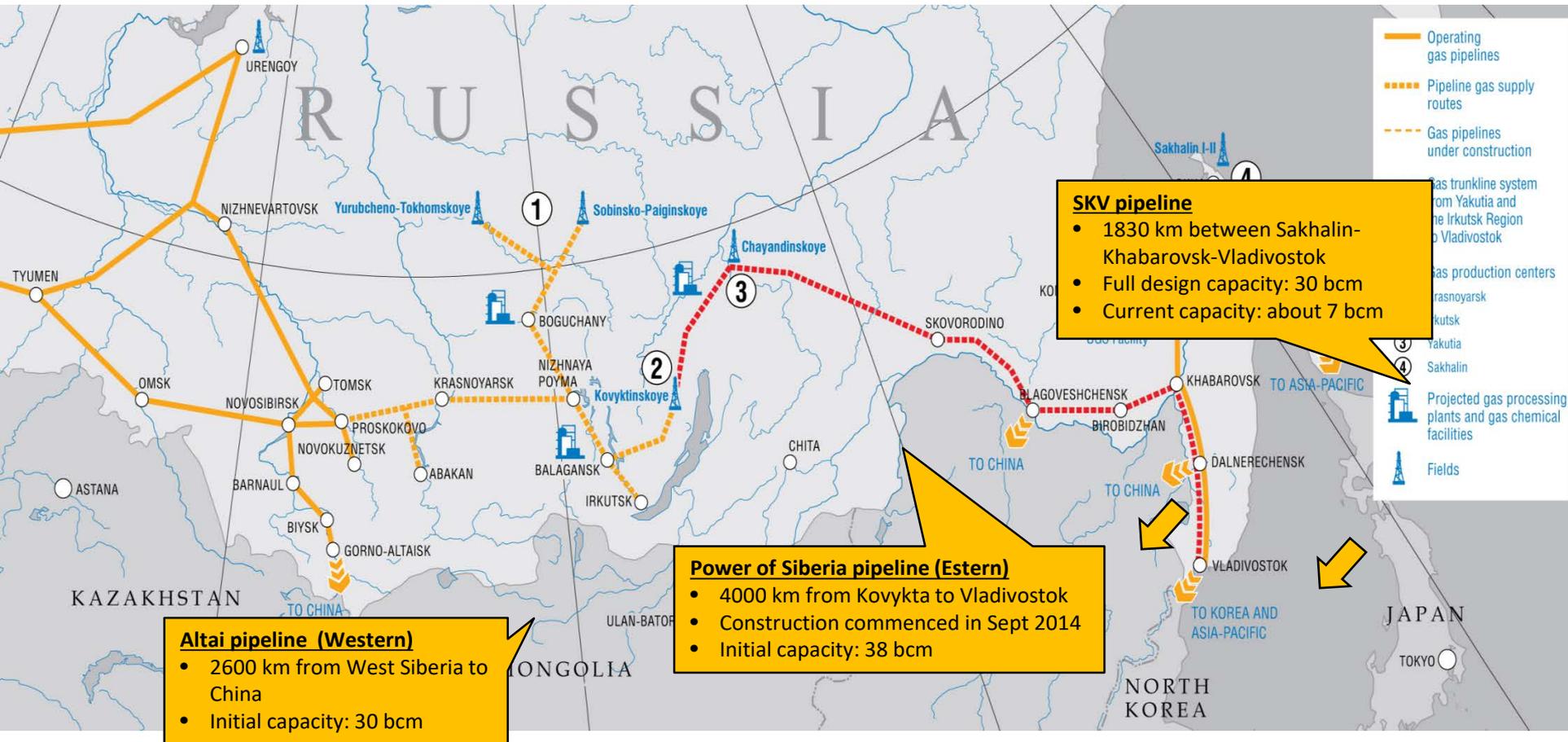
***LTO development might start but will remain under its geological potential***

## Russian oil and gas upstream investment, in Roubles 2010-2016



***80-90% of capital spending is Rouble based due to a large domestic service industry and focus on conventional brownfield development***

# East Siberia: the manifest destiny?



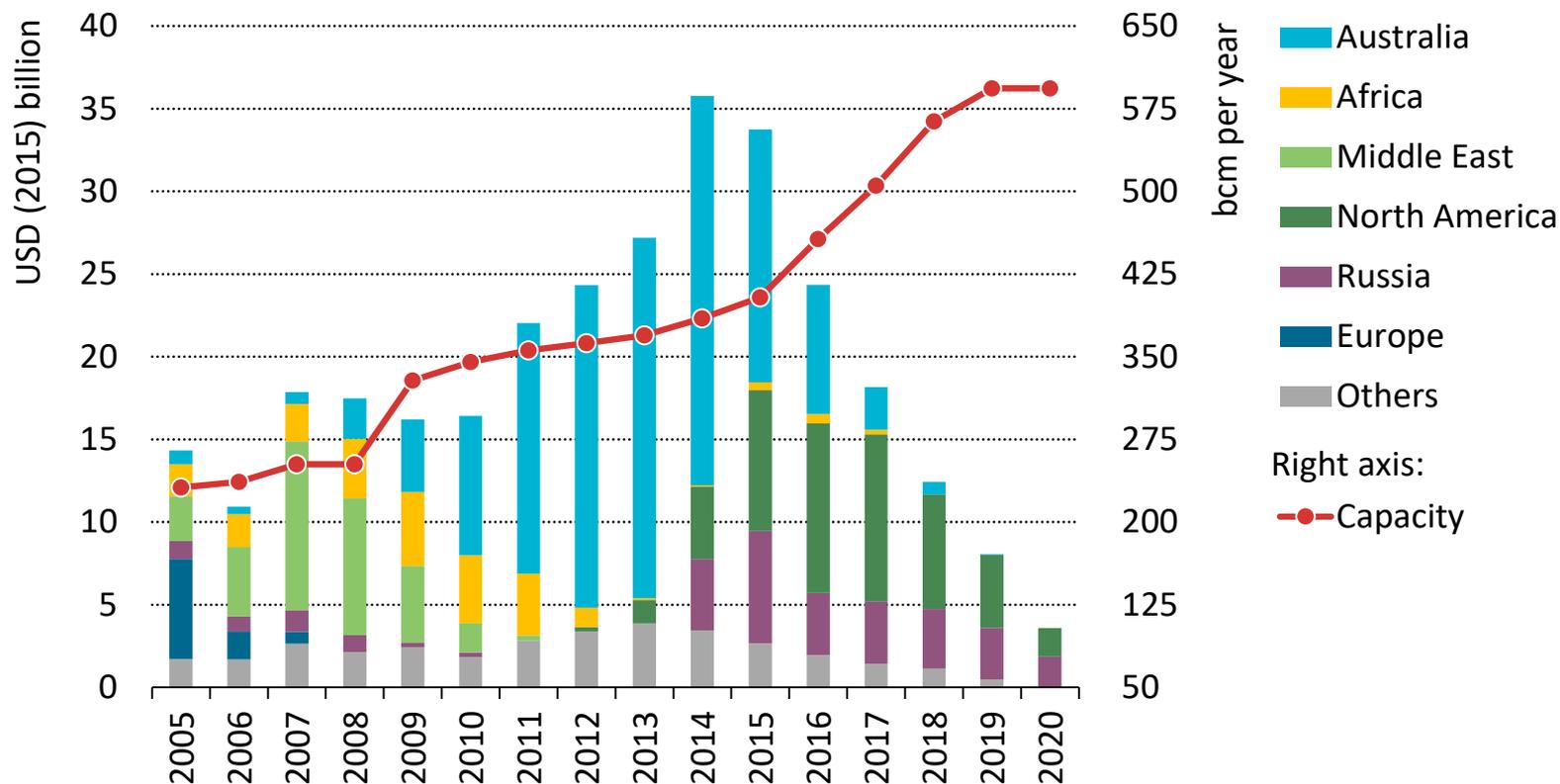
Source: Gazprom and IEA (forthcoming)

# Yamal LNG: overcoming the odds



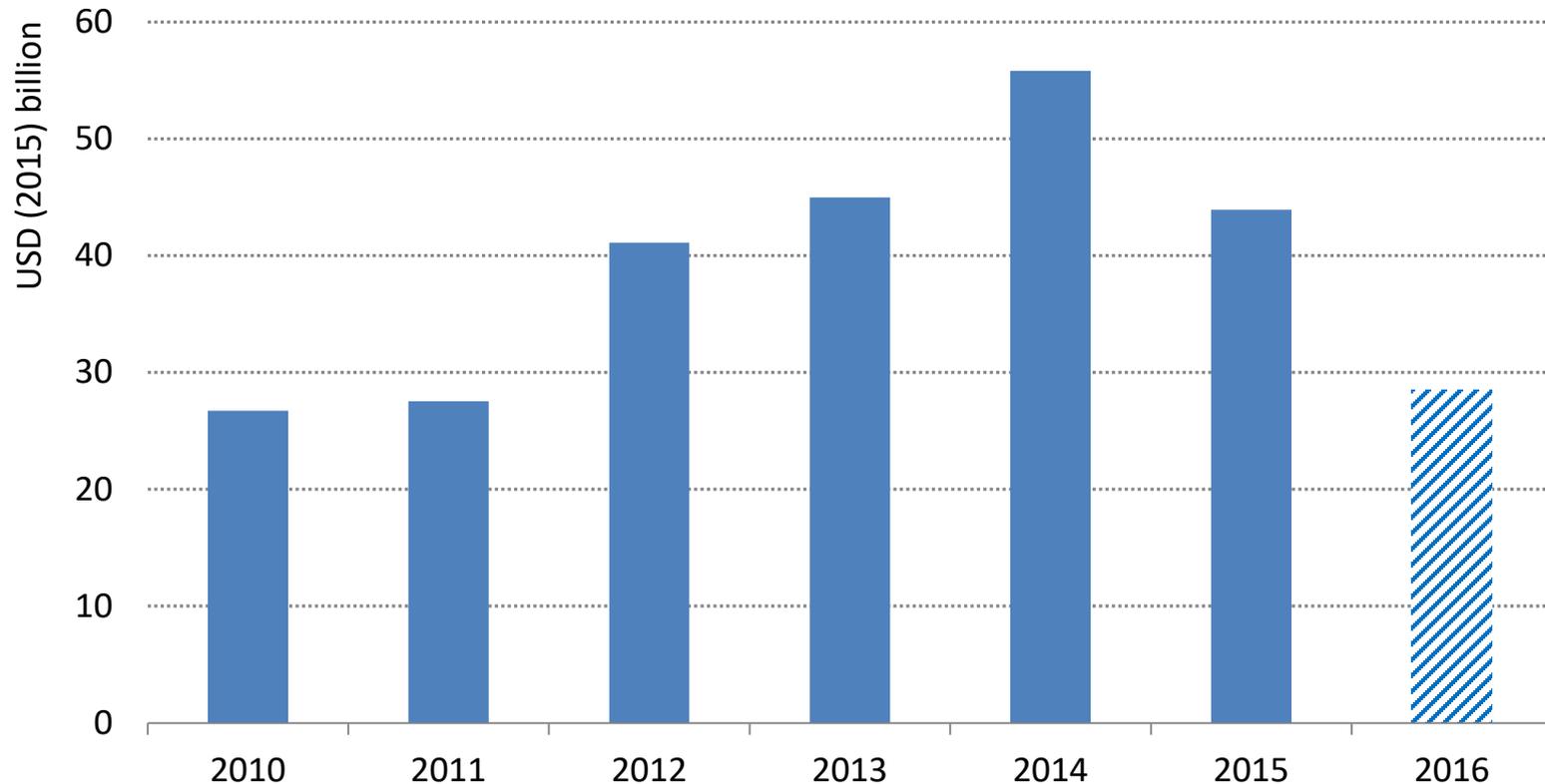
- ✓ **Equity stake by Total and EPC contract with Technip maintained**
- ✓ **CNPC + Silk Road Fund equity stakes**
- ✓ **Multibillion Euro/RMB Chinese project financing secured**

## LNG terminals investment

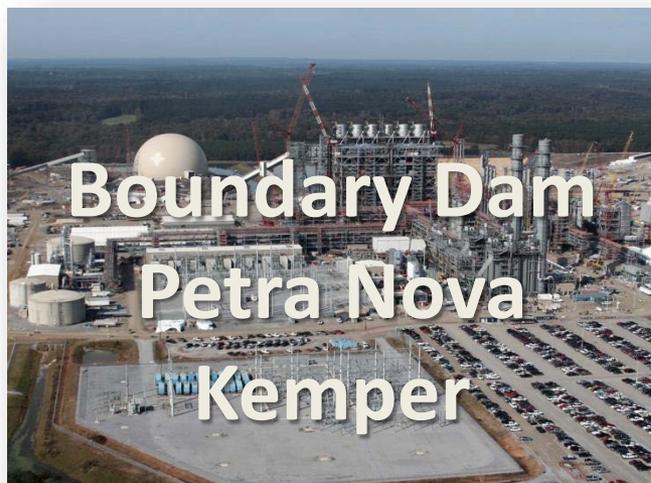


***Given the sharp fall of investment and increasing reluctance for new long term contracts LNG might be heading towards a new boom and bust cycle***

## North America oil & gas infrastructure capital spending 2010-2016



***Less well-connected states and regions that concentrated boom in production led investment in new infrastructure***



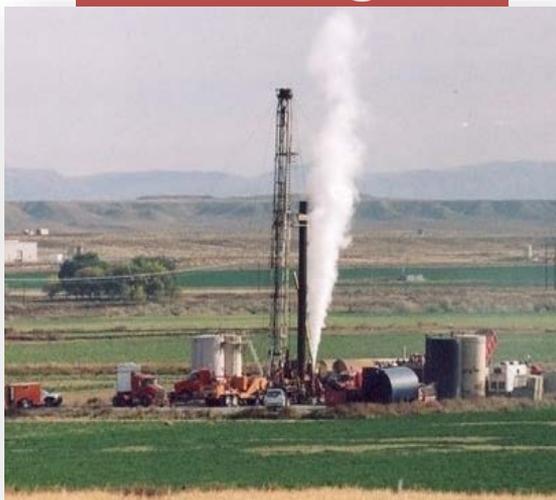
EOR oil pays for  
clean coal



Large oil and gas projects with  
an integrated CCS component

*For every single CCS project that has succeeded in real life hydrocarbon revenues played an important role*

## North American flaring



LTO slowdown enables midstream to catch up

## Russia, Nigeria, Iraq



Investment capability, geopolitics, and other priorities...

## Distribution



Investment capability of utilities

# Backup