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Global supply and market impacts of US unconventional oil production growth

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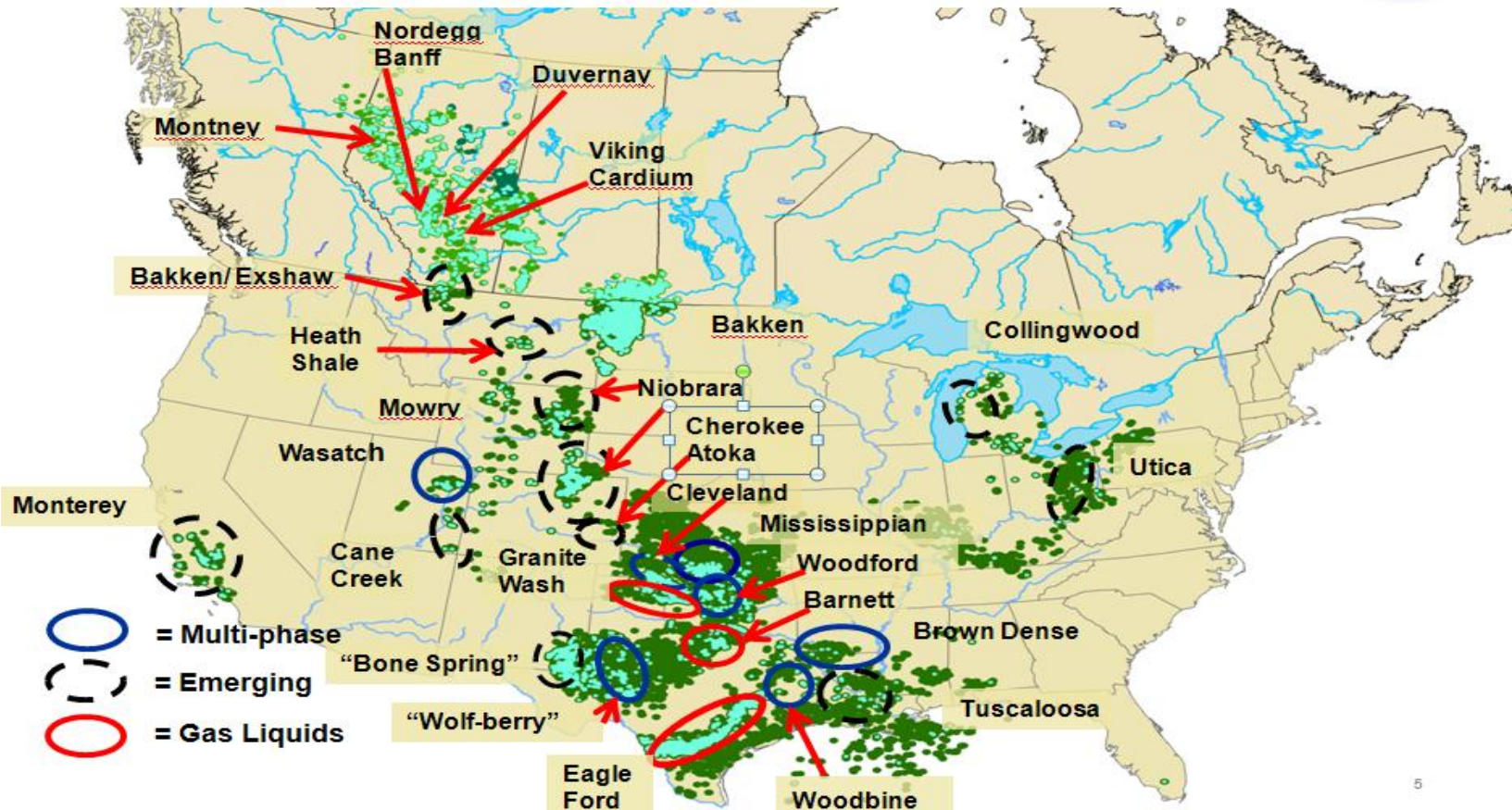
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Today's Themes



- US unconventional oil – where, how, how much?
- US position in global oil supply growth
- Market implications
- Can tight oil go global?

Tight Oil plays in North America - diverse and distributed



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- IHS estimates that tight oil adds over 40 billion barrels to North American recoverable supply



Price and technology drove success in US unconventional oil and gas plays

Step 1: Higher prices enabled investment in technology

- Gas prices began to rise in early 2000s -- gas supply bubble worked off and concerns grew over future gas supply
- Tight gas sand work in the Rockies develops slick water fracturing
- Horizontal drilling rolled out in earnest and combined with hydraulic fracturing in the Barnett Shale

Step 2: Technology transformed uneconomical and inaccessible resources into viable large-scale unconventional plays

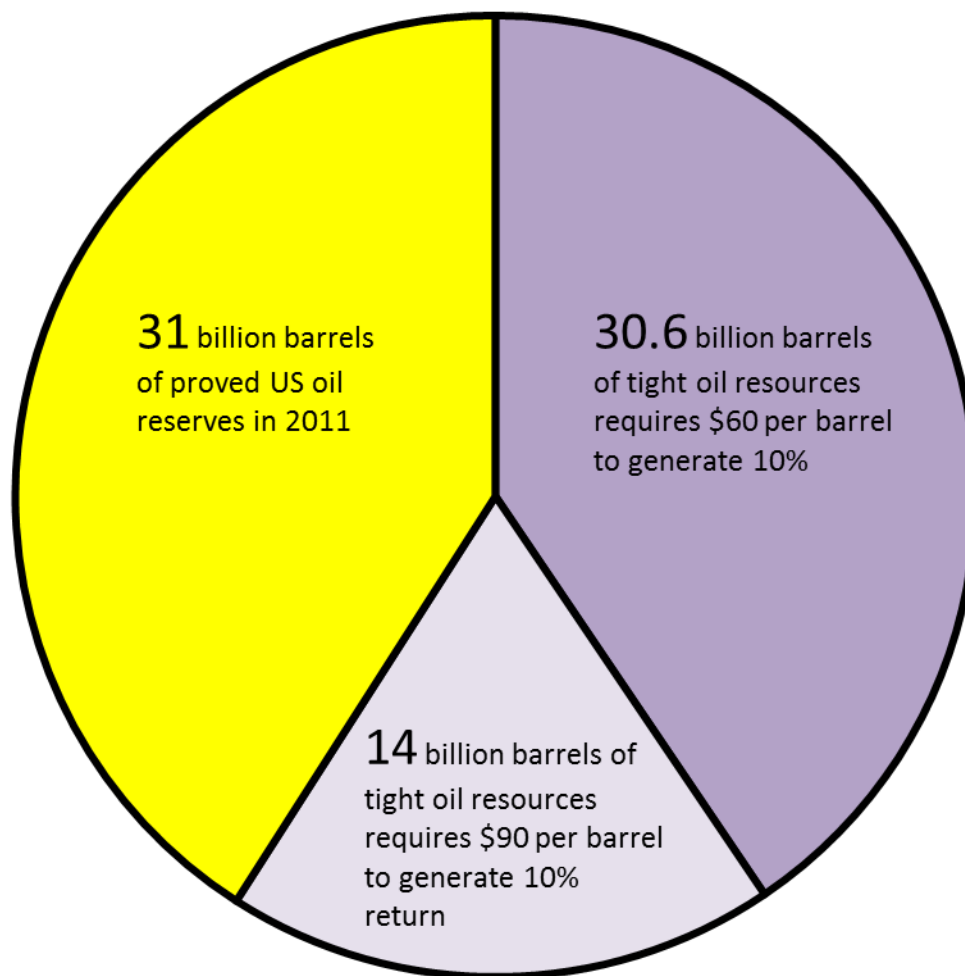
- Shale gas boom unleashed in multiple basins
- New supply led to fall in gas prices
- Oil prices remained strong and supported migration of horizontal drilling and multi-stage fracturing technology to tight oil plays, beginning with the North Dakota Bakken
- Multiple tight oil plays now developing

The US oil and gas business environment has enabled a rapid pace of development to scale



- Regulatory frameworks in the main allow horizontal drilling and fracturing to safely proceed
- Mineral ownership in the U.S. resides with private individuals, not just government, allowing for access to resources on private lands
 - Mineral owners are stakeholders in success
 - Acreage leaseholdings are distributed among many operators
- Intense competition for leases and acreage price escalation causes companies to develop plays very quickly to protect land investments
- Infrastructure, human resources, rigs, services and fit-for-purpose equipment are all readily available

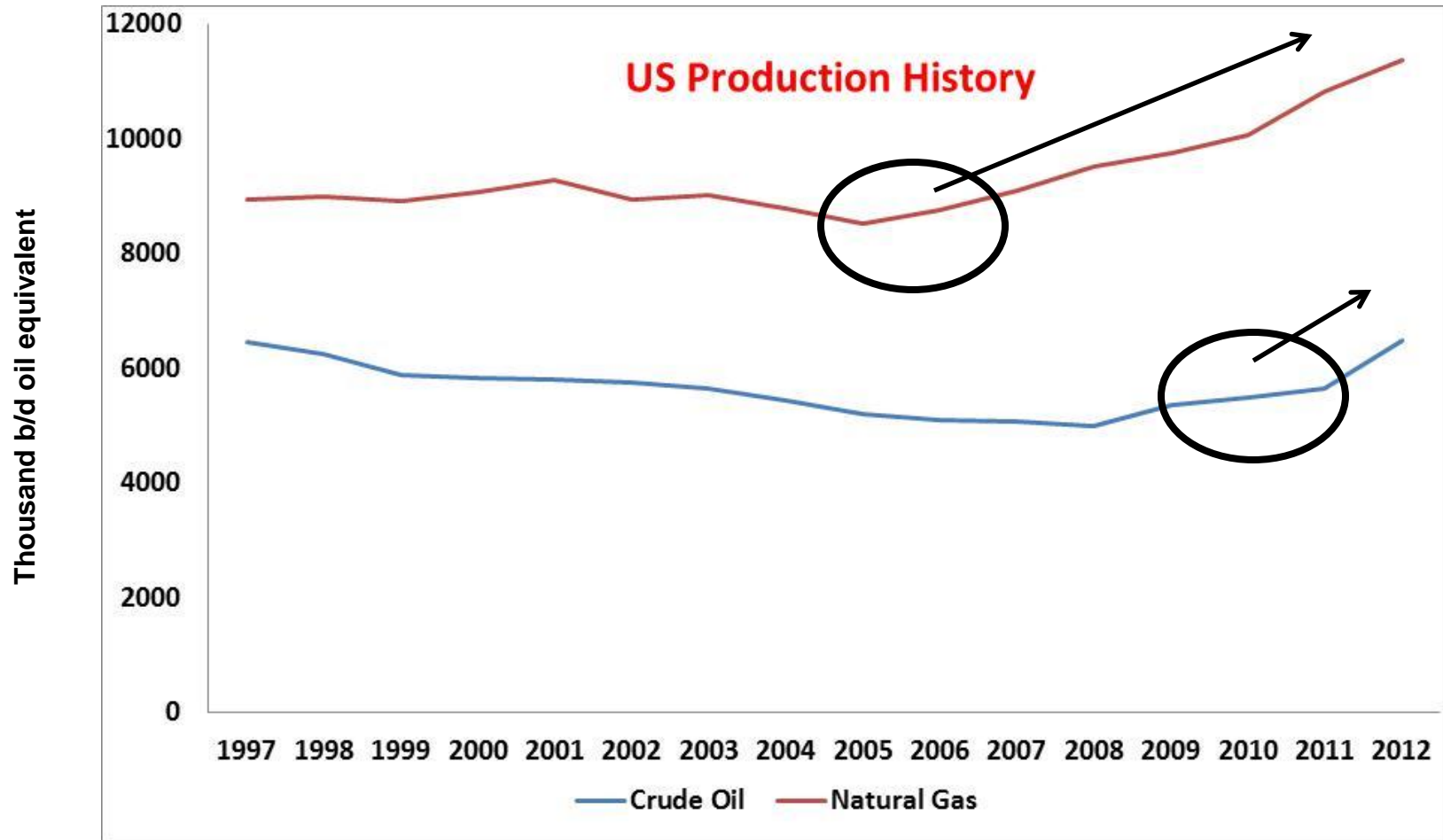
How big and how competitive is the US tight oil resource?



Tight oil resources are larger than US proved oil reserves—and much can be produced at a wellhead price of up to \$60

Source: IHS CERA.

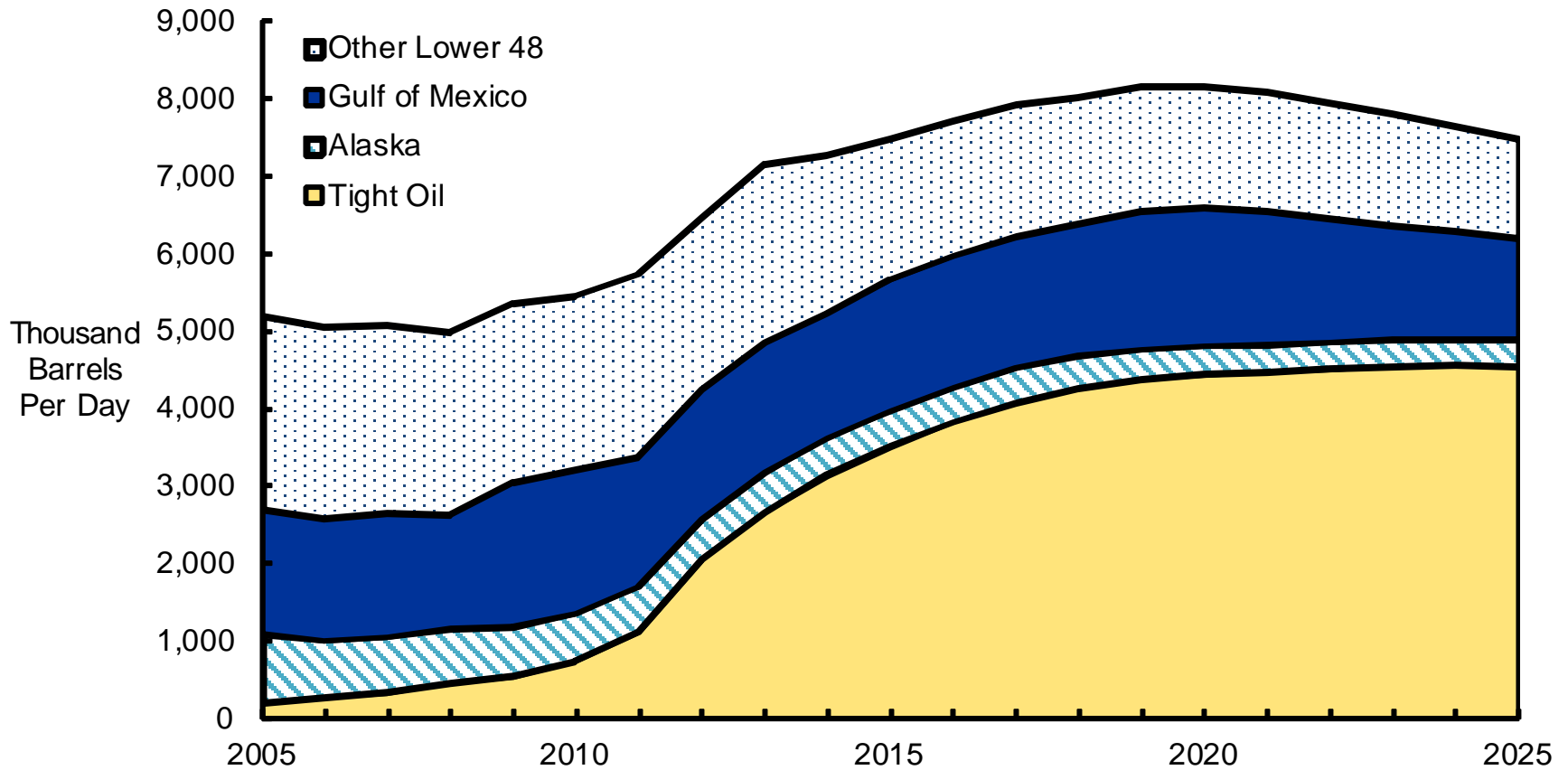
Unconventional natural gas and crude oil has revitalised US hydrocarbon production



Tight Oil is driving US crude oil production towards 8 mbd

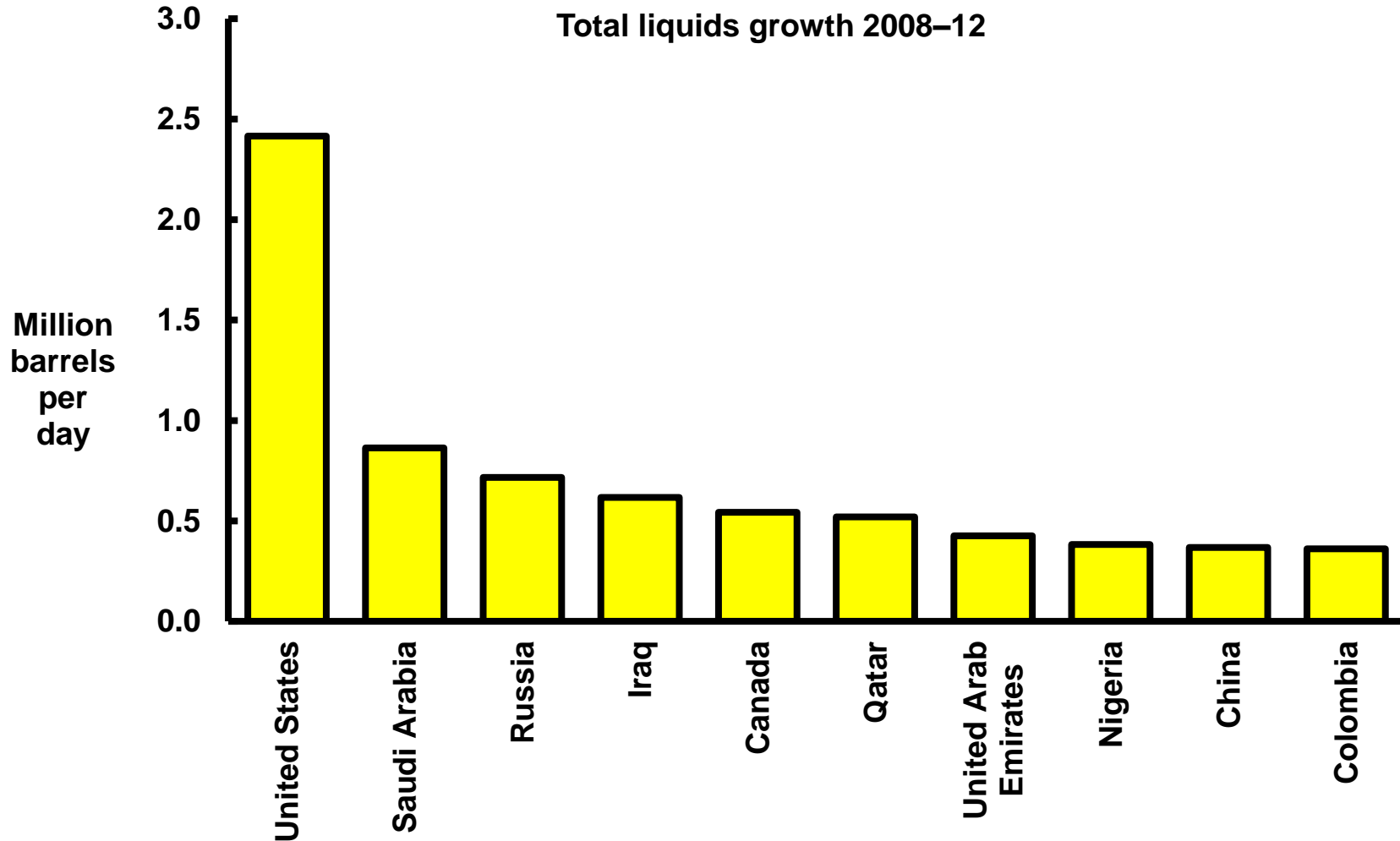


US crude oil production outlook



Source: IHS CERA

United States is the largest source of new liquids supply since 2008



Source: IEA, IHS CERA, national government data.

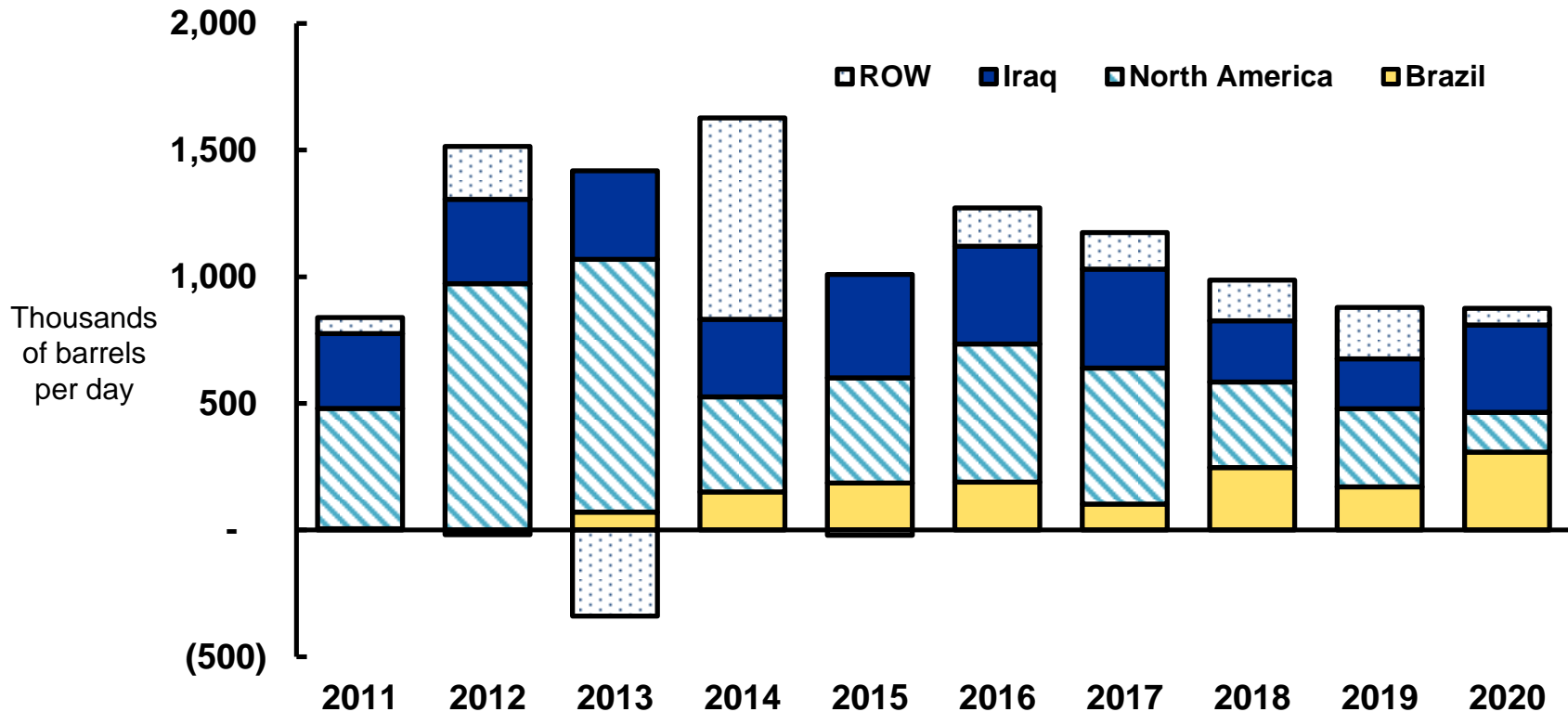
Note: Liquids includes ethanol and biodiesel for the United States and Canada, and ethanol for China and Columbia.

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North America will sustain its position as a leading contributor to liquids growth



Year-On-Year World Crude Oil Supply Growth

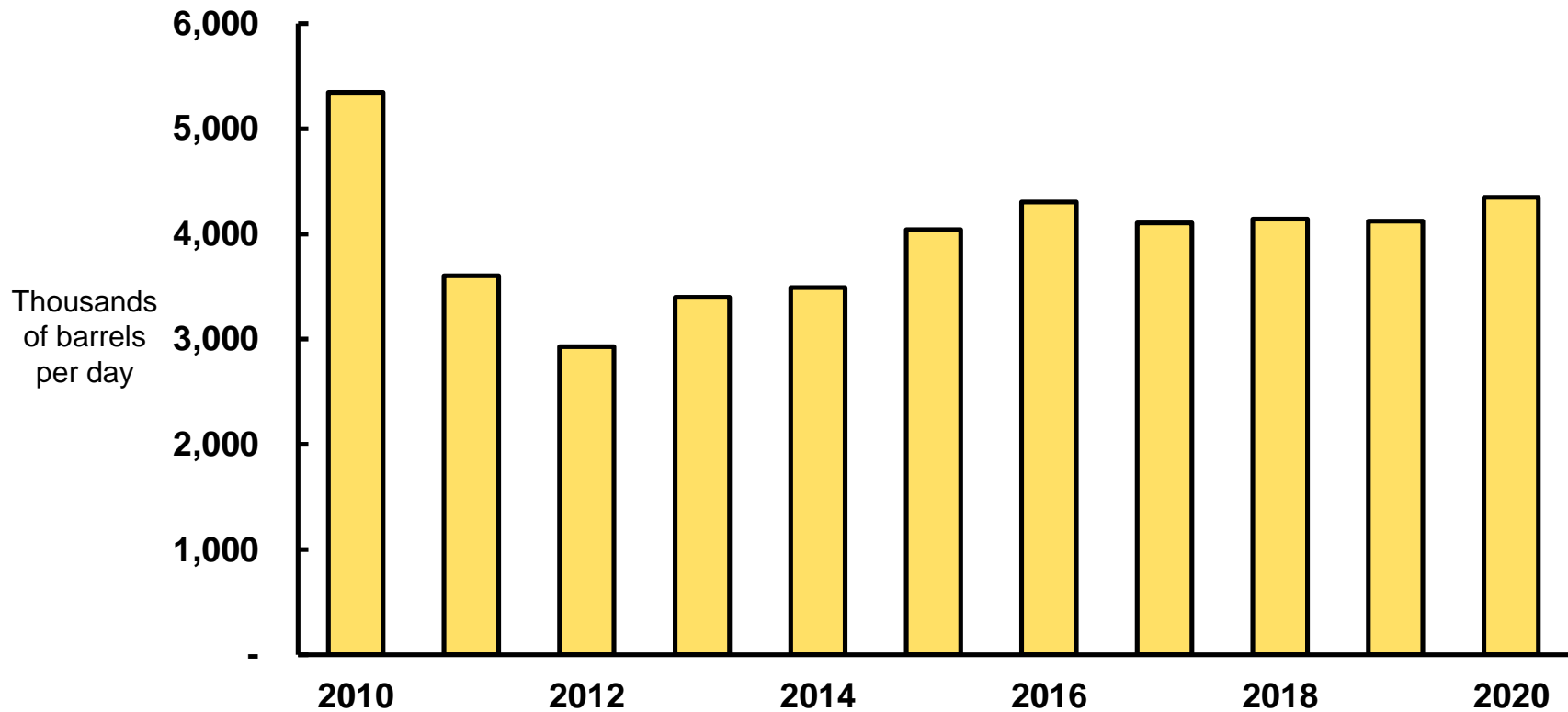


Sources: IHS CERA, with some historical data from International Energy Agency and US EIA.

Growing supply contributes to higher OPEC spare capacity



OPEC Spare Crude Oil Production Capacity

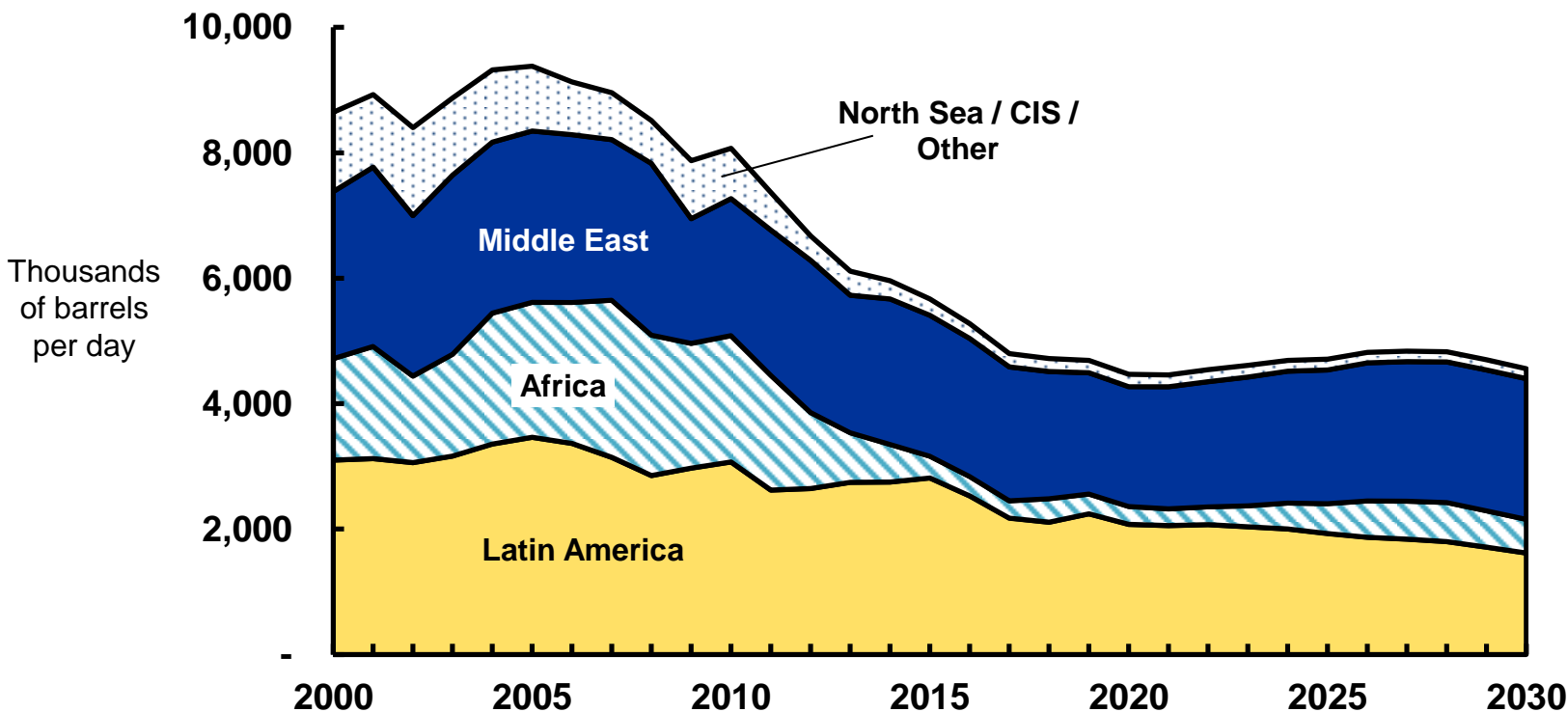


Sources: IHS CERA

Strong North American supply will reshape trade patterns

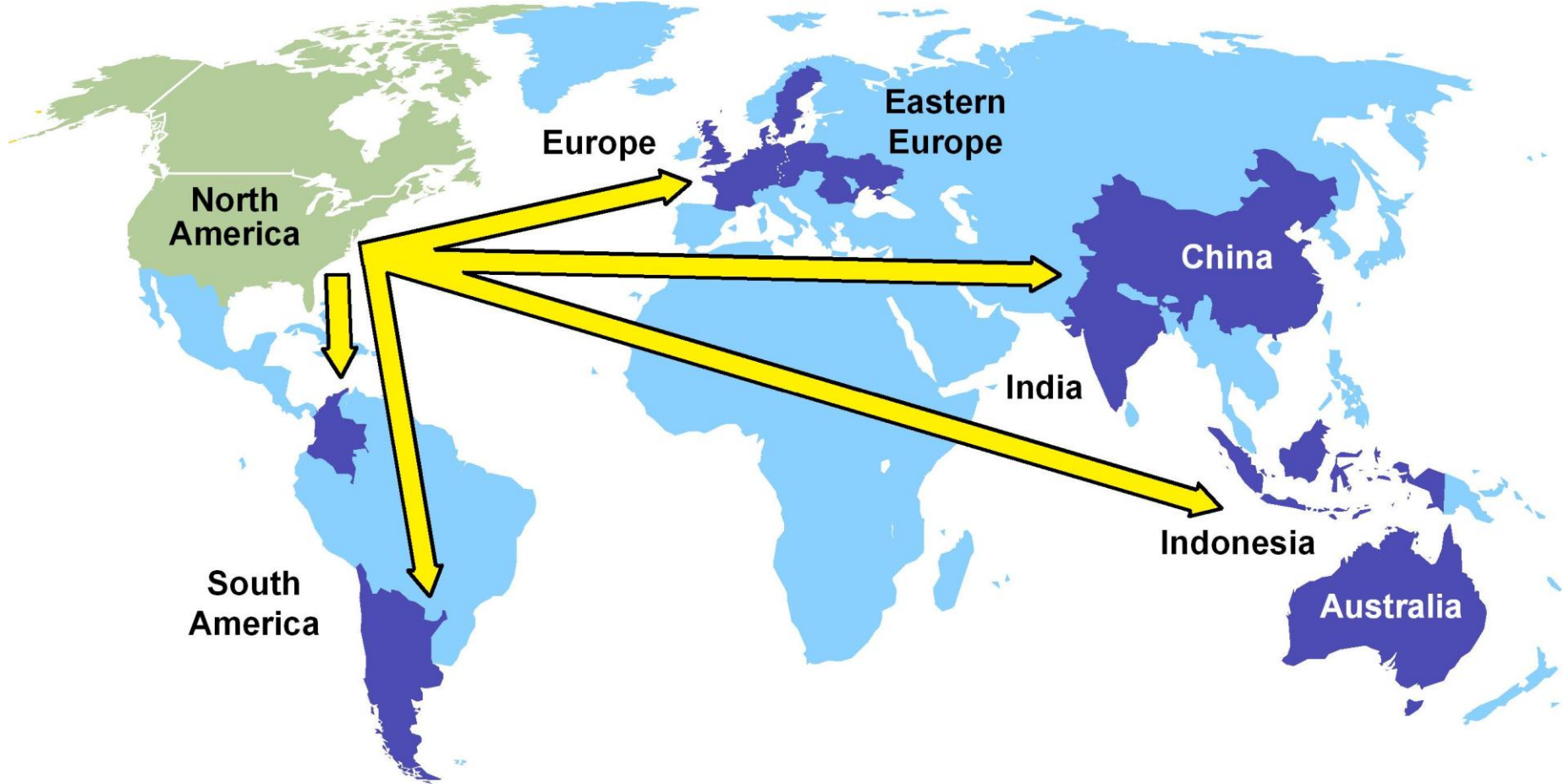


North America Offshore Crude Imports



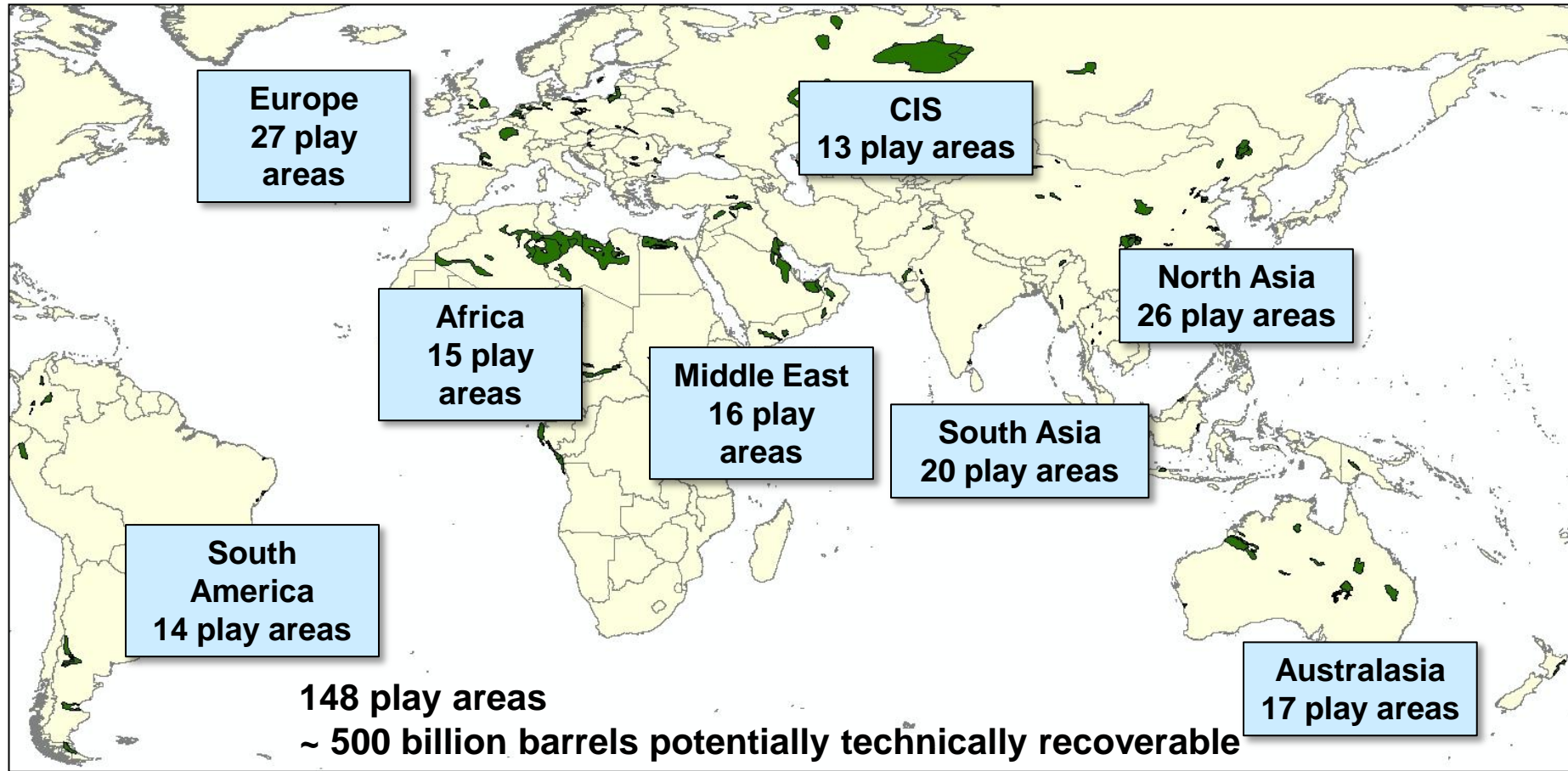
Sources: IHS CERA, with some historical data from US EIA.

Can lessons learned migrate to new regions of unconventional oil development?



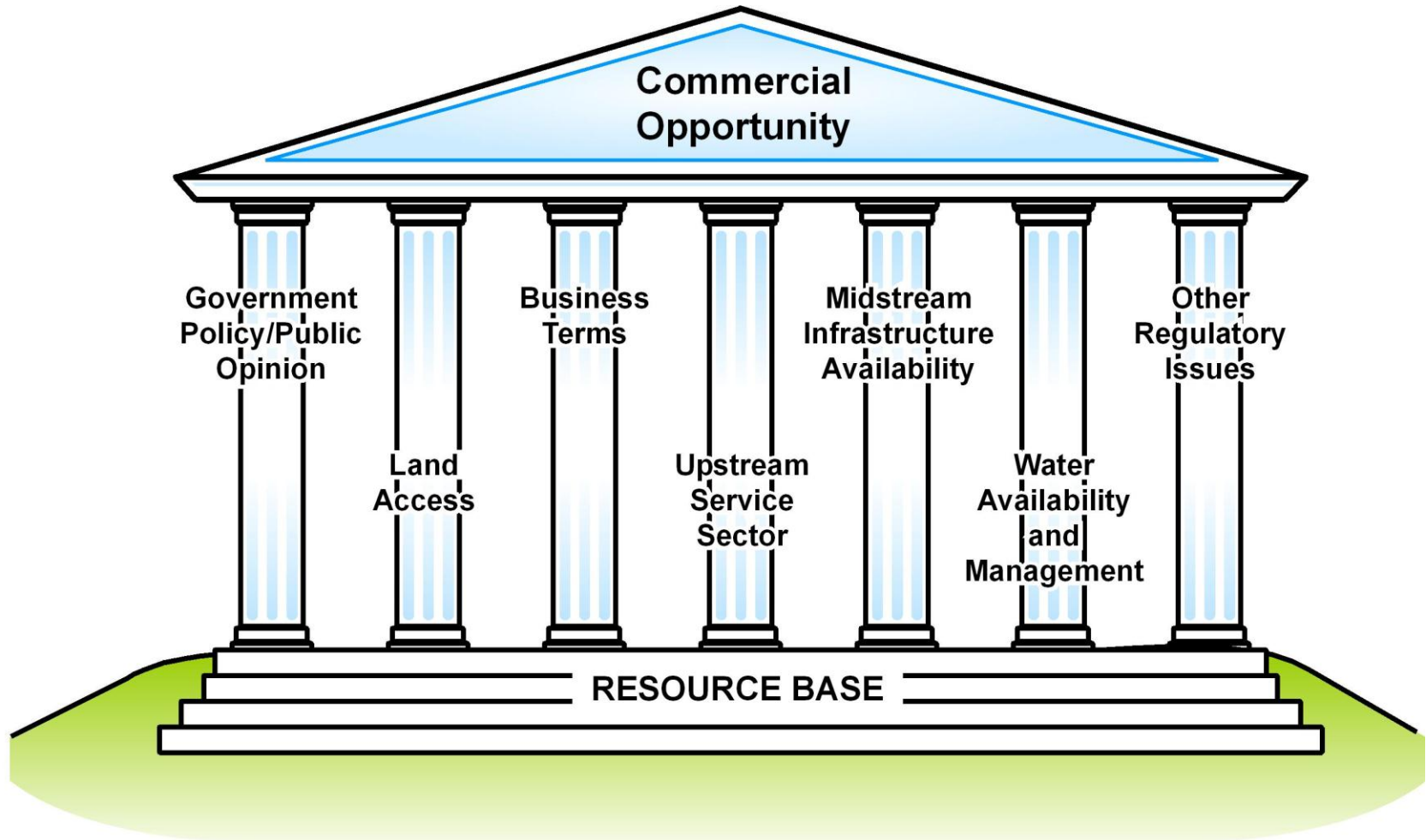
Source: IHS CERA.
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Many plays outside North America could be sources of significant development



Source: IHS CERA.

Unconventional oil and gas E&P: Above ground factors more challenging outside North America



In conclusion



- North America has led the world in unconventional gas and oil development
 - Uniquely favourable business environment factors helped accelerate development scale and timing
 - The rest of the world has high scope for both unconventional gas and oil
 - Above ground factors will limit the speed of development in most places relative to North America but long-term prospects are positive
- Expansion of supply options opens up new options for markets and trade
 - Shifting patterns of crude oil trade as US import needs decline
 - Spill over effects into refined products trade
 - Consolidates non-OPEC role in future investment and supply growth