

World Hydrocarbon Resources



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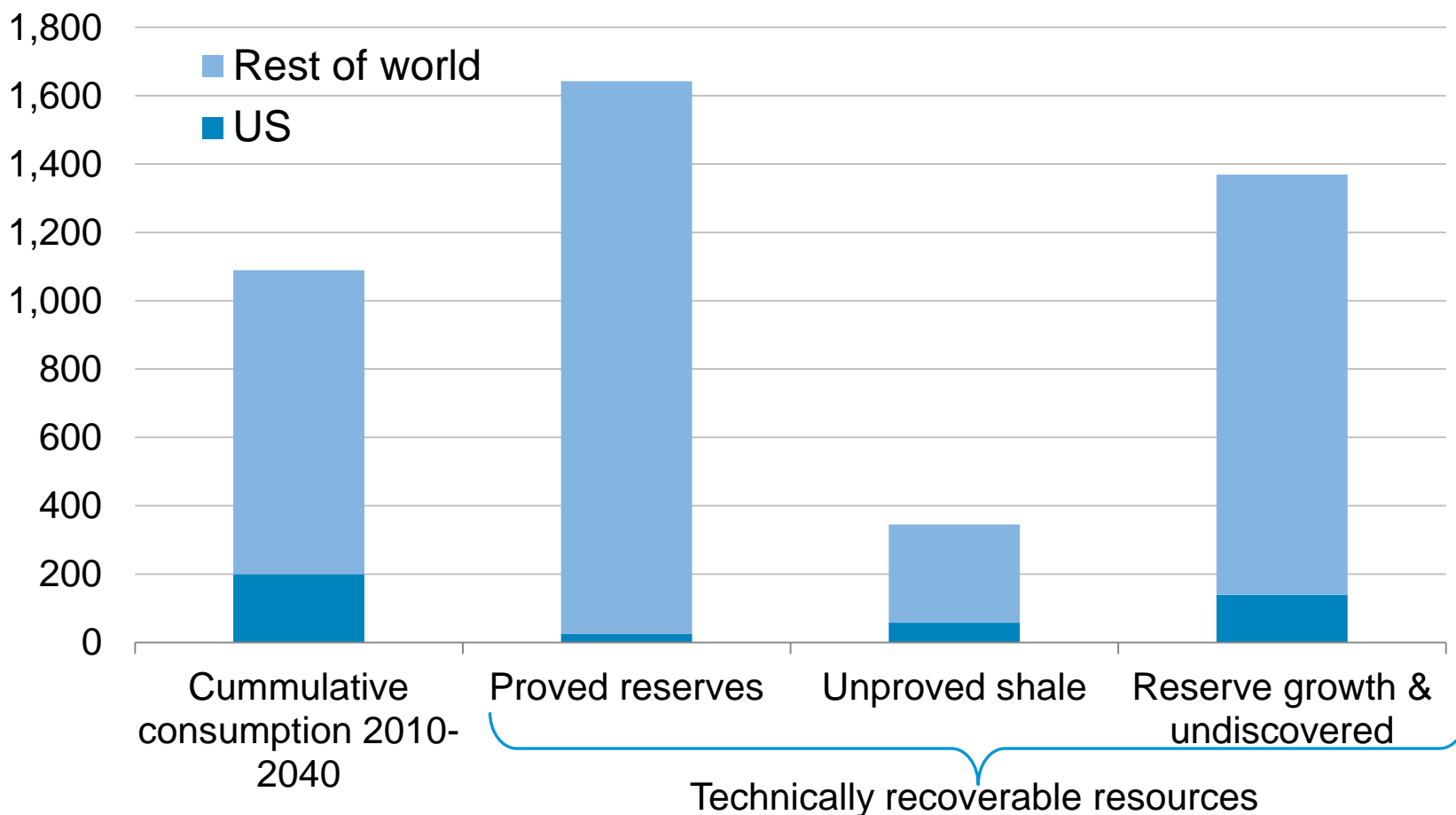
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The world will consume 1,100 billion barrels of oil between 2010 and 2040

oil

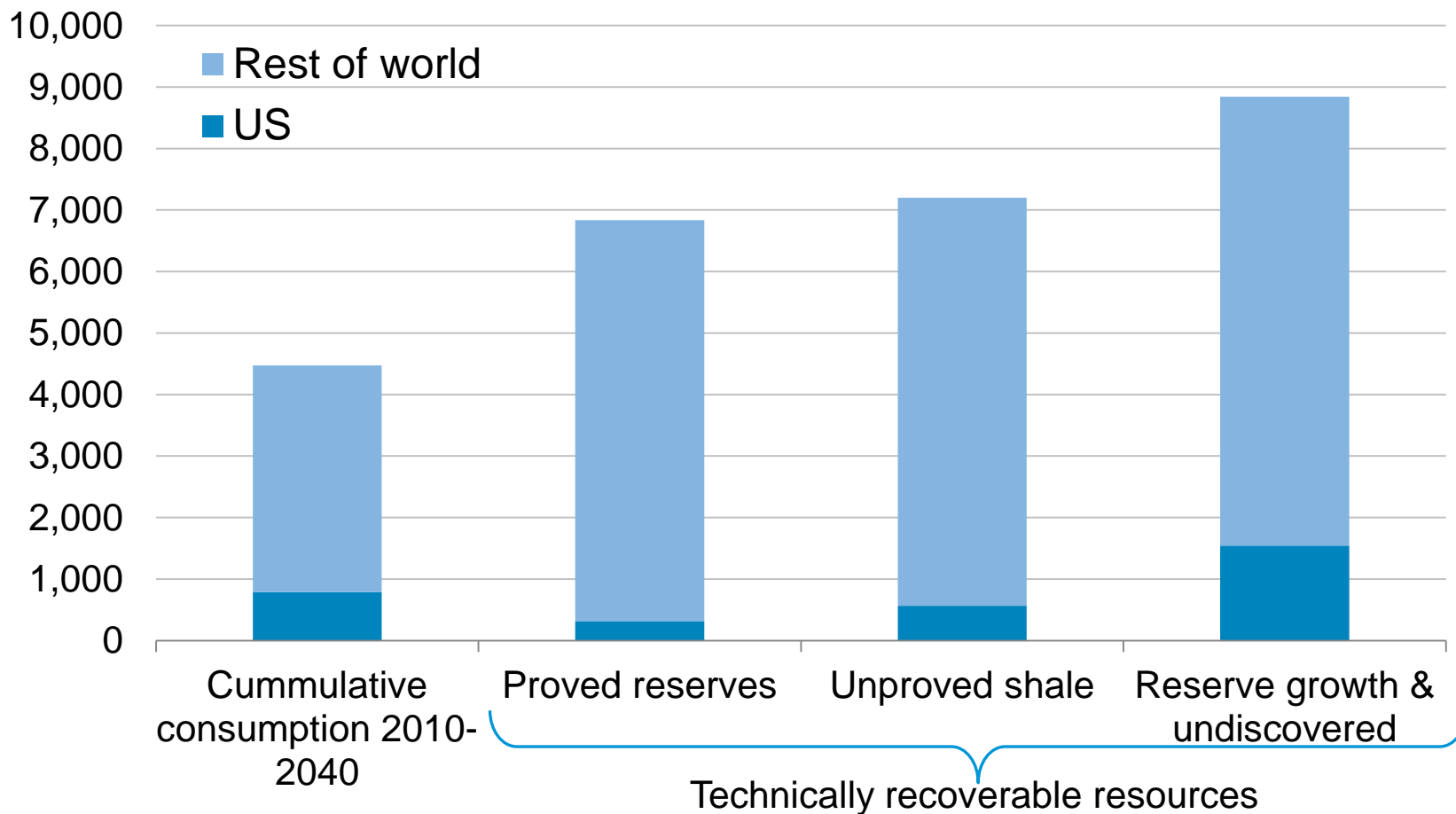
billion barrels



Source: ARI 2013; O&GJ Dec. 2012; USGS 2012; EIA AEO2013 Reference case

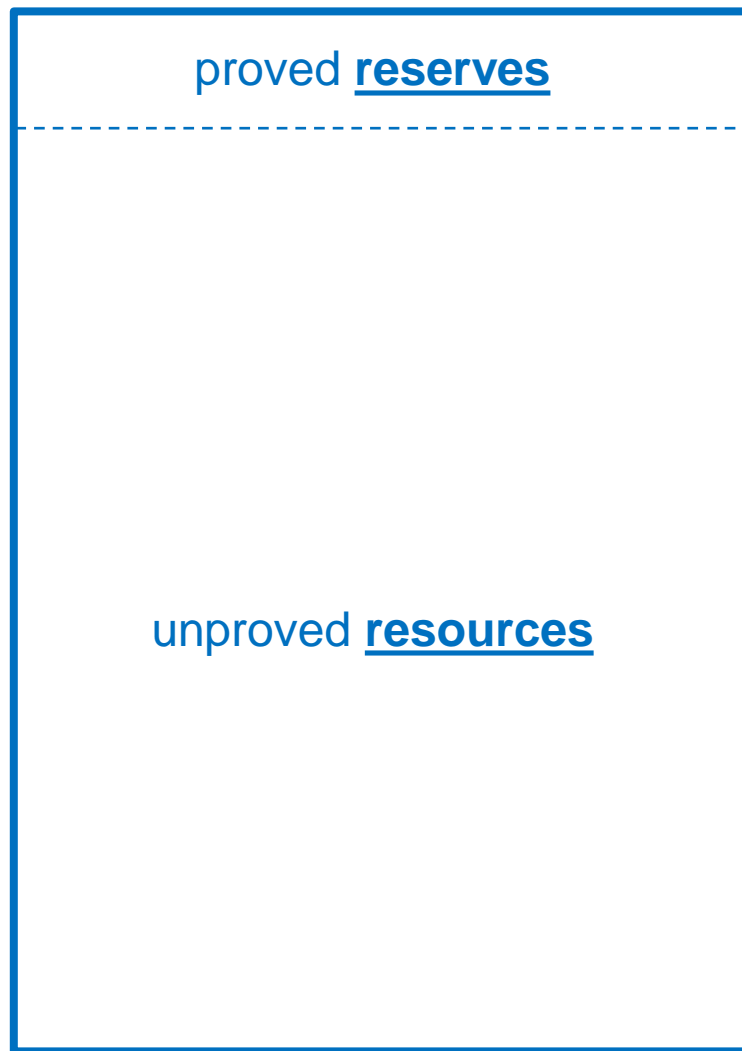
And 4,475 trillion cubic feet of natural gas between 2010 and 2040

natural gas
trillion cubic feet



Source: ARI 2013; O&GJ Dec. 2012; USGS 2012; EIA IEO2011 Reference case

Technically recoverable resources (TRR)



Economic recoverability depends on

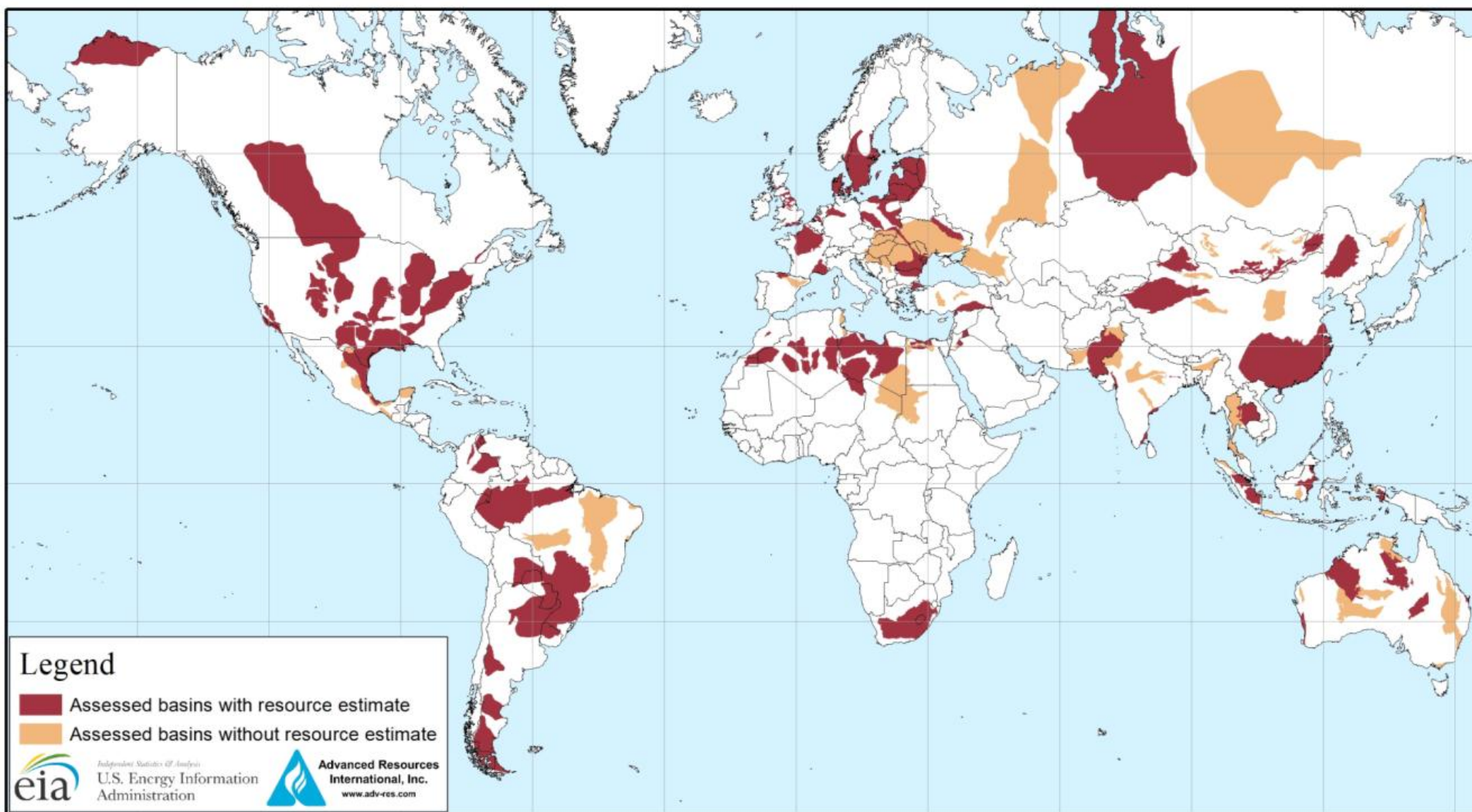
1. cost of drilling and completing wells
2. amount of hydrocarbon produced from an average well over its lifetime, and
3. prices received for oil and gas production

unproved resources

could be produced with current technology, but no consideration of oil and natural gas prices and production costs

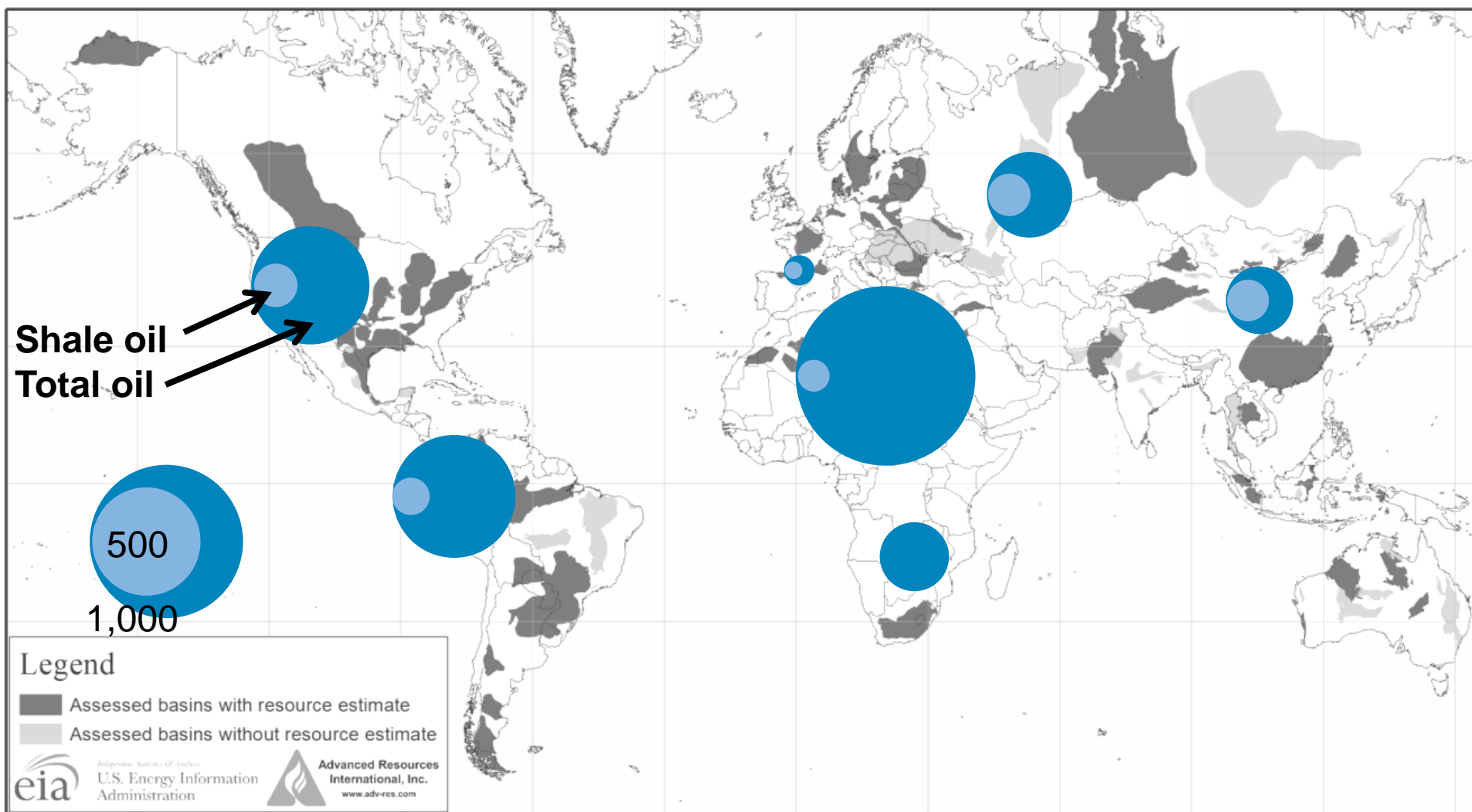
Not to scale

EIA / ARI assessed shale oil and shale gas resources 2013



Source: United States basins from EIA and United States Geological Survey, other basins from ARI based on data from various published studies

World shale and nonshale oil resources (billion barrels)



Source: United States basins from EIA and United States Geological Survey, other basins from ARI based on data from various published studies

World shale and nonshale gas resources (trillion cubic feet)



Source: United States basins from EIA and United States Geological Survey, other basins from ARI based on data from various published studies

Technically recoverable shale oil and shale gas resources in the context of total world resources

	Crude oil (billion barrels)	Wet natural gas (trillion cubic feet)
United States		
Shale / tight oil and shale gas	58	665
Non-shale	164	1,766
Total	223	2,431
Increase in total resources due to inclusion of shale oil and shale gas	35%	38%
Shale as a percent of total	26%	27%
Total World		
Shale / tight oil and shale gas	345	7,299
Non-shale	3,012	15,583
Total	3,357	22,882
Increase in total resources due to inclusion of shale oil and shale gas	11%	47%
Shale as a percent of total	10%	32%

Source: 1. ARI 2013; 2. O&GJ Dec. 2012 and USGS 2012; 3. U.S. EIA

This is a foundational study that can be continually updated with new information. It should remain an “evergreen” study.

- Volumetric approach

- Volume of rock
- Identify share of area with potential
- Estimate oil and gas **in-place** based on pore space
- Apply geology and above-ground risk factors to “de-risk” the developable resource
- Multiply by a recovery factor (informed from U.S. experience)
 - Generally 20% to 30% for natural gas
 - Generally 3% to 7% for oil

Basic Data	Basin/Gross Area		Alberta Basin (28,700 mi ²)
	Shale Formation		Banff/Exshaw
	Geologic Age		L. Mississippian
	Depositional Environment		Marine
Physical Extent	Prospective Area (mi ²)		10,500
	Thickness (ft)	Organically Rich	65
		Net	15
	Depth (ft)	Interval	3,900 - 6,200
Average		4,800	
Reservoir Properties	Reservoir Pressure		Normal
	Average TOC (wt. %)		3.2%
	Thermal Maturity (% Ro)		0.90%
	Clay Content		Medium
Resource	Oil Phase		Oil
	OIP Concentration (MMbbl/mi ²)		2.5
	Risky OIP (B bbl)		10.5
	Risky Recoverable (B bbl)		0.32