

Shale Gas and Tight Oil Development in the U.S., Poland and the Rest of World: Status and Outlook



US-Poland Energy Roundtable

United States Energy Association

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by

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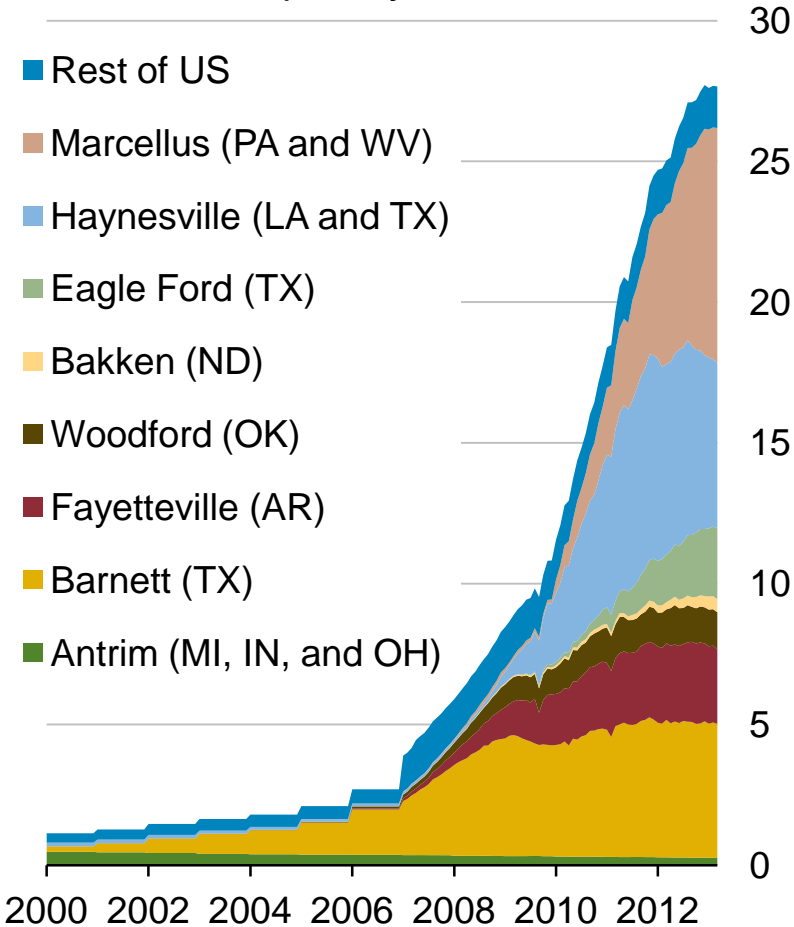
World Shale Oil and Gas Resource Assessments and Activities

Overview

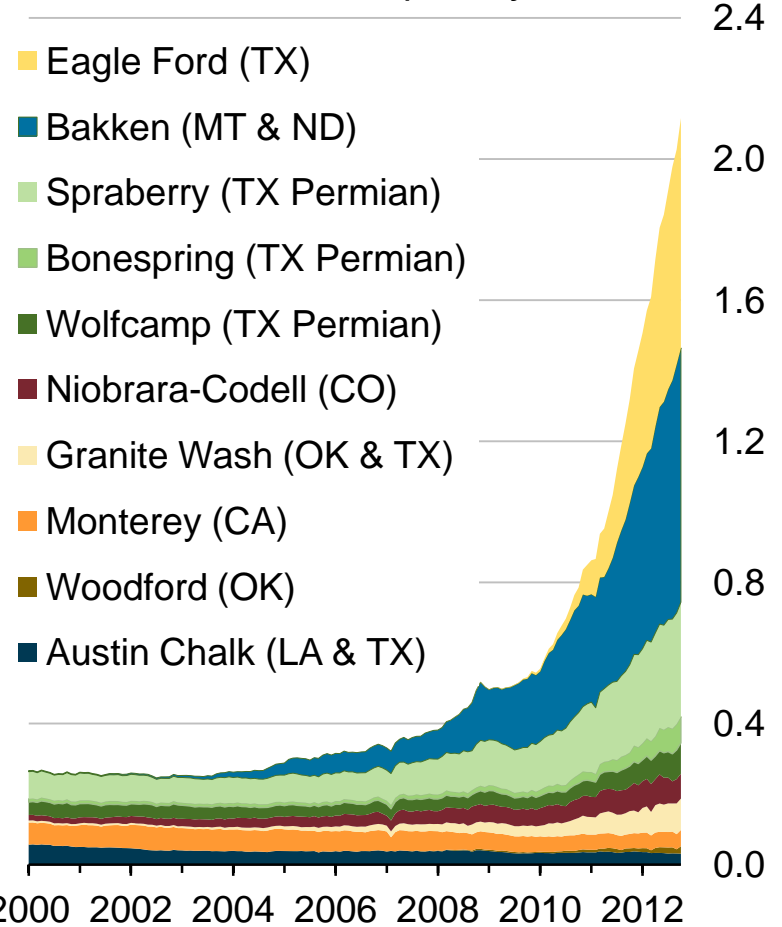
- Status and outlook of shale gas and tight oil development in the U.S.
- EIA perspective on shale gas and tight oil resources in Poland and the rest of the world

Domestic production of shale gas and tight oil has grown dramatically over the past few years

shale gas production (dry)
billion cubic feet per day

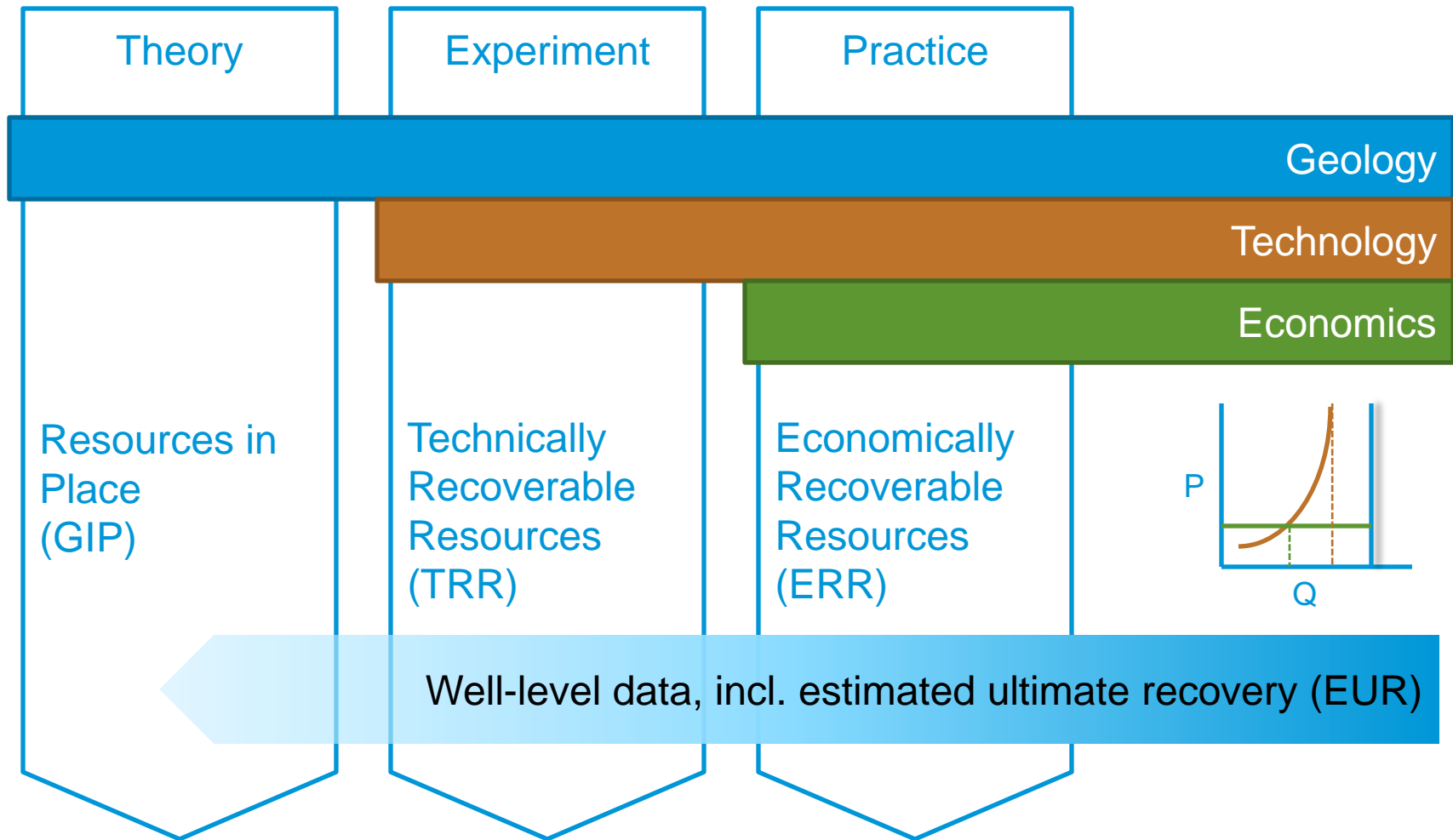


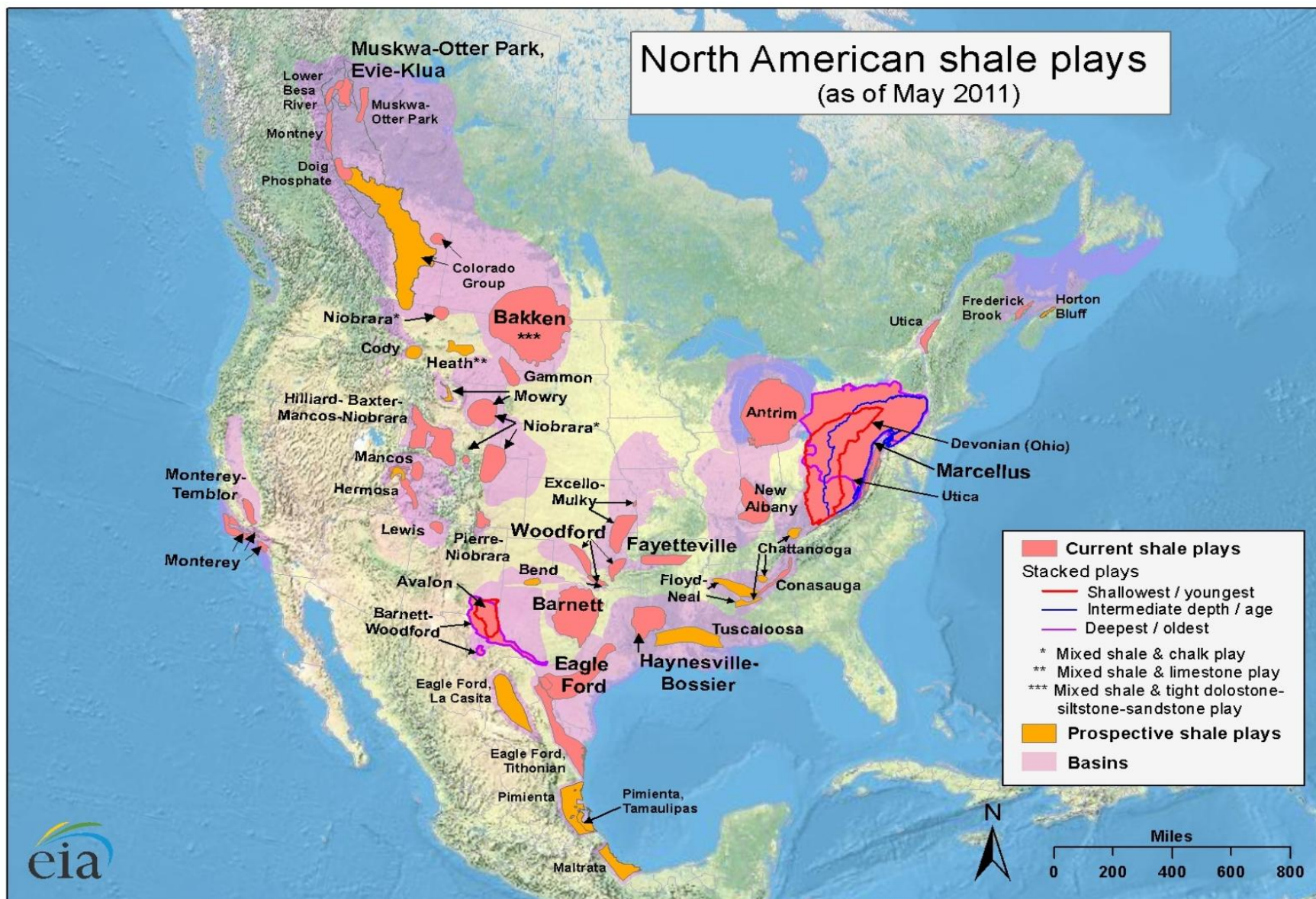
tight oil production
million barrels of oil per day



Sources: LCI Energy Insight gross withdrawal estimates as of March 2013 and converted to dry production estimates with EIA-calculated average gross-to-dry shrinkage factors by state and/or shale play. Tight oil: Drilling Info & EIA through December 2012

These three drivers impact resource estimation metrics differently over time in an iterative process





Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.

Technically recoverable natural gas resources reflect new information, a combination of assessments and EIA updates

U.S. dry gas resources

trillion cubic feet

3000

2500

2000

1500

1000

500

0

Unproved shale gas

Unproved other gas (including Alaska* and offshore)

Proved reserves (all types & locations incl. 94 Tcf shale)

*Alaska resource estimates prior to AEO2009 reflect resources from the North Slope that were not included in previously published documentation.

USGS Marcellus Assessment Benchmarking

2000

2005

2006

2007

2008

2009

2010

2011

2012

2013

AEO Edition

2,327

543

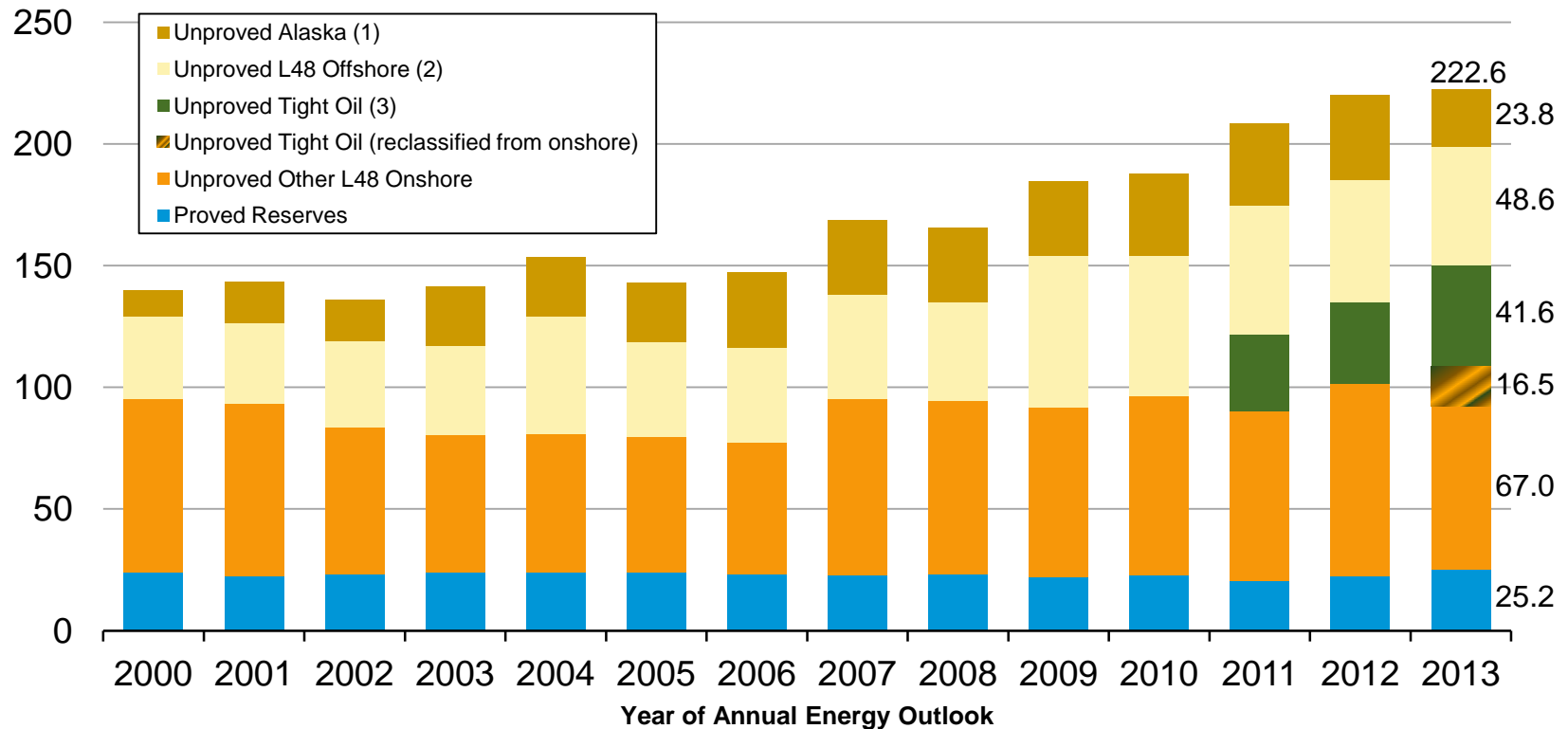
1,479

304

Source: EIA, Annual Energy Outlook 2013 Early Release

Multiple factors have contributed to U.S. crude oil resource estimate increases over the years, with tight oil contributing recently

U.S. crude oil and lease condensate resources in non-prohibited areas
billion barrels



(1) The USGS reduced NPR-A resource estimates, which is responsible for the lower AEO2013 Alaska resources.

(2) Prior to AEO2009, resources in Pacific, Atlantic, and Eastern GOM OCS were under moratoria and not included.

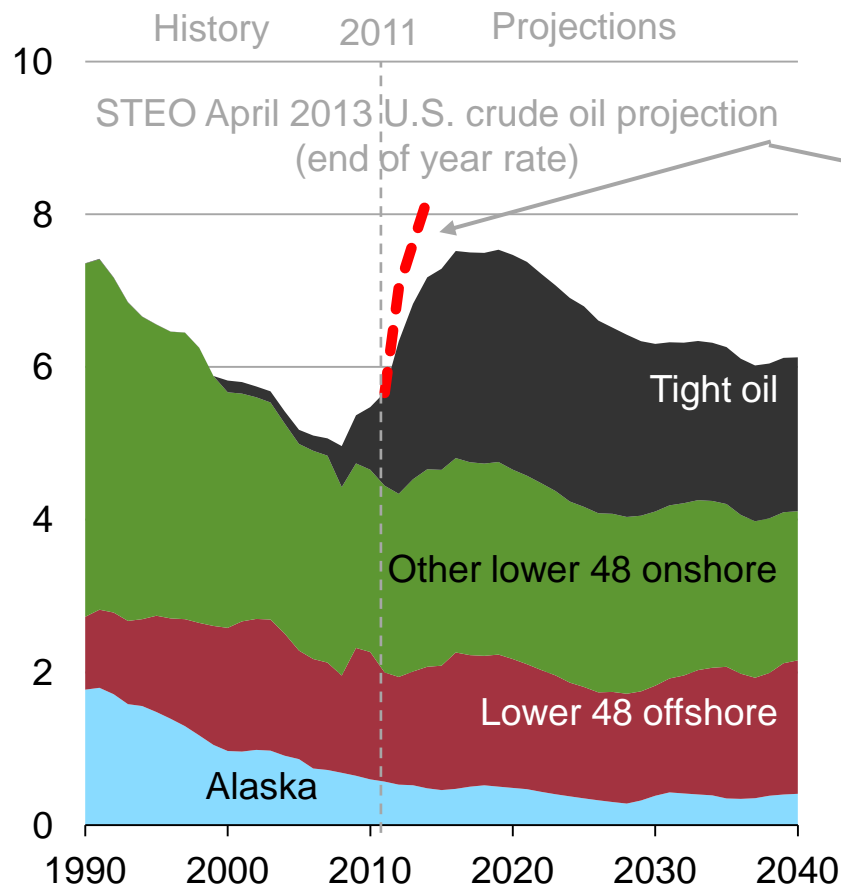
(3) Includes shale oil. Prior to AEO2011, tight oil is included in unproved other lower-48 onshore category.

Source: EIA, Annual Energy Outlook 2013 Early Release

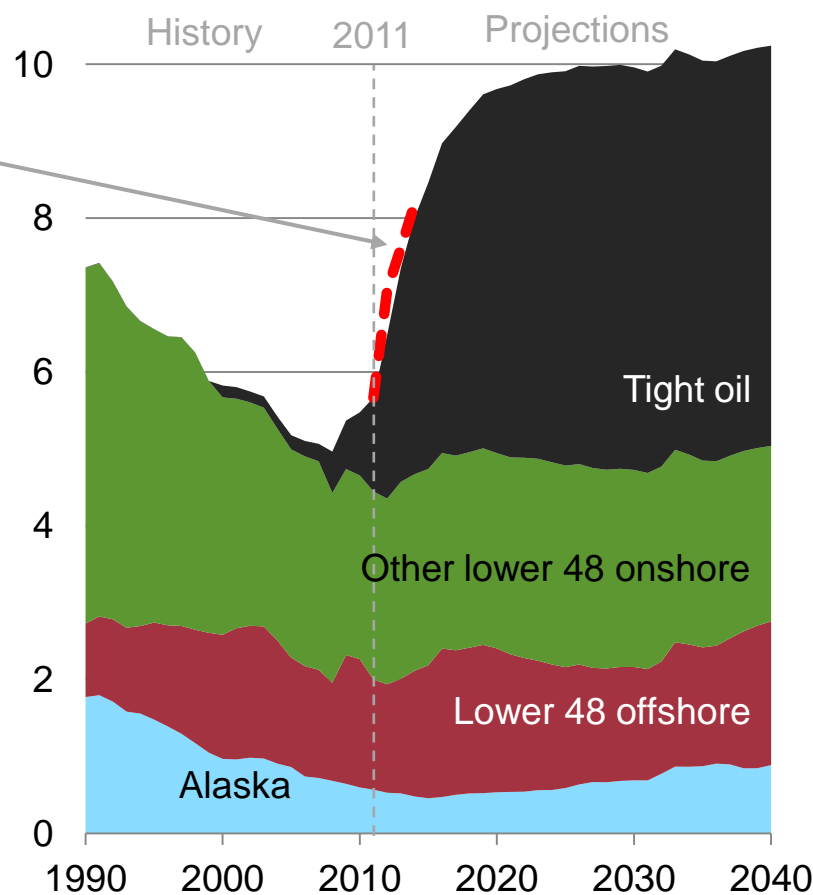
U.S. tight oil production leads growth in domestic production

Reference case

U.S. crude oil production (million barrels per day)



High Oil & Natural Gas Resource case

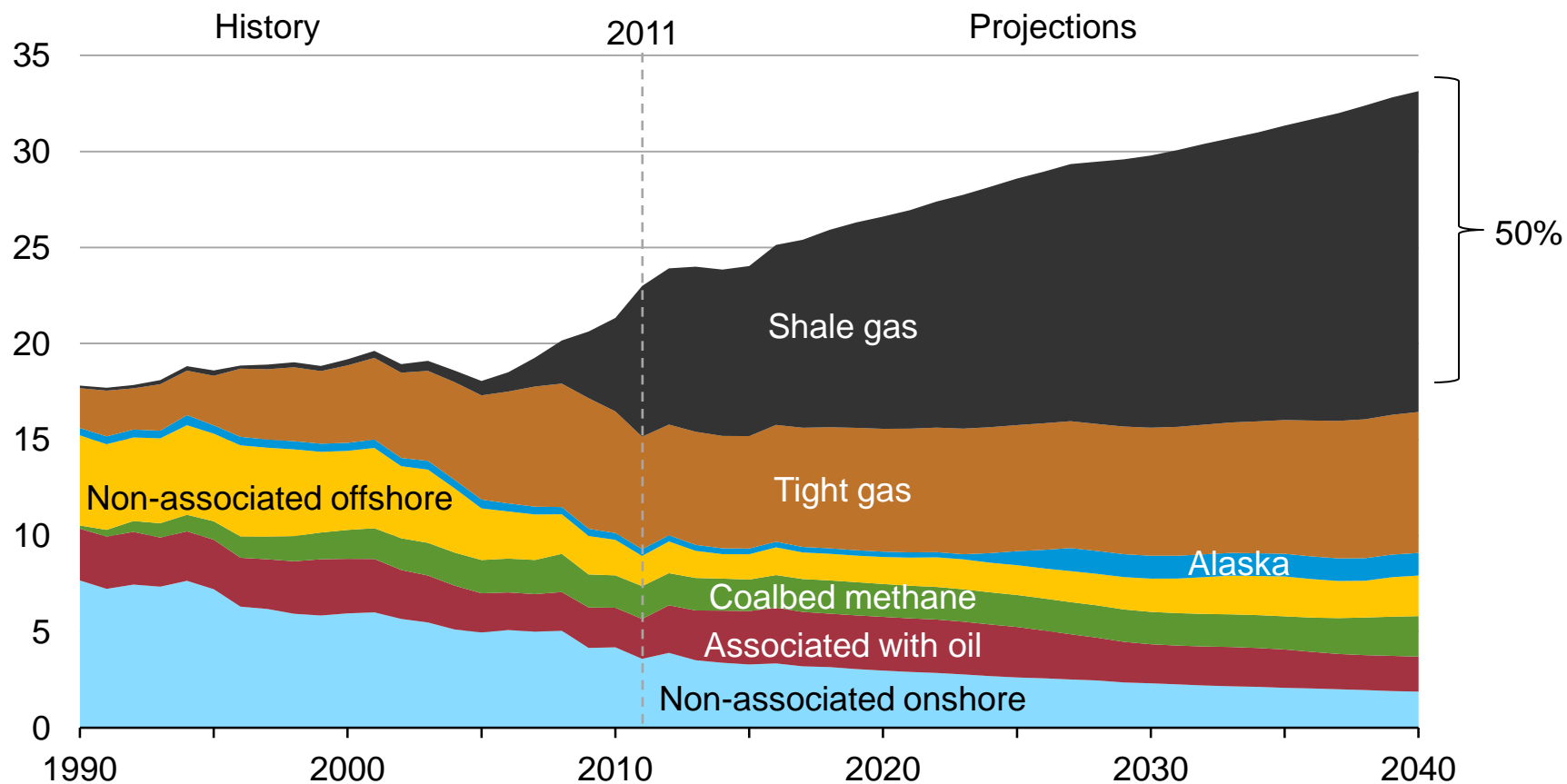


Source: EIA, Annual Energy Outlook 2013 Early Release, and Short-Term Energy Outlook, April 2013

Source: EIA, Annual Energy Outlook 2013 High Oil & Gas Resource case

Shale gas production leads growth in production through 2040

U.S. dry natural gas production
trillion cubic feet

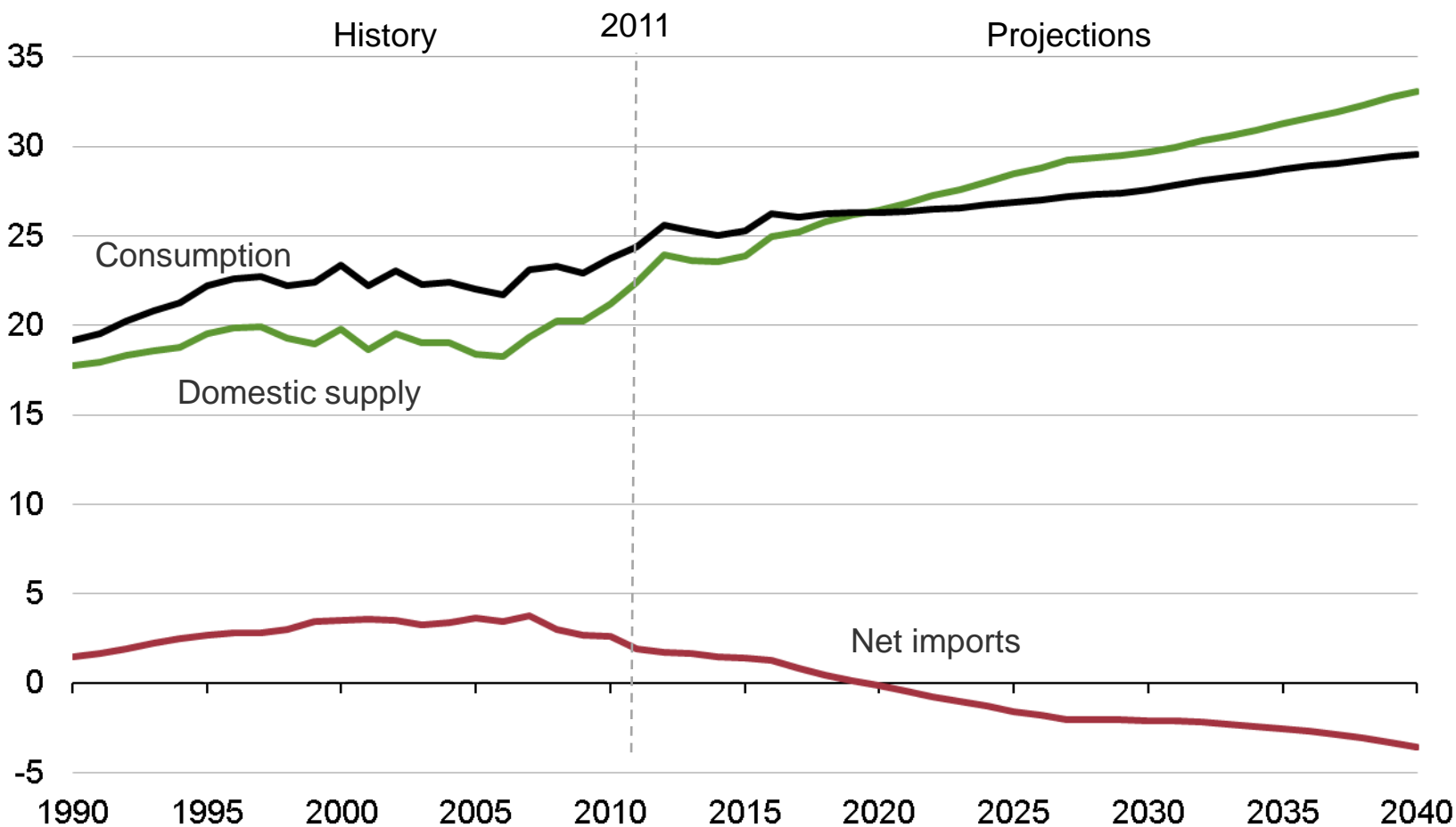


Source: EIA, Annual Energy Outlook 2013 Early Release

Domestic natural gas production grows faster than consumption and the U.S. becomes a net exporter of natural gas around 2020

U.S. dry gas

trillion cubic feet

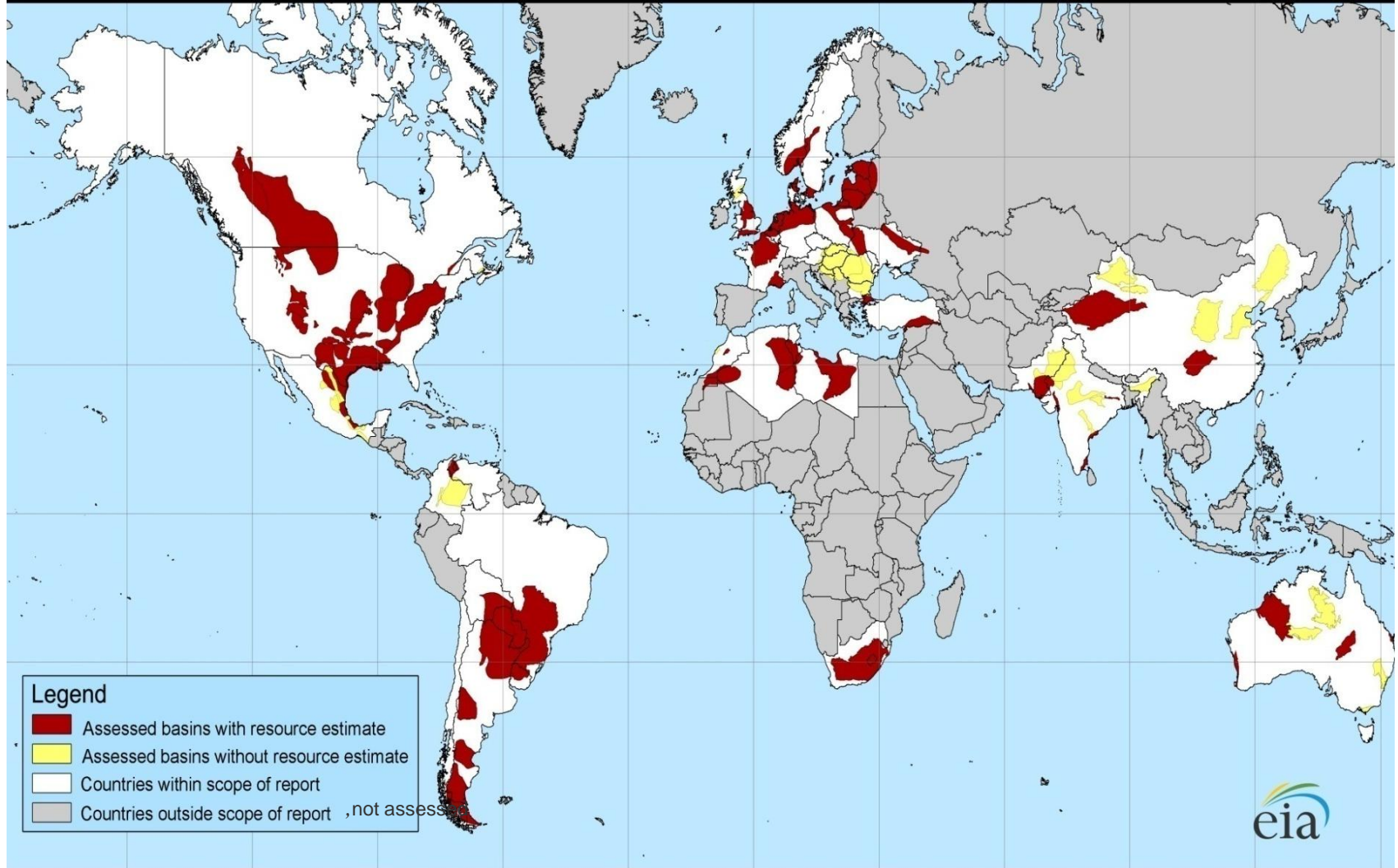


Source: EIA, Annual Energy Outlook 2013 Early Release

Foreign joint venture investment in U.S. shale plays

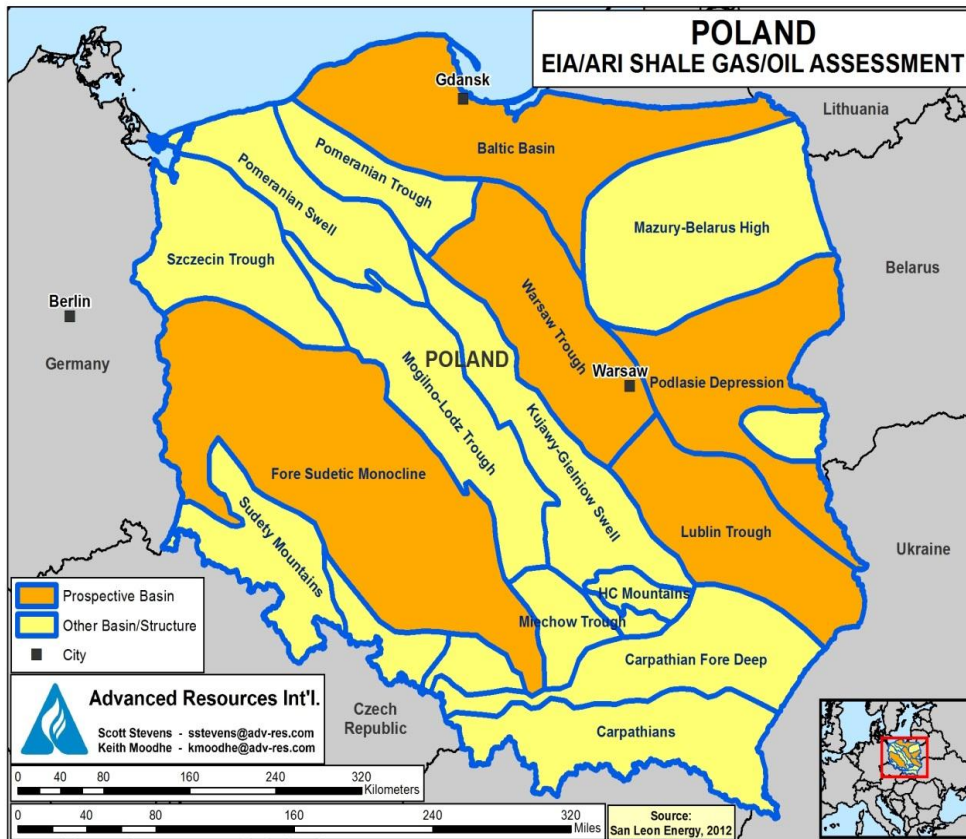
Foreign Partner	Country	Domestic Partner	Shale Play	Amount (\$B)	Year
British Petroleum	UK	Chesapeake	Woodford	1.70	2008
British Gas Group	UK	EXCO	Marcellus	0.95	2009
StatoilHydro	Norway	Chesapeake	Marcellus	3.38	2009
Reliance	India	Pioneer	Eagle Ford	1.36	2010
Reliance	India	Atlas	Marcellus	1.70	2010
Reliance	India	Carrizo	Marcellus	0.39	2010
Total	France	Chesapeake	Barnett	2.25	2010
CNOOC	China	Chesapeake	Niobrara	0.57	2010
British Gas	UK	EXCO	Haynesville	1.30	2010
Mitsui	Japan	Anadarko	Marcellus	1.40	2010
CNOOC	China	Chesapeake	Eagle Ford	1.08	2011
KNOC	Korea	Anadarko	Eagle Ford	1.55	2011
Marubeni	Japan	Marathon	Niobrara	0.27	2011
Mitsui	Japan	SM Energy	Eagle Ford	0.68	2011
GAIL	India	Carrizo	Eagle Ford	0.10	2011
Total	France	Chesapeake/EnerVest	Utica	2.30	2012
Sinopec	China	Devon	TMS, Niobrara, Utica	2.20	2012
Marubeni	Japan	Hunt Oil	Eagle Ford	1.30	2012
Osaka Gas	Japan	Cabot Oil and Gas	Eagle Ford	0.25	2012
Sumitomo	Japan	Devon	Wolfcamp	1.40	2012
Sinochem	China	Pioneer	Wolfcamp	1.70	2013
Source: EIA, trade media				Total	28.17

EIA study to update & expand coverage of shale gas assessment of 2011 and identifying prospective tight oil formations



Source: U.S. Energy Information Administration with ARI, Inc. 2011 www.eia.gov/analysis/studies/worldshalegas/

Poland assessed basins



- Baltic/Warsaw
- Lublin
- Podlasie
- Fore Sudetic

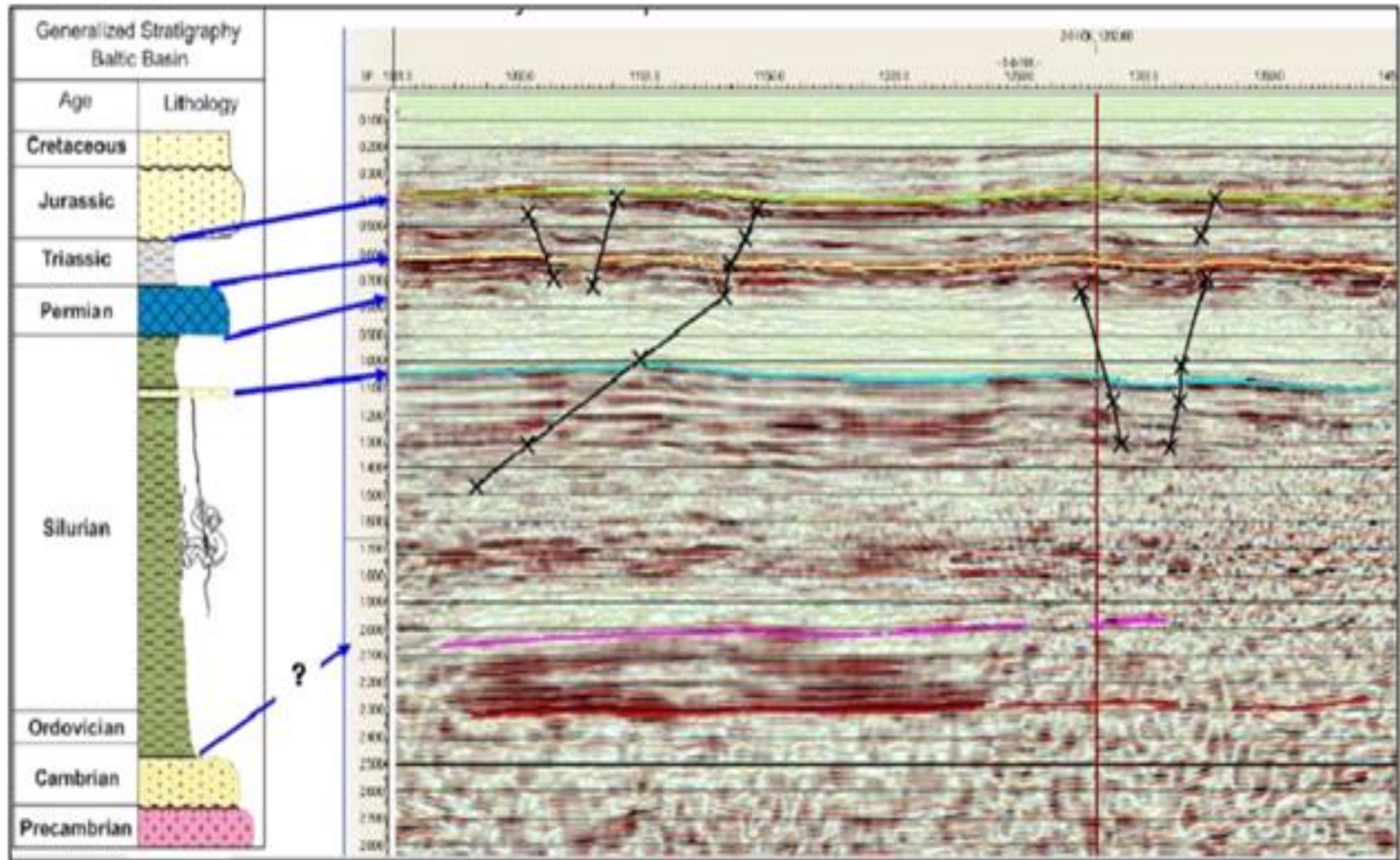
Activities: 30 vertical data wells, 6 vertical and 2 horizontal production test wells.

PGNiG, ConocoPhillips and Chevron, Marathon, Talisman

Total taking over Exxon stakes in Lublin and Podlasie

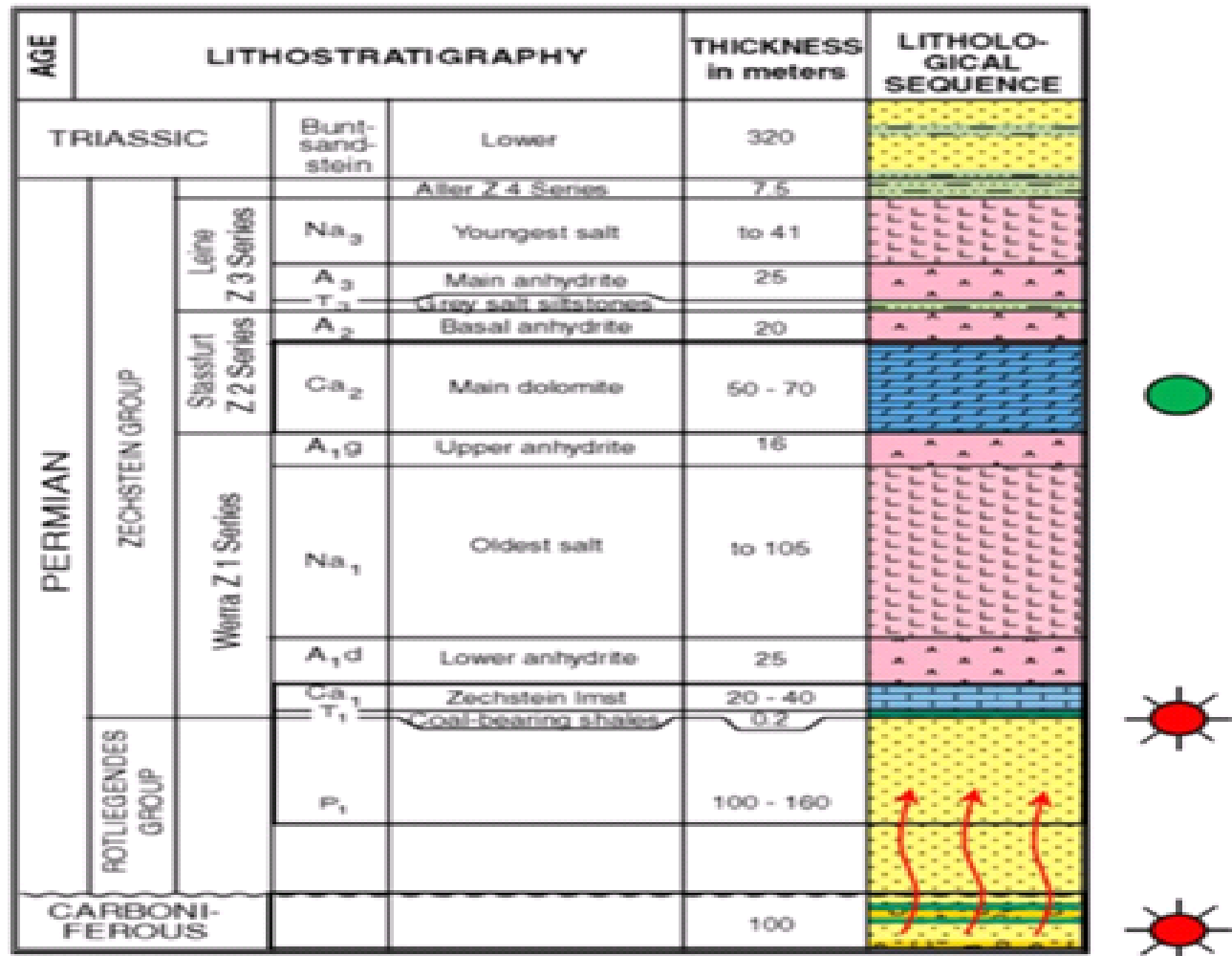
Source: EIA/ARI World Tight Oil and Shale Gas Resource Assessment 2013 (**Preliminary, Do Not Cite**)

Silurian, Ordovician and Cambrian formations were targeted for assessing Baltic, Podlasie and Lublin basins



Source: LNG Energy Ltd.

Stratigraphy of the lacustrine-deposited Carboniferous and younger formations in the Fore-Sudetic Monocline



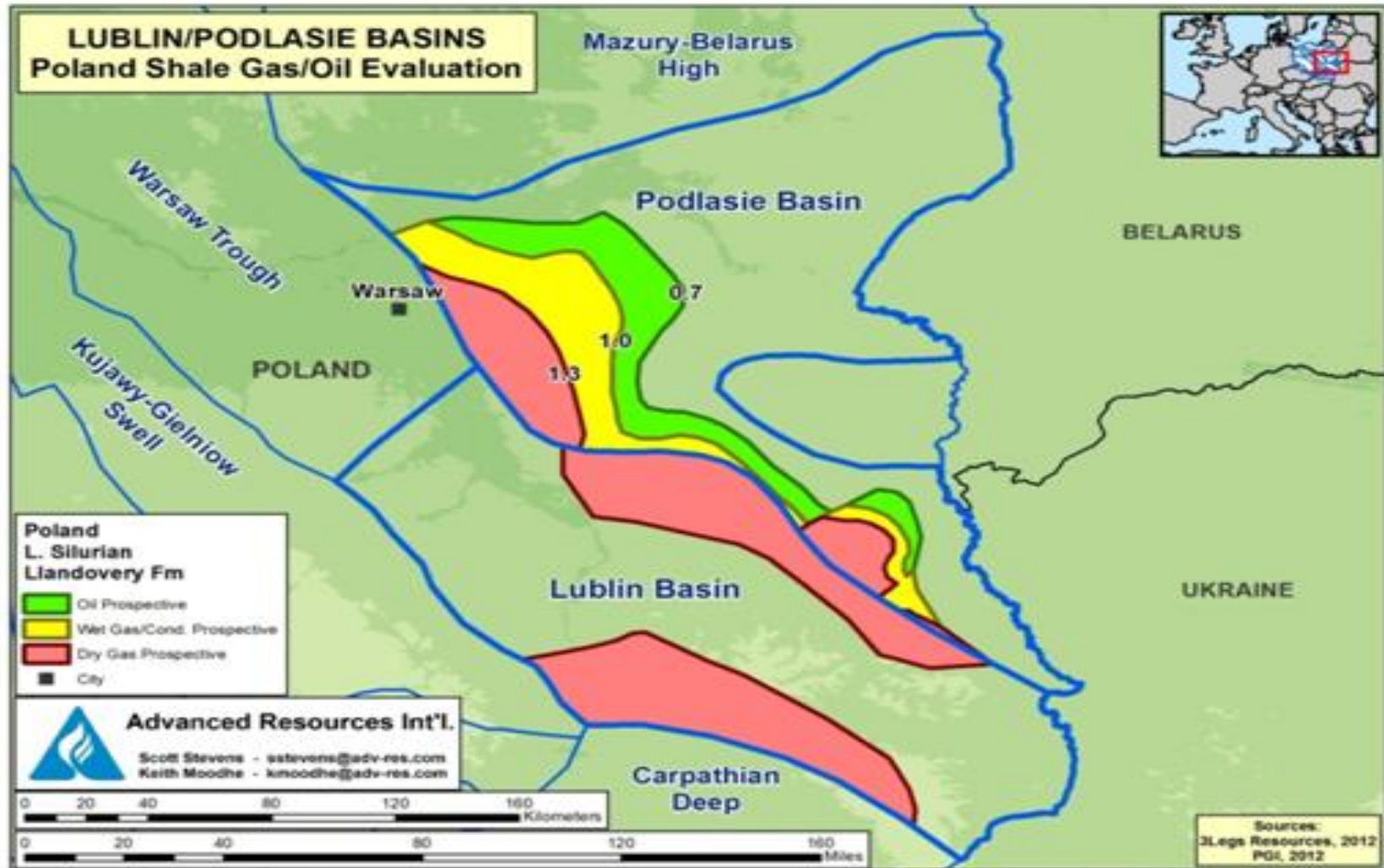
Source: San Leon Energy, 2012

Baltic basin map showing thermal maturity window for the Lower Silurian Llandovery shale based on calculated vitrinite reflectance (R_o).



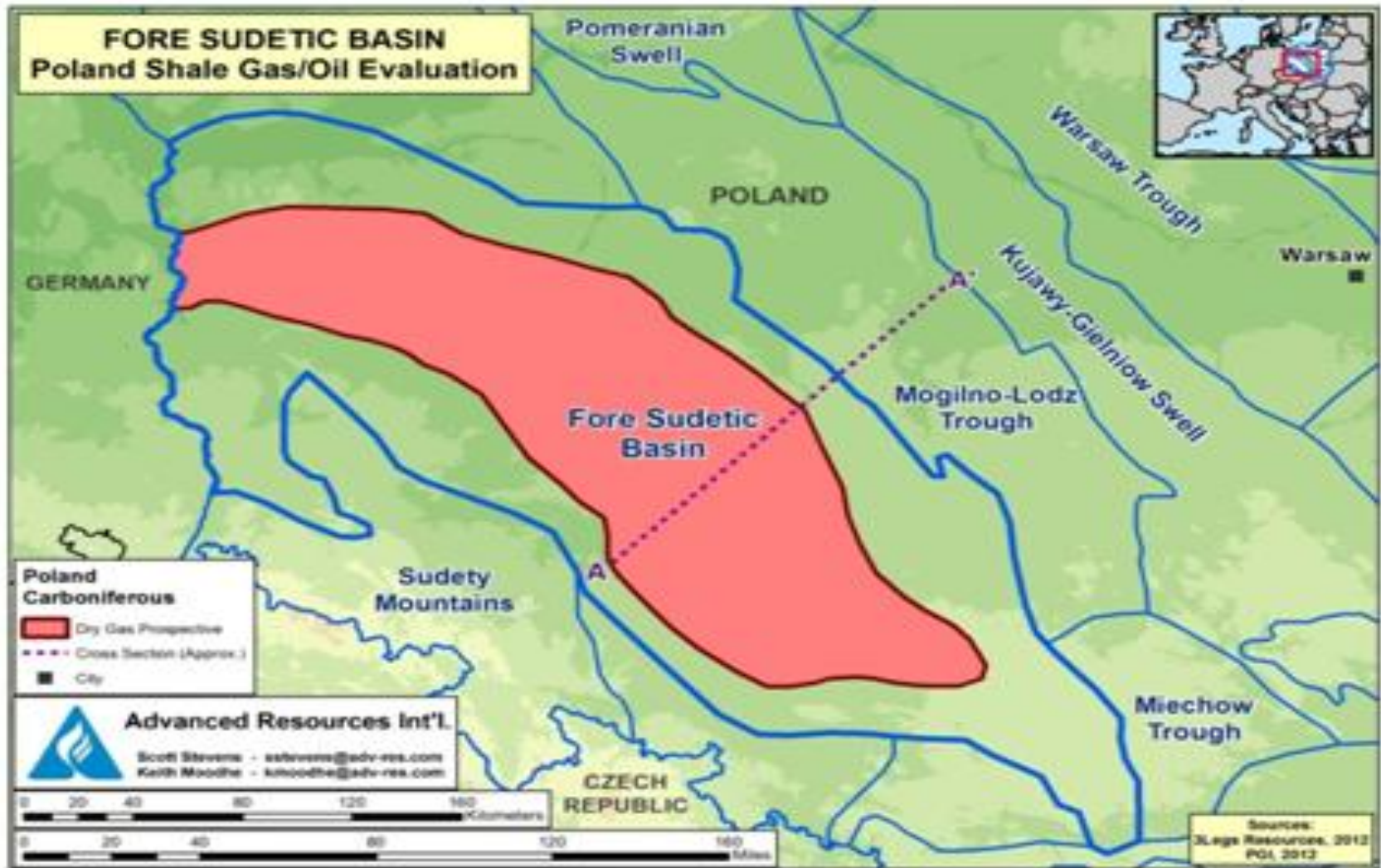
Source: EIA/ARI World Tight Oil and Shale Gas Resource Assessment 2013 (**Preliminary, Do Not Cite**)

Lublin and Podlasie basin map showing thermal maturity window of Lower Silurian Llandovery shale



Source: EIA/ARI World Tight Oil and Shale Gas Resource Assessment 2013 (**Preliminary, Do Not Cite**)

Fore-Sudetic Monocline of southwestern Poland, showing shale prospective area



Source: EIA/ARI World Tight Oil and Shale Gas Resource Assessment 2013 (**Preliminary, Do Not Cite**)

Uncertainties that could slow global growth of shale gas and tight oil

- Resource quantities and distribution
- Surface vs. mineral rights
- Risk appetite of industry participants
- Infrastructure and technology
- Environmental constraints

For more information

U.S. Energy Information Administration home page | www.eia.gov

Annual Energy Outlook | www.eia.gov/forecasts/aeo

Short-Term Energy Outlook | www.eia.gov/forecasts/steo

International Energy Outlook | www.eia.gov/forecasts/ieo

Today In Energy | www.eia.gov/todayinenergy

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

Annual Energy Review | www.eia.gov/totalenergy/data/annual