

Risks, Rewards and Regulation of Unconventional Gas: A Global Perspective



Australian
National
University

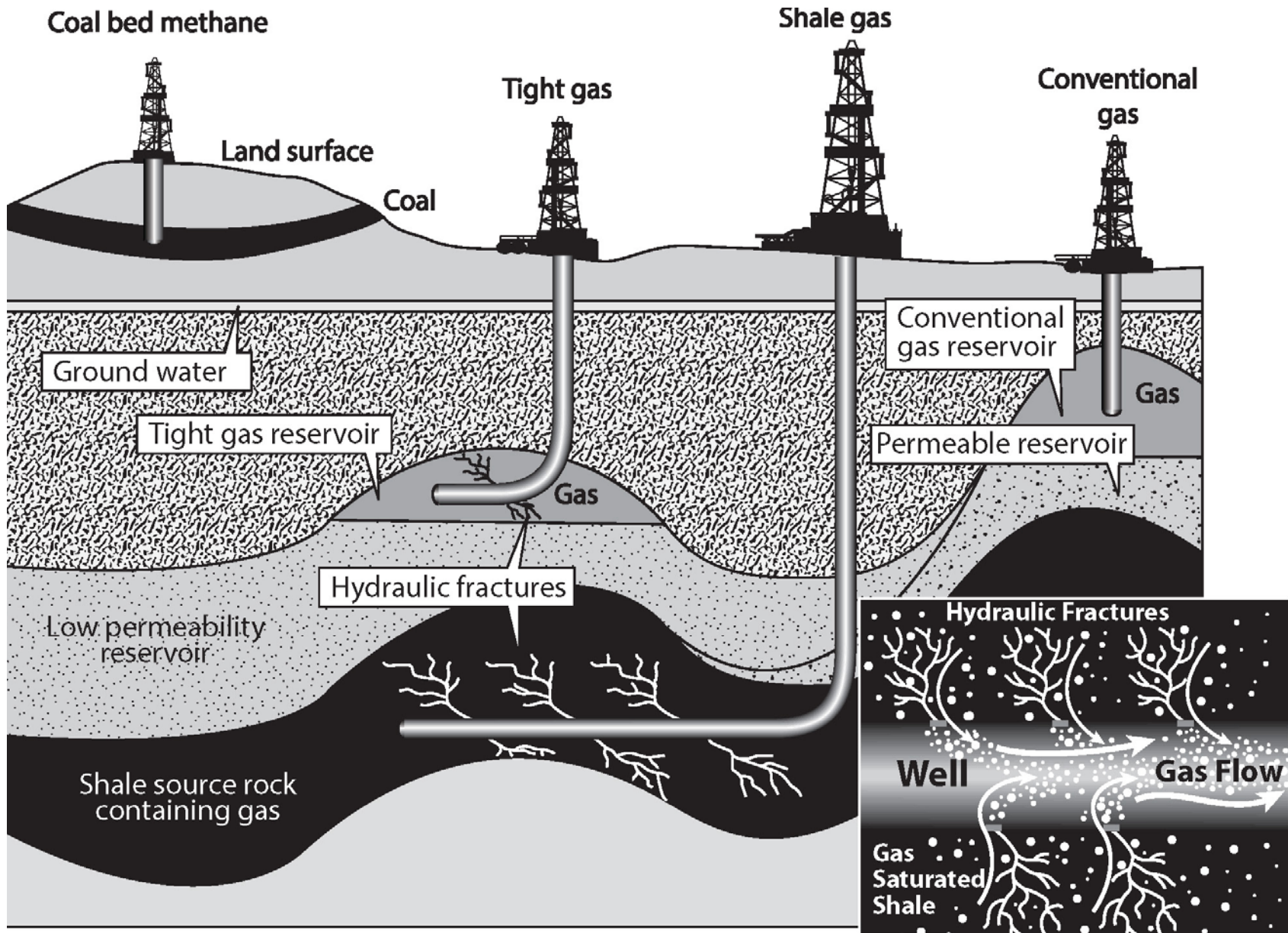
CRAWFORD SCHOOL
OF PUBLIC POLICY

Ian Cronshaw
Visiting Fellow

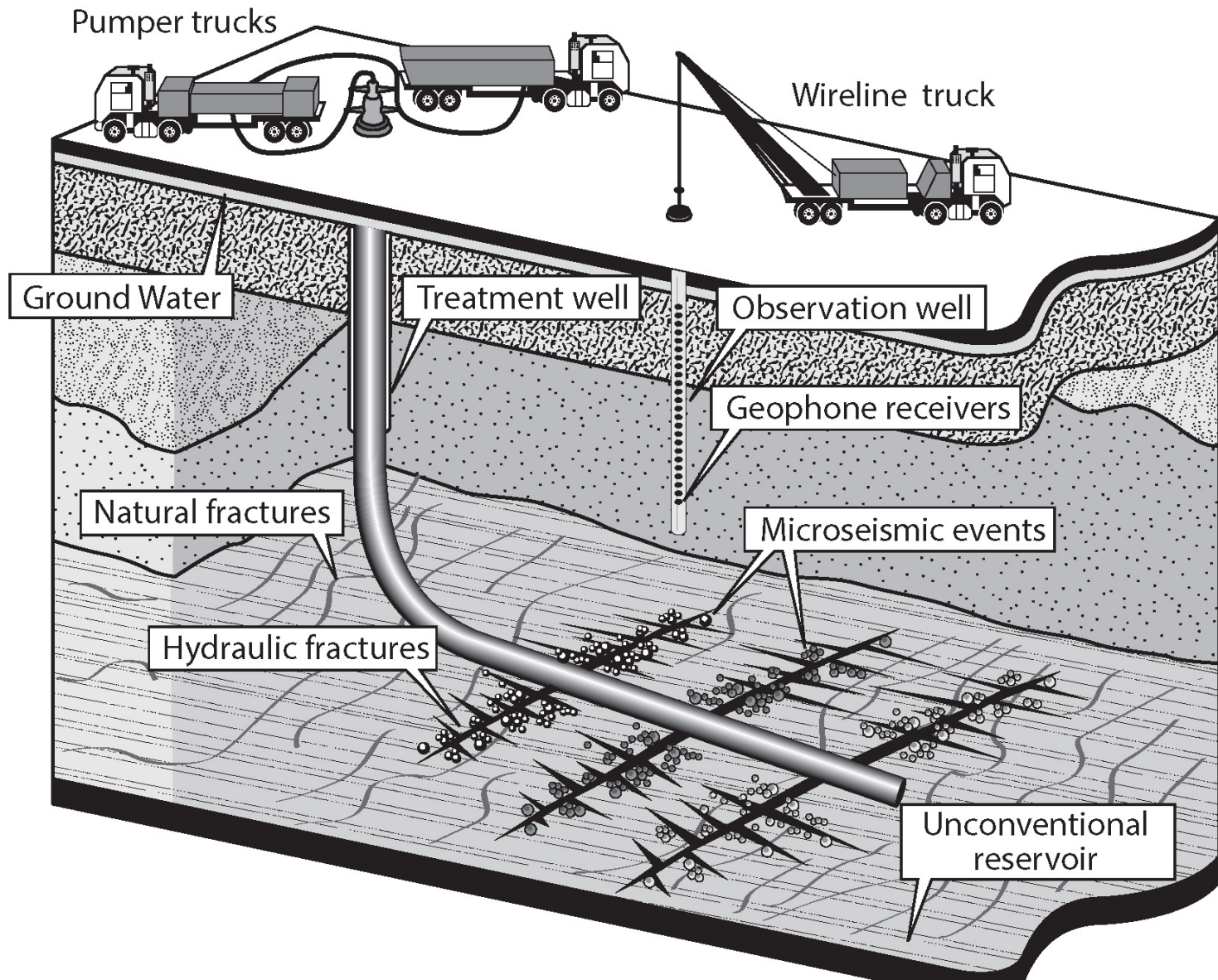
Overview

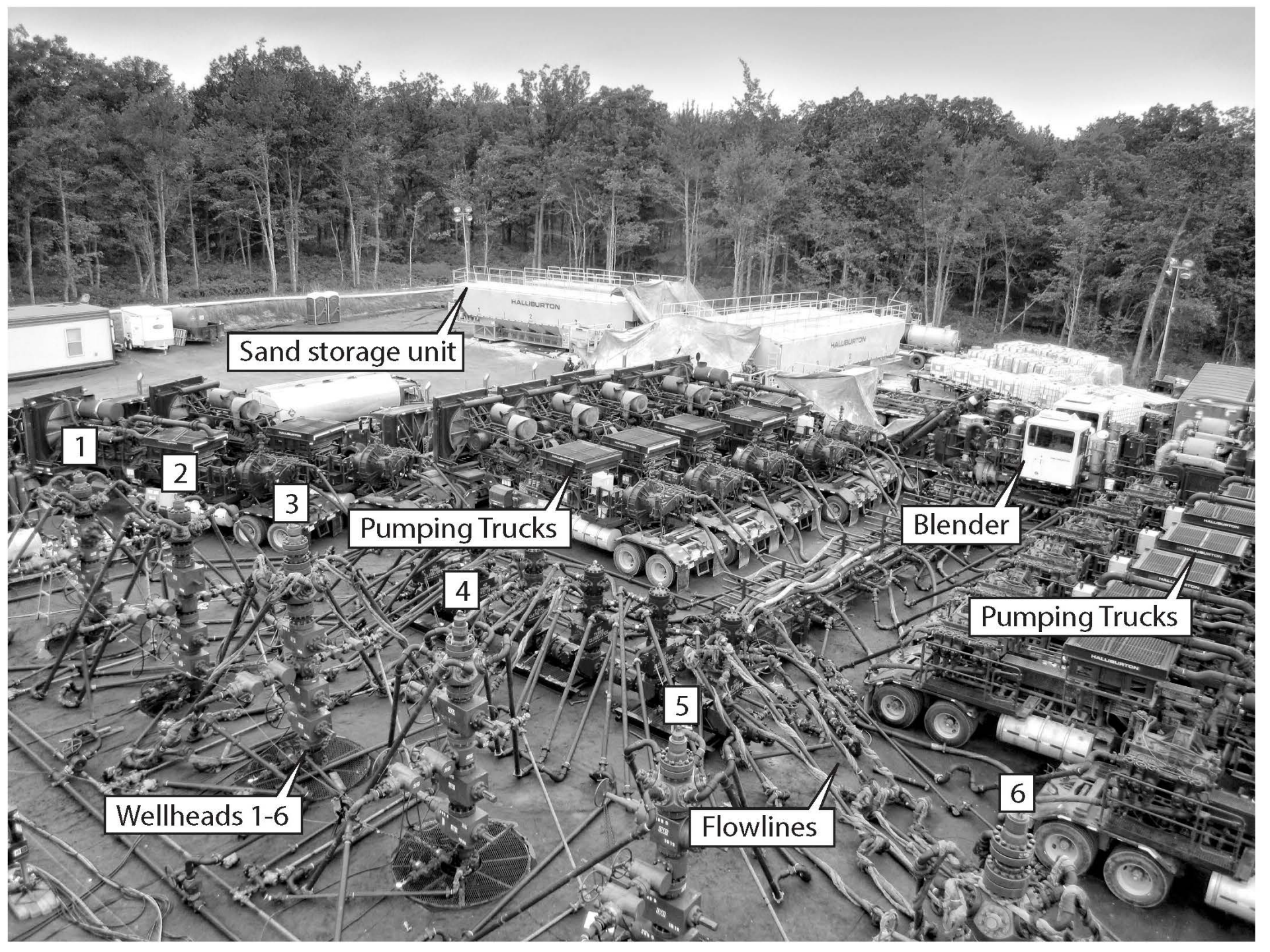
- What is Unconventional Gas?
- The Story So Far
- But Outside North America and Australia?
- Regulation Essentials
- Conclusions

Unconventional Gas Production Techniques



Focus on Shale Gas





Sand storage unit

1

2

3

Pumping Trucks

Blender

4

Pumping Trucks

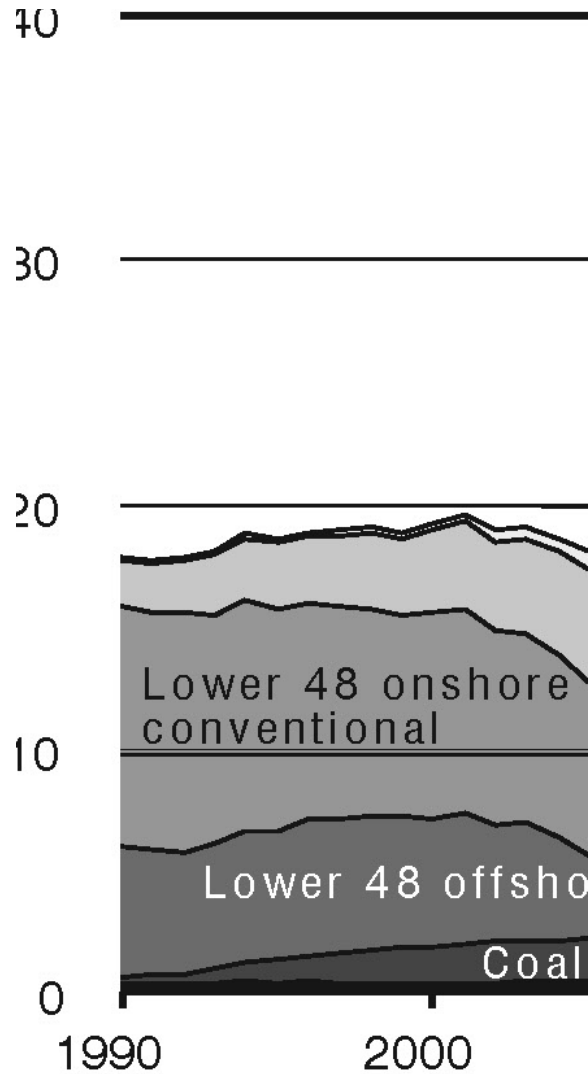
5

Wellheads 1-6

Flowlines

6

The Story So Far- US is running out of Gas

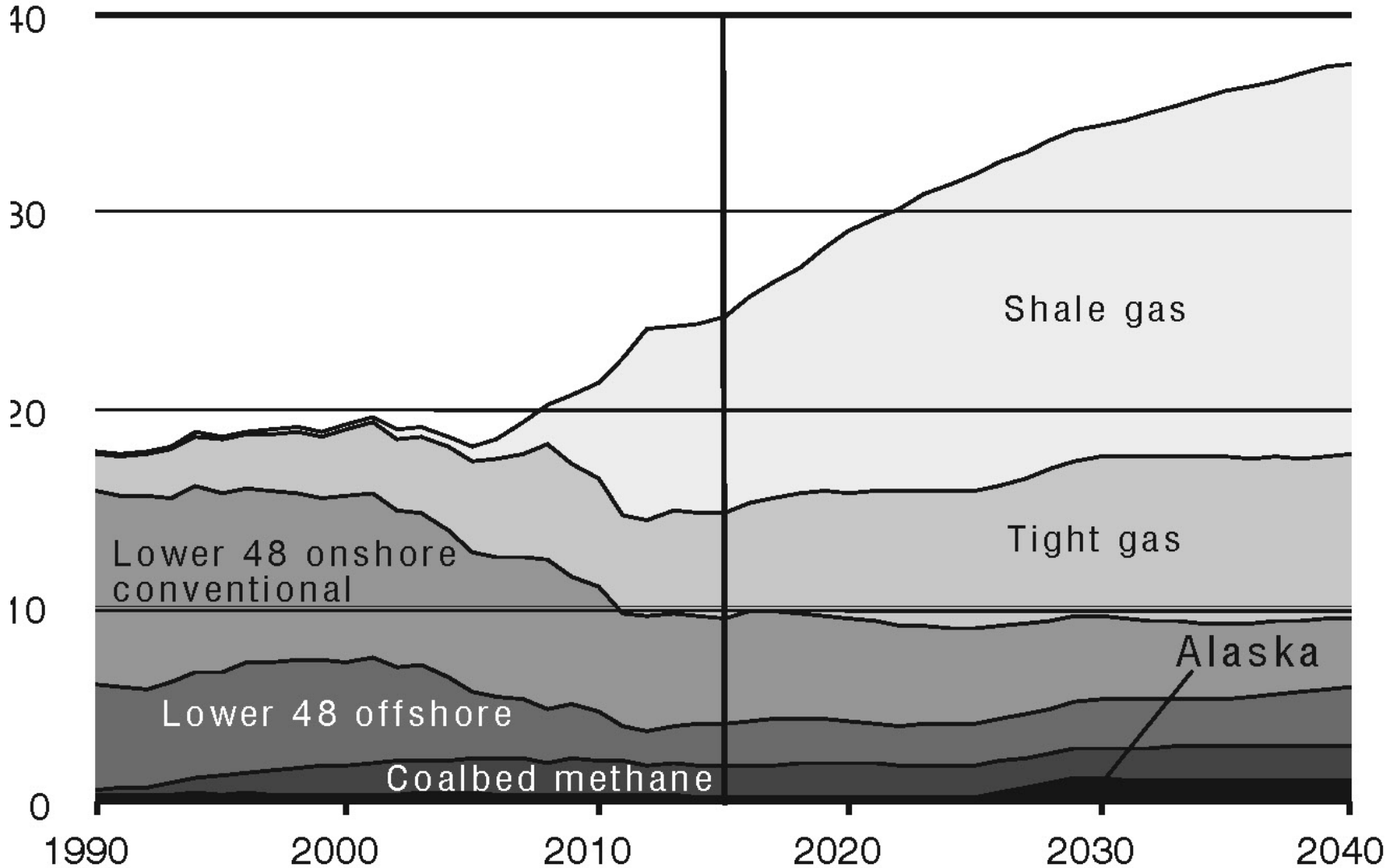


Well, Not Exactly.....

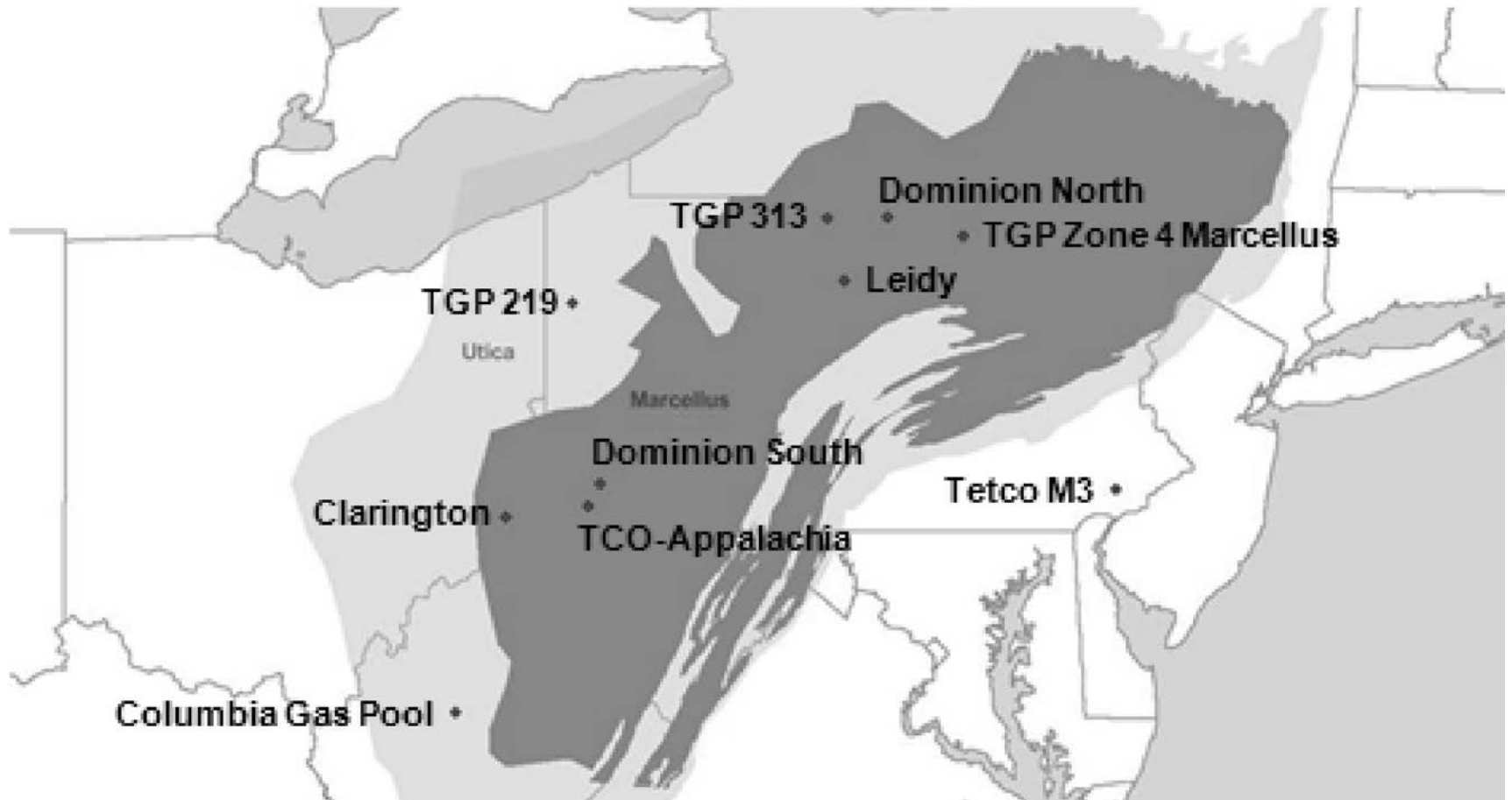
HISTORY

2015

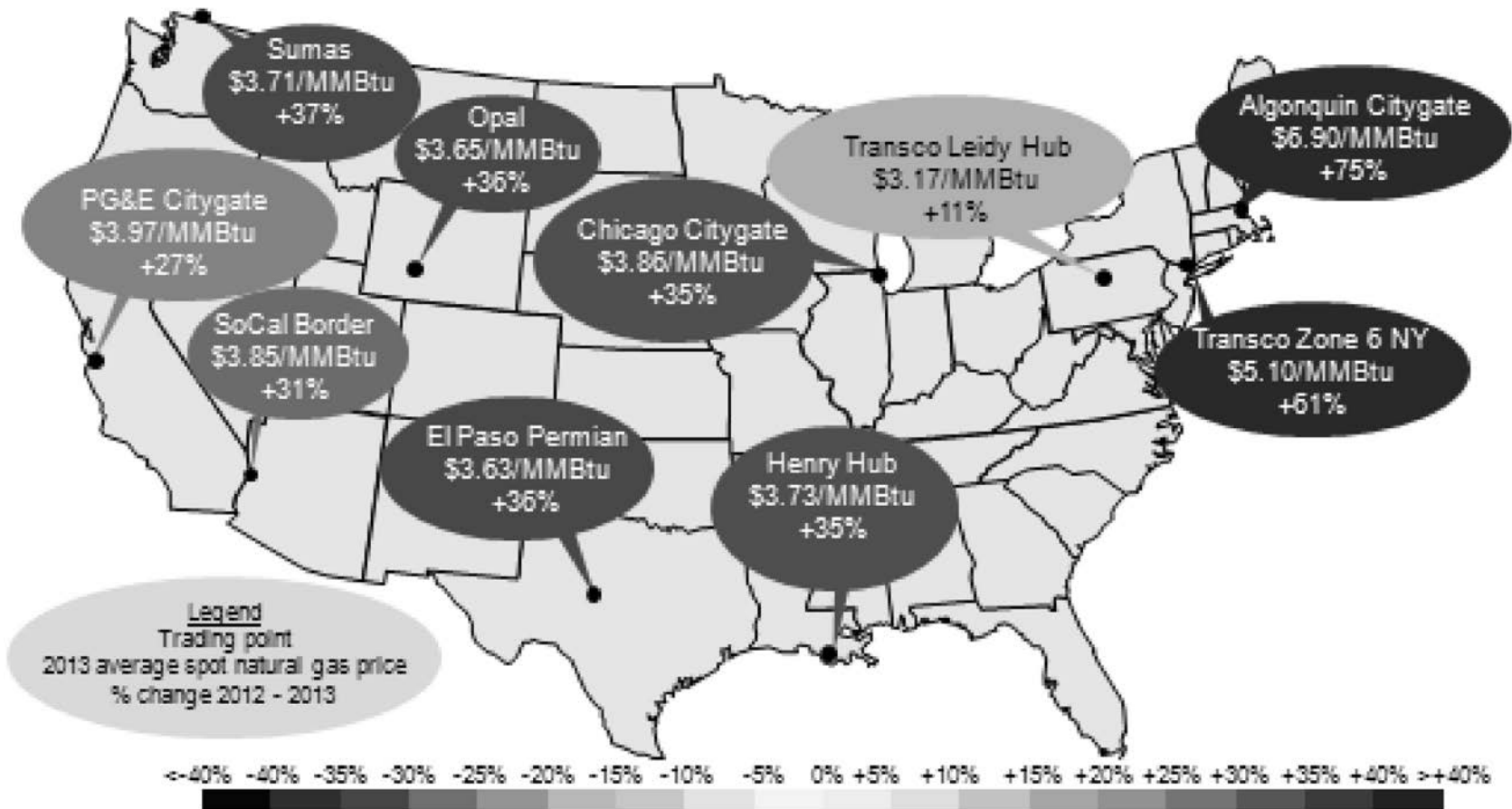
PROJECTIONS



Marcellus in Close Up

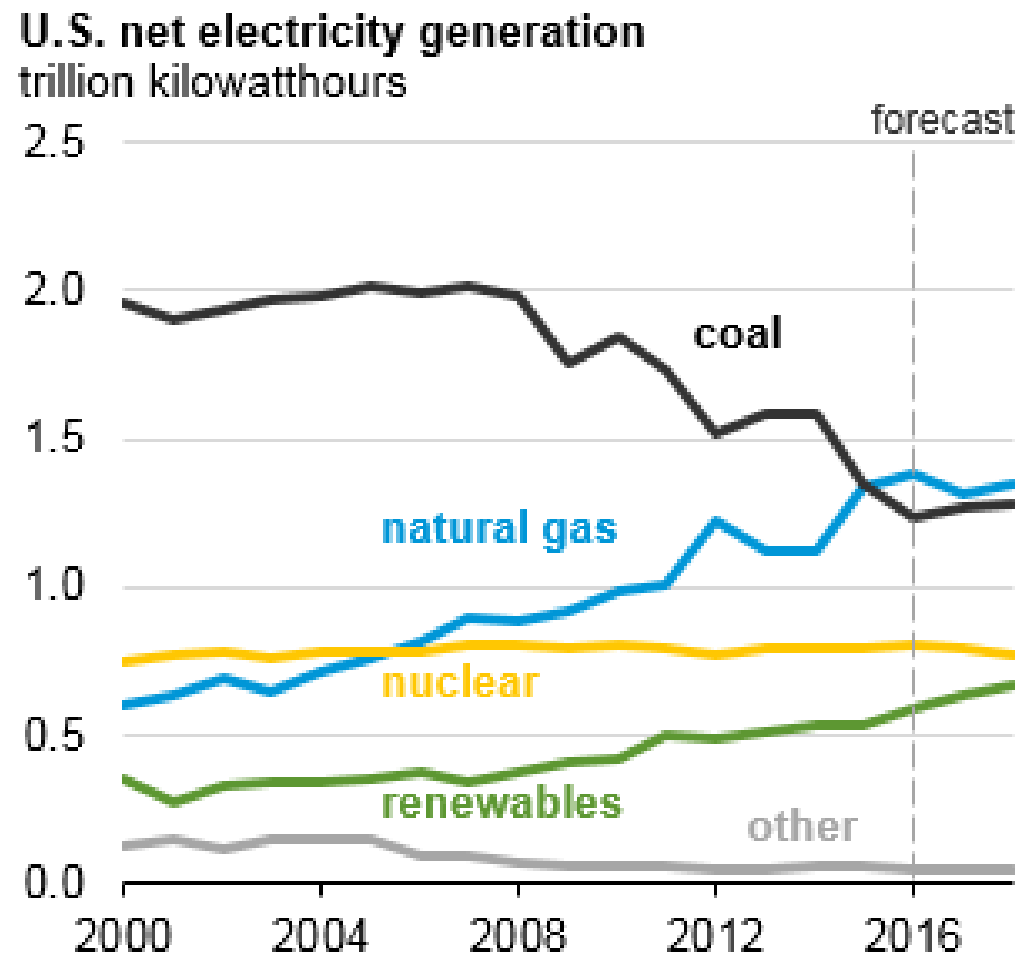


Production Drives Prices Down

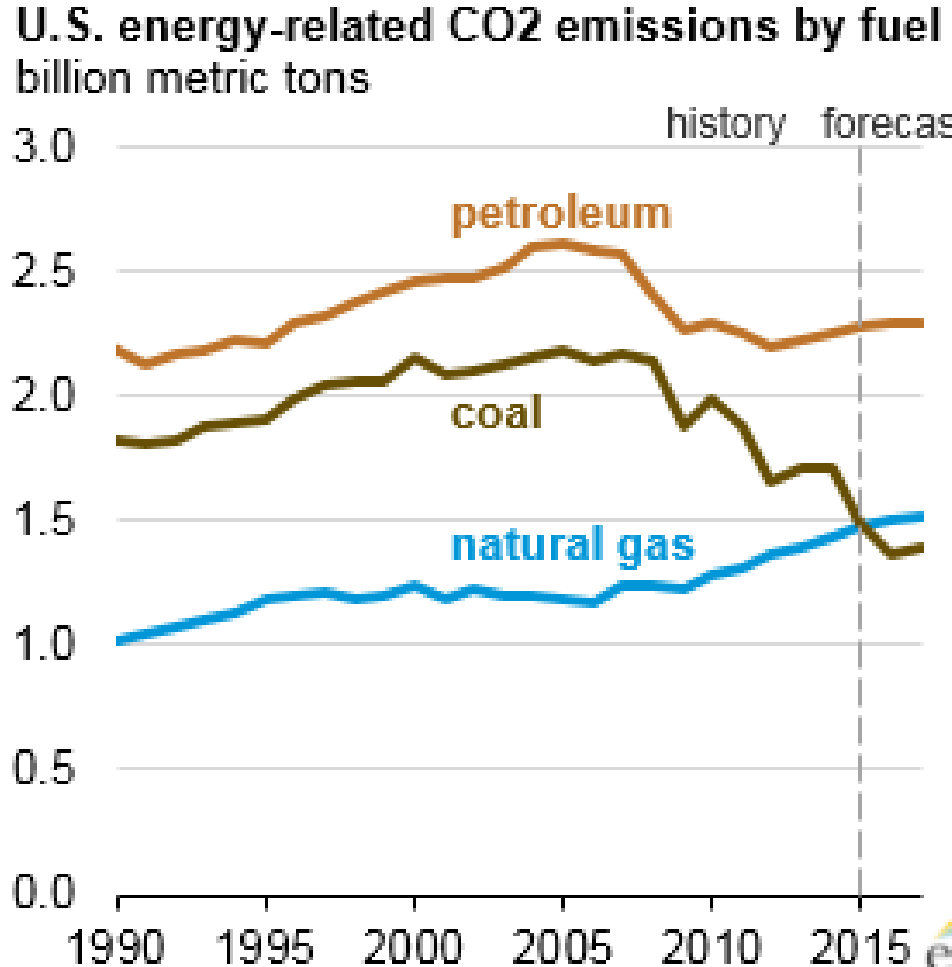
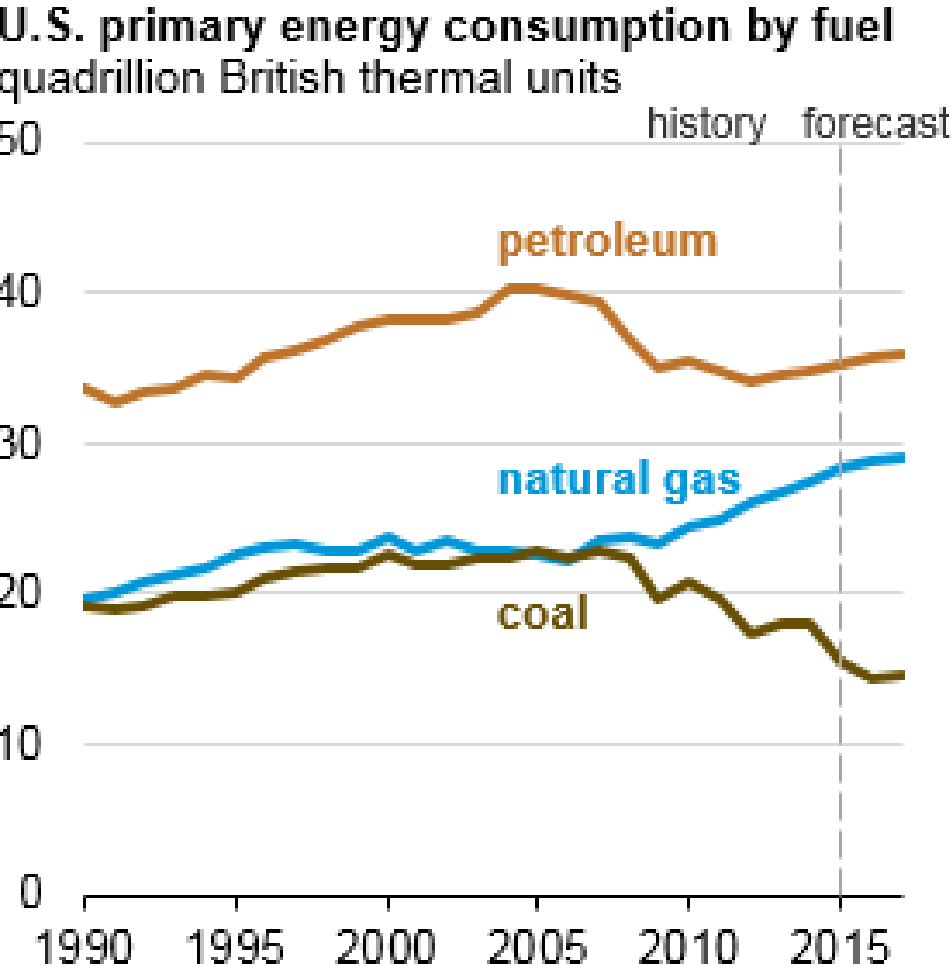


Gas fired power now Number 1 Power Source

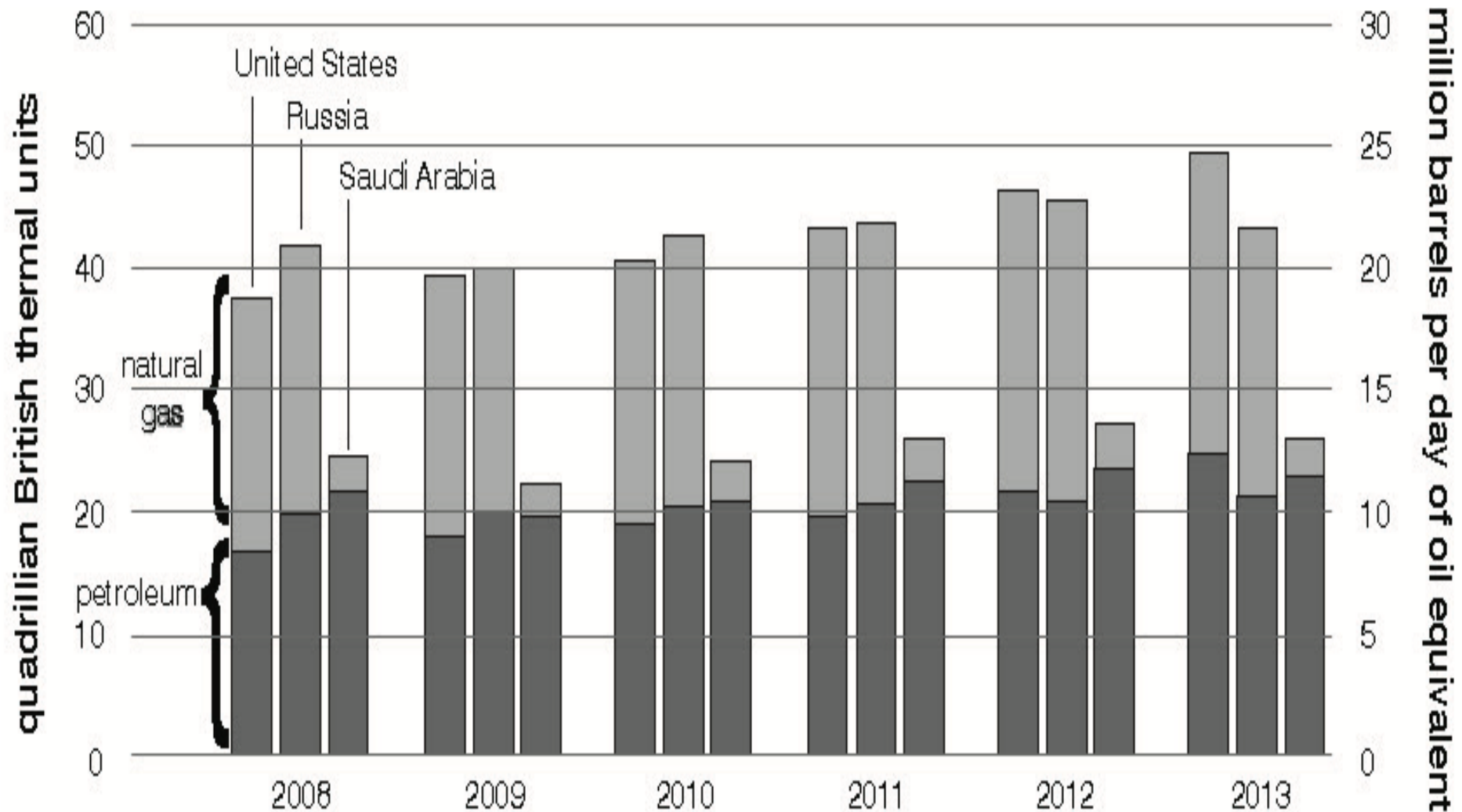
NB Renewables up from 0.4 to 0.6 2005-2016



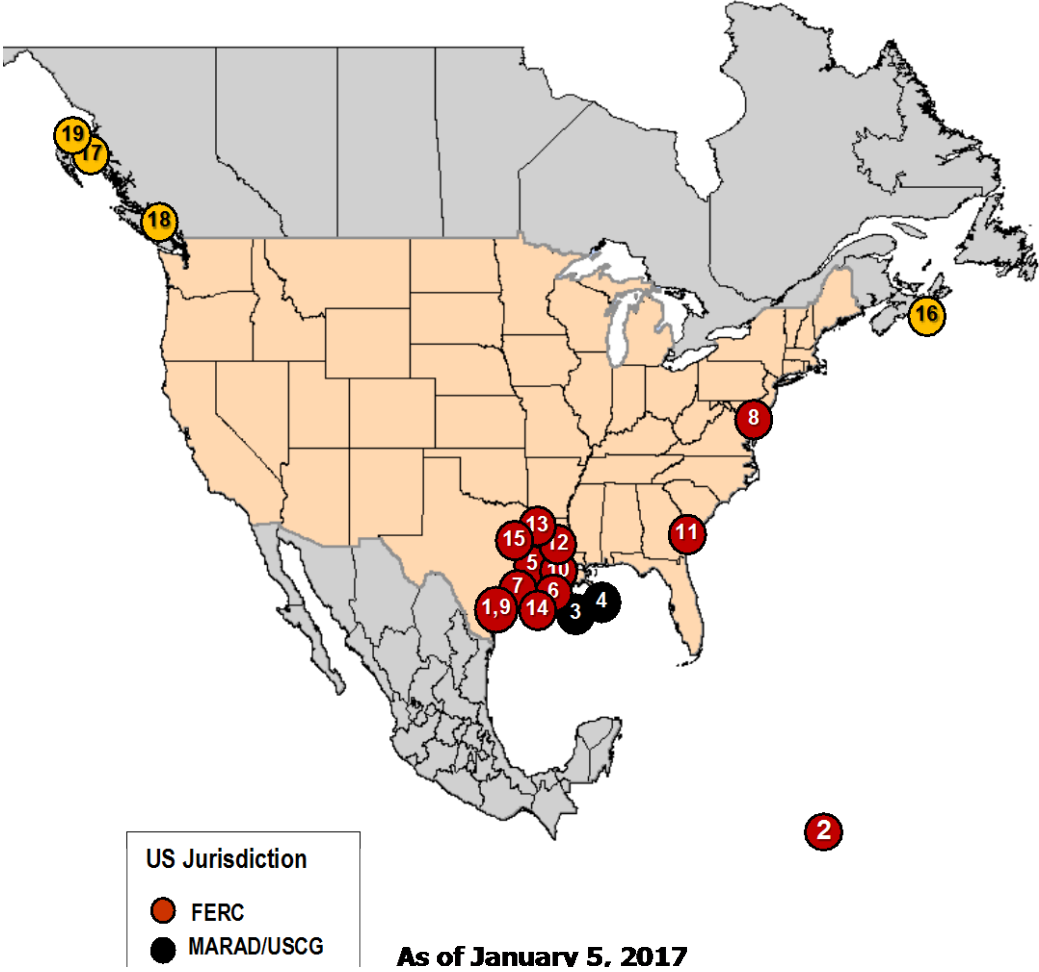
Driving Sharp Reductions in Energy Related Emissions



And Makes the United States Number 1 Oil and Gas Producer

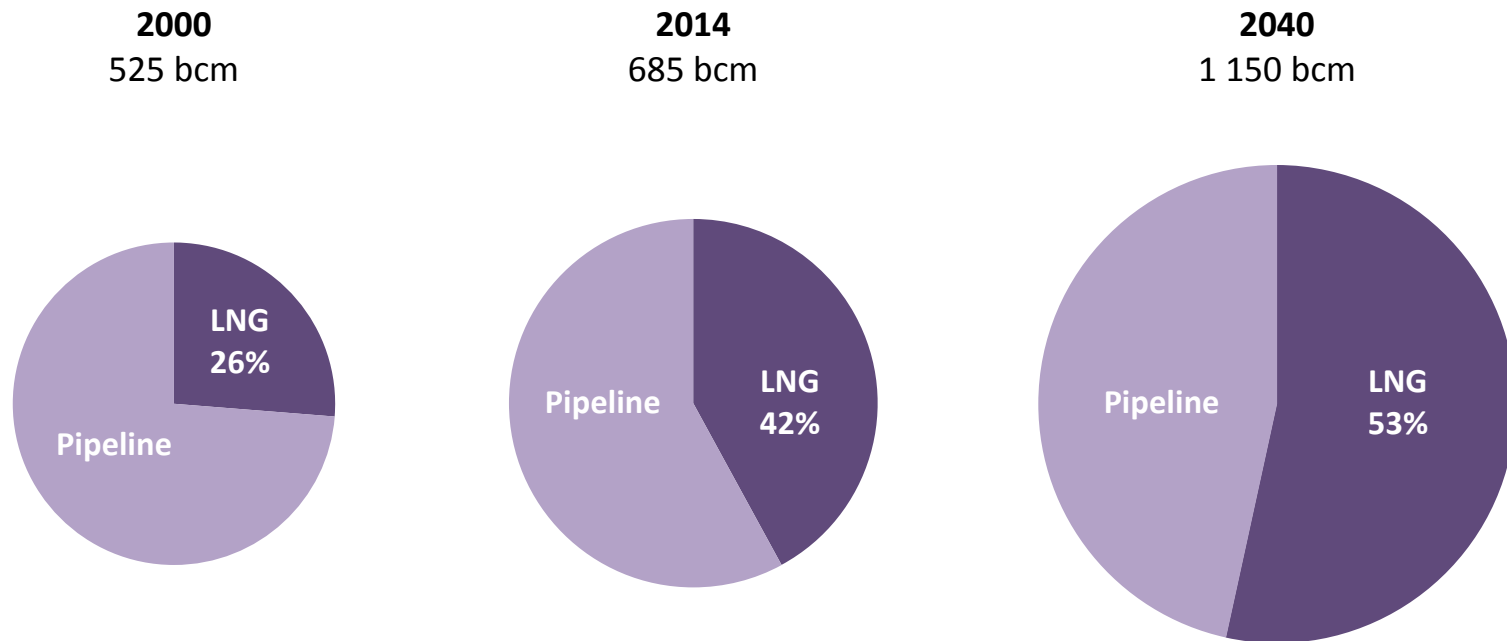


United States becomes a BIG LNG exporter.....



A wave of LNG spurs a second natural gas revolution

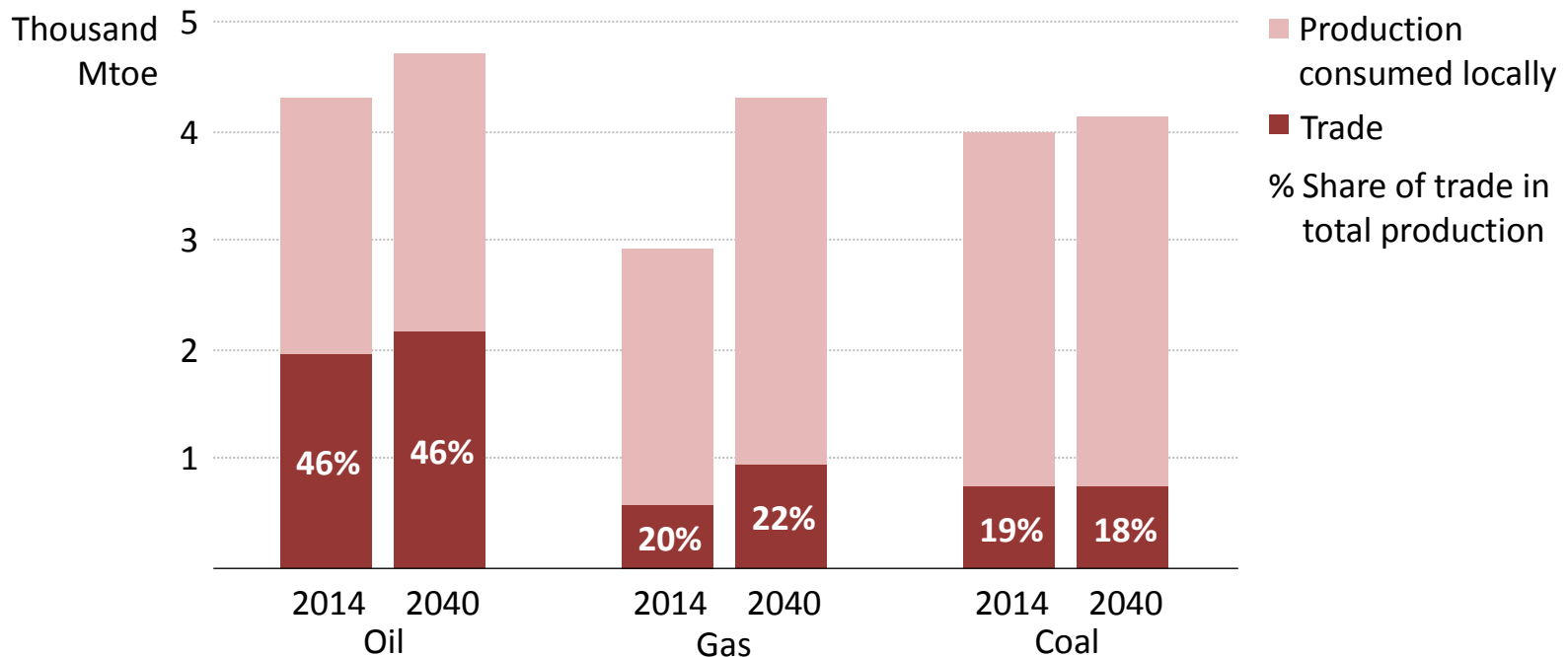
Share of LNG in global long-distance gas trade in the New Policies Scenario



Contractual terms & pricing arrangements are all being tested as new LNG from Australia, the US & others collides into an already well-supplied market

Energy trade remains high even as trade patterns shift

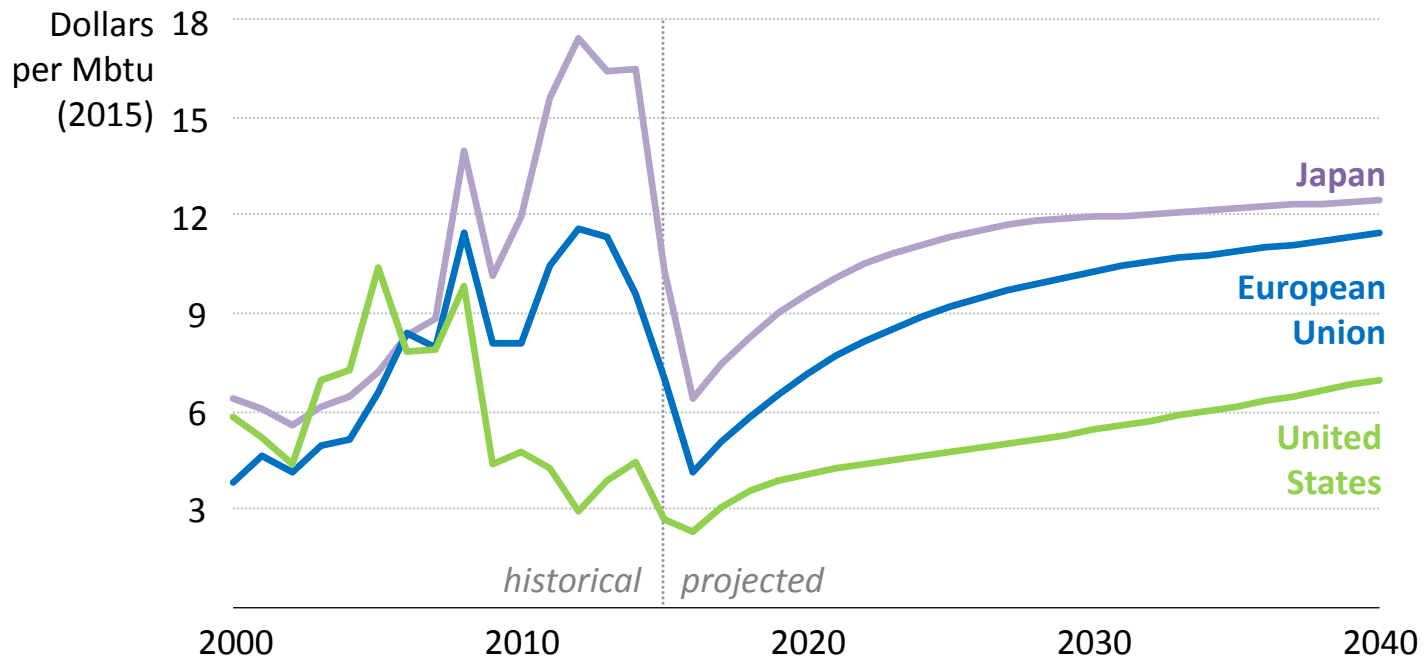
Global fossil-fuel trade in the New Policies Scenario



While coal stands still, the volume of traded oil & gas increases & the share of gas trade in total consumption also moves higher

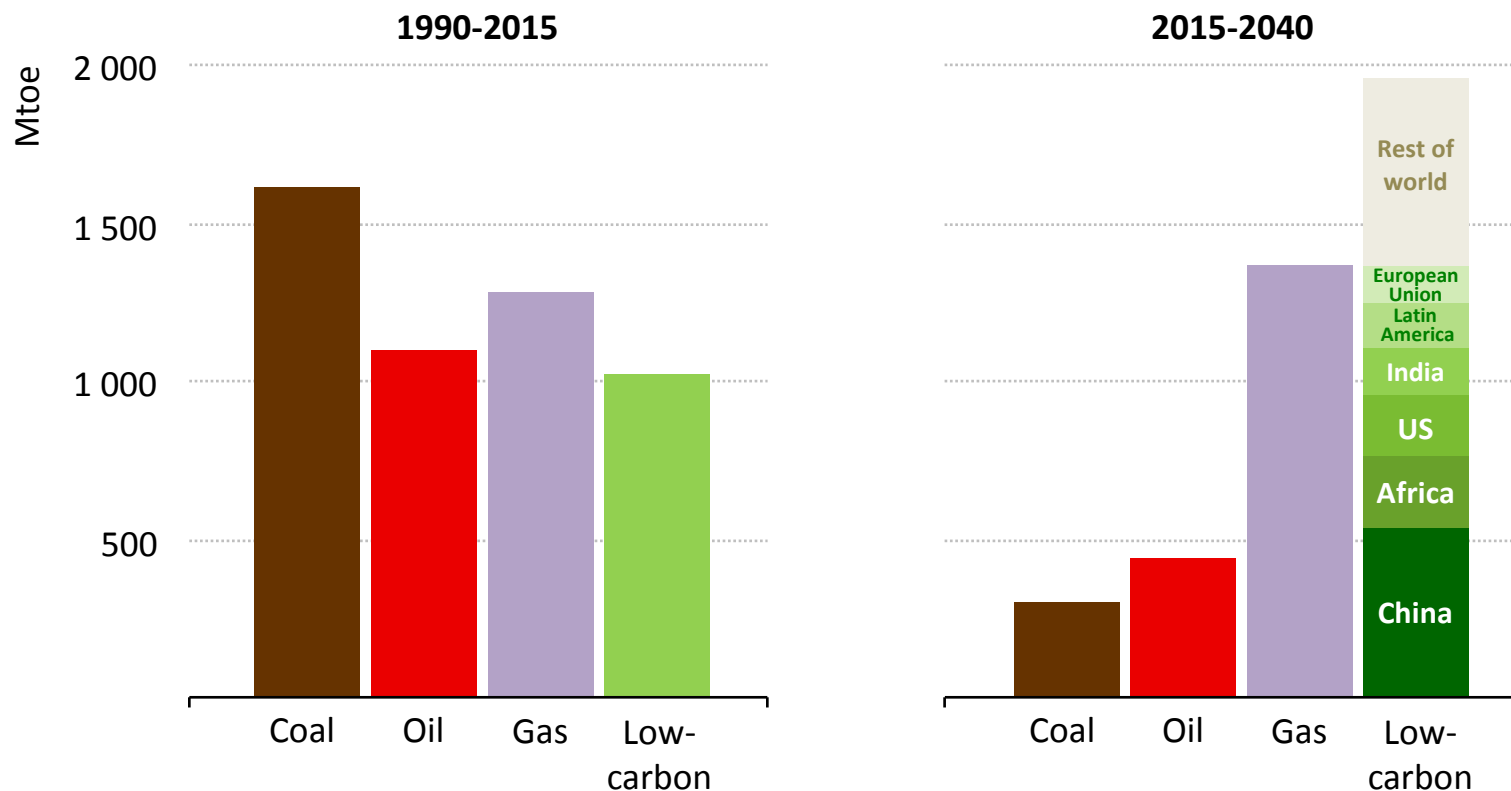
Towards a global gas market

Natural gas prices by region in the New Policies Scenario



Natural gas prices in the main regions are connected by an increasingly flexible global trade in LNG

Change in total primary energy demand in the New Policies Scenario



Low-carbon fuels & technologies, mostly renewables, supply nearly half of the increase in energy demand to 2040

Other Countries: Slow Progress

- China: resource large, but geology tough
- Argentina: Vaca Muerta again large, but high cost, foreign capital and technology needed.
- Europe: promising geology, but results to date disappointing, regulation varies, gas imports will rise
- India: mid 2020s
- Canada: great, but where are markets?

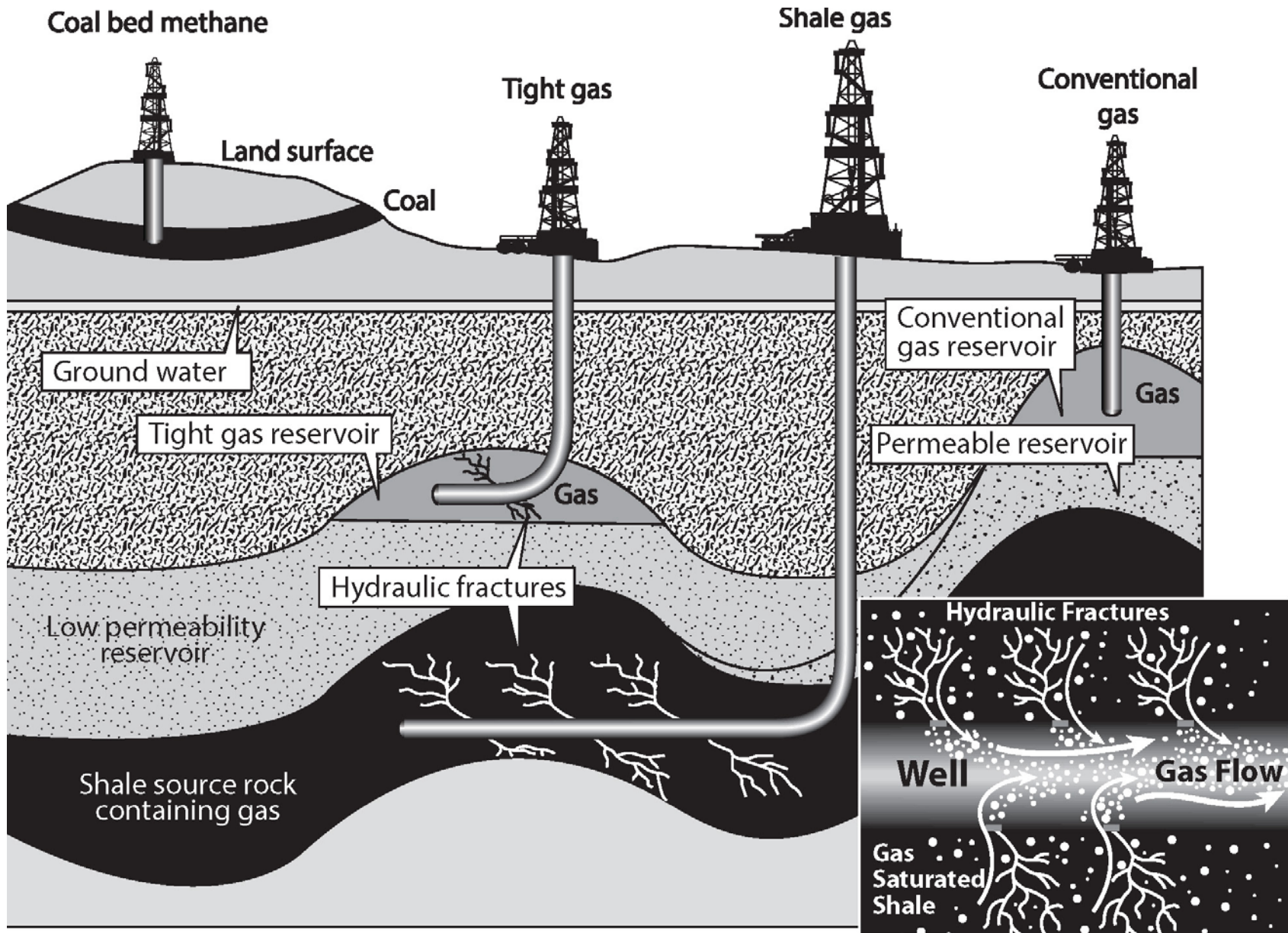
What's Gone Wrong?

- Pavillion Wyoming, 2008, shallow fracturing
- Dimock, Pennsylvania 2009
- Halliburton, Pennsylvania 2014
- New South Wales, 2010, Eastern Star Gas
- (SANTOS subsequently fined in 2014 for Eastern Star Gas saline discharges)
- New South Wales, 2012, Metgasco
- Queensland, 2010, wellhead methane leakages

Concerns and Regulatory Issues

- Land Access
- Water: contamination of aquifers
- Water: disposal of formation water, drilling or fracturing liquids
- Conflict with other users, Loss of Land Value
- Air emissions, notably methane leakage
- Seismic events
- Surface issues, habitat fragmentation, loss of aesthetic benefits

Unconventional Gas Production Techniques



Best Practice Regulation-I

- Pre-production assessment, especially groundwater
- Much greater transparency , especially where fracturing fluids are used (FracFocus)
- Well integrity, from cradle to grave, avoiding cross-contamination of water
- Treatment of formation water (CBM), fracturing liquids

Best Practice Regulation-II

- Eliminating air emissions, especially of methane
- Regional approaches to measure cumulative impacts...large numbers of wells drilled!
- Drive improved performance, rigorous and well resourced compliance
- Purpose built regulatory agencies, with ongoing review of regulatory adequacy

SWOT

- Strengths: local employment, cheaper gas and power, royalties, where applicable.
- Weaknesses: increased traffic, noise, loss of amenity, water availability.
- Opportunities: gas exports, improved energy security, reduced greenhouse gas emissions, more competitive local industries
- Threats: water contamination, methane emissions, higher gas prices through export linkages, seismic events.

References

- Risks, Rewards, and Regulation of Unconventional Gas
- World Energy Outlook 2016 (International Energy Agency, IEA)
- Are We Entering a Golden Age of Gas? (IEA, 2011)
- Golden Rules for a Golden Age of Gas (IEA, 2012)