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Global implications of the technological revolution in the production of gas and oil

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Oil and Natural Gas in North America: Recent Changes and their Geopolitical Consequences
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Presentation outline

- What is the “technological revolution”?
- What have been the immediate global impacts?
  - Gas markets
  - Oil markets
- What are the future global impacts likely to be?
  - Function of replicability of the “Shale Gas Revolution”
  - Gas markets
  - Oil markets

What is the “technological revolution”?

The main components

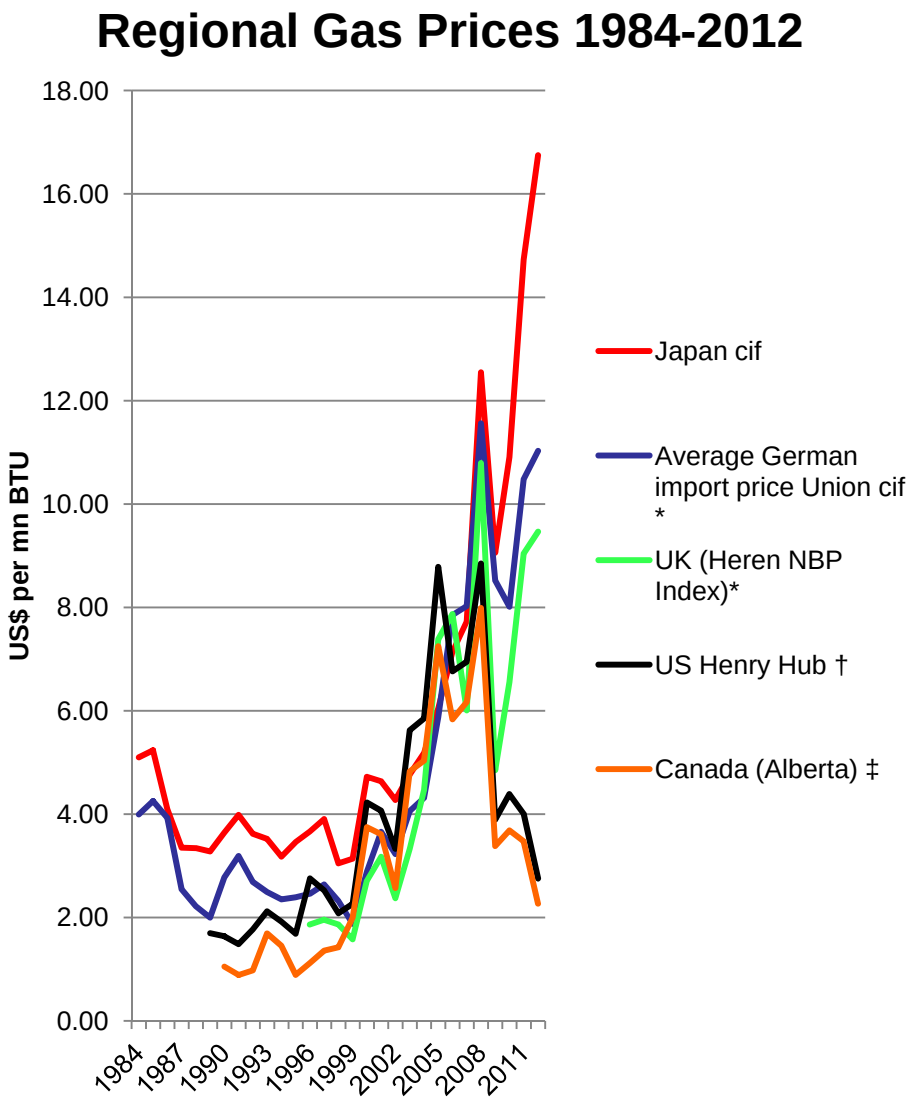
- Extended reach horizontal drilling
- Multistage hydraulic fracturing
- 3-D Seismic
- Coiled tube drilling

The characteristics

- Been around for some time
- Key role for public research funding. Fundamental scientific research is a “public good”
- Constantly improving via “learning by doing”

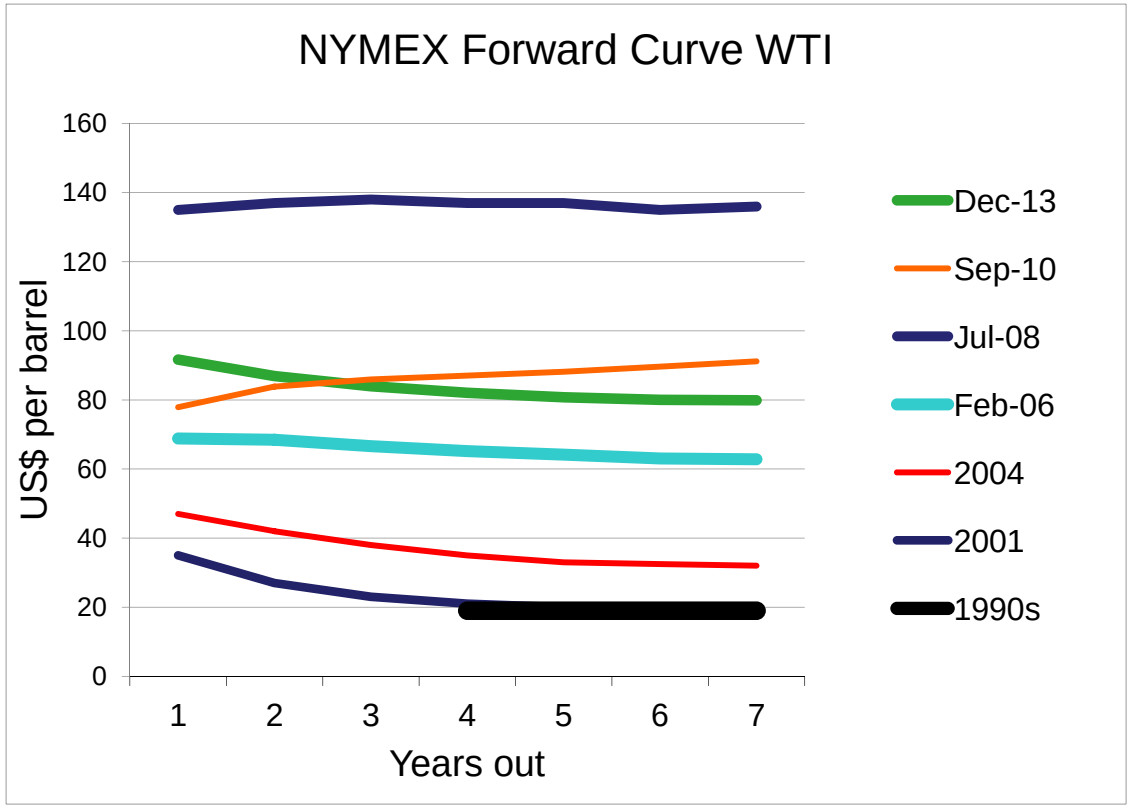
The immediate global impacts on gas

- Major impact on LNG
  - Falling US demand + global recession = surplus 2009-10
  - Partially saved by Fukushima but more to come?
  - Aggravated regional price differentials + higher oil prices
  - Has created significant uncertainty for new projects. US LNG competition?
- Impact on petrochemicals
  - US revival threatens GCC development strategy?



The immediate global impacts on oil (1)

- Kills off “peak oil” : From scarcity to abundance – impact on expectations??



Between 1988-2002 the back end of the forward curve
Remained stubbornly between $18-$20 per barrel.
Then began to rise – why? “We have heard of this idea called “peak oil”…

The immediate global impacts on oil (2)

- US seaborne crude imports 2011 = 7.1 mnb/d. 2007-12 fall by 2.2 mnb/d.
  - US Balance of trade and the value of the dollar?
  - Gives rise to speculation about the impact on US policy
    - Middle East concerns?
    - Policing sea lanes?
    - What about China?

- Crude price differentials
  - Surplus of light sweet – W African crude switching to Asia (2007-12 = 1.4 mnb/d)
  - 8 million b/d of new refinery capacity in Asia 2012 - 20 is “wrongly configured”

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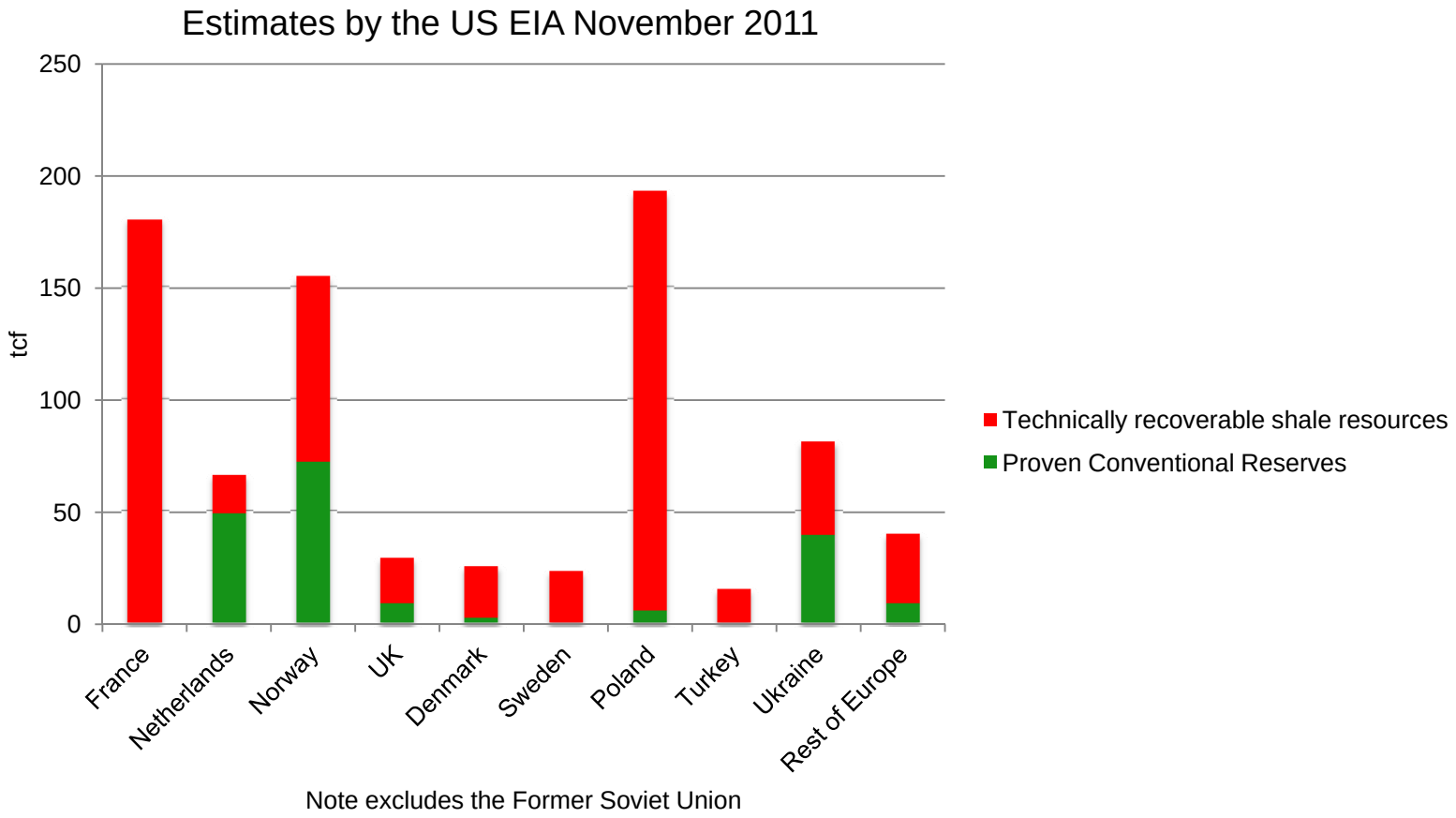
Future global impacts? The replicability of the US experience? Why the “shale gas revolution” in the USA?

Characteristic	USA
Favourable geology	Yes
Lots of drill core data to help identify “sweet spots”	Yes
Weak environmental regulation for fracking	Yes
Tax credits + Intangible drilling cost expensing	Yes
Property rights to the landowner	Yes
Pipeline access easy –large network + common carriage	Yes
Selling gas into a “commodity supply” market very easy	Yes
Dynamic and competitive service industry	Yes
Population familiar with oil and gas operations	Yes
Licensing large areas with vague work programs	Yes
Significant government investment in basic R & D	Yes
High liquids content in the gas	Yes
Started by rising gas prices	Yes

There are shale gas resources elsewhere



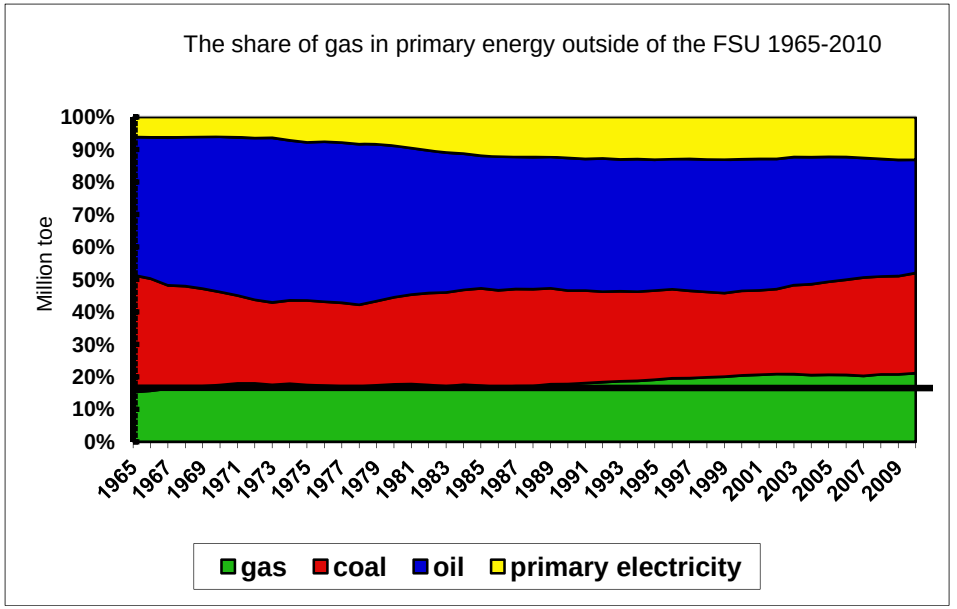
In July 2013 the British Geological Survey estimated the technically recoverable resources in the Bowland Shale play at 1,300 tcf
In 2012 Geoscience Australia estimates Australian technically recoverable resources at 388 tcf. EIA June 2013 estimates 437 tcf

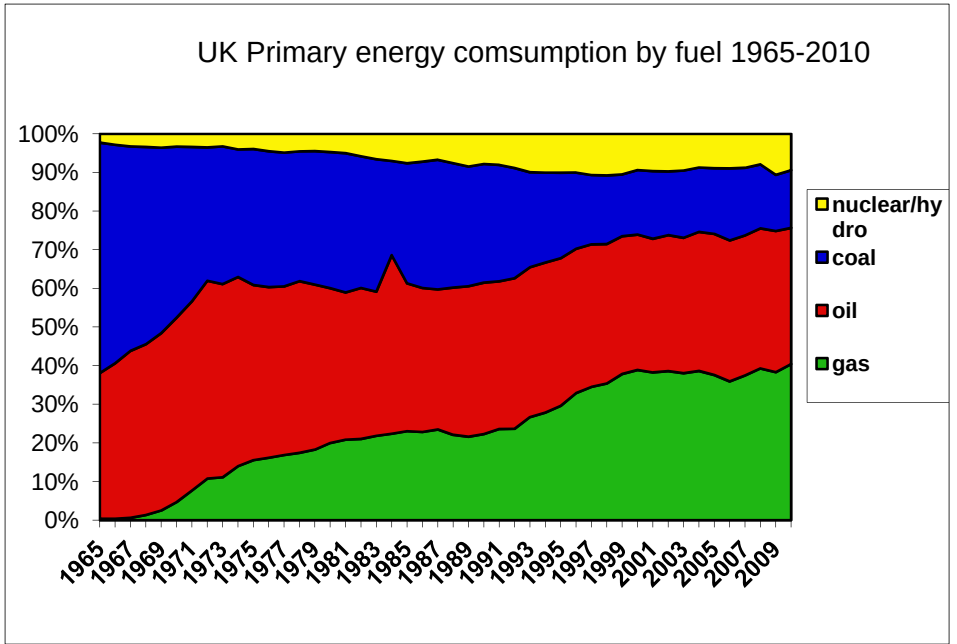
Future global impacts? The replicability of the US experience? Why the "shale gas revolution" in the USA?

Characteristic	USA	EU	UK	Aus
Favourable geology	Yes	?	?	?
Lots of drill core data to help identify "sweet spots"	Yes	No	No	No
Weak environmental regulation for fracking	Yes	No	No	No
Tax credits + Intangible drilling cost expensing	Yes	No	?	No
Property rights to the landowner	Yes	No	No	No
Pipeline access easy –big network+common carriage	Yes	No	No	No
Selling gas into a "commodity supply" very easy	Yes	No	?	No
Dynamic and competitive service industry	Yes	No	No	No
Population familiar with oil and gas operations	Yes	No	No	No
Licensing large areas with vague work programs	Yes	No	No	?
Significant government investment in basic R & D	Yes	No	No	No
High liquids content in the gas	Yes	?	?	?
Started by rising gas prices	Yes	?	?	No

Future global impacts for gas?

- Demand for gas will increase as constraints come off post 1990 in a world where expectations are for lots of cheap gas





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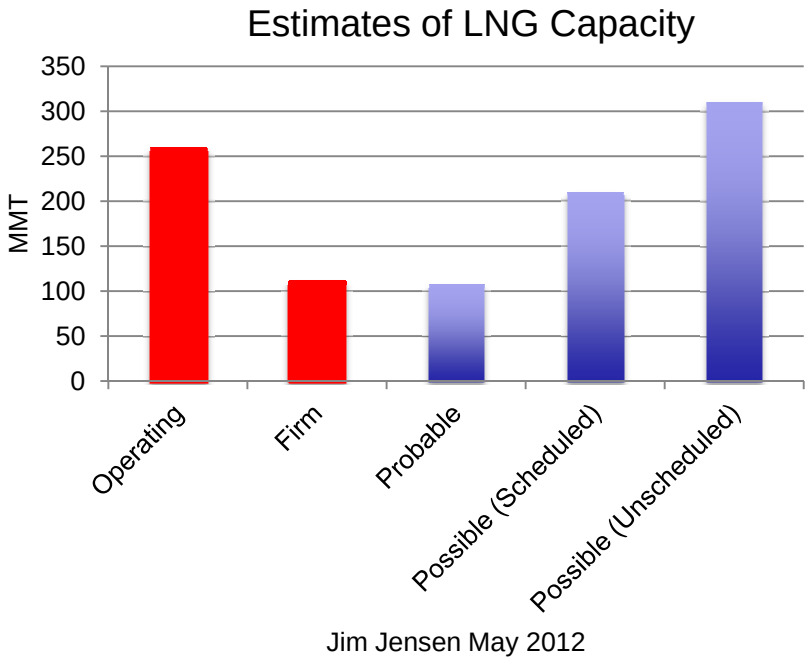
Future global impacts for gas?

- Demand for gas will increase as constraints come off post 1990 in a world where expectations are for lots of cheap gas

- Increased LNG trade?
  - Fears of competition
  - Investor uncertainty

- Pricing issues
  - Links to oil prices?
  - Will the “Asian premium” continue?



Future global impacts for oil?

- Increasing tight oil in the USA
  - Overtakes Saudi Arabia by 2014. BUT size does not matter!
  - But elsewhere? Prospects for “fallow oil fields”?

- Changing trade patterns
  - From West to East

- OPEC’s dilemma
  - Increased “supply price” following the “Arab Uprisings”
  - Leads to demand destruction
  - Increased supply, greatly assisted by the “technological revolution”
  - Higher prices unsustainable

THANK YOU FOR YOUR ATTENTION

A relevant publications from www.chathamhouse.org

- Paul Stevens - The “Shale Gas Revolution”: Developments and Changes. Chatham House Briefing Paper, August 2012