

Shale Gas What Now? What Next?

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- Transporting Britain's Energy July 8 2010

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Market Intelligence
Unconventional Wisdom
Positively Disruptive
Rationally Optimistic

What is the Conventional Wisdom?

- * Economist Intelligence Unit Briefing June 24 2010, survey of 200 UK CEOs
- * 81% expect expect fuel prices to rise sharply over the next five years
- * 47% expect electricity shortages within five years
- * npower Business Energy Index May 2010
- * 6.7 out of 10 identify increased supply costs as the biggest risk
- * 6.1 identify security of supply as the greatest issue

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Changing the narrative:

Align perceptions to reality

Tomorrow is not simply a continuation of today

History matters. But doesn't necessarily repeat.

Replace outdated narratives

Situational Awareness - What's happening that you need to know?

Analysis - What does today's energy news mean to you?

Forecasts - What's ahead in the next quarter, year, and decade that's going to shape your company?

Is security of supply a dead issue?

Today's Takeaway Menu

- The sudden emergence of shale gas in North America today,
- ... indicates a future permanence of abundant natural gas globally in the short, medium and long term
- Shale is impacting European gas prices today via “virtual” US exports
- The effect will strengthen through 2015 even with zero EU shale production
- Shale will go global from 2014, transmitting new price signals
- Post 2015, EU shale production will accelerate
- Prices will moderate over time. Gas as a commodity will be boring
- Shale gas won't change everything.
- It's much more important than that.

Don't just listen to me!



The screenshot shows the Telegraph.co.uk website interface. At the top, there is a search bar and a navigation menu with categories like Home, News, Sport, Finance, Lifestyle, Comment, Travel, Culture, Technology, and Fashion. Below the navigation, there are sub-categories such as News by Sector, Comment, Personal Finance, Markets, Economics, Your Business, Business Club, and Blogs. The main headline reads "Energy crisis is postponed as new gas rescues the world" by Ambrose Evans-Pritchard, published on 11 Oct 2009. The article text states: "Engineers have performed their magic once again. The world is not going to run short of energy as soon as feared." There are social media sharing options (Share, digg, reddit, Email, Print, Text Size) and a small image of a gas flame.



The screenshot shows the Financial Times website interface. The main headline reads "Forget oil, shale gas just gets sexier" by Gwen Robinson, posted on Jun 16 11:11. The article text states: "As BP's oil leak disaster adds to concerns about growing regulatory and safety risks of oil, coal and other conventional energy sources, shale gas is burnishing its reputation as the sexy new energy play." There are social media sharing options (Clip this, Email, Share, Print) and a small image of a gas flame.

From The Sunday Times

November 1, 2009

Shale gas blasts open world energy market
American firms have cracked the technology to tap vast new reserves

- Front page
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 - Niall Ferguson
 - John Gapper
 - Brian Groom
 - Jonathan Guthrie
 - John Kay
 - James Kynge
 - Jurek Martin
 - Wolfgang Münchau
 - David Pilling
 - Ingram Pinn
 - Robert Pozen
 - Gideon Rachman**

Shale gas will change the world

By Gideon Rachman

Published: May 24 2010 20:14 | Last updated: May 24 2010 20:14



The
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Unconventional gas

This changes everything

Natural gas is becoming less like oil and more like coal, which is a good thing

Mar 11th 2010

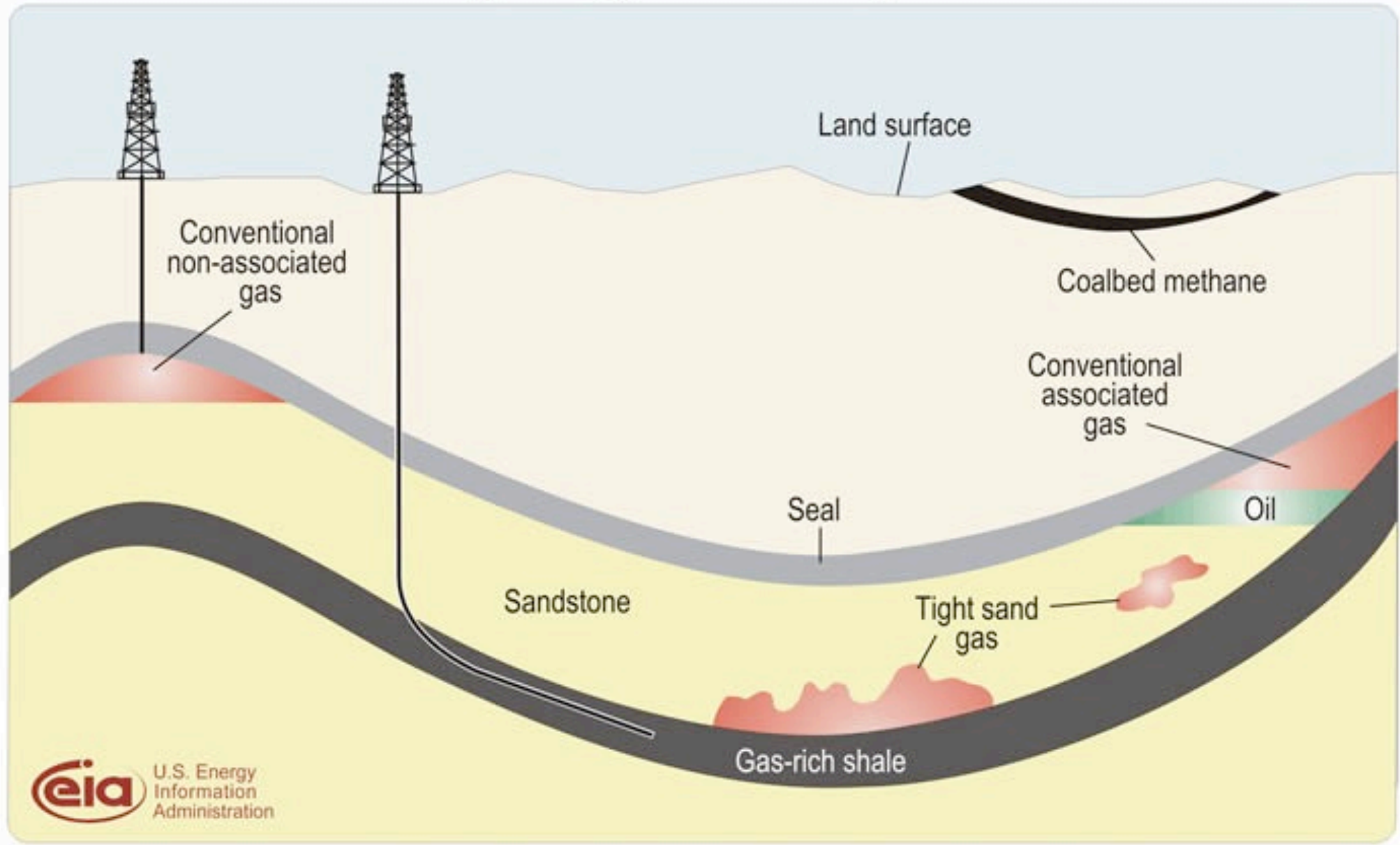
Oil Shale is not Shale Gas



The shale story

- Shale is a technologically driven semi-industrial process for natural gas extraction.
- Shale gas is natural gas found up to 3 km beneath the surface, far deeper than conventional wells
- Shale is hard to extract, but easy to find.
- Shale is changing constantly, and getting cheaper all the time.
- Shale was called unconventional, but now the mix is changing
- Advances in Horizontal Drilling, Hydro-fracturing, Petrophysics met high prices. Many years trial and error from 1981 through 2006
- New technology led to new frontiers
- But many frontiers are under our feet
- “We don’t call it unconventional anymore”

Schematic geology of natural gas resources



North American Shale Plays

Horn River
Montney
10000 BCM

Utica
7000BCM



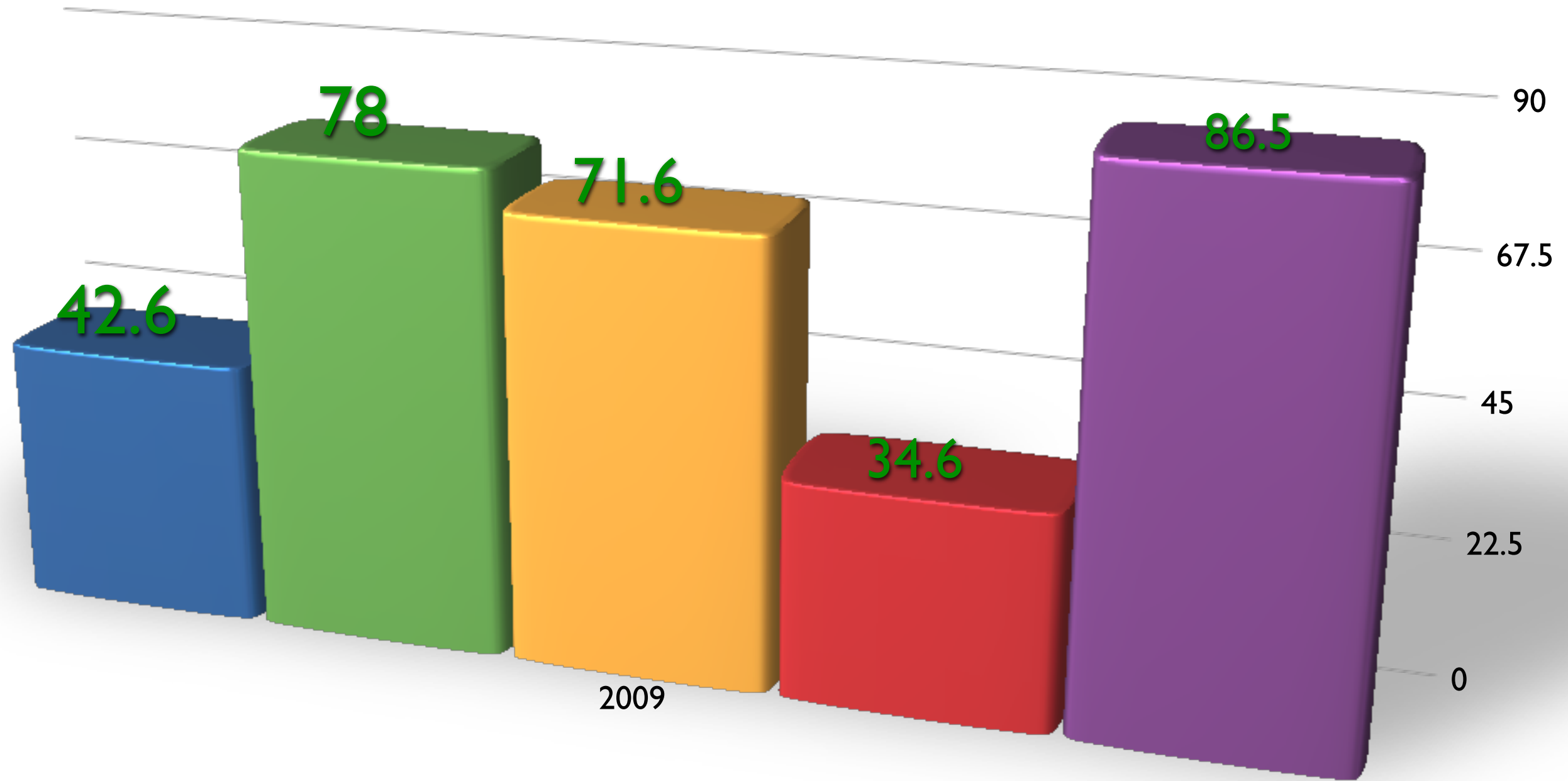
Barnett
1500 BCM

Haynesville
6500 BCM

Marcellus
14000BCM

Gas Demand BCM

■ France ■ Germany ■ Italy ■ Spain ■ UK



Source BP Energy Review June 2010

World Shale Potential



Shale gas in Europe



Troll
1325BCM

Groningen
2850 BCM

Poland?
1300/3000BCM

EPRC, Dec. 2009

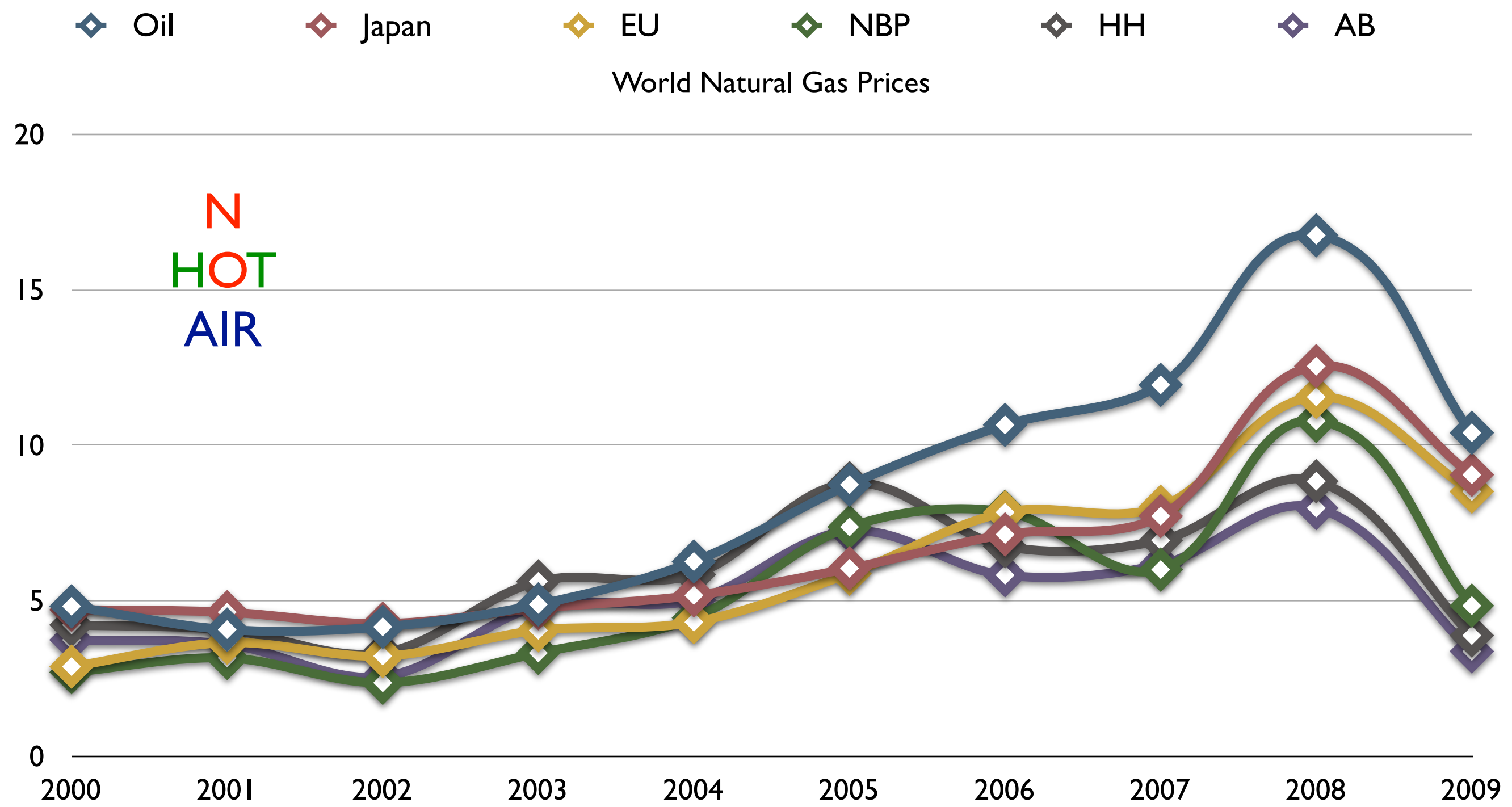
When will shale come to Europe?

Does it really need to?

Even without European shale, we will have solved energy security fears from elsewhere in the world affordably and sustainably.

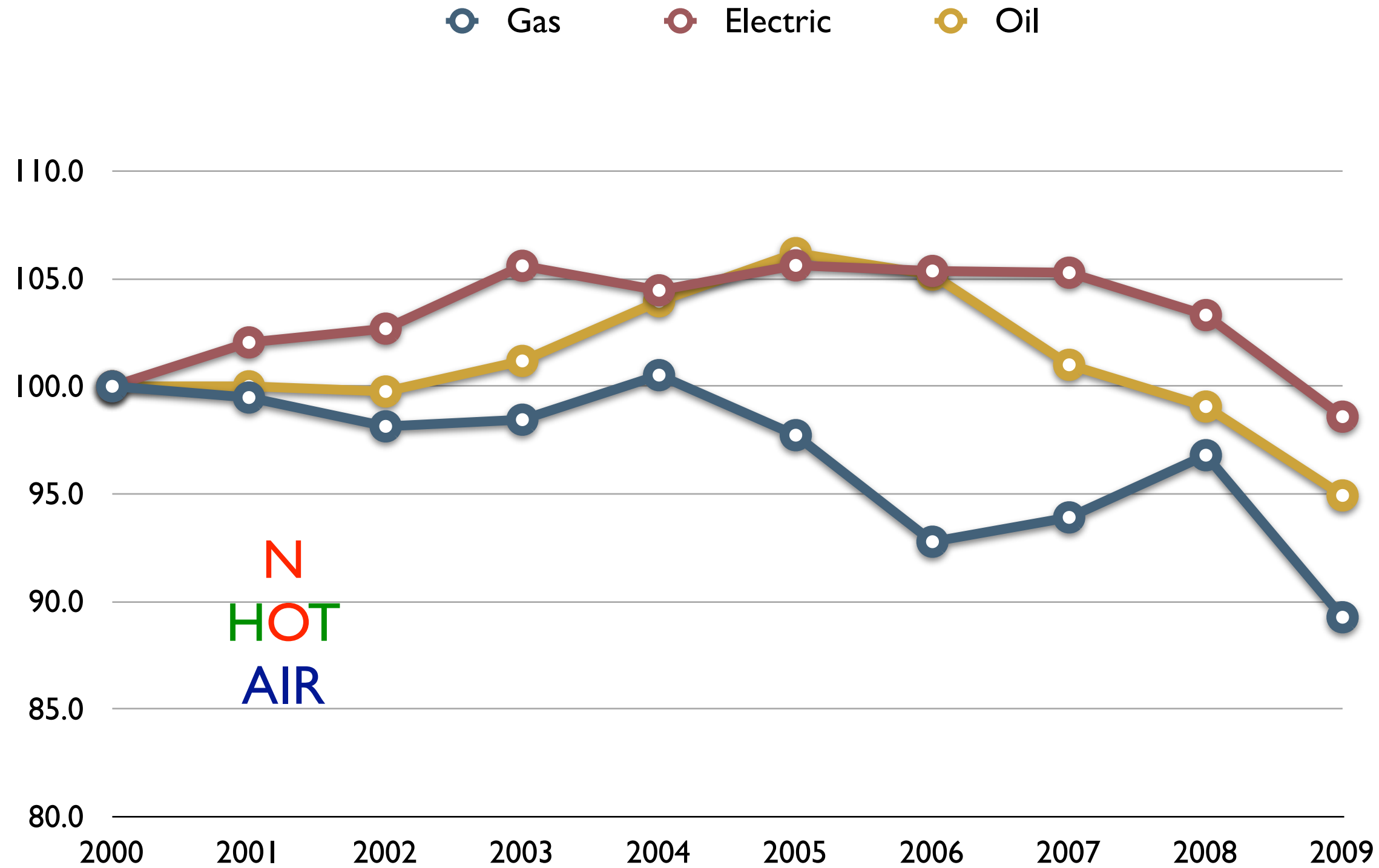
But the economic impact of our own energy would be massive

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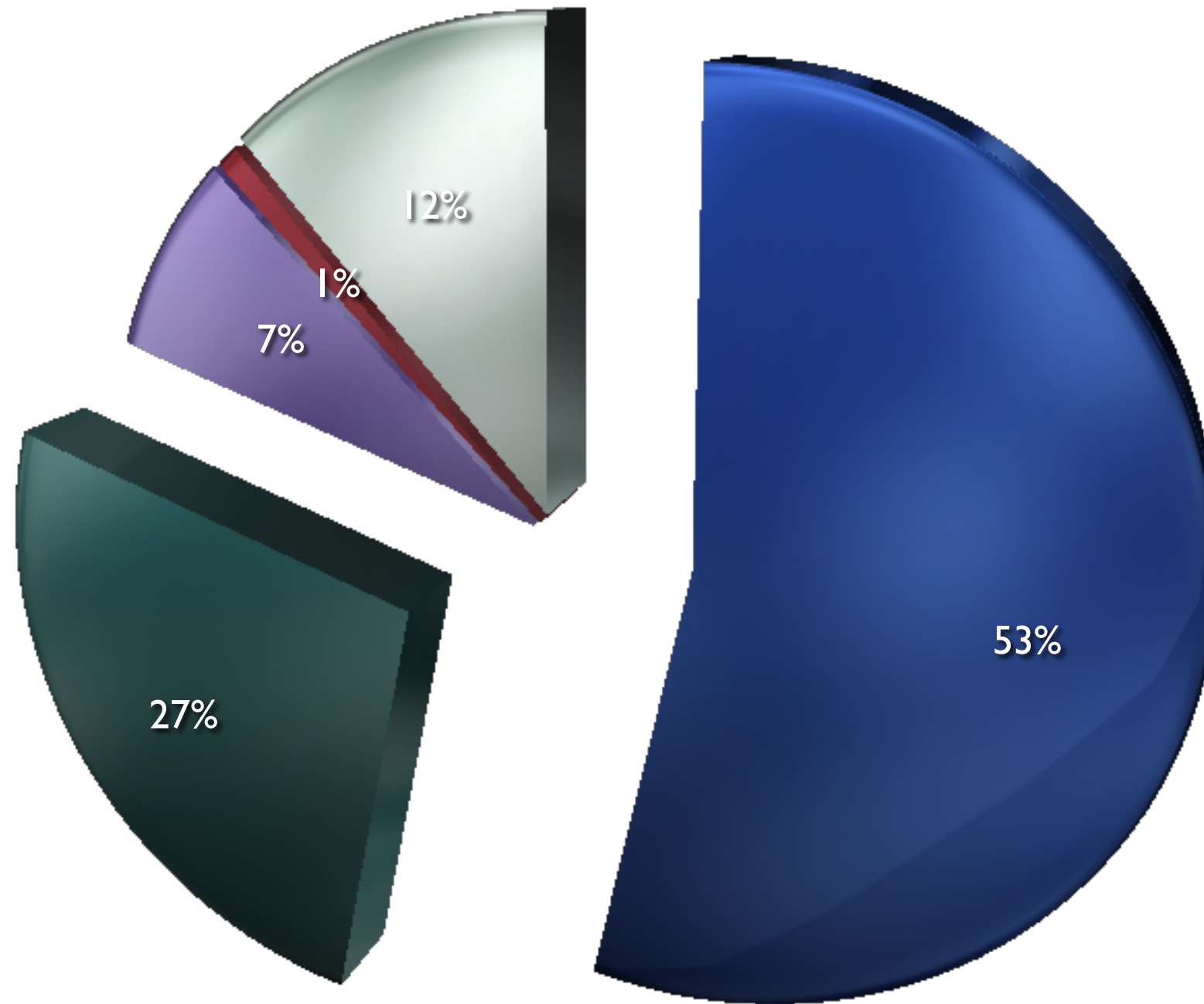
Source: BP World Energy Review 2010

UK Energy Demand peaked pre-recession



Origin of UK gas 2009

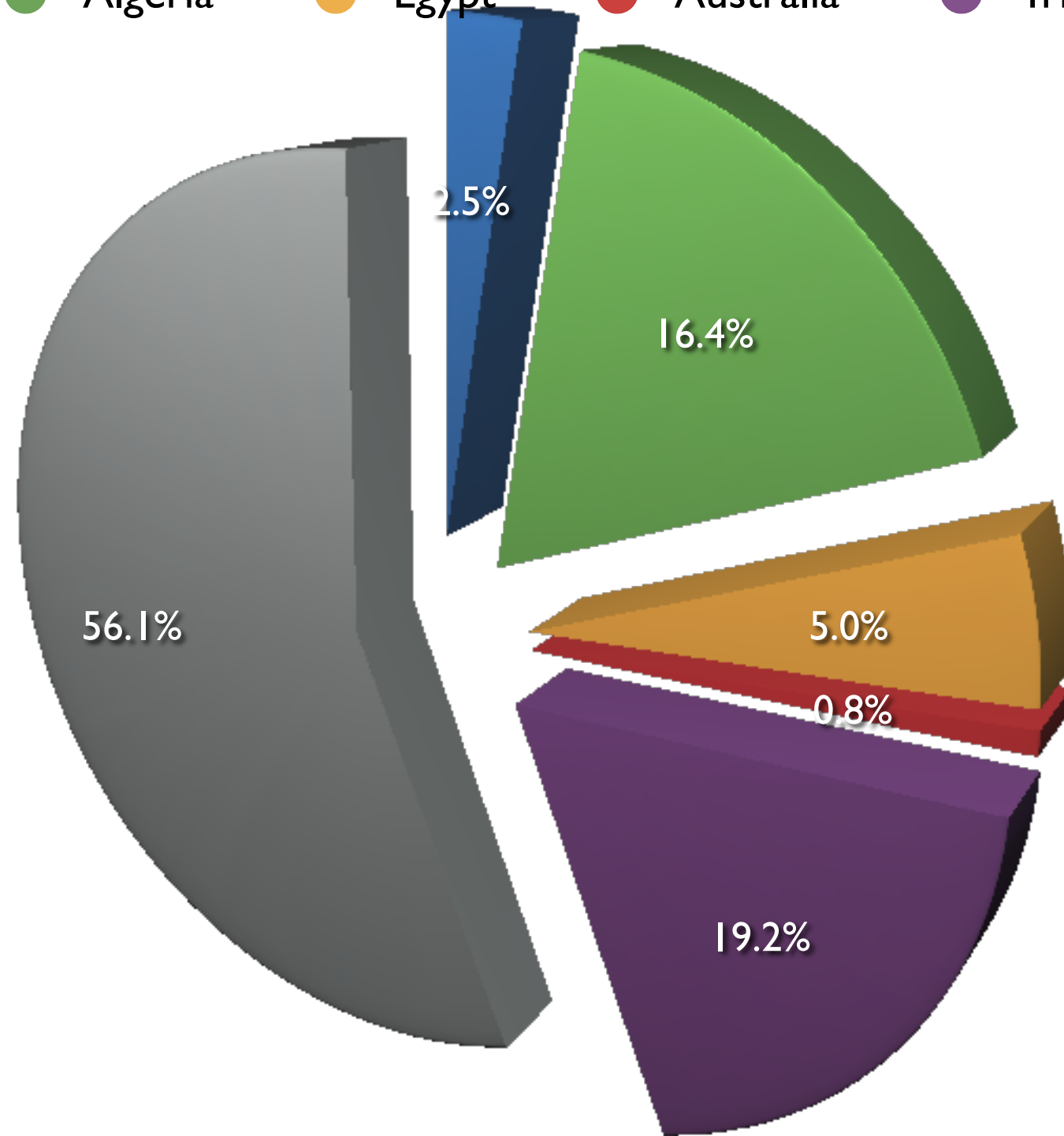
- UK
- Norway
- Netherlands
- Belgium
- LNG



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UK LNG Imports 2009

● Norway ● Algeria ● Egypt ● Australia ● Trinidad & Tobago ● Qatar



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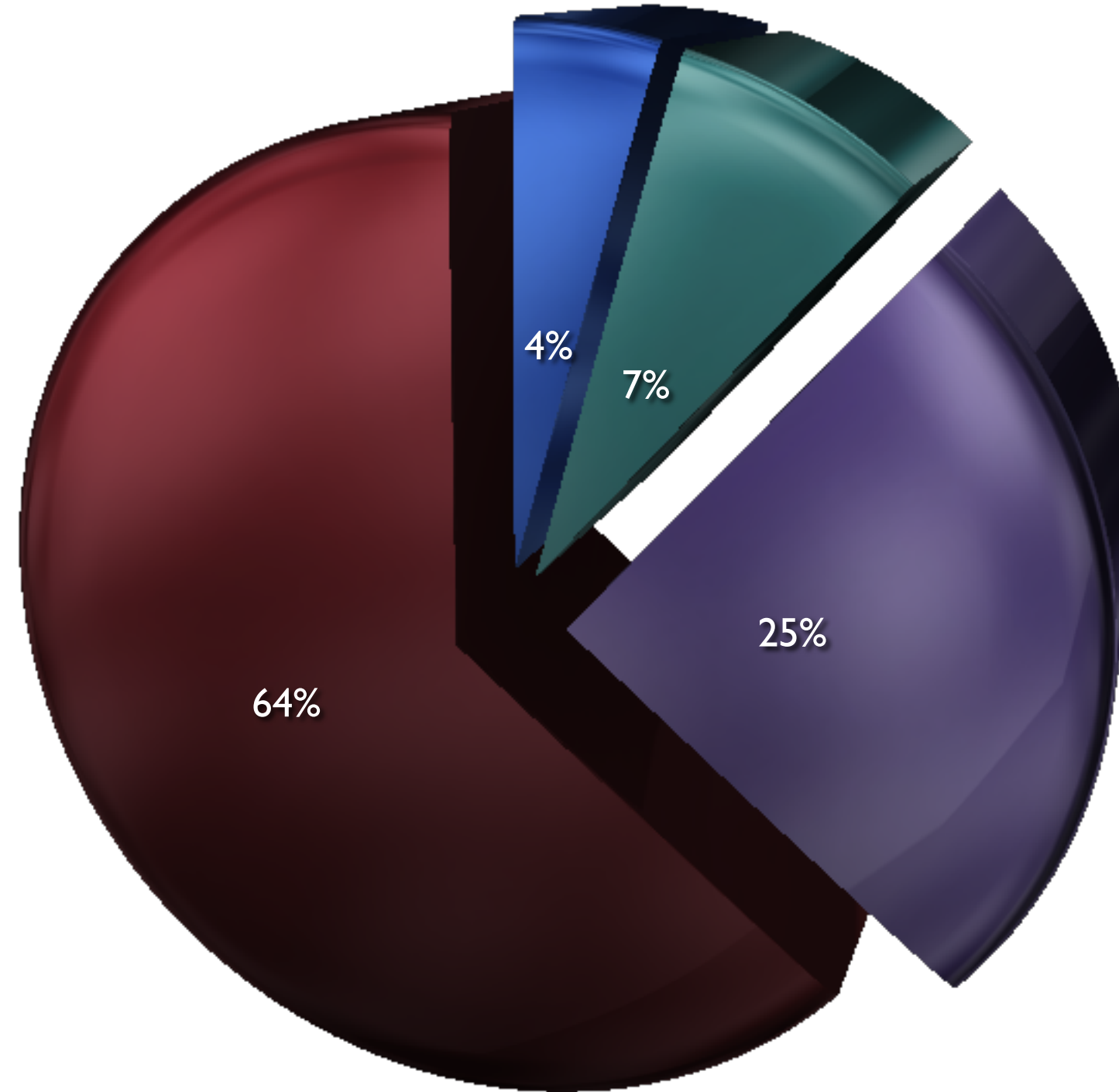
● UK

● North America

● Europe

● Asia

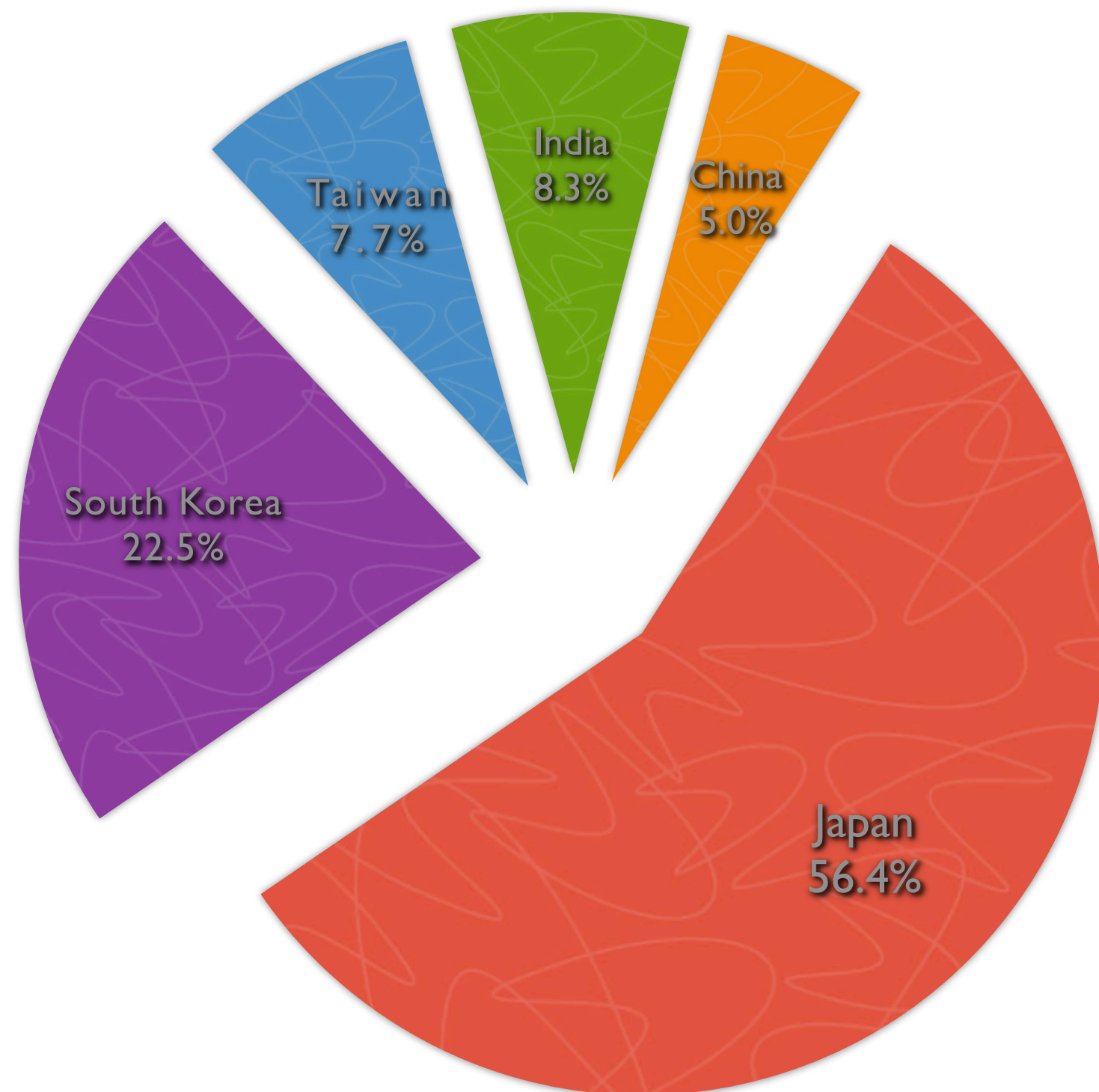
World LNG Imports



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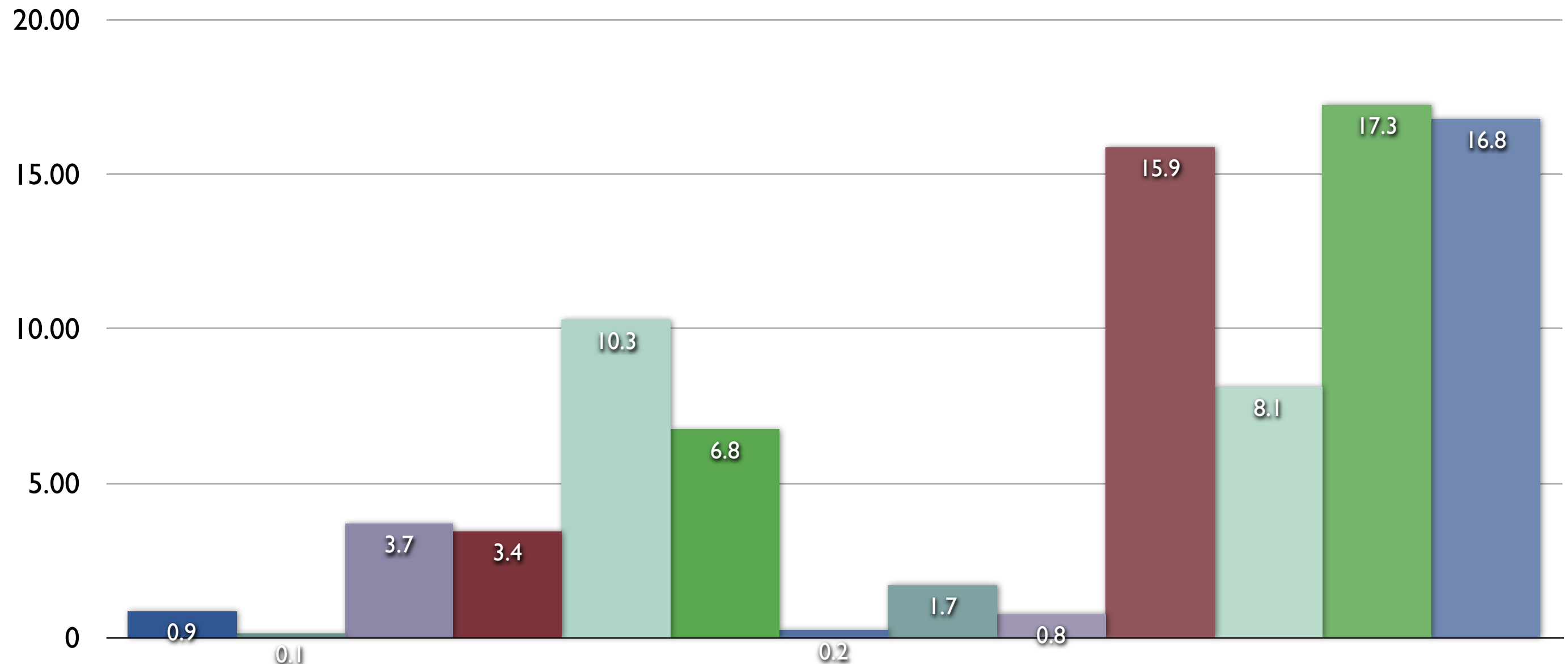
Asian LNG Market Share 2009

● South Korea ● Taiwan ● India ● China ● Japan



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Japan LNG by source



BCM. source: BP World Energy 2010

The three key metrics to measure shale
are: Is it

Environmentally Acceptable?

Available?

Affordable?

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The Key Metric: Environmental Acceptability

Where does gas come from?

What does a gas field look like?

Water?

How big a footprint?

Visual Pollution?

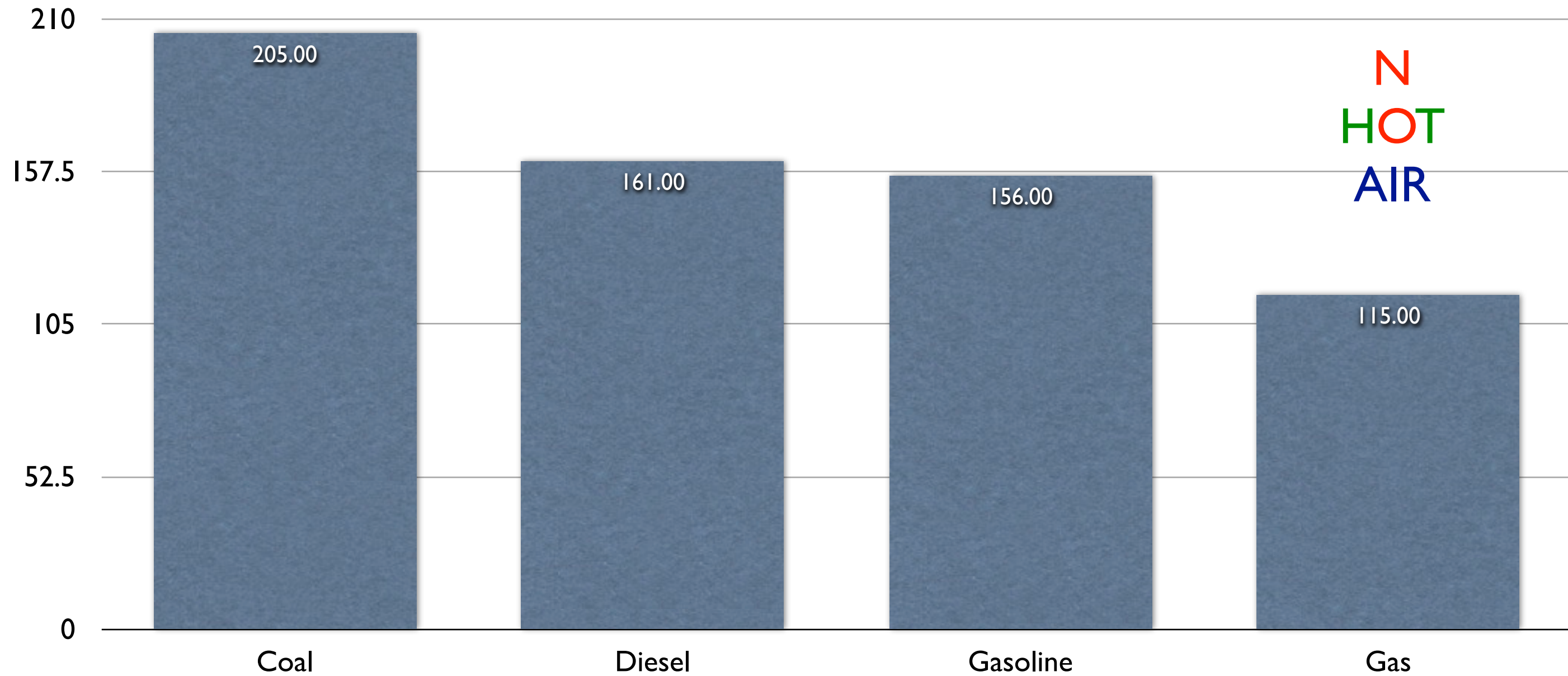
Chemicals?

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Gas is not perfect

But it is possible

■ CO2 per MMBTU



Shale is about the big picture

Climate Change is an immediate issue

The impact is cumulative

Many US Environmentalists support shale:

Sierra Club, Environmental Defence Fund

Waterkeeper's Alliance

UK: Positive feedback from Greenpeace, Jonathan Porritt, Simon Hughes, Green Party.

Gas is the bridge fuel to an affordable carbon free future

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Energy “experts” on the dangers of shale gas

Gazprom scorns shale gas as 'danger to drinking water'

Russia's Gazprom has attacked the idea that huge new US reserves of shale gas will harm its dominance as the world's biggest producer, warning the energy source is environmentally unsound.

Daily Telegraph February 9 2010

"There are major geological issues, environmental issues and major social issues for a population that is very environmentally and climate change aware," Britain's energy regulator Ofgem chief executive Alistair Buchanan said last week. REUTERS March 1 2010

The big picture: Gas delivers carbon savings quickly, securely and cheaply

- 50% v existing coal fired generation
- 60%+ on OCGT/CHP
- 70%+ on backup to wind
- Compared to 90% saving on CCS
- Wind+Solar+Natural Gas= Sustainable Energy
- Local Energy = Sustainable (and secure!) Energy

But the local picture is vital too



Shale Well Drill Site, Quebec May 2010

Shale well, three months after initial drilling



*Marcellus Shale Pennsylvania
Statoil*

Shale and Water

- Average shale well uses 3.5 million gallons and is recycled with a forecast well life of up to 40 years
- Water remains up to 3km below the water table
- Average drinking water <300 meters
- A 1000 MW coal plant uses that in 8.5 hours
- A 1000 MW nuclear plant uses that in 4.5 hours
- Six acres of corn per growing season
- 18 Hole Golf Course in three weeks

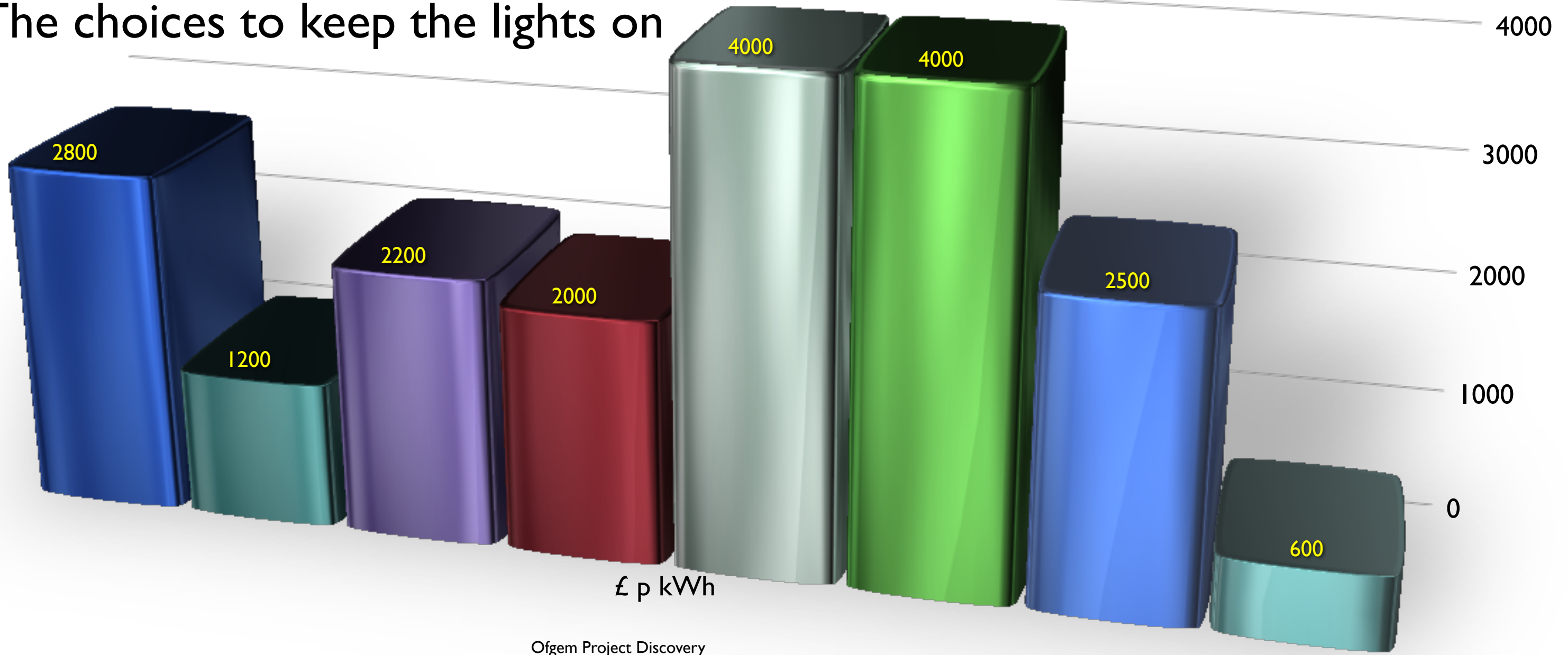
Other uses of frac chemicals

- 98.5% water, 1% sand, 0.5% chemicals
- Potassium Chloride: Table Salt
- Formamide : Prescription Drugs, Plastic Manufacturing
- Ammonium Persulfate : Disinfectant
- Borate salts : Detergents, Soap, Cosmetics
- Isopropranol: Deodorant, Hair Colouring, Lipstick
- Guar Gum: Ice Cream
- Water could be replaced with compressed air, chemicals with biocides or infra red treatment.

Capital Cost £ per kWh

- Off Wind
- On Wind
- CCS
- Nuclear
- Tidal
- Wave
- Biomass
- Gas

The choices to keep the lights on

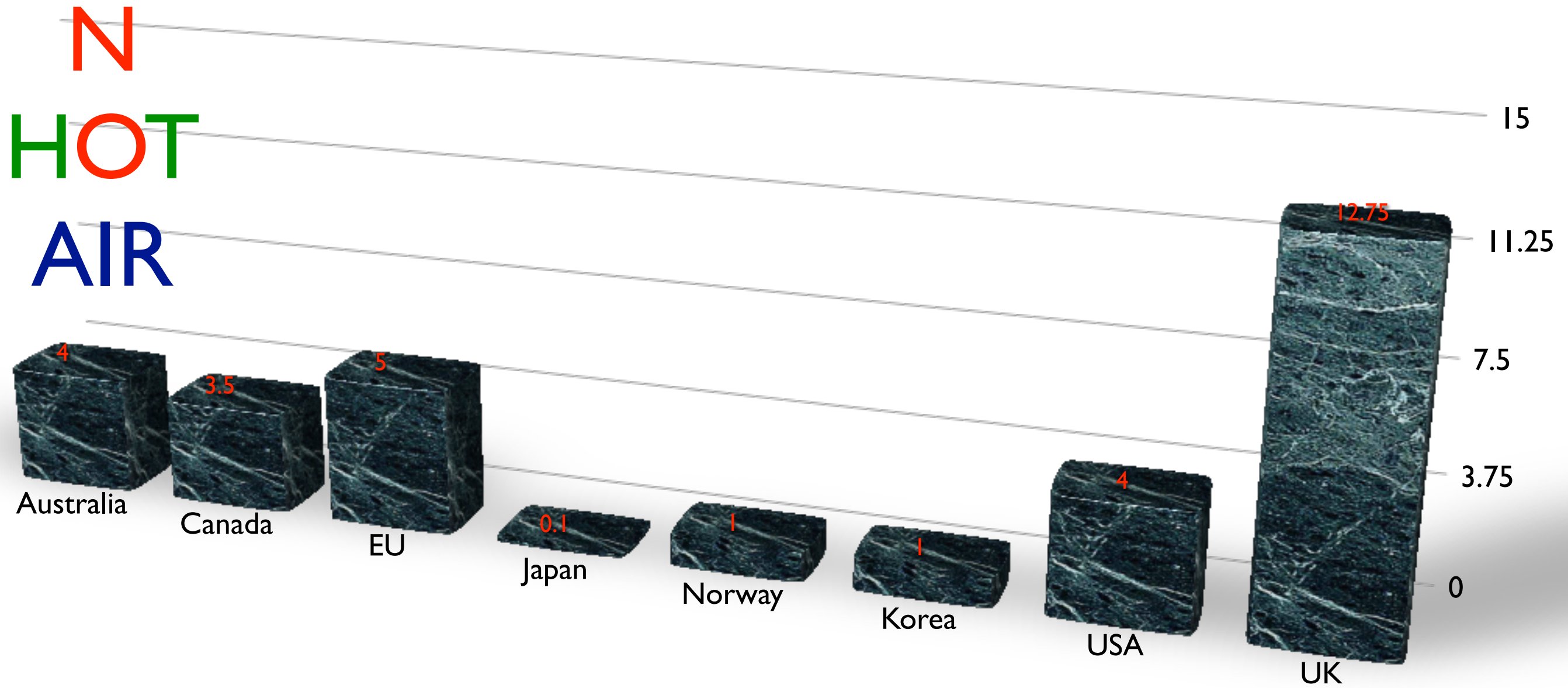


£ p kWh

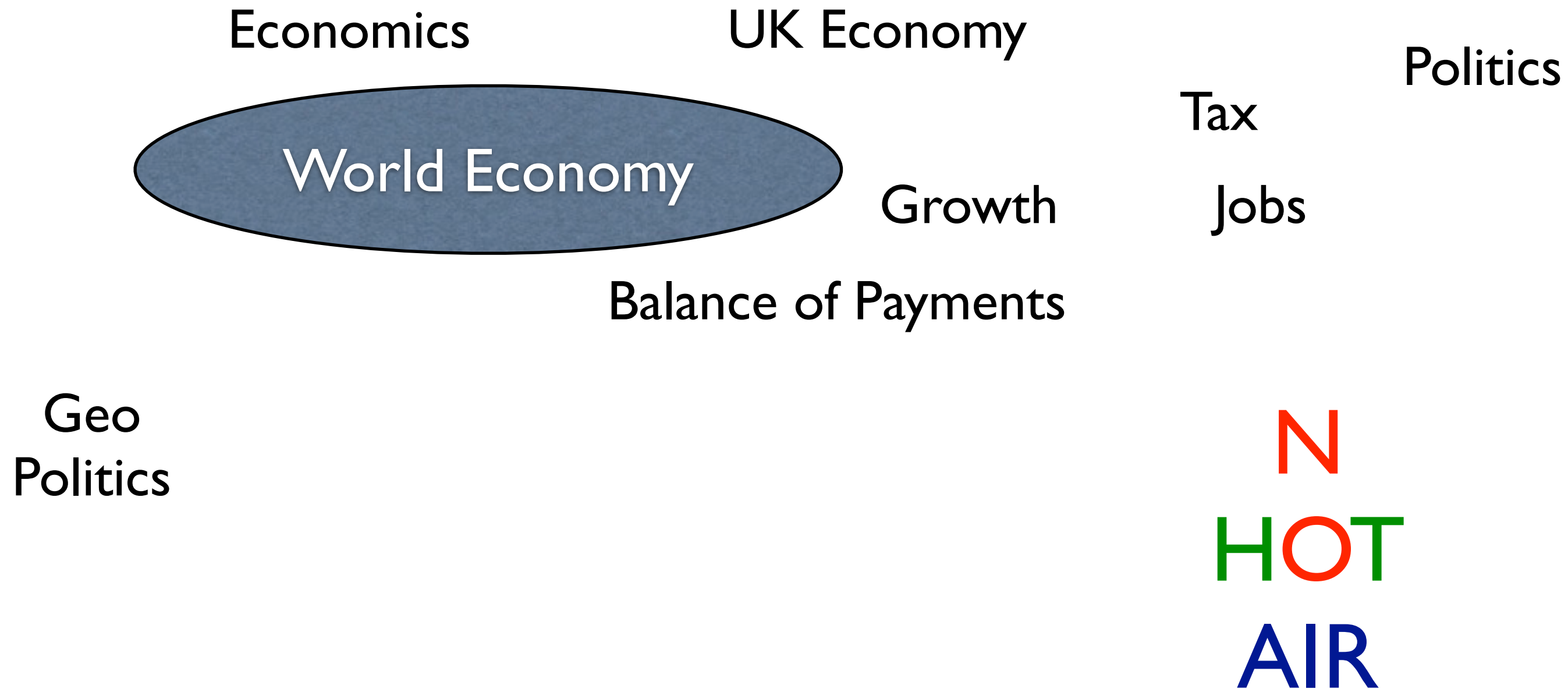
Ofgem Project Discovery

Projected funding for CCS Billions of USD

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- Is shale gas too important to be left to energy experts?



Is the conventional wisdom on energy (very) wrong?

Shale is impacting Europe and world LNG
prices NOW

Energy will be secure and moderately
priced

Fixing the price of an abundant
commodity is !!!!

Gas Price forecast to 2015, 2020, 2030 at
www.nohotair.co.uk

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- When the facts change, I change my mind. What do you do Sir?
John Maynard Keynes

- We should not forego the possible in pursuit of the perfect

Barack Obama

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