

Natural Gas Net-Export Trends

A graphical review of the historical data.

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Historical Data has Advantages

- Production and consumption data are freely available: BP Statistical Review, EIA, IEA
- Comparison between datasets gives an idea of the error bars.
- No assumptions are needed.
- Historical time series map out trends – zeroth order predictions.

Historical data capture the Human Story:

discoveries, accidents, wars, politics, economics, technology, environmental issues, *etc.*

Telling Stories with Pictures

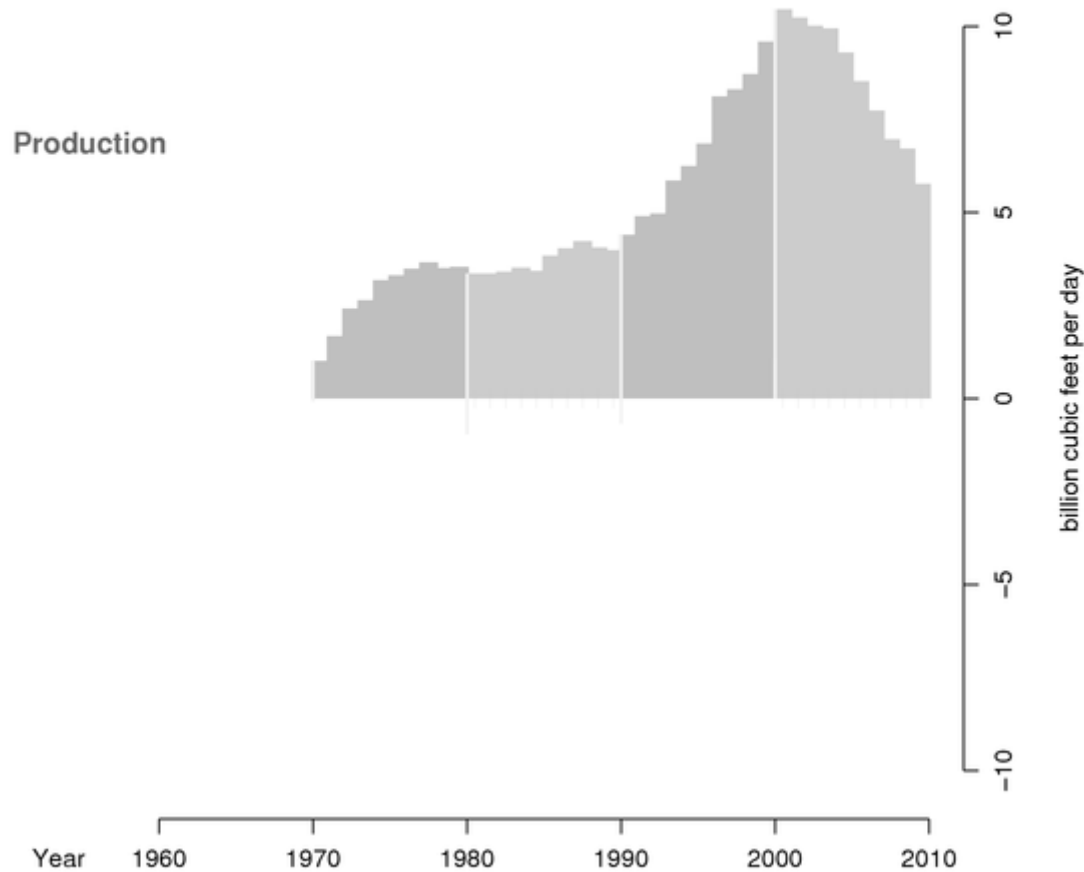
- Humans communicate by telling stories.
- Pictures help us tell those stories.
- Good data graphics allow us to “tell stories” with data.



Cave painting, Lascaux, France, 15,000 to 10,000 B.C.

UK – Historical Gas Production

United Kingdom : Nat. Gas

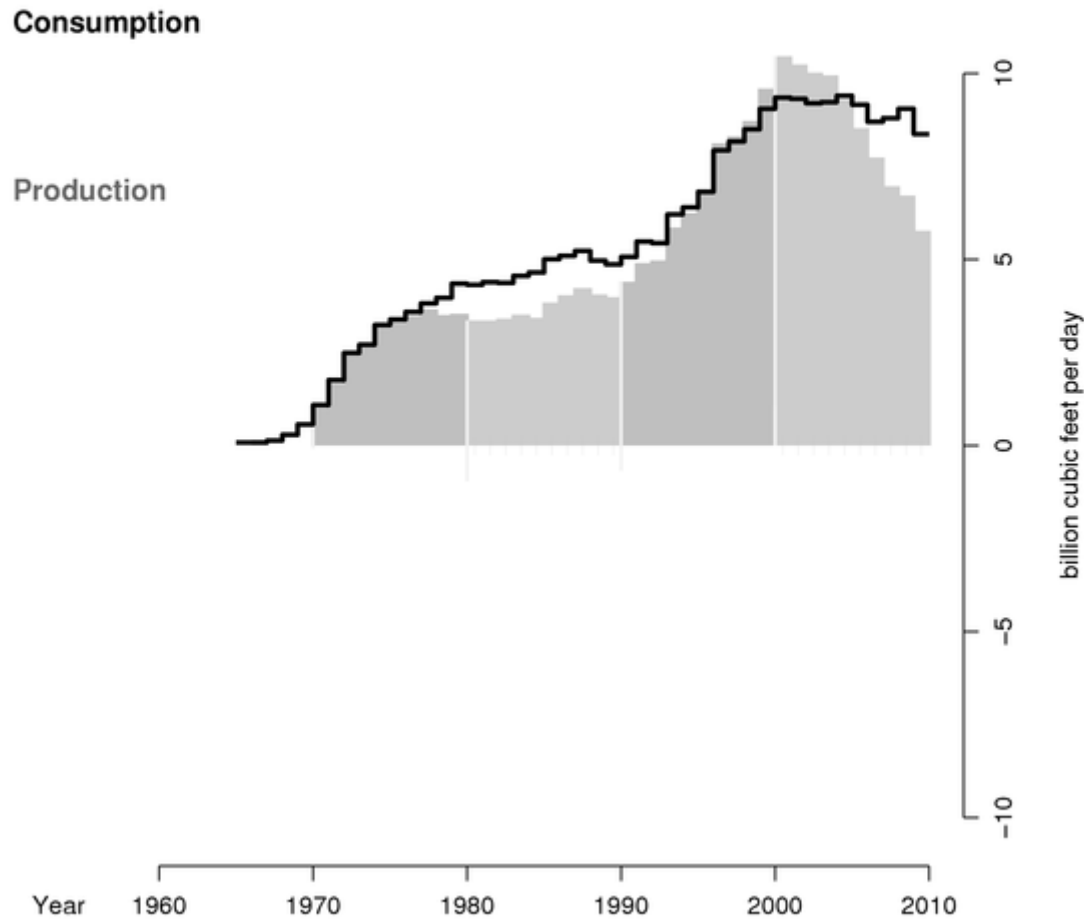


Data: BP Statistical Review 2010 Graphic: mazamascience.com

- 1970's – rising
- 1980's – stable
- 1990's – rapid rise
- 2000's – rapid fall

UK – Consumption

United Kingdom : Nat. Gas

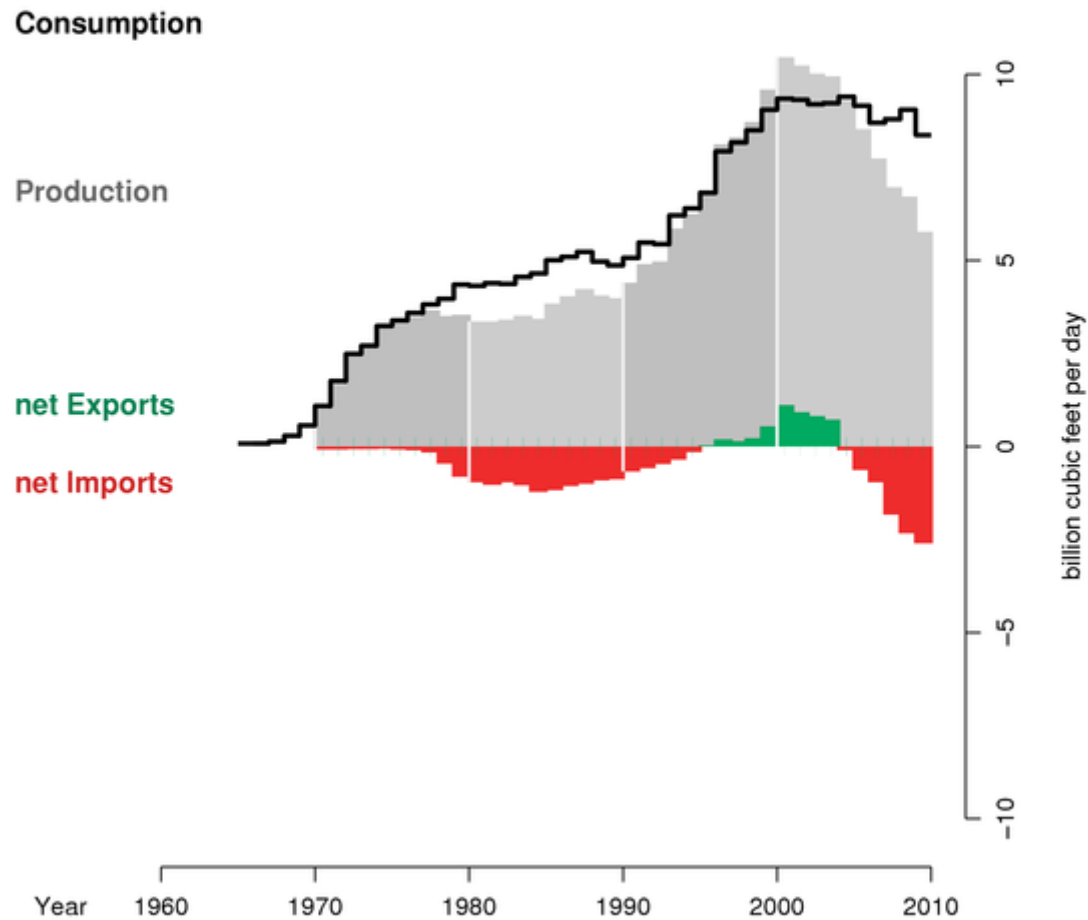


Data: BP Statistical Review 2010 Graphic: mazamascience.com

- 1970's – rising
- 1980's – slight increase
- 1990's – rising
- 2000's – slight decline

UK – Net Exports

United Kingdom : Nat. Gas



Data: BP Statistical Review 2010 Graphic: mazamascience.com

- 1970's – self sufficient
- 1980's – stable imports
- 1990's – declining imports
- 2000's – increasing imports

A Sense of History

*“A careful reading of history clearly demonstrates ...
that people don't read history carefully.”*

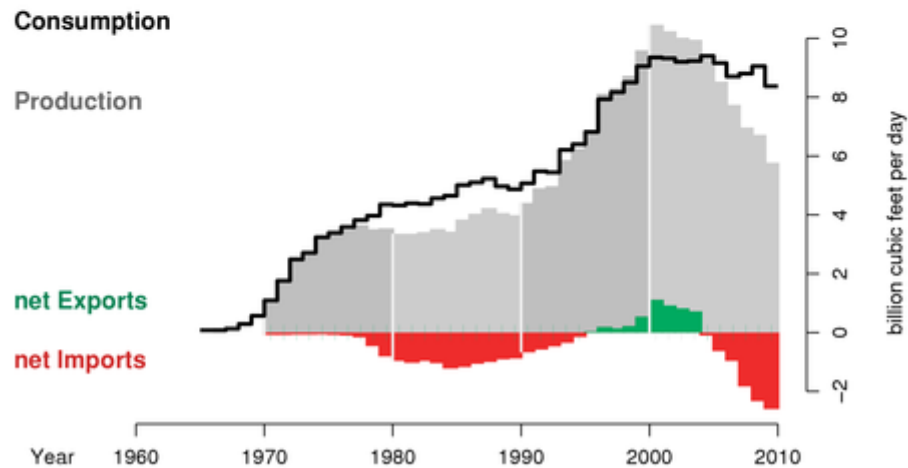
- Understanding Net Export trends means understanding production and consumption trends.
- Geology and technology set limits on production.
- But actual production and consumption depend on economics, politics and cultural values – human factors.
- Historical curiosity can help explain (and predict) a lot.

“History doesn't repeat but she sure rhymes a lot.”

Data-driven story: *Privatization vs. Polder*



United Kingdom : Nat. Gas

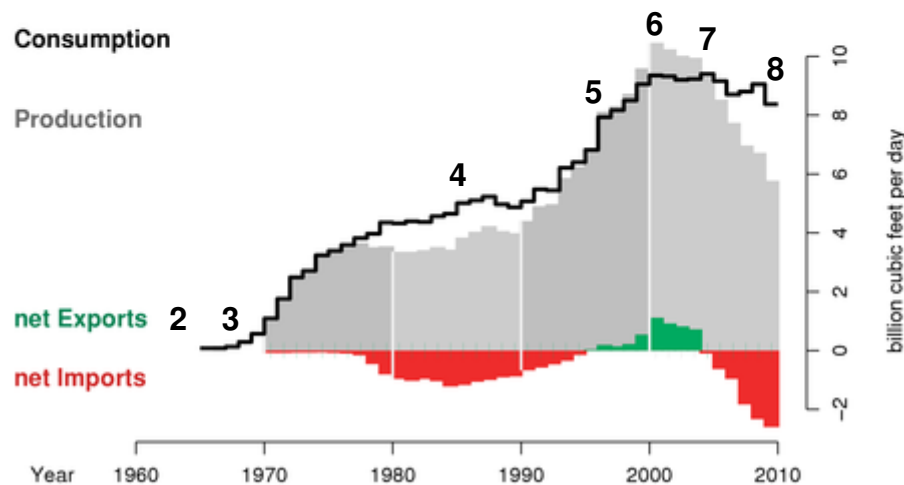


Data: BP Statistical Review 2010 Graphic: mazamascience.com

British policy emphasized “free market”.



United Kingdom : Nat. Gas



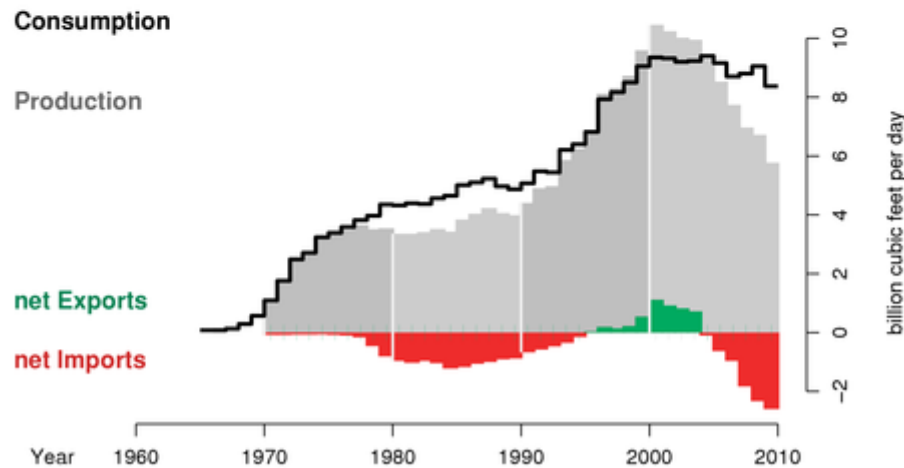
Data: BP Statistical Review 2010 Graphic: mazamascience.com

- (1) 1959 – first LNG from LA
- (2) 1963 – LNG from Algeria
- (3) 1967 – first North Sea gas
- (4) 1986 – **privatization** (Gas Act)
- (5) 1996 – **market competition**
- (6) 2000 – peak production
- (7) 2004 – net importer
- (8) 2010 – Gas Balancing Alert

Dutch policy emphasized “small fields” first.



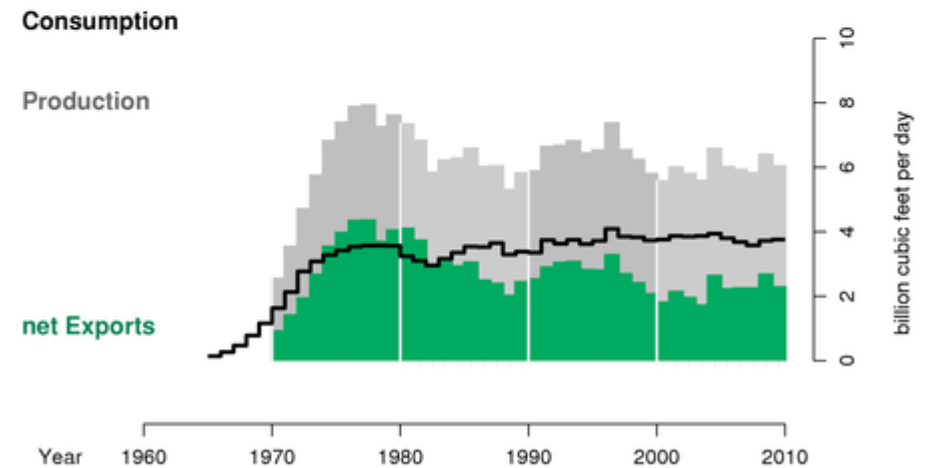
United Kingdom : Nat. Gas



Data: BP Statistical Review 2010 Graphic: mazamascience.com



Netherlands : Nat. Gas



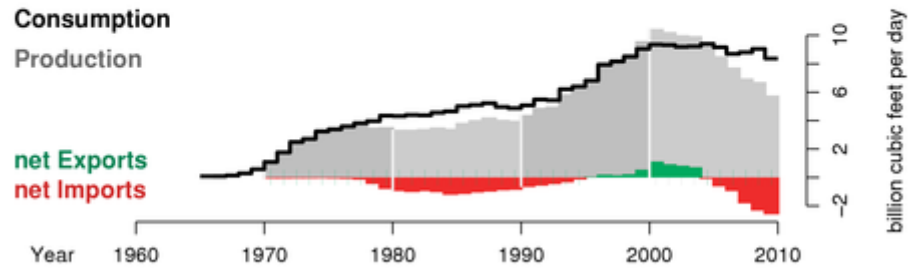
Data: BP Statistical Review 2010 Graphic: mazamascience.com

Same geology, different policies → different outcomes.

What does “peak production” look like?

United Kingdom : Nat. Gas

2009 imports increased by 11. %

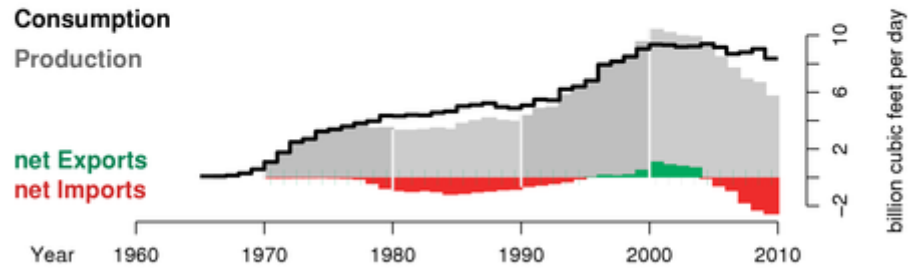


Data: BP Statistical Review 2010 Graphic: mazamascience.com

Romania's decline from peak has been steady.

United Kingdom : Nat. Gas

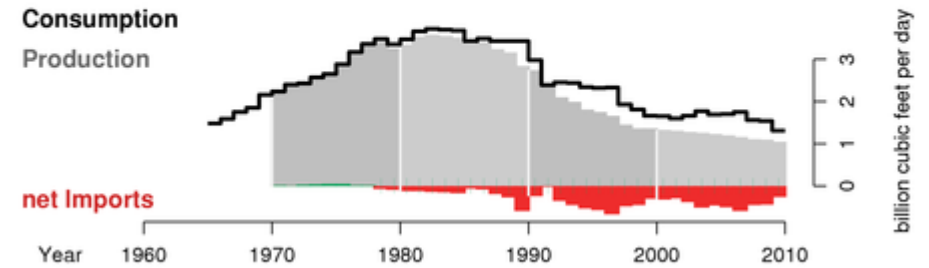
2009 imports increased by 11. %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

Romania : Nat. Gas

2009 imports decreased by 40.9 %

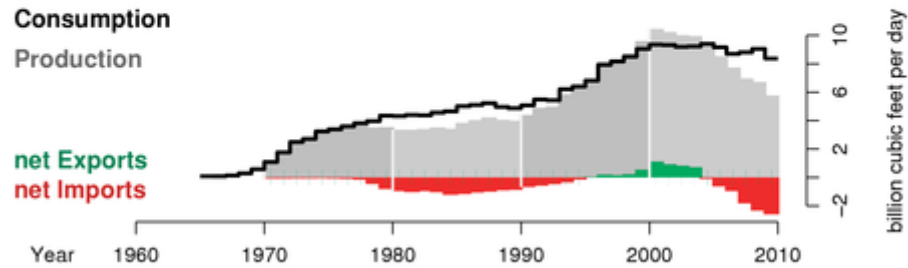


Data: BP Statistical Review 2010 Graphic: mazamascience.com

Italy's production decline has been gradual.

United Kingdom : Nat. Gas

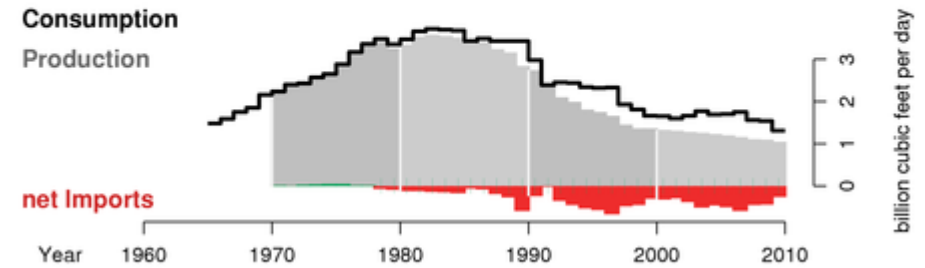
2009 imports increased by 11. %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

Romania : Nat. Gas

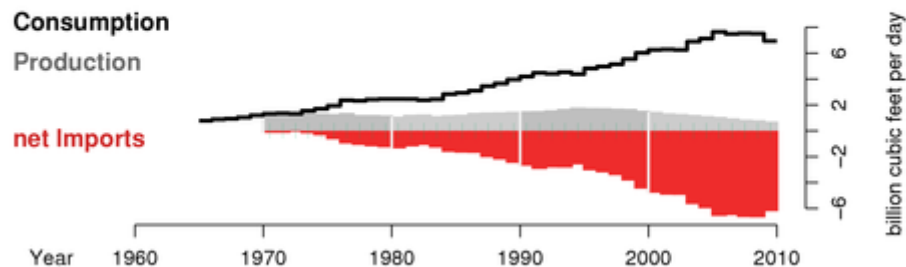
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Data: BP Statistical Review 2010 Graphic: mazamascience.com

Italy : Nat. Gas

2009 imports decreased by 7.1 %

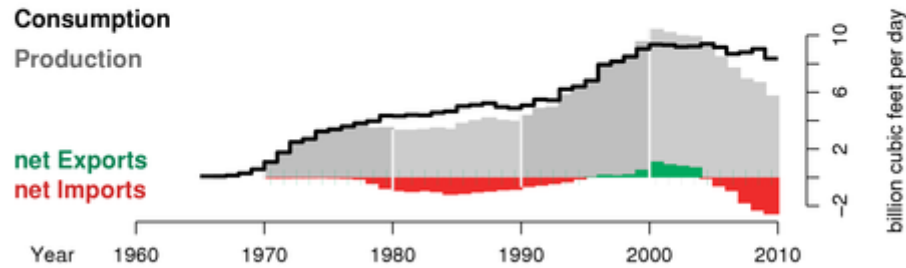


Data: BP Statistical Review 2010 Graphic: mazamascience.com

Is Argentina at peak production?

United Kingdom : Nat. Gas

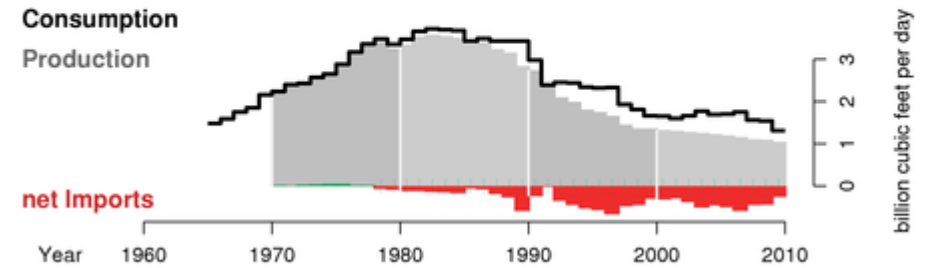
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Romania : Nat. Gas

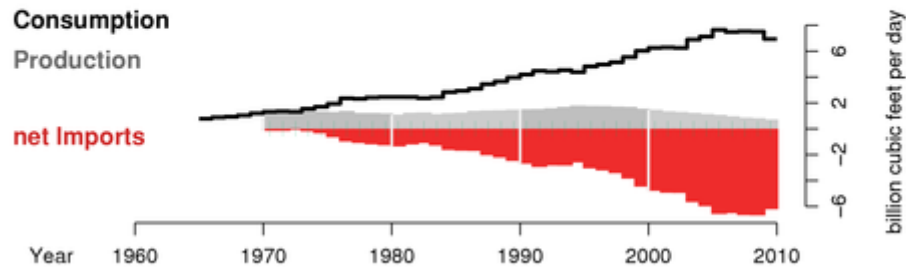
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Data: BP Statistical Review 2010 Graphic: mazamascience.com

Italy : Nat. Gas

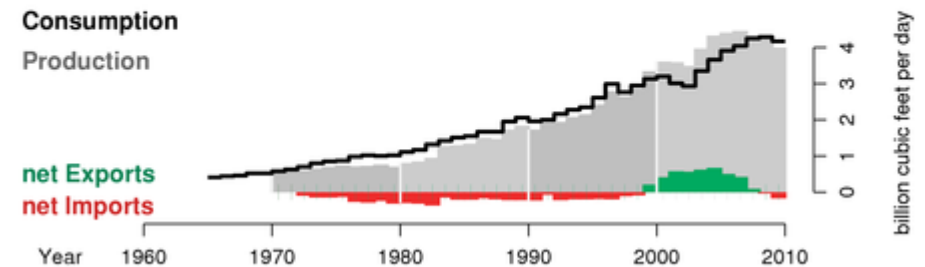
2009 imports decreased by 7.1 %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

Argentina : Nat. Gas

2009 imports increased by 324 %

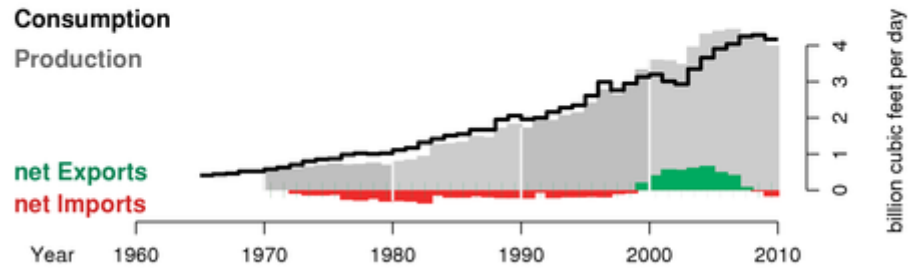


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What about “peak exports” – the green bit?

Argentina : Nat. Gas

2009 imports increased by 324 %

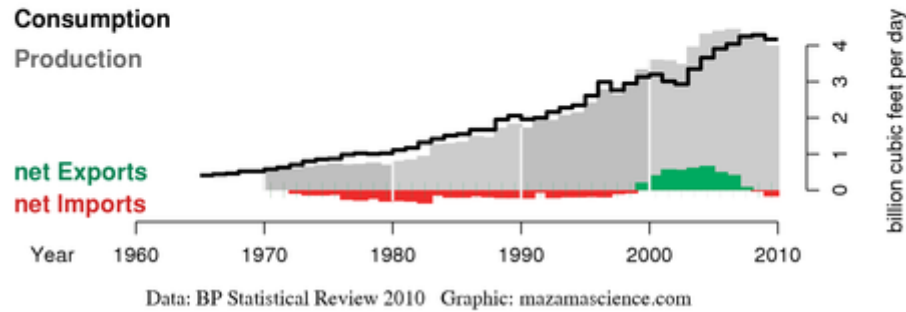


Data: BP Statistical Review 2010 Graphic: mazamascience.com

Increased consumption can cause peak exports.

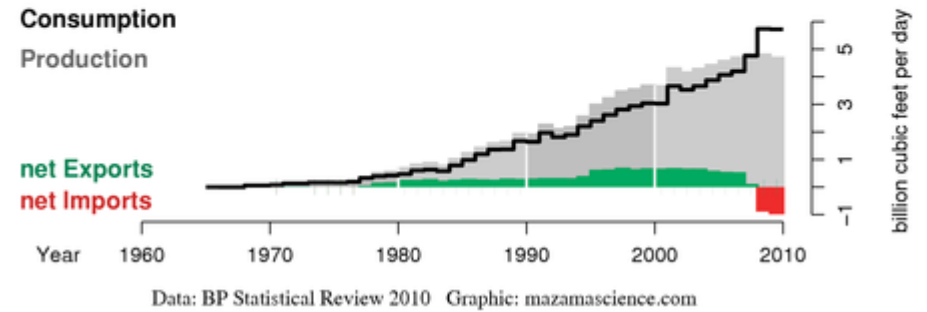
Argentina : Nat. Gas

2009 imports increased by 324 %



United Arab Emirates : Nat. Gas

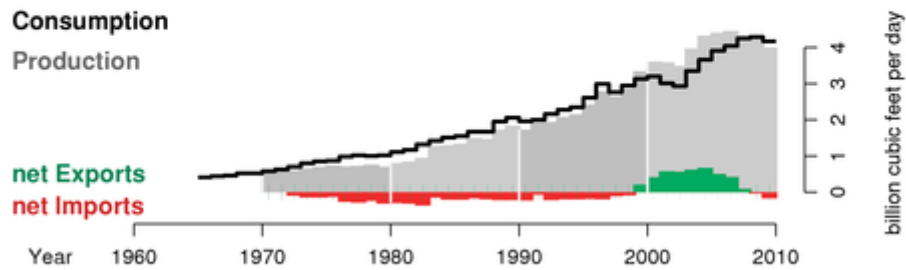
2009 imports increased by 11. %



Decreased production can cause peak exports.

Argentina : Nat. Gas

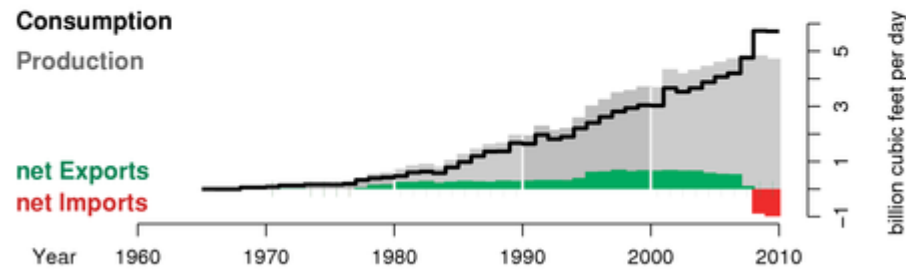
2009 imports increased by 324 %



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United Arab Emirates : Nat. Gas

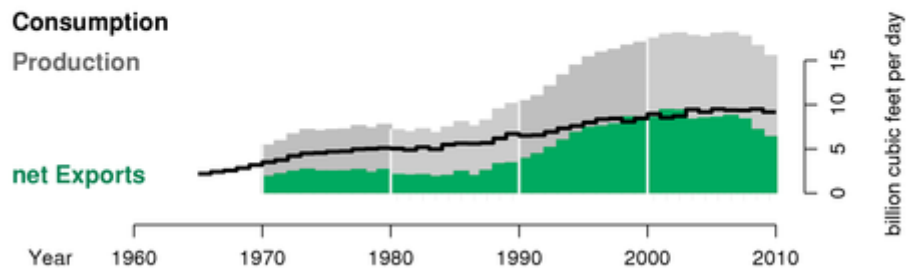
2009 imports increased by 11. %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

Canada : Nat. Gas

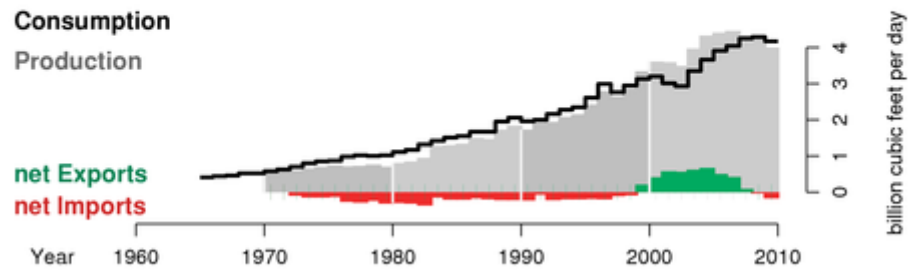
2009 exports decreased by 11. %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

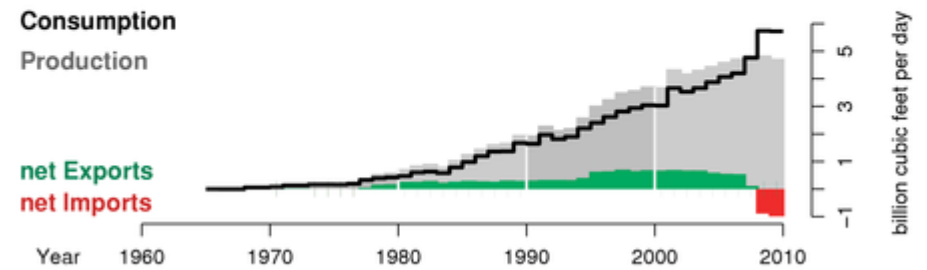
Is Indonesia at peak exports?

Argentina : Nat. Gas
2009 imports increased by 324 %



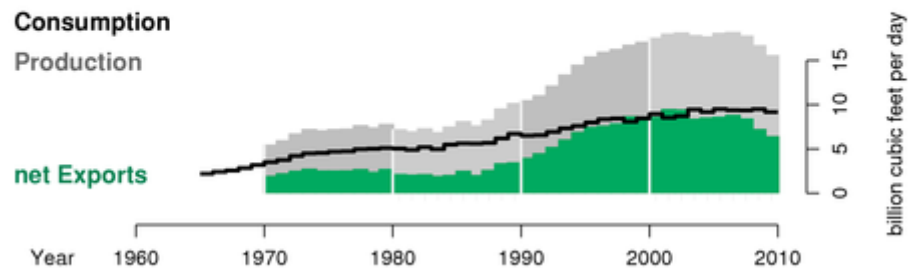
Data: BP Statistical Review 2010 Graphic: mazamascience.com

United Arab Emirates : Nat. Gas
2009 imports increased by 11. %



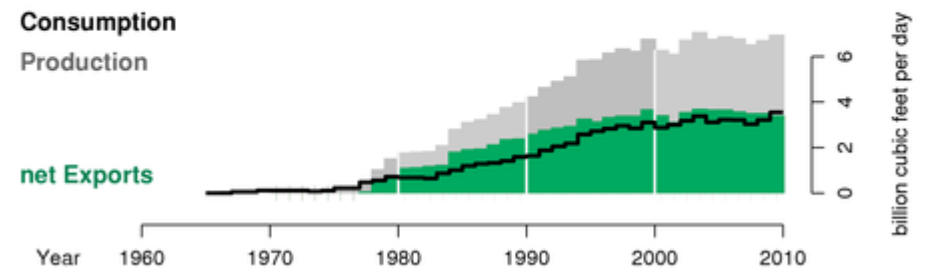
Data: BP Statistical Review 2010 Graphic: mazamascience.com

Canada : Nat. Gas
2009 exports decreased by 11. %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

Indonesia : Nat. Gas
2009 exports decreased by 2.8 %



Data: BP Statistical Review 2010 Graphic: mazamascience.com

International Pipelines vs. LNG

Pipelines

- Planning and construction take years
- International cooperation
- Right-Of-Way issues
- Constant delivery
- Transit nations
- Partners are locked in

LNG

- Planning and construction take months
- National decision
- Coastal access required
- Intermittent delivery
- High seas
- Open market

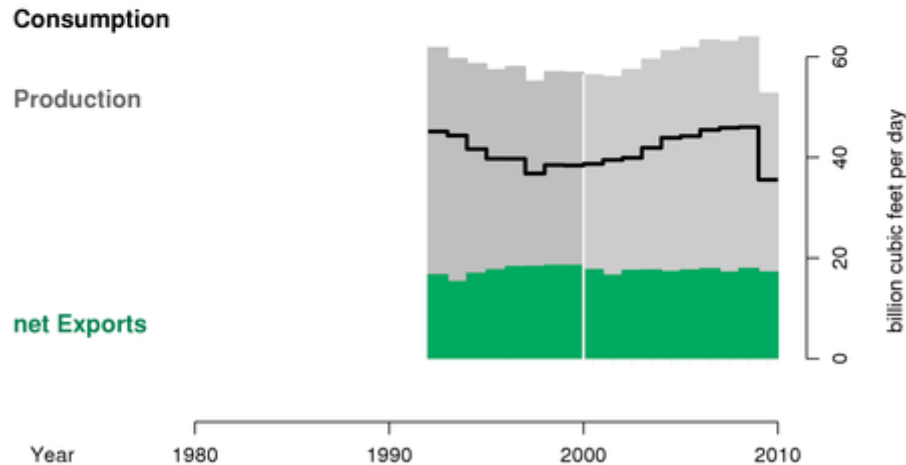
Largest Net-Exporting Regions in 2008

#1 Russia	17 Bcf/day
#2 North Sea	10 Bcf/day
#3 North Africa	8 Bcf/day
#4 SE Asia	7 Bcf/day
#5 Canada	6 Bcf/day
#6 Central Asia	6 Bcf/day
#7 Middle East	5 Bcf/day
#8 Sub-Saharan Africa	3 Bcf/day

Russian exports have remained steady.



Russia : Nat. Gas
2009 exports decreased by 3.8 %



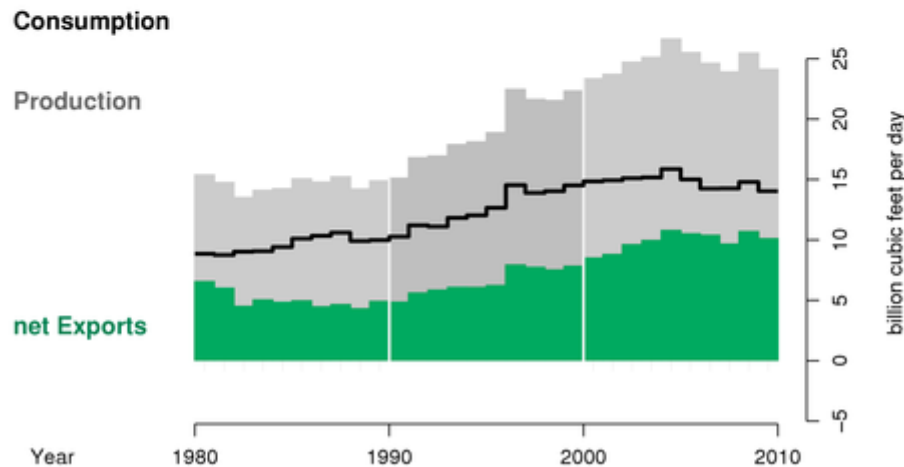
Data: EIA International 2010 Graphic: mazamascience.com

- Huge reserves
- High levels of consumption
- Declining population
- Europe's biggest supplier
- Pipeline control battles
- 2012 Nord Stream pipeline
- 2015? South Stream pipeline

North Sea exports are expected to decline.



North Sea : Nat. Gas
2009 exports decreased by 5.4 %



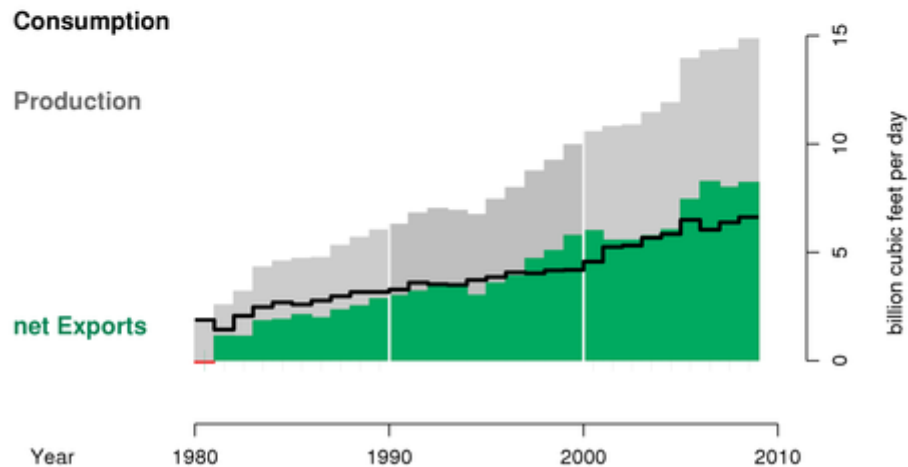
Data: EIA International 2010 Graphic: mazamascience.com

- Norway is ~80% of net-exports
- Very good data
- Lack of new discoveries
- Using latest technology
- Peak anticipated this decade

North African exports are growing.



North Africa : Nat. Gas
2008 exports increased by 2.7 %



Data: EIA International 2010 Graphic: mazamascience.com

- Algeria is ~60% of net-exports
- Huge reserves
- Population growth
- Modern development
- Higher levels of consumption
- Existing trans-med pipelines
- Existing LNG plants
- 2010 Medgaz pipeline
- 2011 new LNG plants and vessels

SE Asian exports appear to have peaked.



- Developing economies
- Past peak oil production
- Major coal users
- Close to huge LNG importers

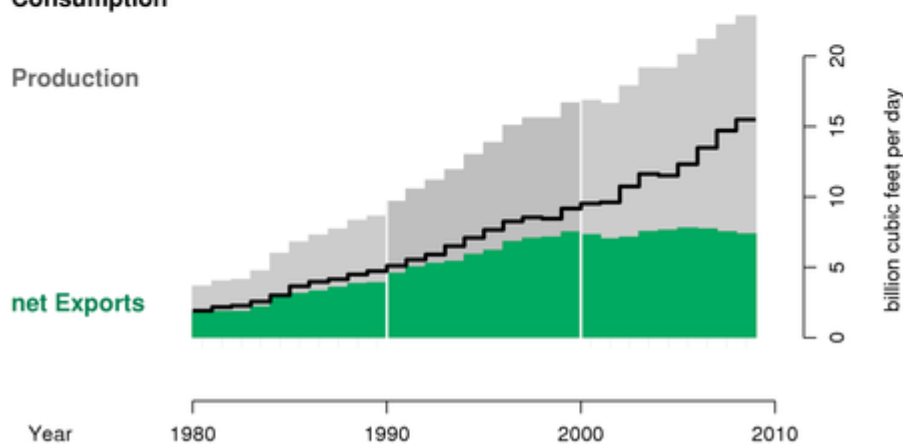
net zero

SE Asia + Australia : Nat. Gas 2008 exports decreased by 2.1 %

Consumption

Production

net Exports

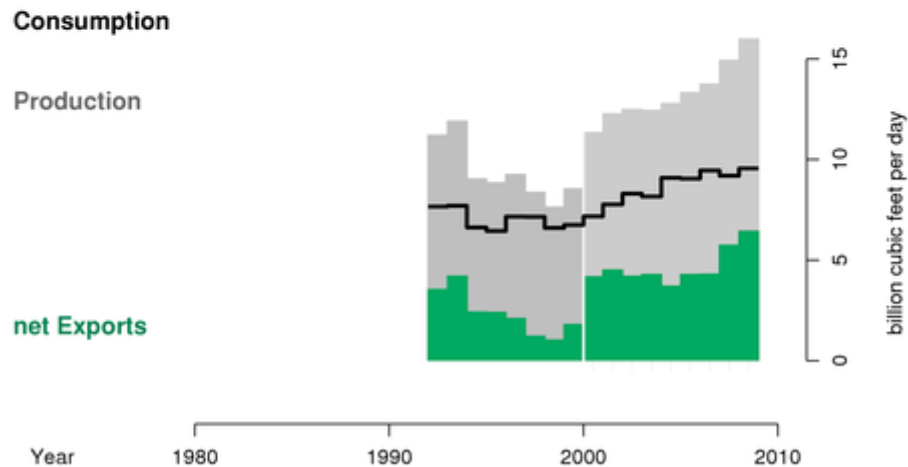


Data: EIA International 2010 Graphic: mazamascience.com

Central Asian exports are growing.



Central Asia : Nat. Gas
2008 exports increased by 12.0 %



Data: EIA International 2010 Graphic: mazamascience.com

- Huge reserves in Turkmenistan
- Landlocked region
- Existing Russian pipelines
- 2010 China-Turkmen pipeline
- 2015? Nabucco pipeline

Middle Eastern exports have peaked.



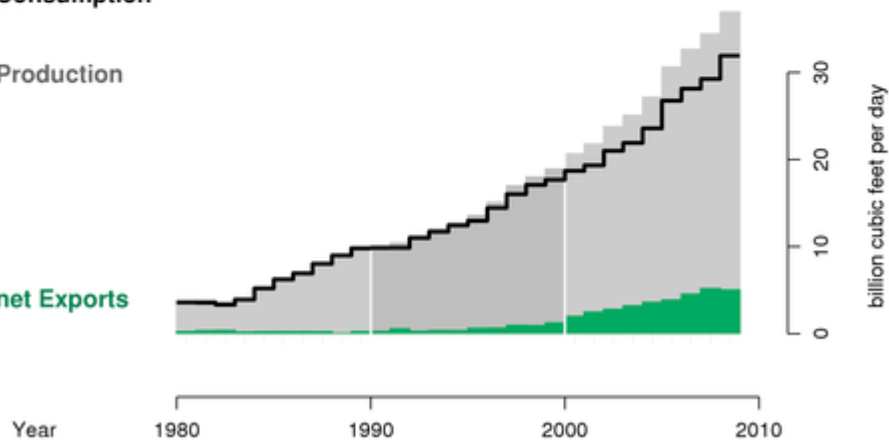
net zero

Middle East : Nat. Gas 2008 exports decreased by 3.1 %

Consumption

Production

net Exports



- Huge reserves
- Population growth
- Modern development
- Higher levels of consumption
- Increased desalination
- Oil fired power plants
- Regular power crises
- GCC power grid
- Petrochemical industry
- New pipelines and LNG terminals

Recognizing Patterns

Reviewing historical trends leads to the following realizations:

- Production peaks can be sharp or very broad.
- Production is still rising in many countries.
- National consumption often follows production upward.
- Consumption can increase very rapidly.
- Consumption levels are “sticky” – decreases are strongly correlated with economic hardship.
- Pipelines and LNG pose different energy security issues.

Factors affecting Production Growth

- **Geology** (UK)
- **Technology** (US)
- **Government regulation** (Netherlands)
- **Market access** (Turkmenistan)
- **Financing** (Venezuela)

Factors affecting Consumption Growth

- Gas displacing coal due to **environmental concern**. (EU)
- Fuel switching as **oil production declines**. (Indonesia)
- Inadequate water supply requires **desalination**. (Saudi Arabia)
- Increased demand due to **population growth**. (Pakistan)
- Increased consumption from **higher living standards**. (China)

Predictions for the next decade (2010-2019).

- Global production will increase dramatically.
- Norway will reach both peak production and peak exports.
- The Middle East will reach peak exports.
- SE Asia will reach peak net exports.
- South America (including Trinidad) will become a net importer.
- China will become a huge net importer.
- LNG will become increasingly expensive.
- The UK Gas Balancing Alert will be triggered multiple times.
- ¿European piped gas *could* become increasingly expensive?
- Russia and Central Asia will remain inscrutable!!

For the Curious:

<http://mazamascience.com/Energy/GasTrends>

