



Natural Gas Flare-Ups: Present & Future

Michael J.
Economides

The Continuous Energy Crisis of the 21st Century

- ✓ **Oil almost \$150, then fell to below \$40... headlines rule ... “crisis”**
 - ✓ **OPEC has little excess capacity “behind the valve”, Venezuela, Nigeria, Iraq**
 - ✓ **IEA (Nov. 2008) 9.1% decline in oil production**
 - ✓ **China still grows in economy and energy**
- ✓ **Saudi Arabia world regulator**
- ✓ **\$100 around the corner in 2010**





I will be \$100, again



\$100 OIL



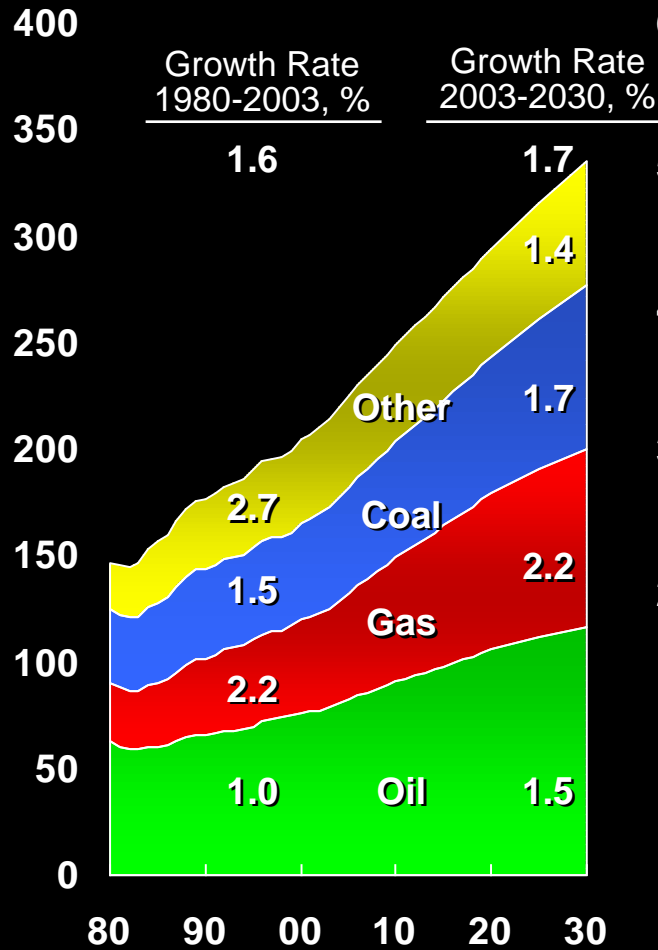
\$40 OIL



Oil & Gas Remain as Primary Energy Sources

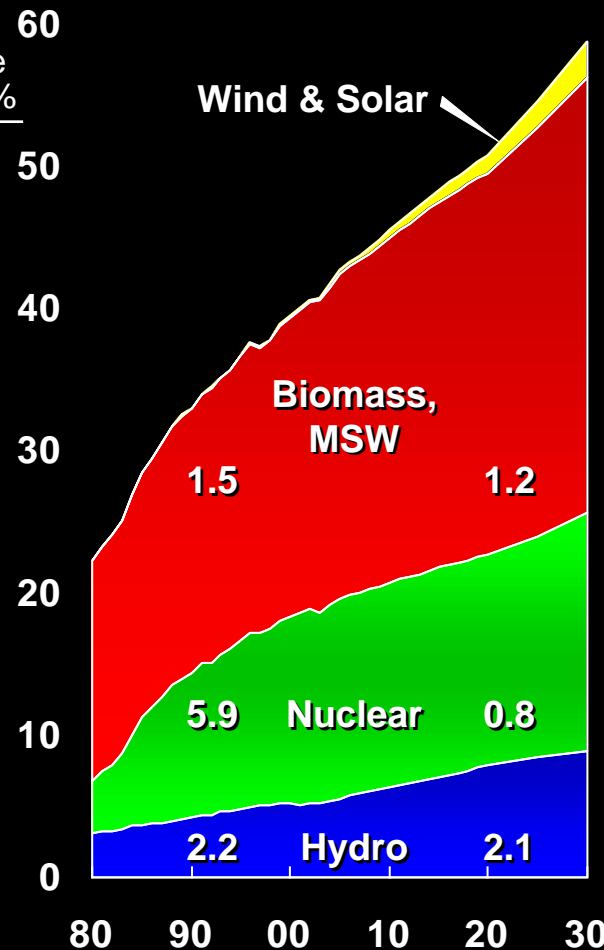
Total Energy

MBDOE



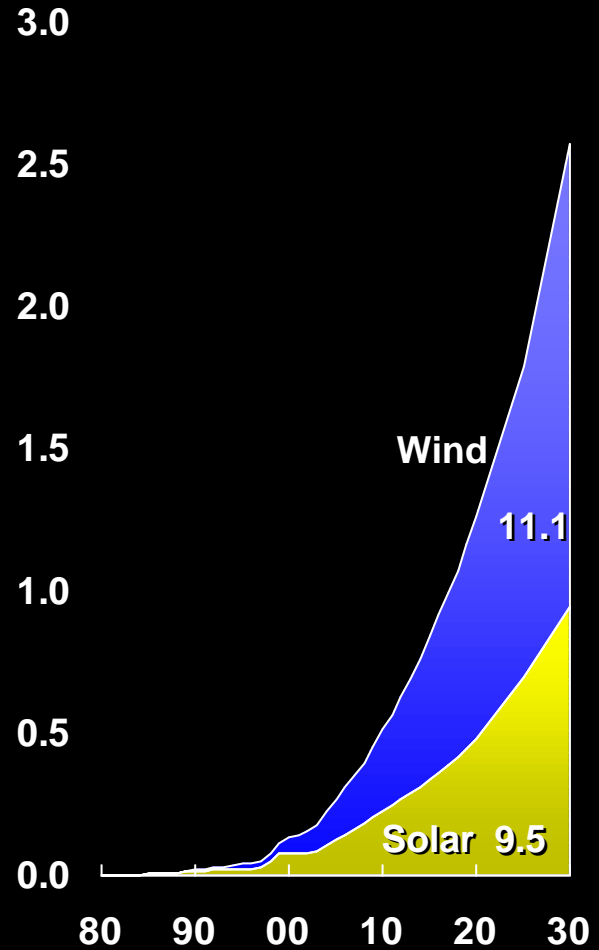
Other Energy

MBDOE

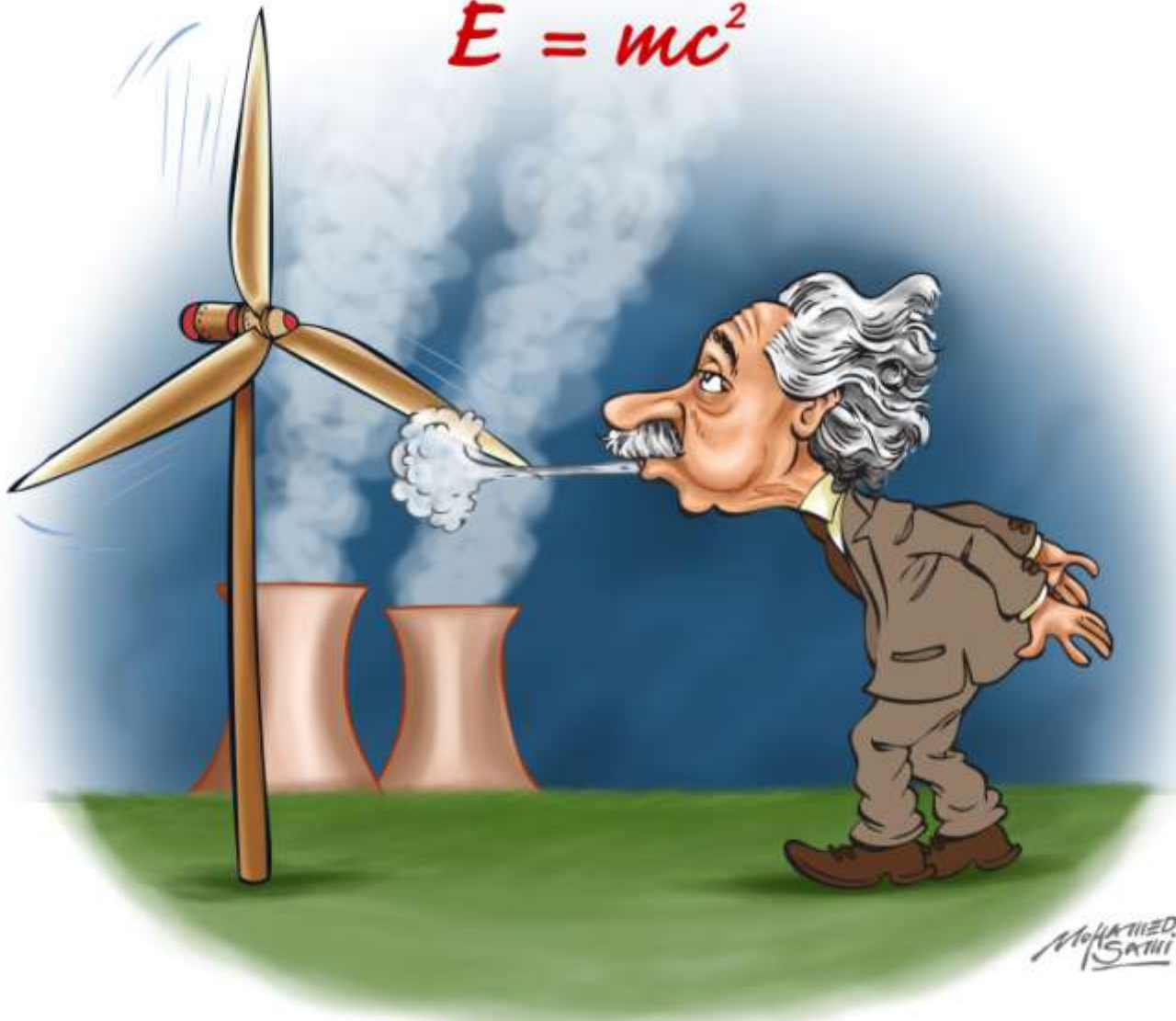


Wind & Solar

MBDOE



$$E = mc^2$$



This just doesn't make it





**There are no alternatives
to hydrocarbon energy
sources in the
foreseeable future**



Energy

Renewable hydrogen may be 'grown'

Bloomberg News

LONDON — A clean, low-cost and renewable source of energy may be generated by making hydrogen fuel from plant material, a study in last week's edition of the journal *Nature* says.

The process converts sugar from plant materials like corn into hydrogen that could power energy-intensive consumer needs, according to study author Jim Dumesic, a chemical engineer at the University of Wisconsin at Madison.

Hydrogen is a power source for fuel cells, batterylike devices that convert hydrogen and oxygen directly into electrical energy with little or no waste. Hydrogen production is energy intensive, making fuel cells expensive to operate, Dumesic said.

"Right now, most of the hydrogen from fuel cells comes from petroleum," he said. "We're looking at making hydrogen from renewable resources, like corn stalks."

If it works, it would be possible to get large amounts of a clean, energy-rich fuel from waste plant


products, such as tons of leftover sugar cane, weeds and wood, and even from such animal byproducts as cheese whey.


Dumesic and his colleagues have devised a way of getting hydrogen from vegetable matter by heating it to about 437 degrees,

about 120 degrees lower than current methods of hydrogen production. The process produces only small amounts of carbon monoxide, which degrades fuel cells Dumesic said.

A number of automakers have built or are planning prototypes powered by fuel cells.

Golfing for Hydrogen




YAHOO! FINANCE  [Search](#) - [Finance Home](#) - [Yahoo!](#) - [Help](#)



Welcome, pelewis [\[Sign Out\]](#) [Money Manager](#) - [My Yahoo! View](#) - [Customize](#)

Financial News

Enter symbol(s) Basic [Symbol Lookup](#)

Press Release Source: WCI Communities, Inc.

Golfers to Drive the Hydrogen Highway

Tuesday April 6, 10:09 am ET

Developer WCI Communities Embarks on One-Year Hydrogen Fuel Cell Research Project at Venetian Golf & River Club

VENICE, Fla.--(BUSINESS WIRE)--April 6, 2004--Golfers driving the fairways at WCI's (NYSE: [WCI](#) - [News](#)) Venetian Golf & River Club are helping pave the way for what many believe will be the energy source of future generations: hydrogen.

ADVERTISEMENT

With the Country's dependence on fossil fuels hitting an all time high, and consumers paying the price at the gas pump with prices approaching the \$2.00 mark, the recent installation of a hydrogen fuel cell at the Venetian Golf & River Club in Venice, Florida marks the first partnership of its kind between Florida Power & Light Company (FPL) and a builder-developer for fuel cell research in the State of Florida. Other partners have included governments and universities.

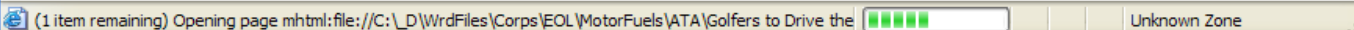
Related Quote
WCI 21-Apr @ 3:31pm (C)Yahoo!


WCI 23.22 +0.33 [News](#)
[View Detailed Quote](#)
Delayed 20 mins
Quote data provided by Reuters

Related News Stories

- [ADVISORY/Media Advisory - Earth Day Feature](#) - Business Wire (1:30 pm)
- [WCI Announces Annual Shareholders' Meeting](#) - Business Wire (Tue Apr 20)
- [WCI COMMUNITIES INC Files SEC form 8-K, Financial Statements and Exhibits](#) - EDGAR Online (Fri Apr 16)
- [WCI Reports Record Quarterly Orders and Backlog](#) - Business Wire (Thu Apr 15)

[More...](#)



(1 item remaining) Opening page mhtml:file:///C:/_D/WrdFiles/Corps/EOL/MotorFuels/ATA/Golfers to Drive the  Unknown Zone

Bovine Brain Power > Mad Car Disease?



The screenshot shows a web browser window with the title "US cattle brains may be turned into biofuels-USDA". The address bar shows the file path "C:_D\WrdFiles\Corps\EOL\Wacky\US cattle brains may be turned into biofuels-USDA.mht". The page is a Yahoo! Finance article from Reuters, dated Monday May 17, 5:32 pm ET, by Richard Cowan. The article headline is "US cattle brains may be turned into biofuels-USDA". The text states: "WASHINGTON, May 17 (Reuters) - Cattle brains and other remains that may carry the deadly mad cow disease would be turned into biofuels under a plan announced on Monday by the U.S. Department of Agriculture." The right sidebar shows "Top Stories" including "Stocks Hit 2004 Lows on Iraq Oil Prices", "Average Gasoline Price Tops \$2 a Gallon", "Lucent Employees Charged by SEC", and "Oil Strikes High on Stubborn Supply Fears".

US cattle brains may be turned into biofuels-USDA

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Mail Print Print Preview

Address Go

YAHOO! FINANCE [Search](#) - [Finance Home](#) - [Yahoo!](#) - [Help](#) **REUTERS**

Welcome, pelewis [Sign Out](#) [Money Manager](#) - [My Yahoo! View](#) - [Customize](#)

Financial News

Enter symbol(s) Basic [Symbol Lookup](#)

GO! \$7 TRADES **HARRISdirect** get 20 FREE EQUITY TRADES [Learn more](#) **TD Waterhouse** Get Free Trades for a month.

Reuters
US cattle brains may be turned into biofuels-USDA
Monday May 17, 5:32 pm ET
By Richard Cowan

WASHINGTON, May 17 (Reuters) - Cattle brains and other remains that may carry the deadly mad cow disease would be turned into biofuels under a plan announced on Monday by the U.S. Department of Agriculture.

Top Stories

- [Stocks Hit 2004 Lows on Iraq Oil Prices](#) - Reuters (4:42 pm)
- [Average Gasoline Price Tops \\$2 a Gallon](#) - Reuters (4:43 pm)
- [Lucent Employees Charged by SEC](#) - Reuters (5:41 pm)
- [Oil Strikes High on Stubborn Supply Fears](#) - Reuters (3:38 pm)

[More...](#)

Internet

April 2006
Energy Tribune
Leading the debate. Beating the street.

The
ETHANOL
SCAM pg. 11

**John Olson:
Bet on
Services**

pg. 9

**Idiocy of
the Energy
Isolationists**

pg. 14

**Apologizing
for Success?**

pg. 15

820 Gessner Rd. - Ste. 920 Houston, TX 77024

The Ethanol Scam



Wind Power Exposed: Expensive, Unreliable and Won't Save Natural Gas



**UK Ofgem: wind “grossly distorting the market”
29.7% of cost for 1.3% of electric supply
Load factor: 27.4%. Gas demand goes up**



Texas Wind

- ✓ **Installed capacity: 9,400 MW, #1 in the United States**
- ✓ **On February 2, 2010 at 9:50 AM, total wind output was 527 MW**
- ✓ **About 5.6 % of installed capacity**
 - ✓ (Clifton Andrews, Houston Chronicle, Feb. 7, 2010)

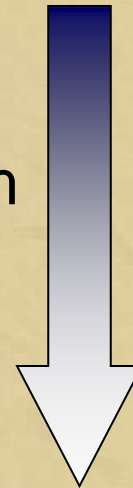


The New Energy Economy

- Wood (1800s)
- Coal
- Oil
- Natural Gas
- Hydrogen (envisioned)

Carbon
content:

High
Medium
Low
(Zero)



Increasingly:

- Clean
- Energy intensive
- Technologically sophisticated
- Distributed

Natural Gas

- ✓ **International demand destruction is larger than was anticipated**
- ✓ **Because of LNG developments in Qatar, Egypt and Sakhalin 2, there could be 10 Bcf/d excess supply. Considerable impact on gas prices in Europe and the United States – Cheniere LNG**
- ✓ **\$5 gas for two to three years?
Devastating impact on US shale gas**

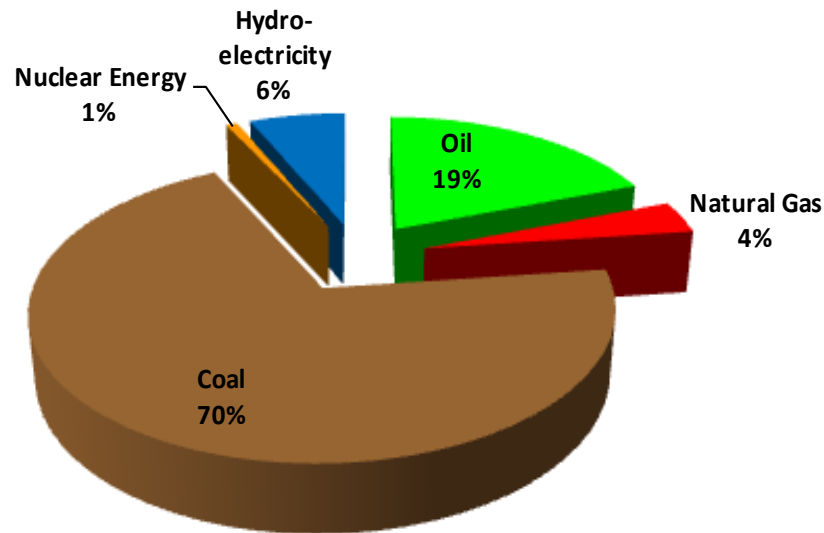


Future Oil and Gas Prices

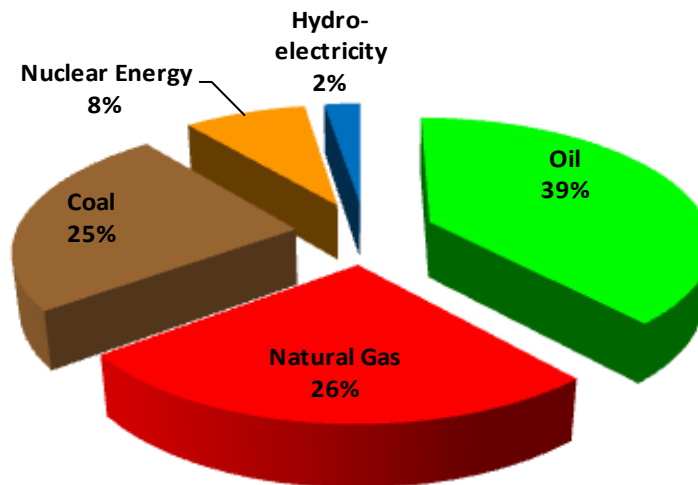
- ✓ **Major BTU disparity lasting decade(s)**
- ✓ **Because of technology challenges (and not just resource availability) and transportation robustness and homogeneity prices the world over will equalize**
- ✓ **\$8 for natural gas in three years ad-infinitum, \$100+ for oil**



Energy Consumption by Fuel



China Energy Consumption by Fuel Types - 2008



USA Energy Consumption by Fuel Types - 2008

Natural Gas Consumption in both US and China

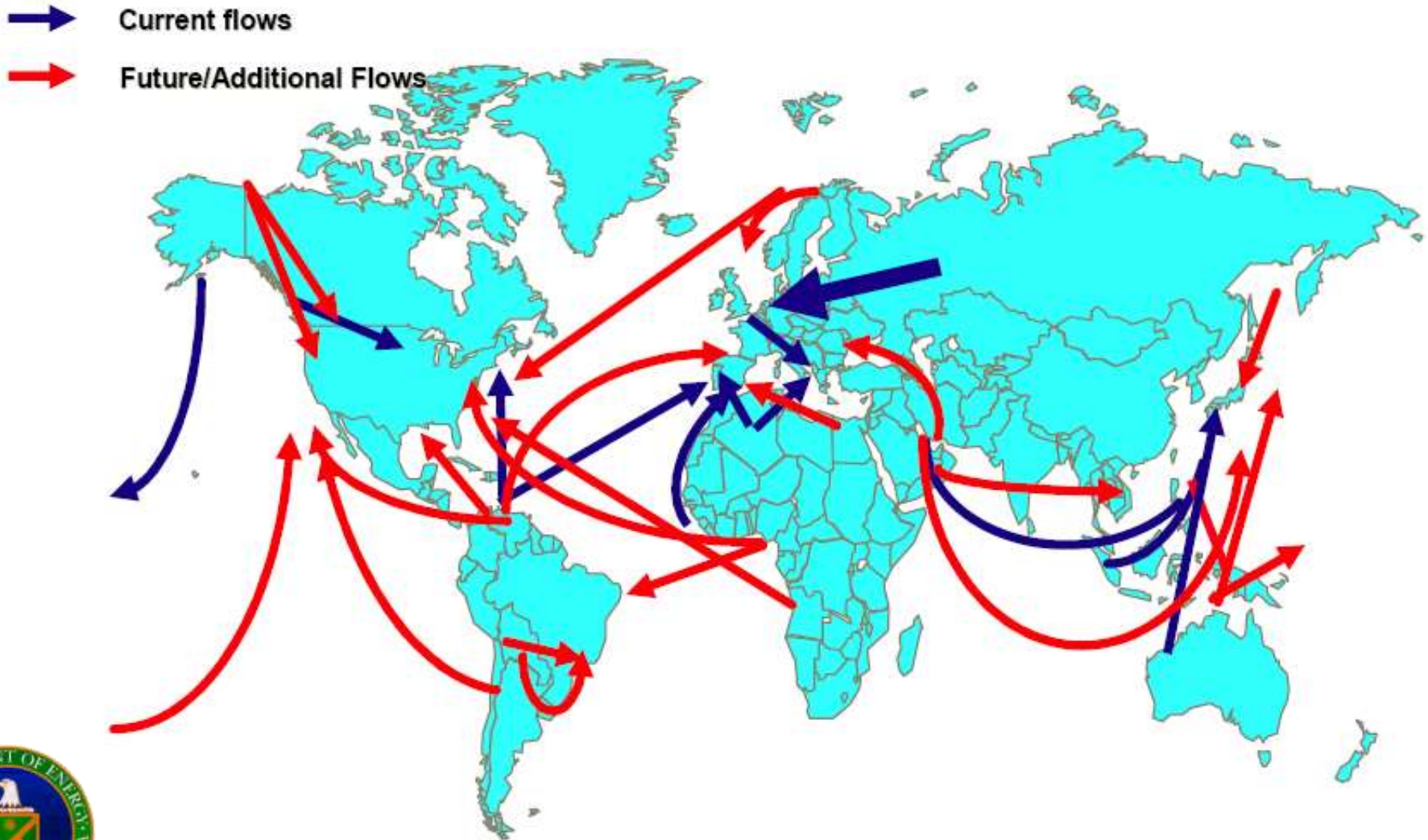
Countries	Current Natural Gas Consumption		
	Natural Gas Consumption in 2008	Population	Natural Gas Consumption per Capita
	Bcm/yr	billion	cm/yr/capita
US	657.2	0.3	2,191
China	83.3	1.35	61.7
Ratio	8 to 1	1 to 4.5	35.5 to 1

LNG Tanker Underway



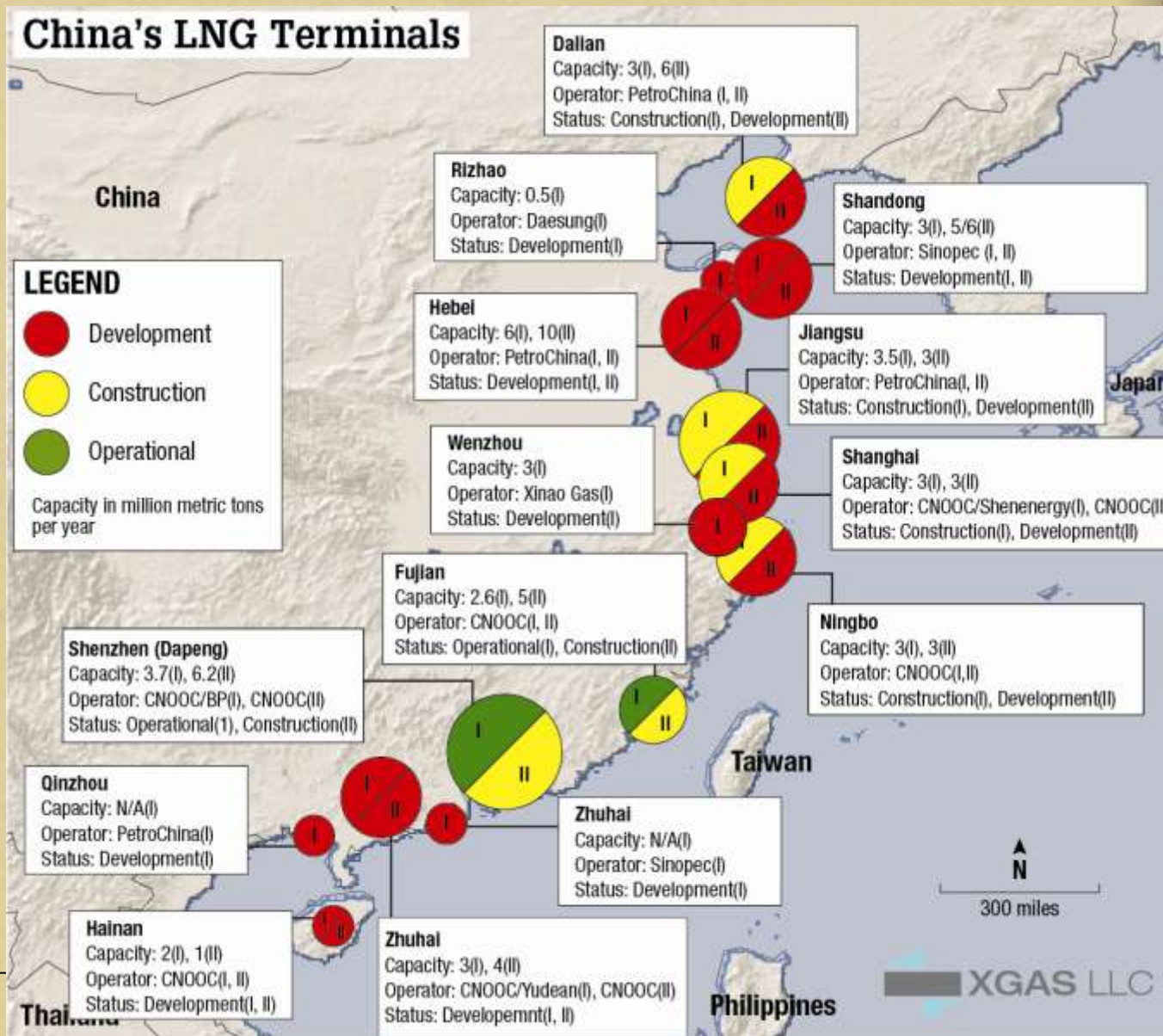
Photo Courtesy of BP

Globalization of Natural Gas Trade

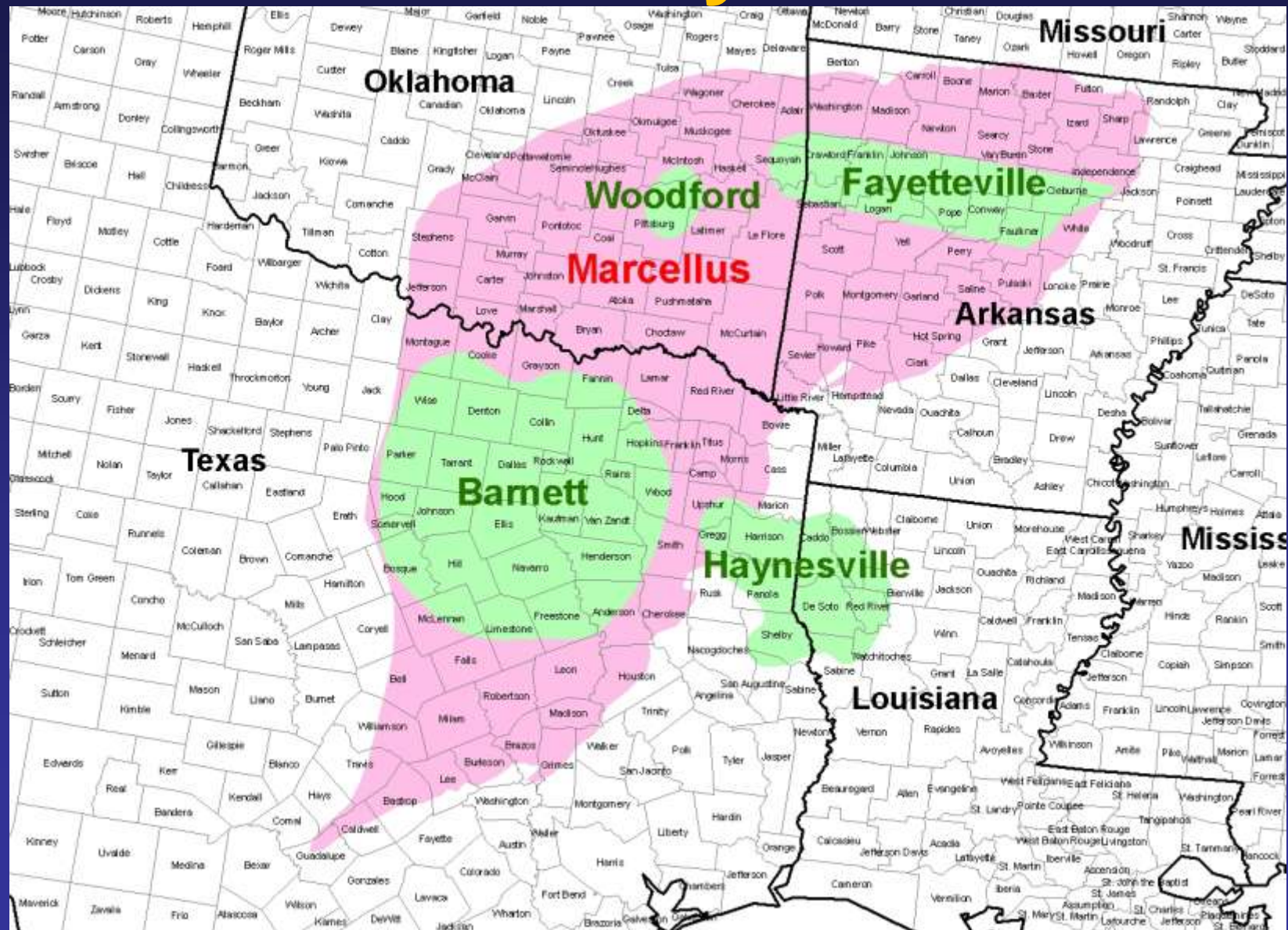


Source: International Energy Agency

China's LNG Terminals



Shale Gas Plays in the US



What is Shale Gas?

- ✓ **Unconventional**
- ✓ **No porosity to speak of.... Essentially no permeability. Much of the gas is *adsorbed* on the rock surface.**
- ✓ **Creating massive area by drilling horizontal wells with multiple transverse fractures is the obvious way to produce. No other.**
- ✓ **Technology made shale gas a reality.**



MARCELLUS

SO HOW BIG IS IT???



DATE	AGENCY OR AUTHOR	RECOVERABLE (TCF)
2009	HISCOCK & BARCLAY	516
2008	IOGA OF NY	500
2009	ENGELDER	489
2008	DOE	262
2007	ENGELDER & LASH	168
2008	NCI	34.2
2006	USGS	31
2002	USGS	0.8 To 30.7
2005	USGS	1.3

US SHALE IN THE WORLD



HOW DO THE MARCELLUS AND HAYNESVILLE COMPARE TO OTHER GAS FIELDS WORLD-WIDE?

300 -500 Tcf



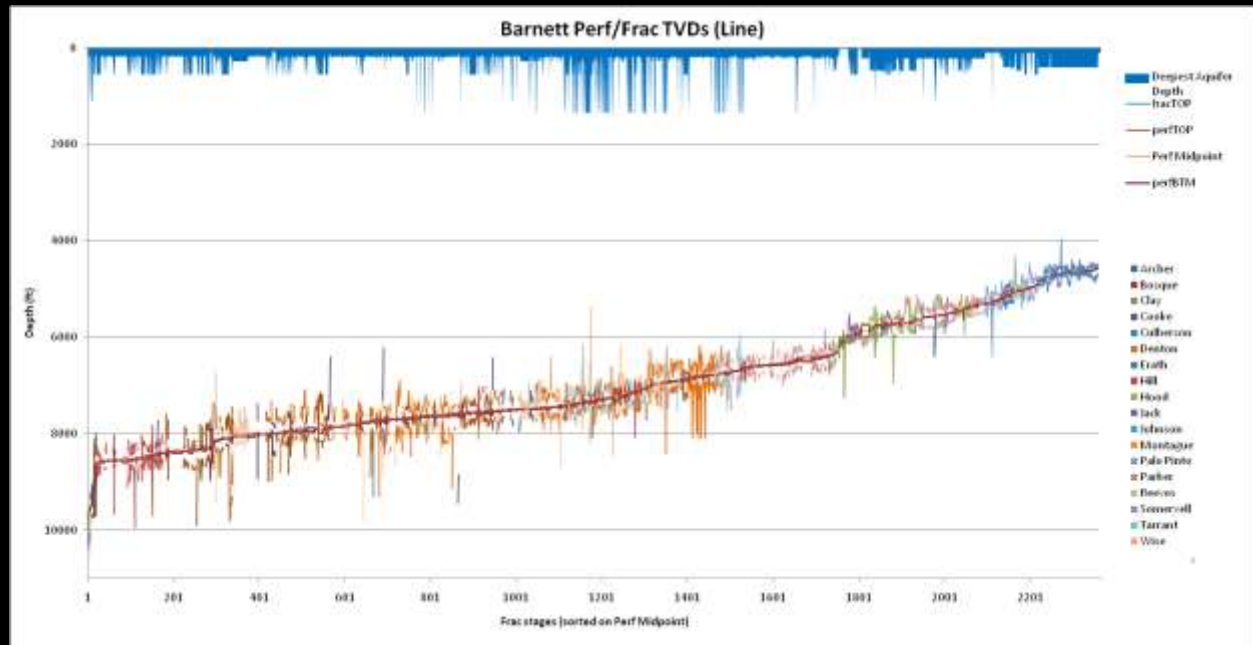
World's 10 Largest Gas Fields (2005)	
Source: IEA 2005	
<u>Field Name</u>	<u>Tcf</u>
1. North Field-South Pars (Iran)	1,400
2. Urengoy (Russia)	222
3. Yamburg (Russia)	123
4. Hassi R'Med (Algeria)	123
5. Shtokman (Russia)	110
6. Zapolyarnye	95
7. Hugoton	81
8. Groningen	73
9. Bonavenko	70
10. Medvezhye	68

Fracturing and Gas Leaking

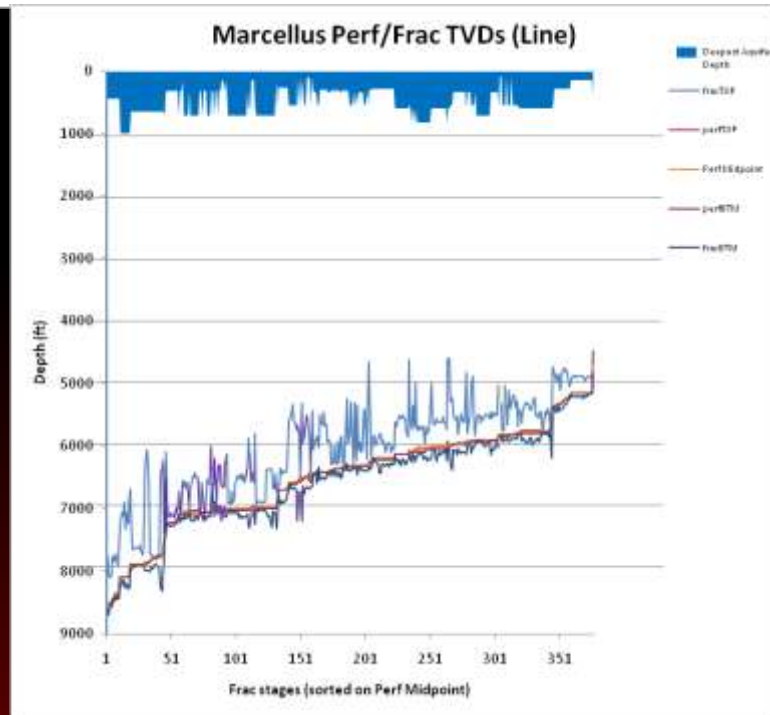
- ✓ **“A lie repeated many times becomes reality” (Joseph Goebbels)**
- ✓ **Fracturing is nothing new: 60 years old, about 60,000 treatments per year, \$13 billion business**
- ✓ **We are worried about fracture height of 100 ft not 8,000 ft. Impossible for gas to contaminate drinking water aquifers. It would have happened long before fracturing**



Hydraulic fracturing versus the environment: what do diagnostics say?



- Marcellus issues?
 - More height growth than Barnett
 - Far from mapped aquifers





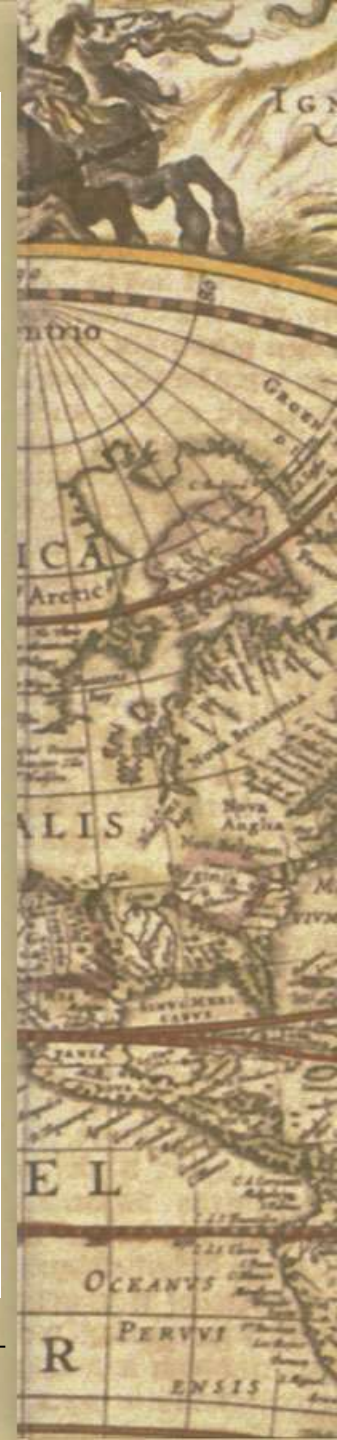
Energy Geopolitics

The Axis of Energy Militants

- Iran
- Venezuela
- Russia under Putin
- The quagmire that is Iraq
- China







Russia under Putin

- Bright spot in oil is gone
- Re-Sovietization
- Corruption
- Total control of press
- Investment climate has cooled down
- Production is bound to decline



From the Author of *The Color of Oil*

MICHAEL J. ECONOMIDES
and **DONNA MARIE D'ALEO**



From Soviet to Putin and Back

**THE DOMINANCE OF ENERGY
IN TODAY'S RUSSIA**





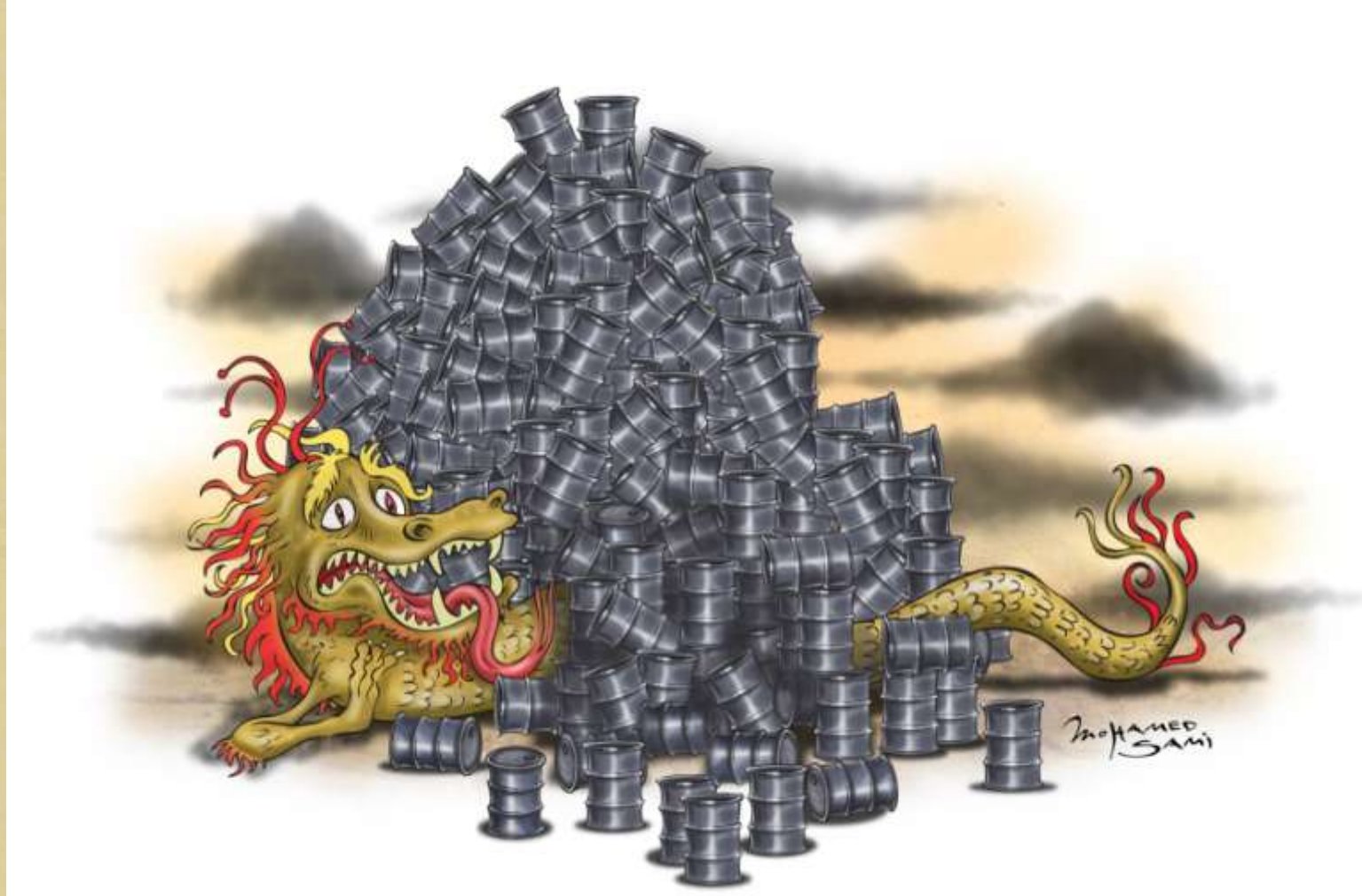


Can *China*

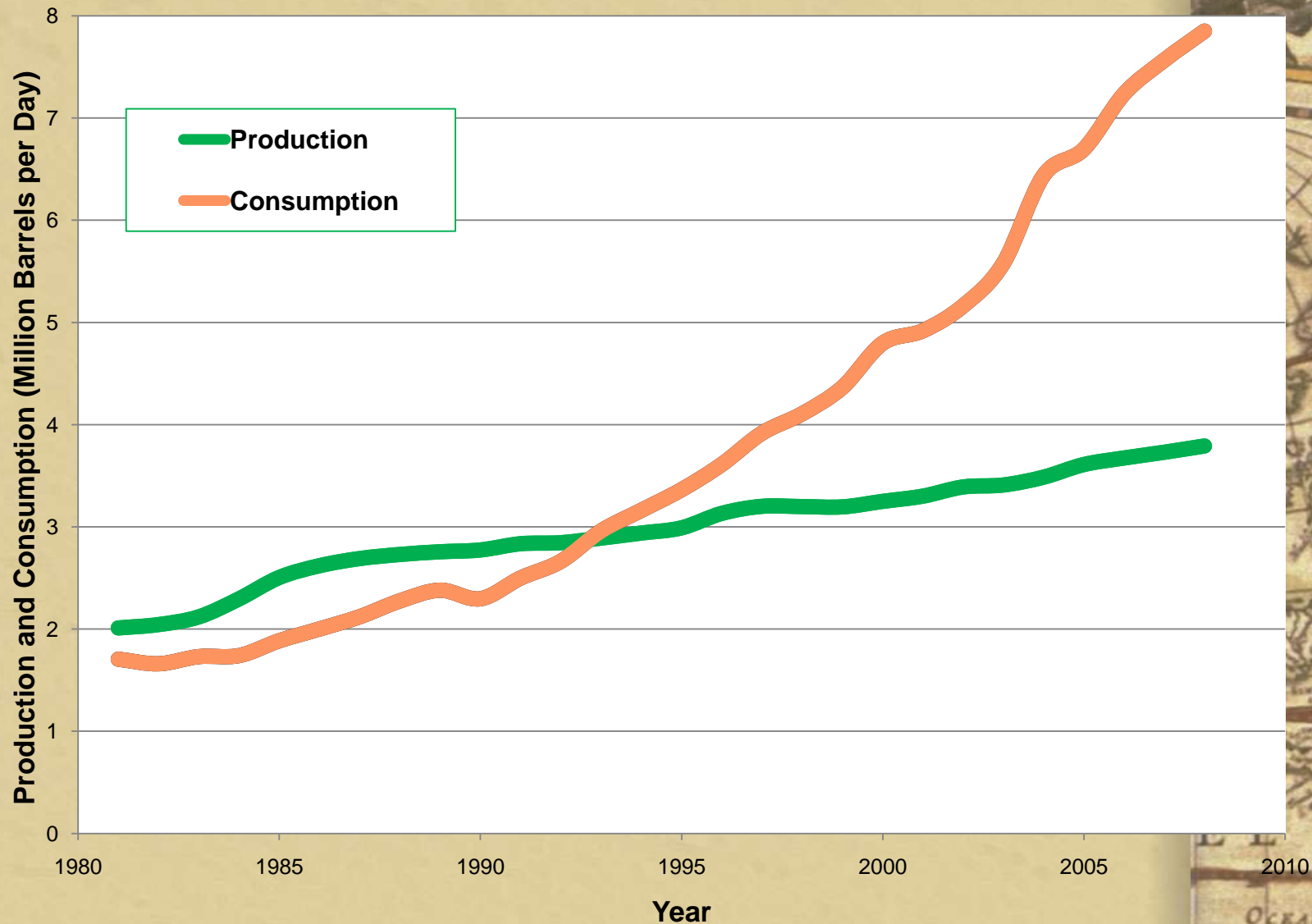
Keep the Lights On?



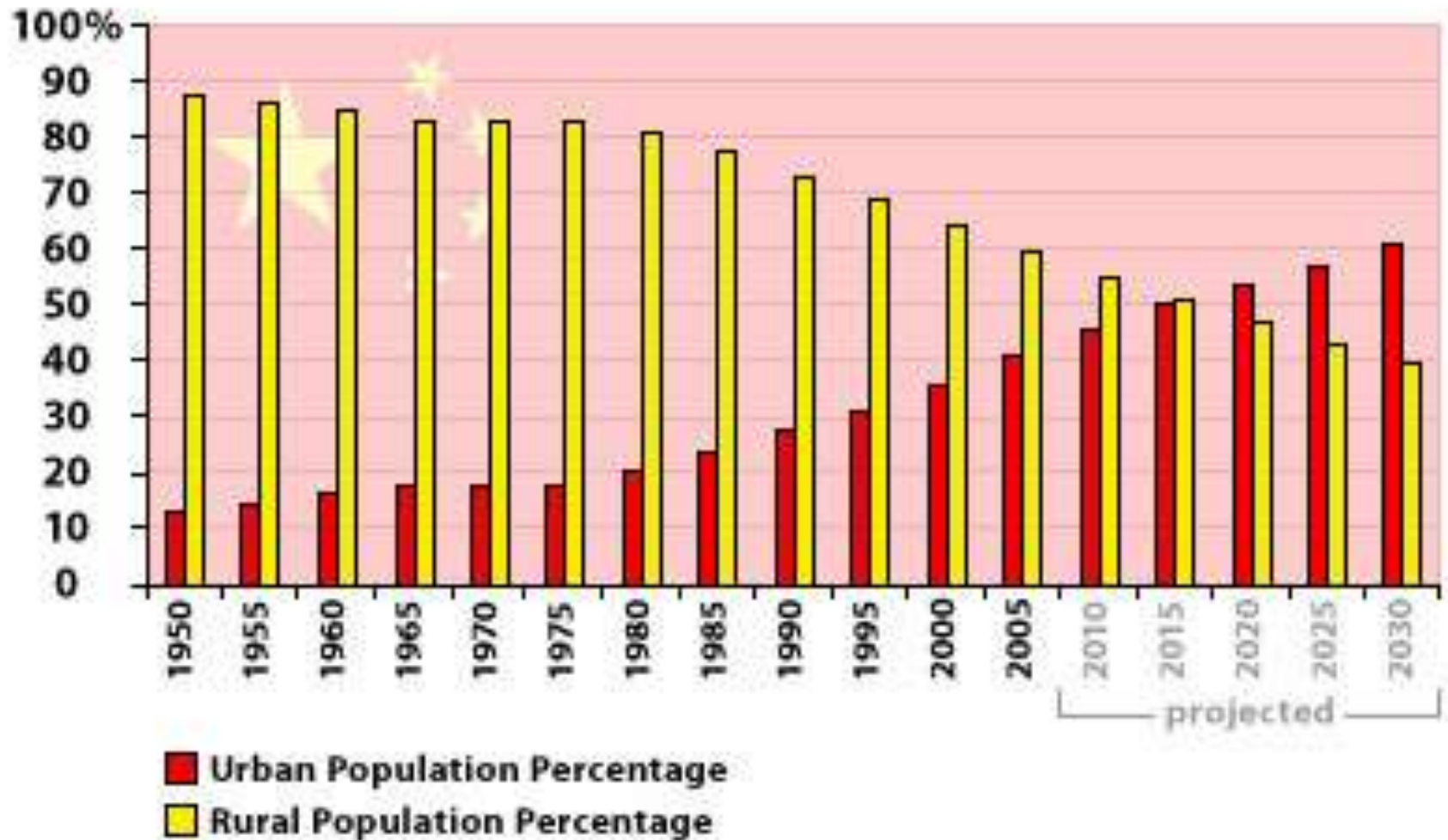
Energy: China's Choke Point



China's Oil Production and Consumption



CHINA URBAN/RURAL POPULATION GROWTH 1950-2030



From Stratfor, 2009

China and Russia

- Energy will be China's choke point
- Has become recently very assertive, if not belligerent.
 - Sudan, Nigeria
 - Canada
 - Argentina, Venezuela
- China's energy future passes through Russia....



Russia and China



Russia, China and Japan



China will probably lead

