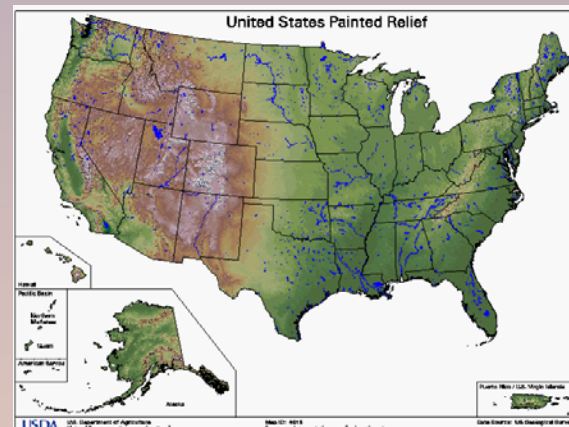


The Global Scramble for Minerals and Energy— Its Impact on The U.S.



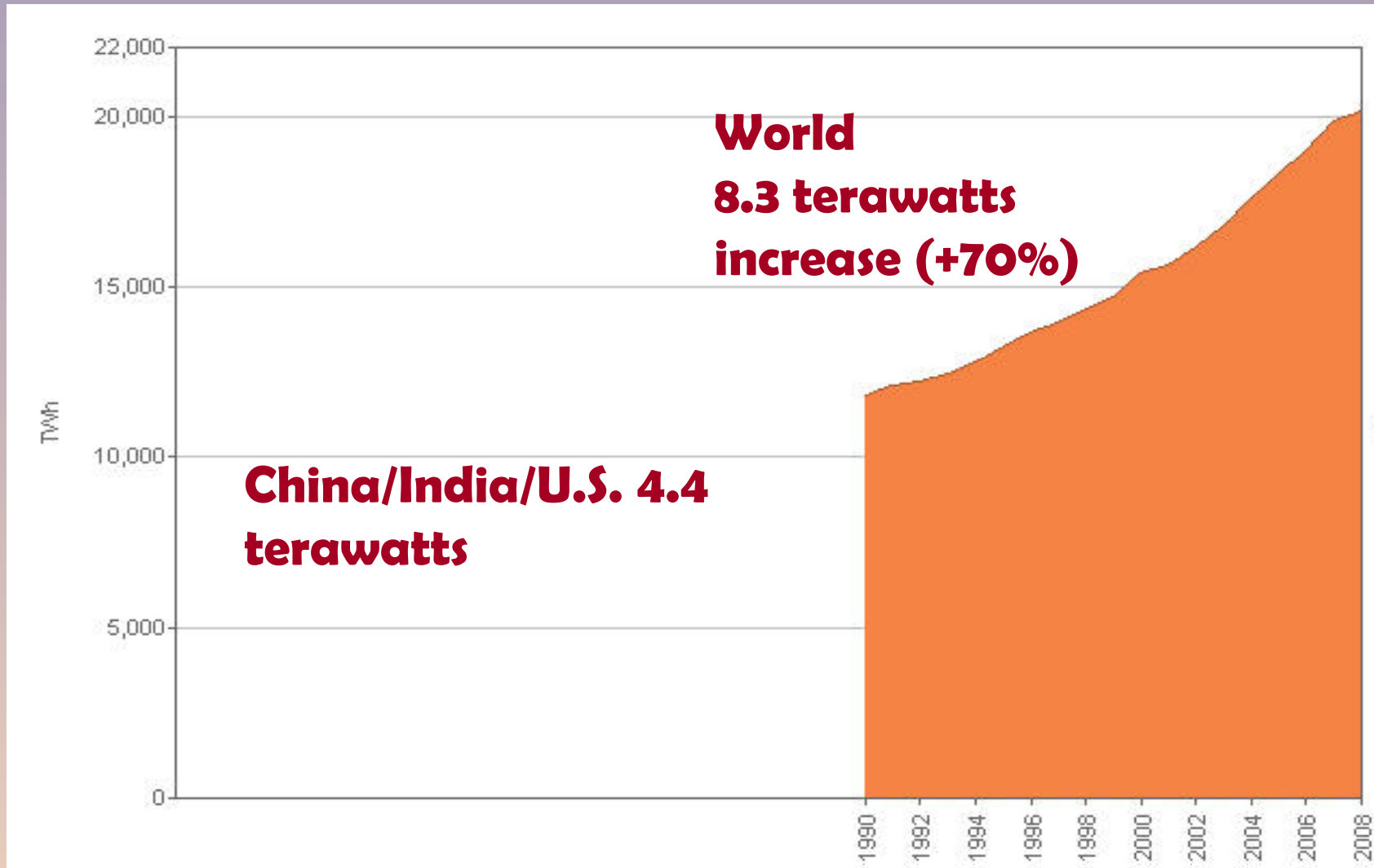
Vince Matthews

**Director
Colorado Geological Survey**

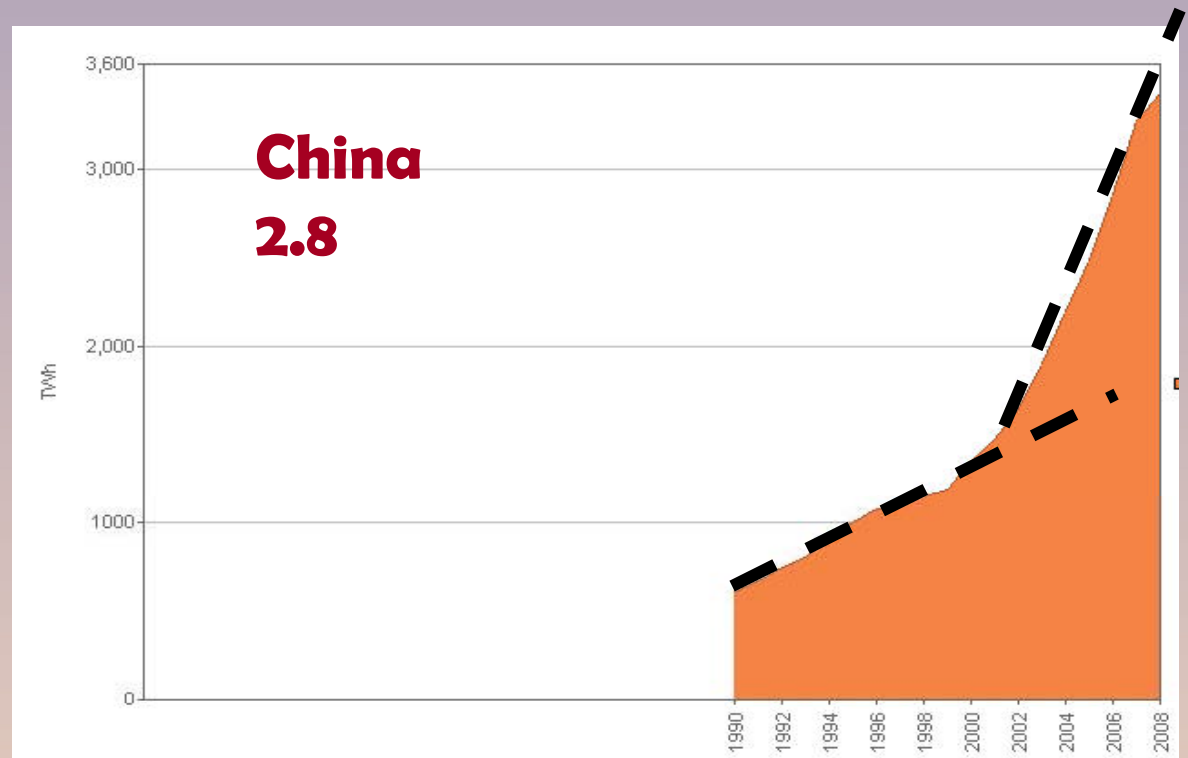
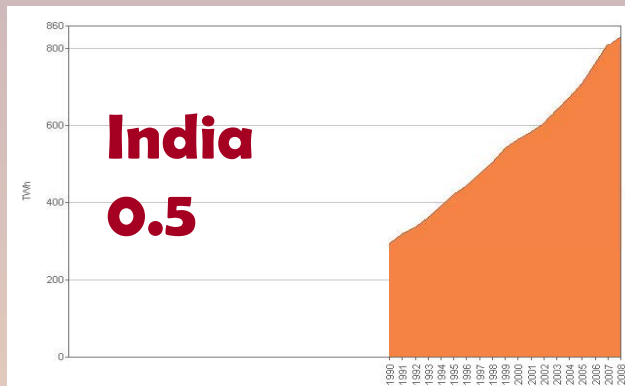
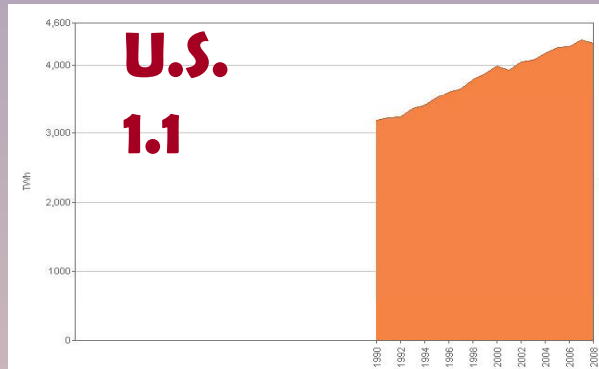
COLORADO GEOLOGICAL SURVEY



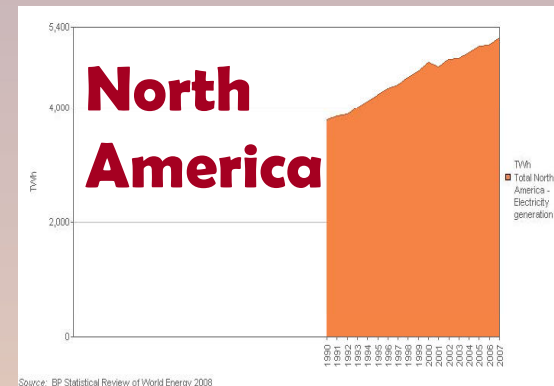
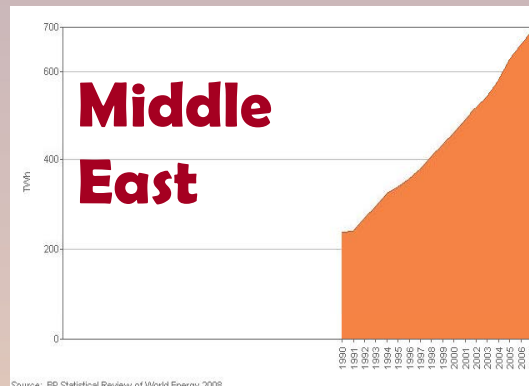
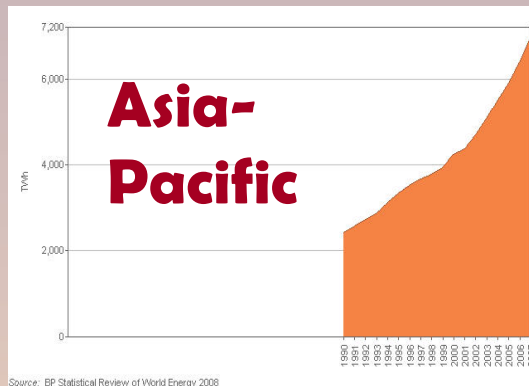
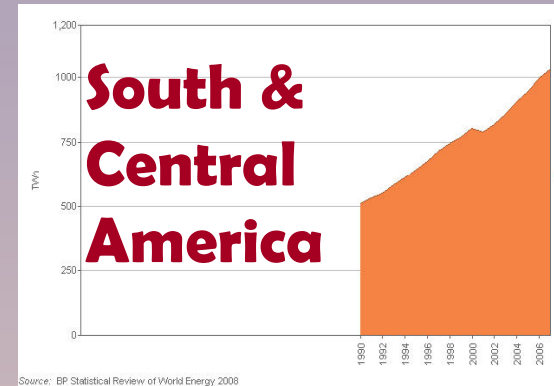
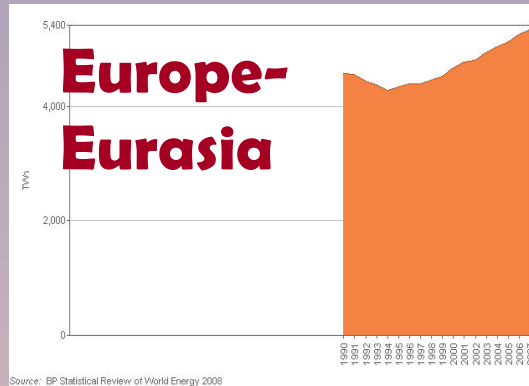
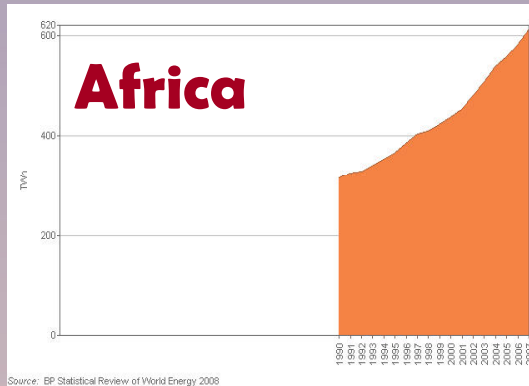
World Electrical Growth



World Electrical Growth



World Electrical Growth



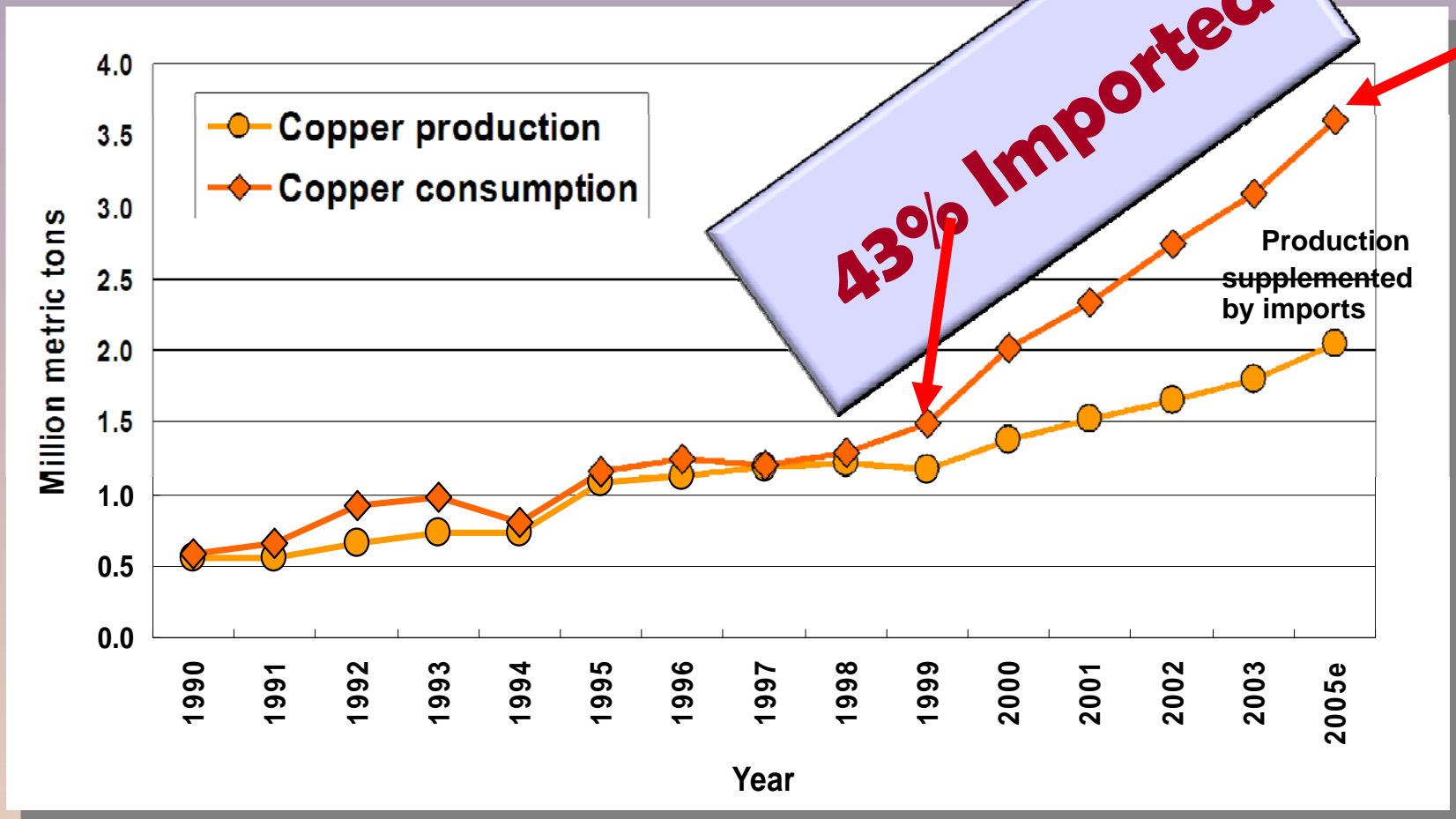
China's Share of World Mineral Production in 2005

	%	Rank
Industrial minerals:		
Cement	45	1
Fluorspar	51	1
Rare earths	96	1
Metals:		
Aluminum	24	1
Antimony	86	1
Copper	16	2
Gold	9	4
Lead	32	1
Magnesium	75	1
Molybdenum	22	3
Silver	12	3
Steel, crude	31	1
Tin	35	1
Tungsten	87	1
Zinc	26	1

Source: USGS, Menzie and Tse



China's Production and Consumption of Copper



Source: USGS, Kenzie, et al



Global Impact



Global Impact



Global Impact



Ball mill gets real Leadville welcome

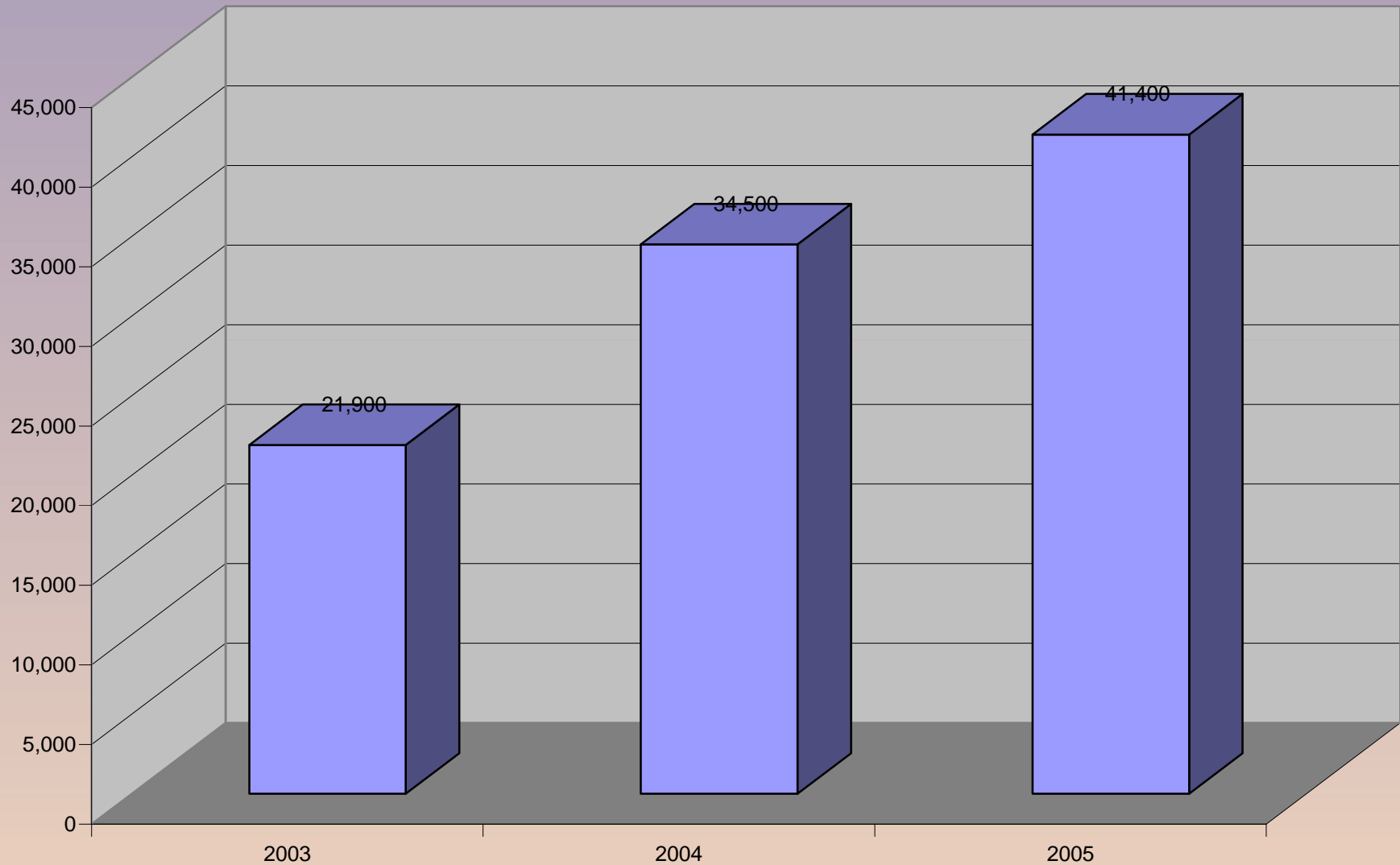


Image courtesy of Leadville Herald Democrat

COLORADO GEOLOGICAL SURVEY



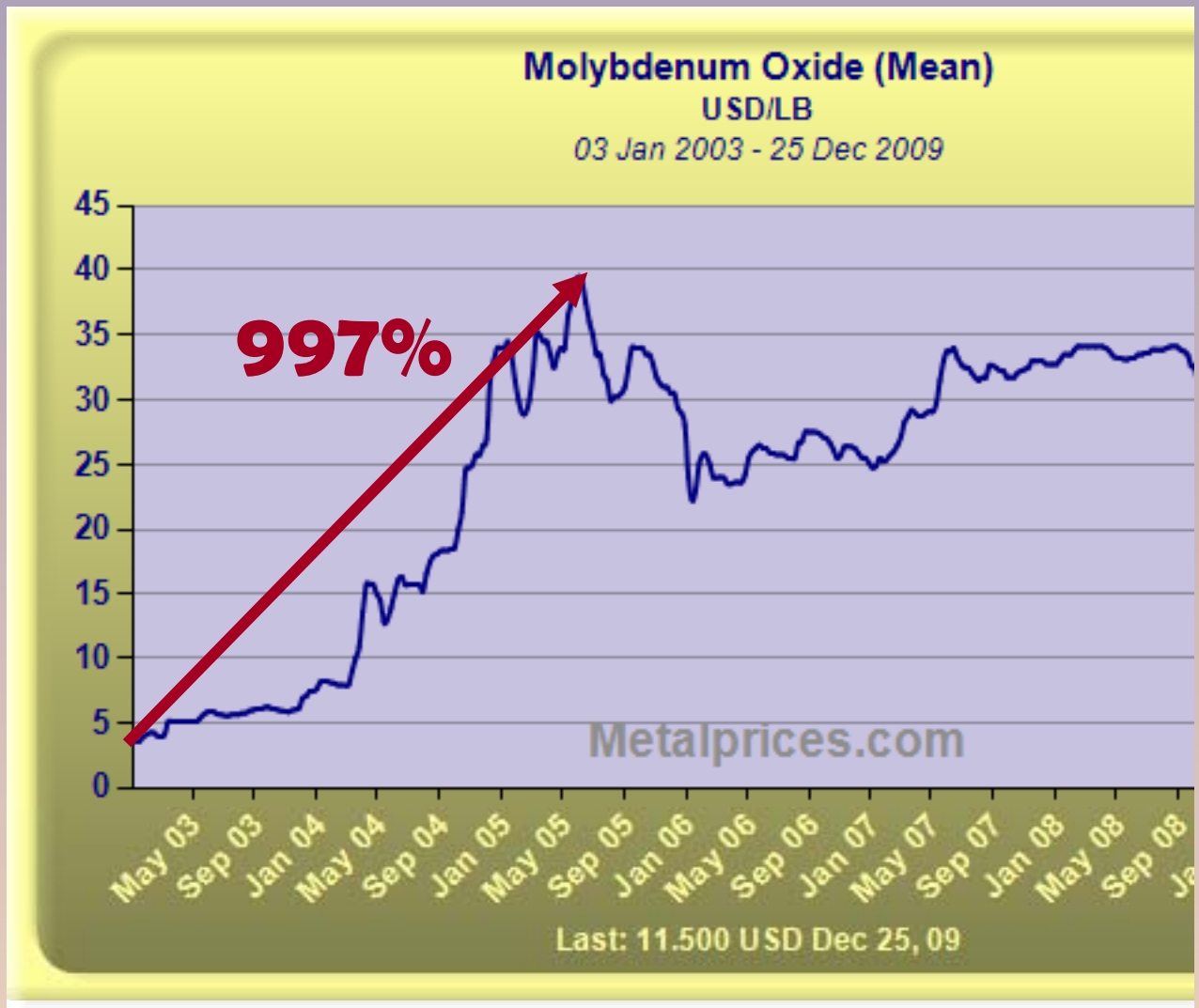
U.S. molybdenum exports



COLORADO GEOLOGICAL SURVEY



MOLYBDENUM Price



Ball mill gets real Leadville welcome

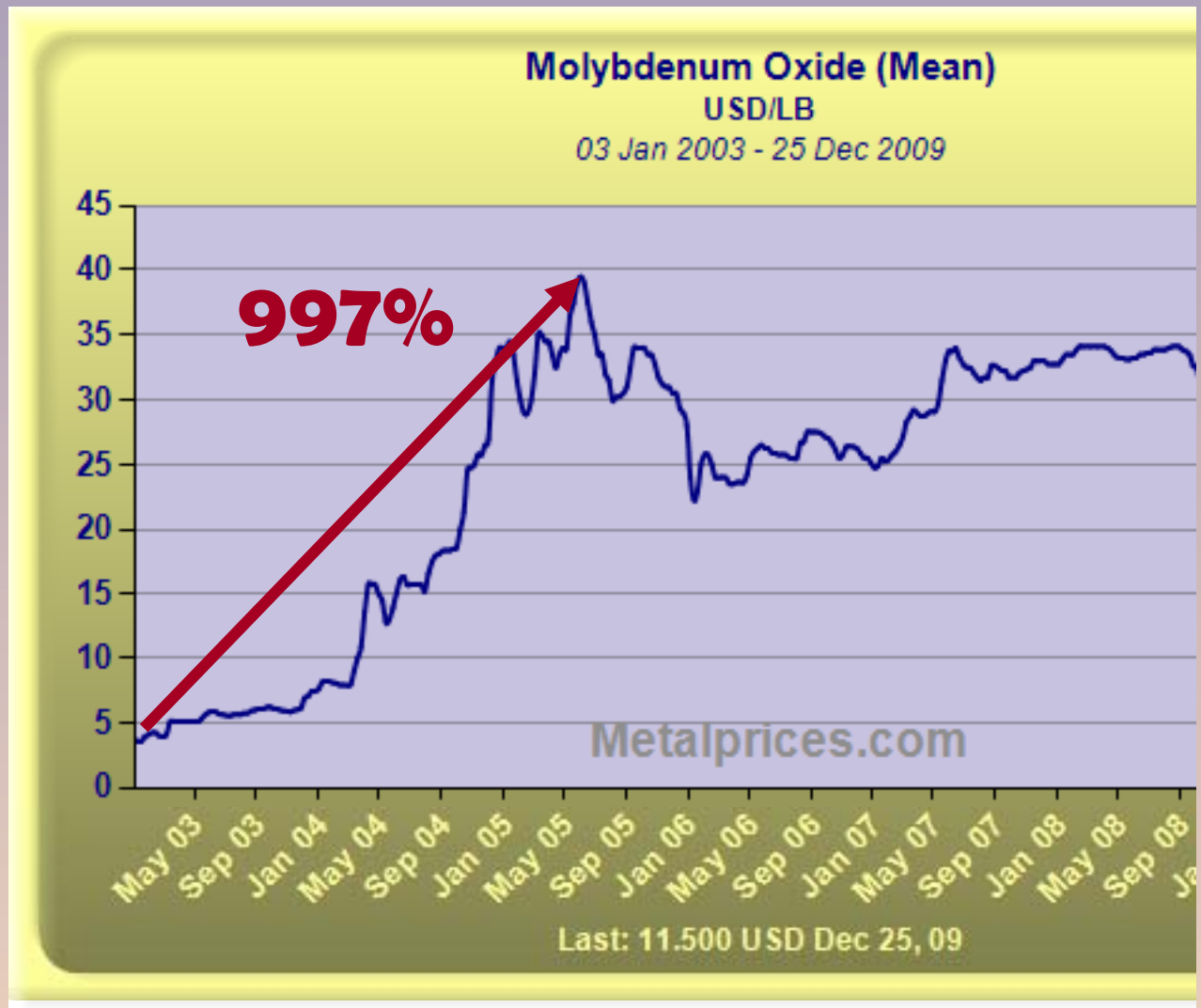


Image courtesy of Leadville Herald Democrat

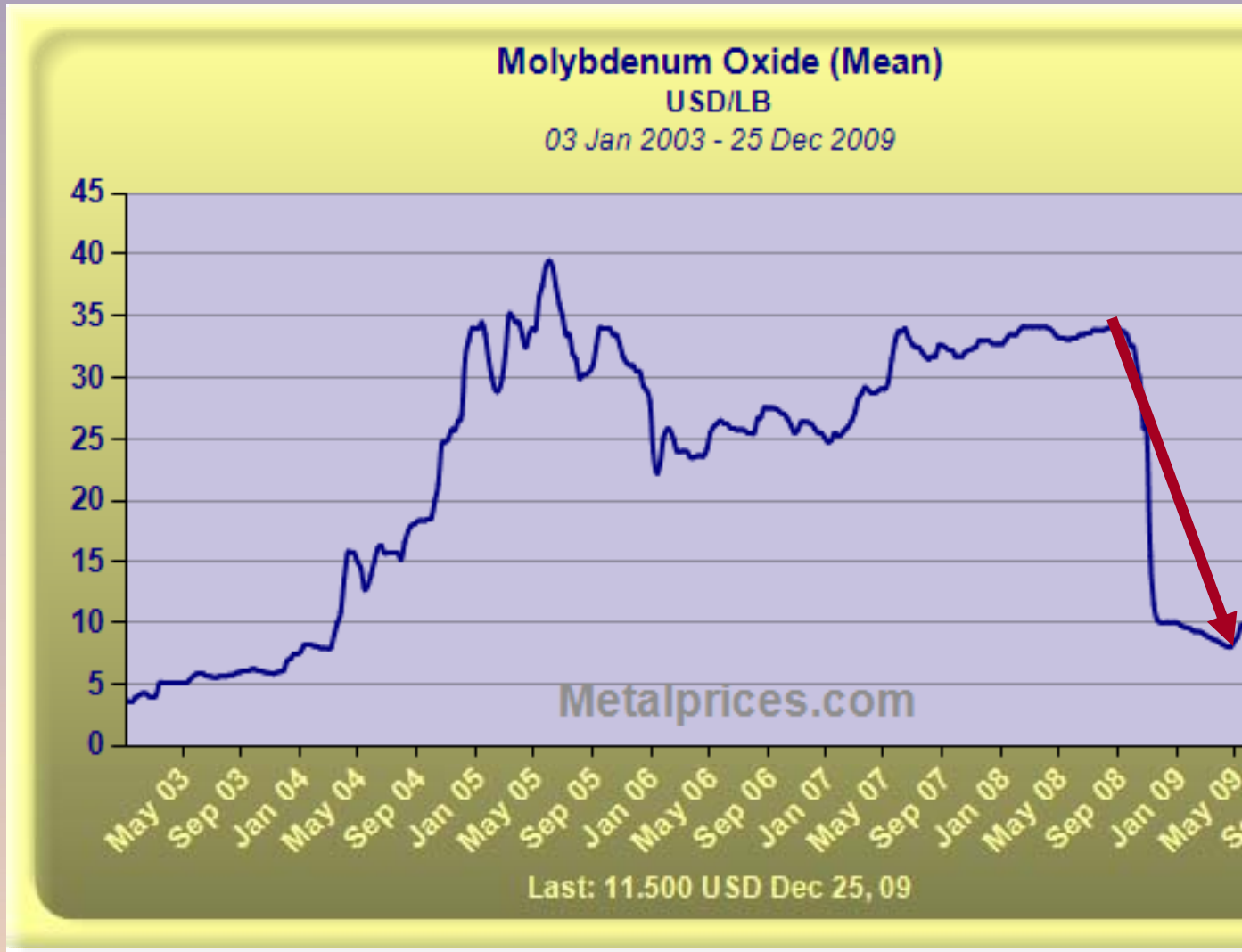
COLORADO GEOLOGICAL SURVEY



MOLYBDENUM Price



MOLYBDENUM Price



Metal prices fall further than during Great Depression

The price of key industrial metals has fallen further over the last four months than occurred during the worst years of Great Depression between 1929 and 1933, according to research by Barclays Capital.

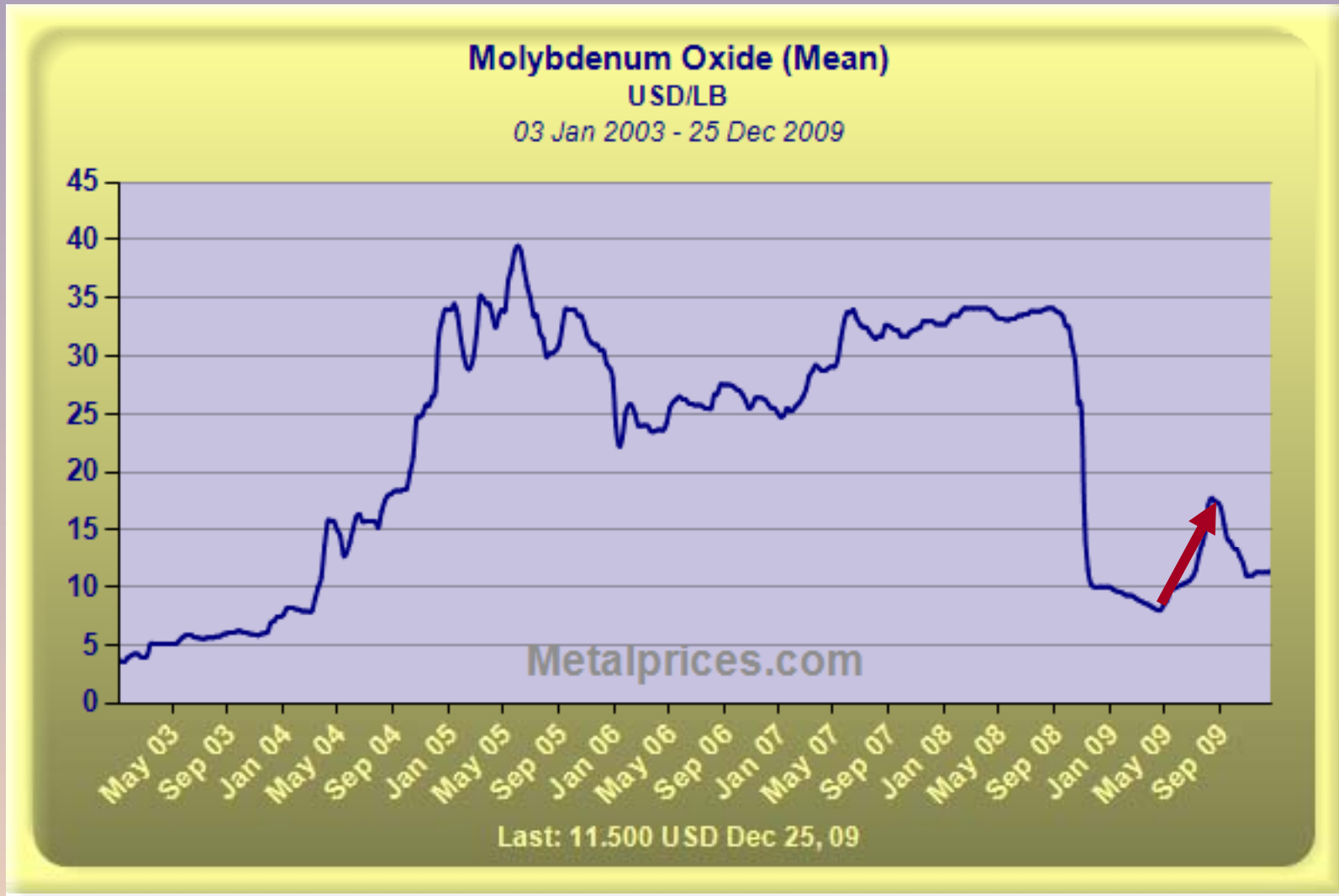
By Ambrose Evans-Pritchard

Last Updated: 7:29AM GMT 03 Dec 2008

COLORADO GEOLOGICAL SURVEY



MOLYBDENUM Price



Precious & Base Metal Increases 01/03 - 01/10



Gold
274%



Silver
367%

Platinum
255%



Average Price Increase

379%

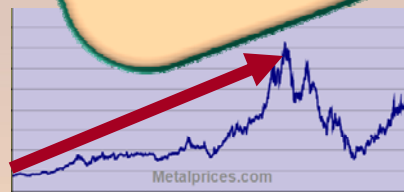
Nickel 630%



Aluminum
144%



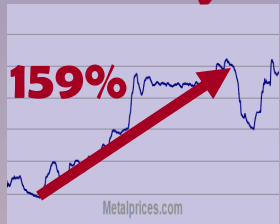
Tin
229%



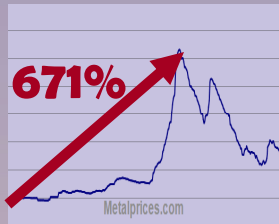
Zinc
497%



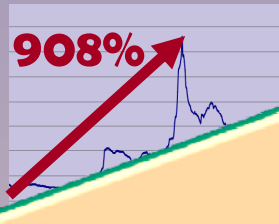
Antimony



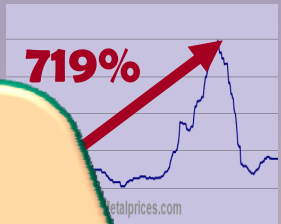
Bismuth



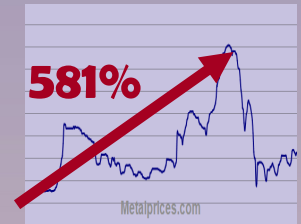
Cadmium



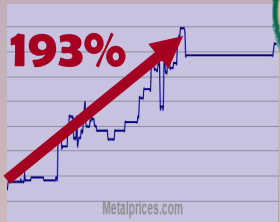
Chromium



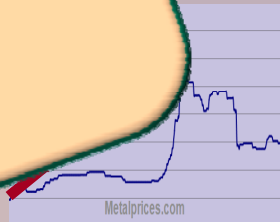
Cobalt



Germanium



Niobium



Rhenium



Average Price Increase

746%

Selenium



Titanium



Tungsten



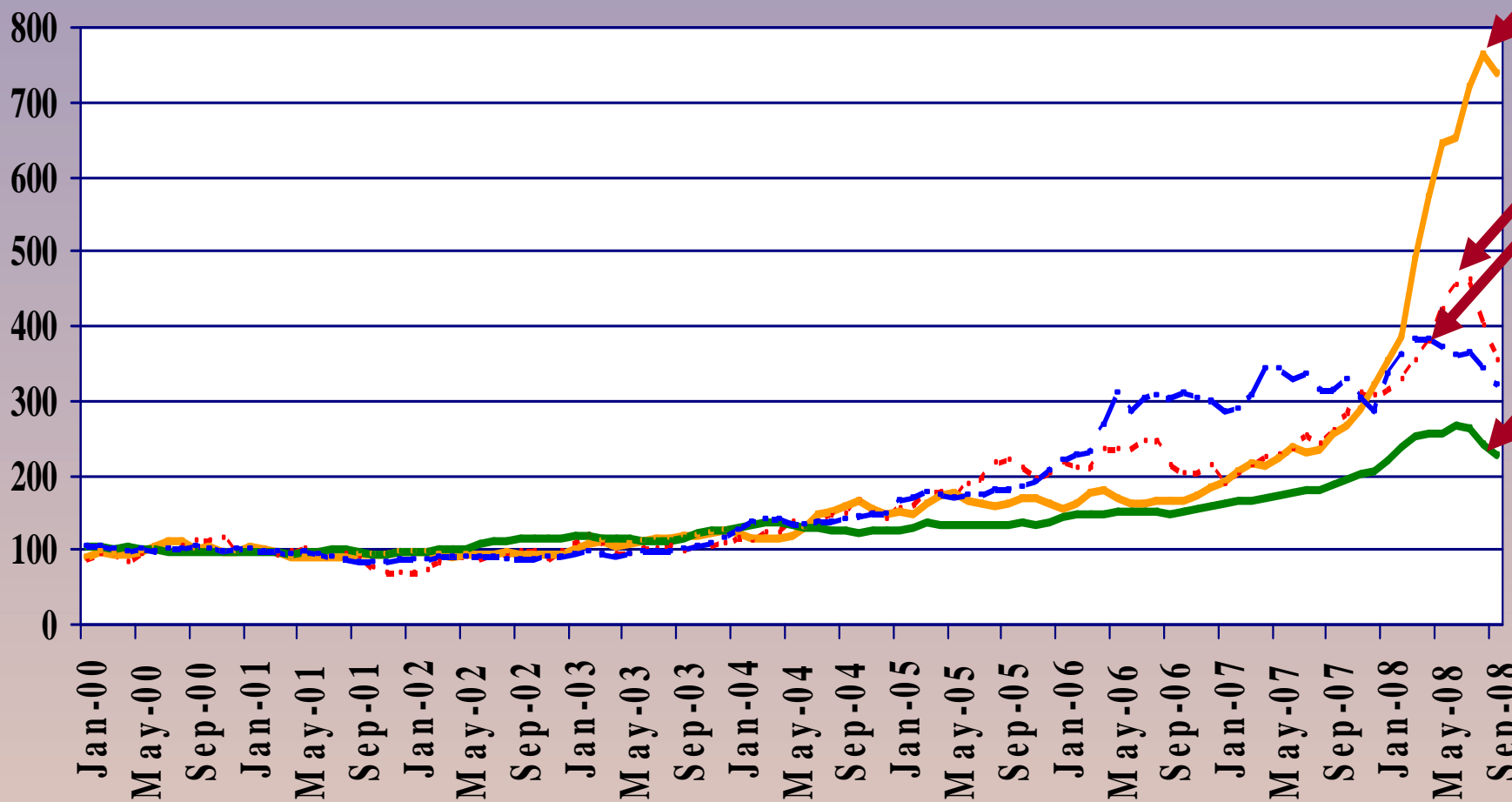
Vanadium



COLORADO GEOLOGICAL SURVEY



(2000 = 100)



--- Energy

— Fertilizers

— Agriculture

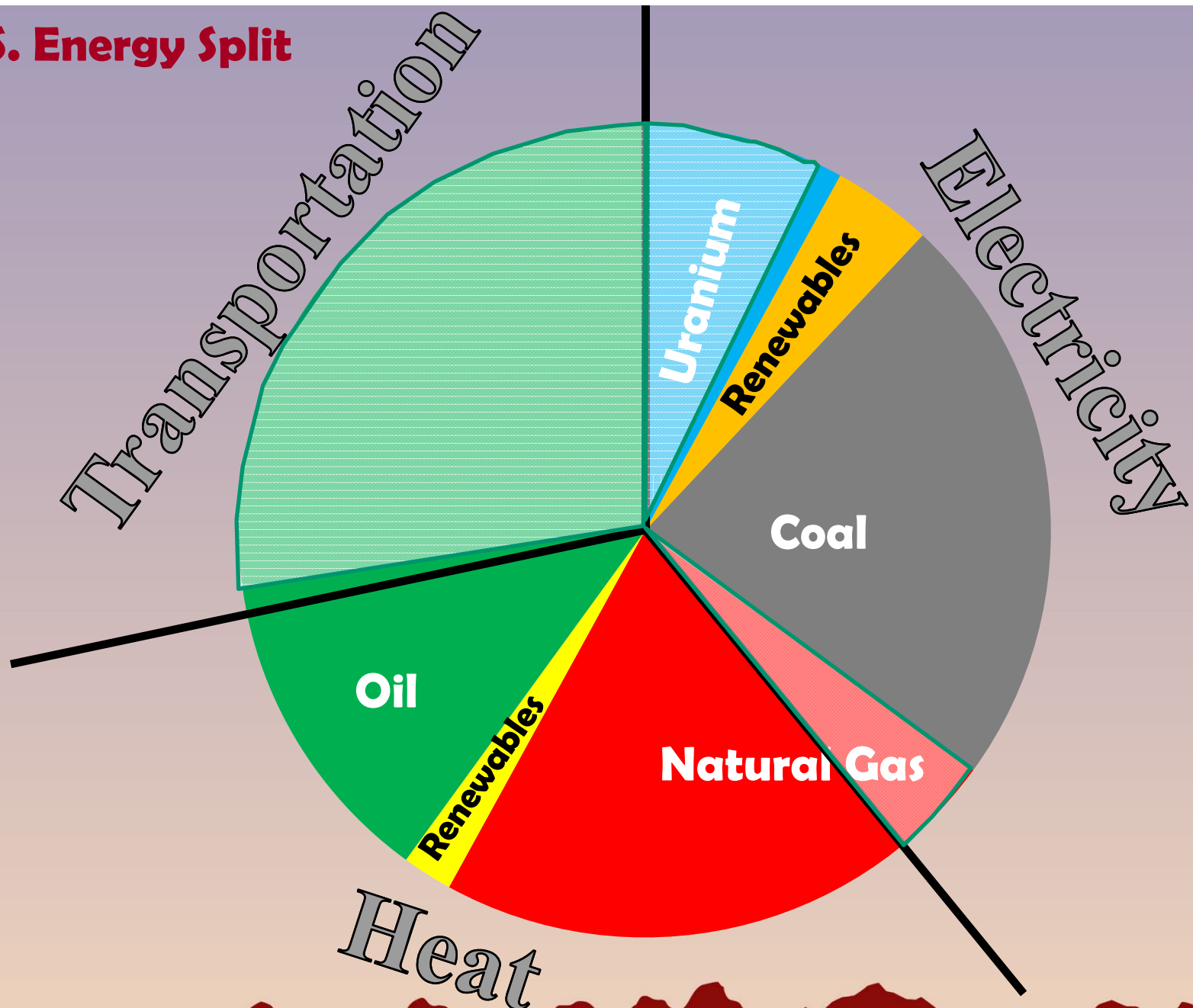
-.- Metals/minerals

Dr Colin Thirtle, Professor of Development Economics, Imperial College London

COLORADO GEOLOGICAL SURVEY



U.S. Energy Split



U.S. Energy Split

94%

6%

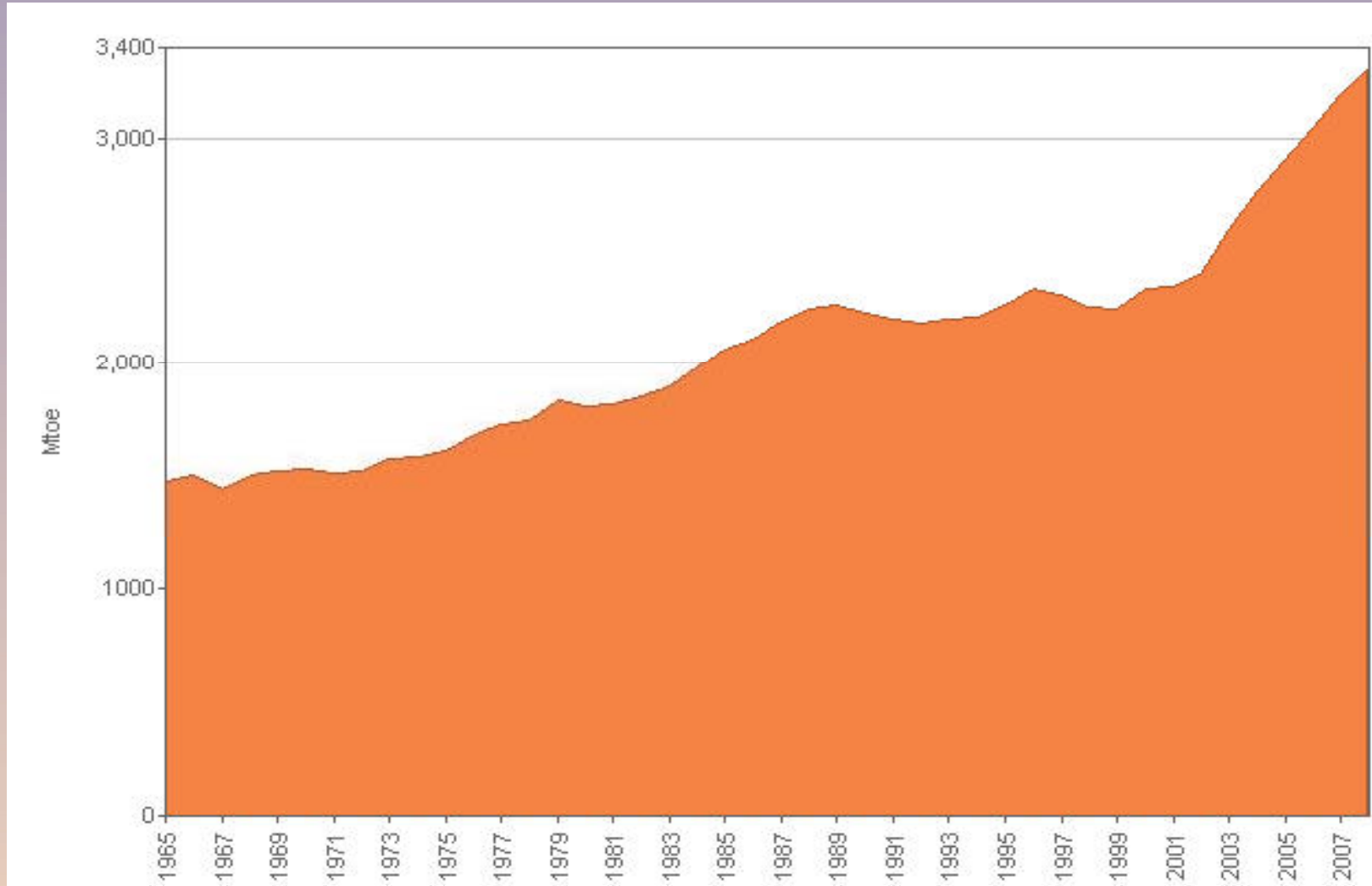
Commodity	Percent of U.S. energy supply	Percentage Price Increase 2003-07	Percent Imported (2007 Net)
Coal	22.8	381	0
Oil	39.8	306	67
Uranium	8.4	481	89
Natural Gas	23.6	206	16
Hydroelectric	2.5	-	-
Biomass	3.6	-	-
Solar	.1	-	-
Wind	.3	-	-
Geothermal	.3	-	-

Source: EIA, Annual Report 2007

COLORADO GEOLOGICAL SURVEY



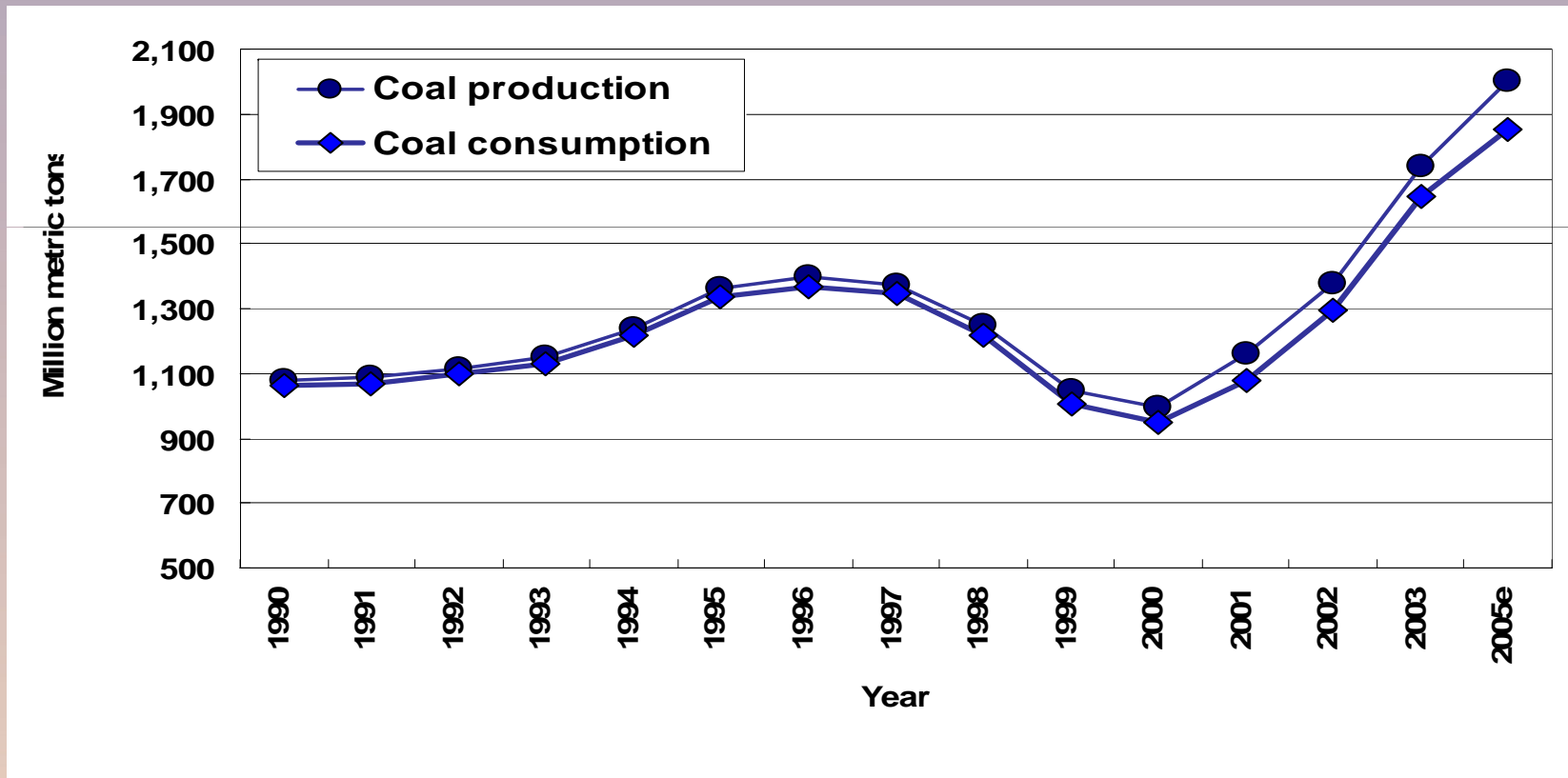
World Coal Consumption



COLORADO GEOLOGICAL SURVEY

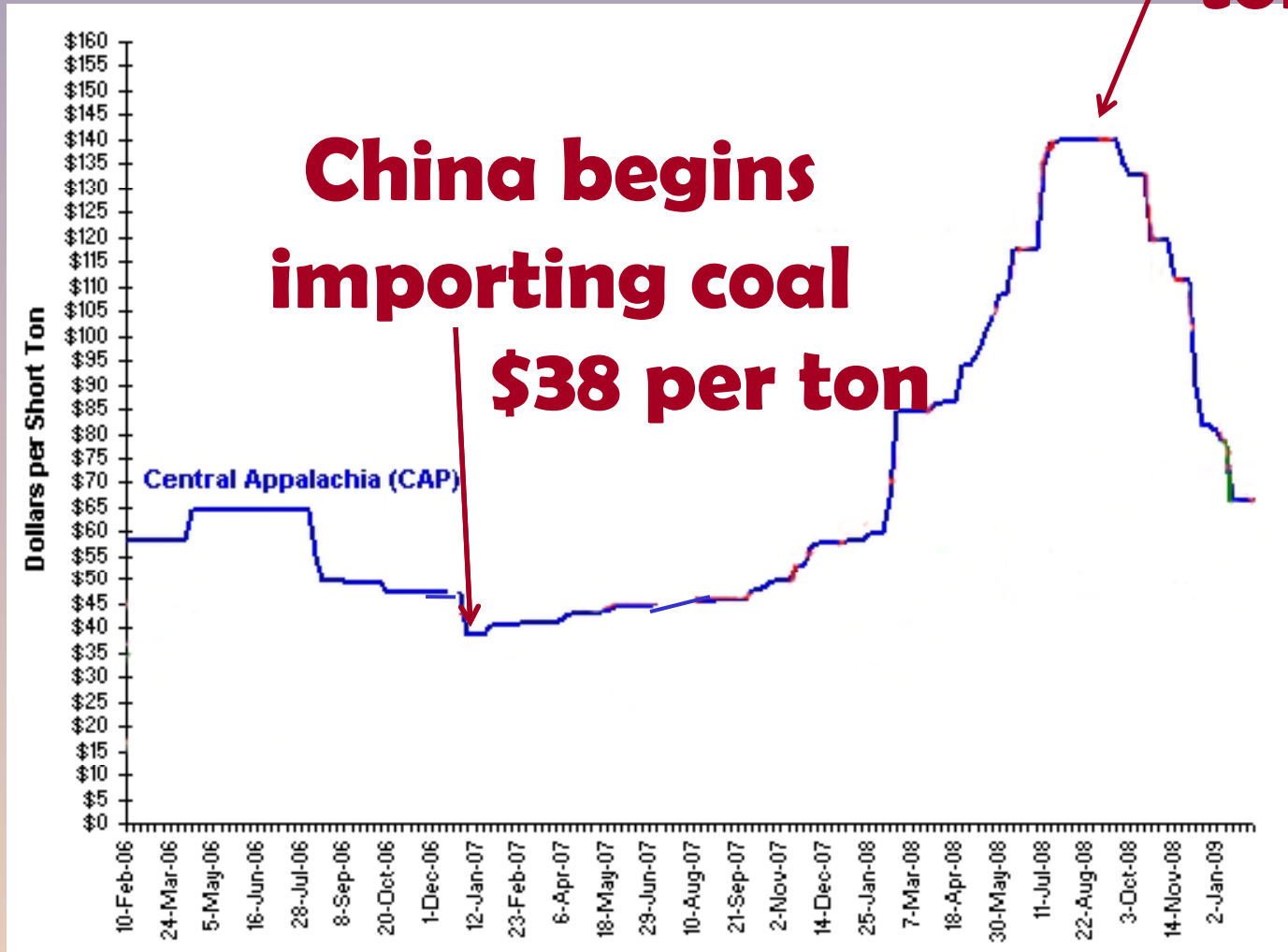


China's Production and Consumption of Coal



Coal Spot Price 2/06 – 2/09

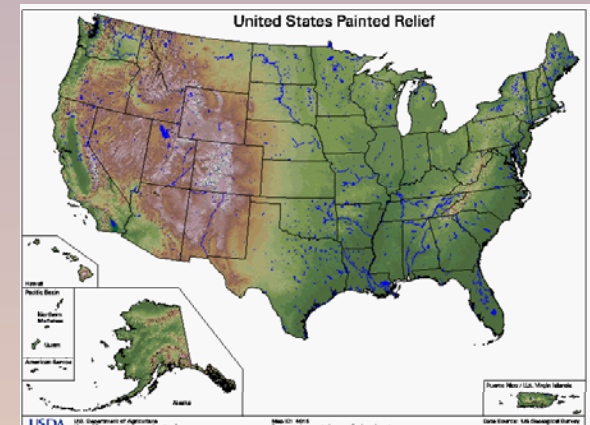
\$140 per ton



China/U.S. Coal

54% of world production.

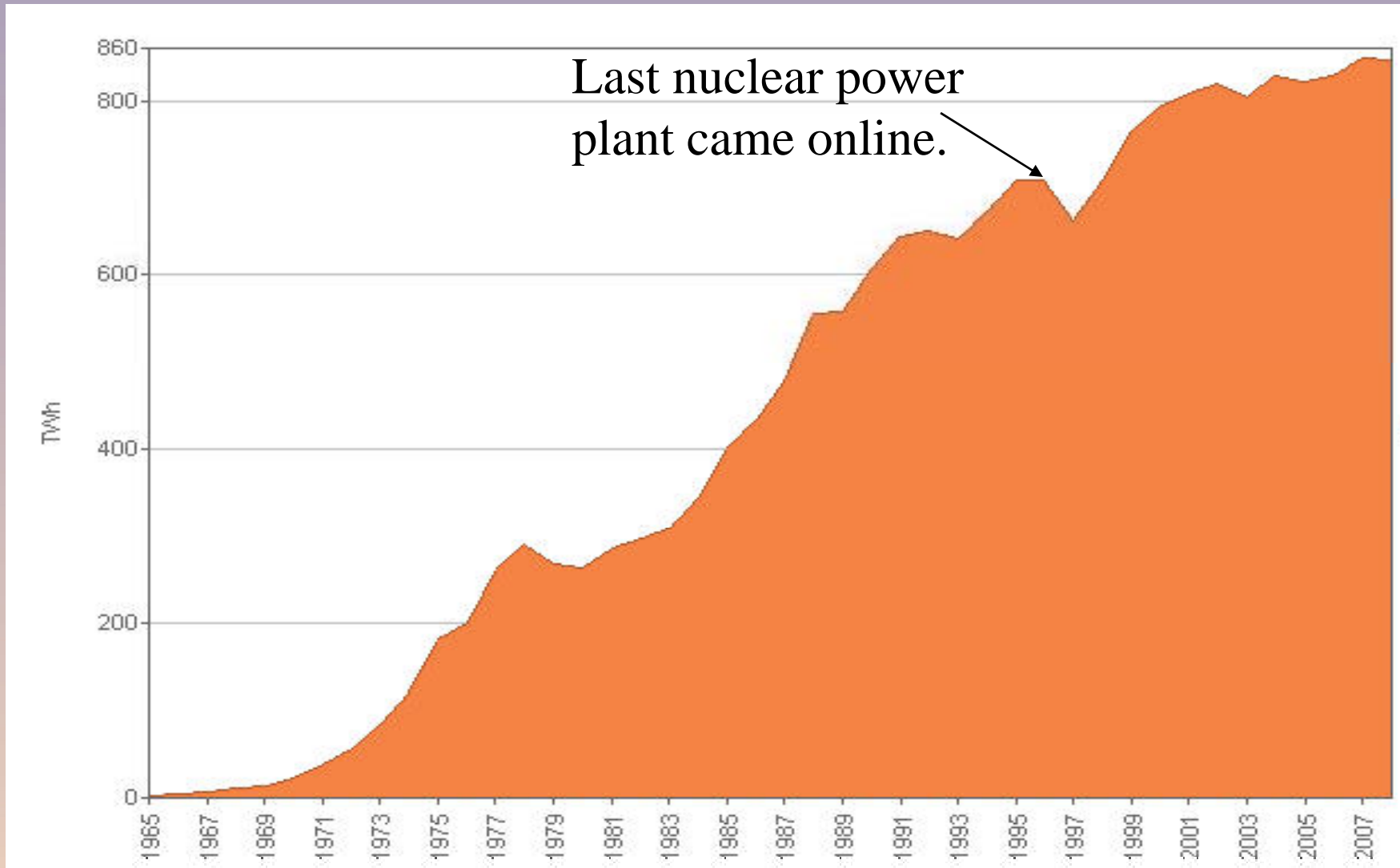
51% of world consumption.



COLORADO GEOLOGICAL SURVEY



NUCLEAR- U.S.



**The United States generates as much
nuclear energy as—**

France,

Germany,

Spain,

Sweden,

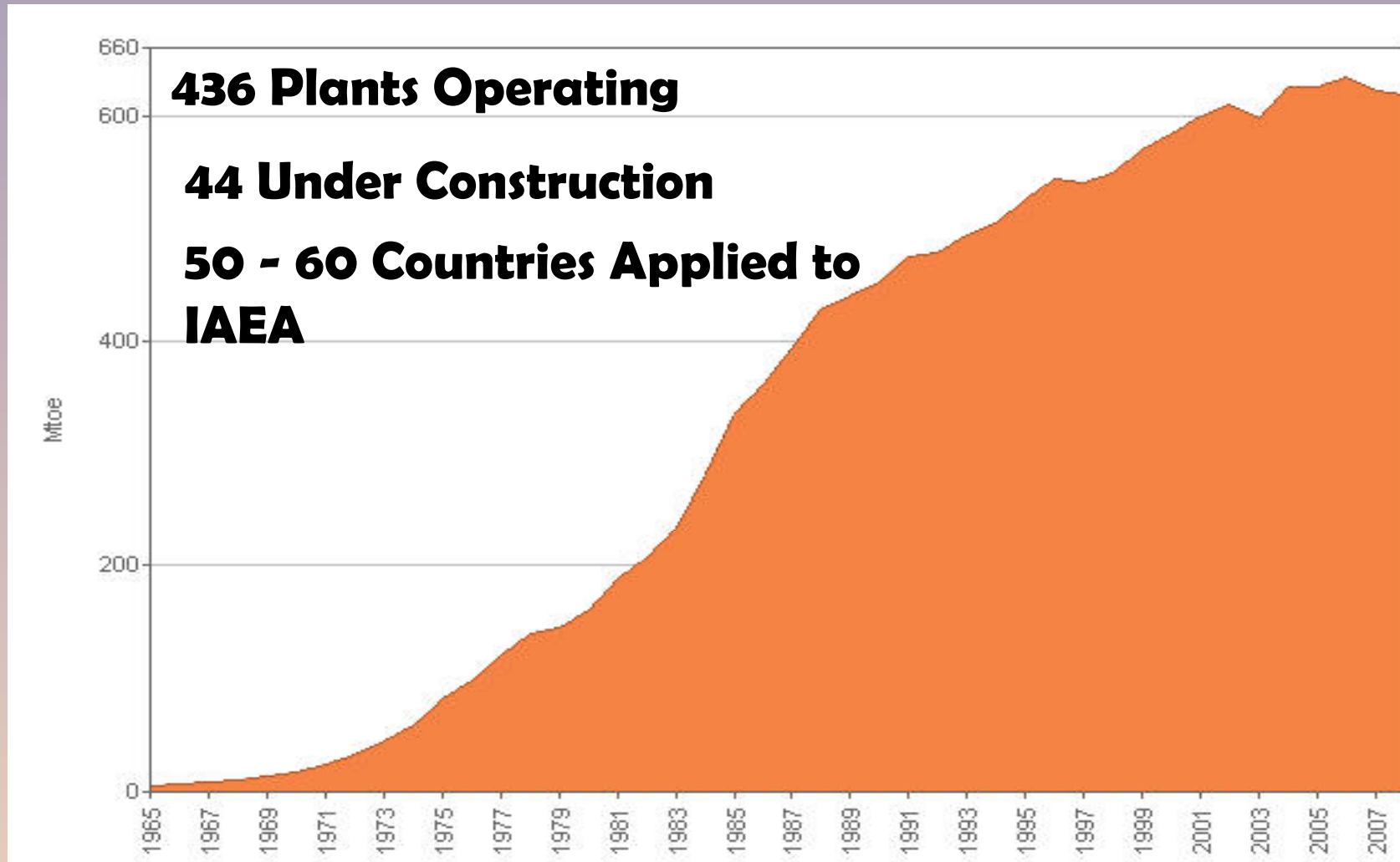
United Kingdom

combined!

COLORADO GEOLOGICAL SURVEY



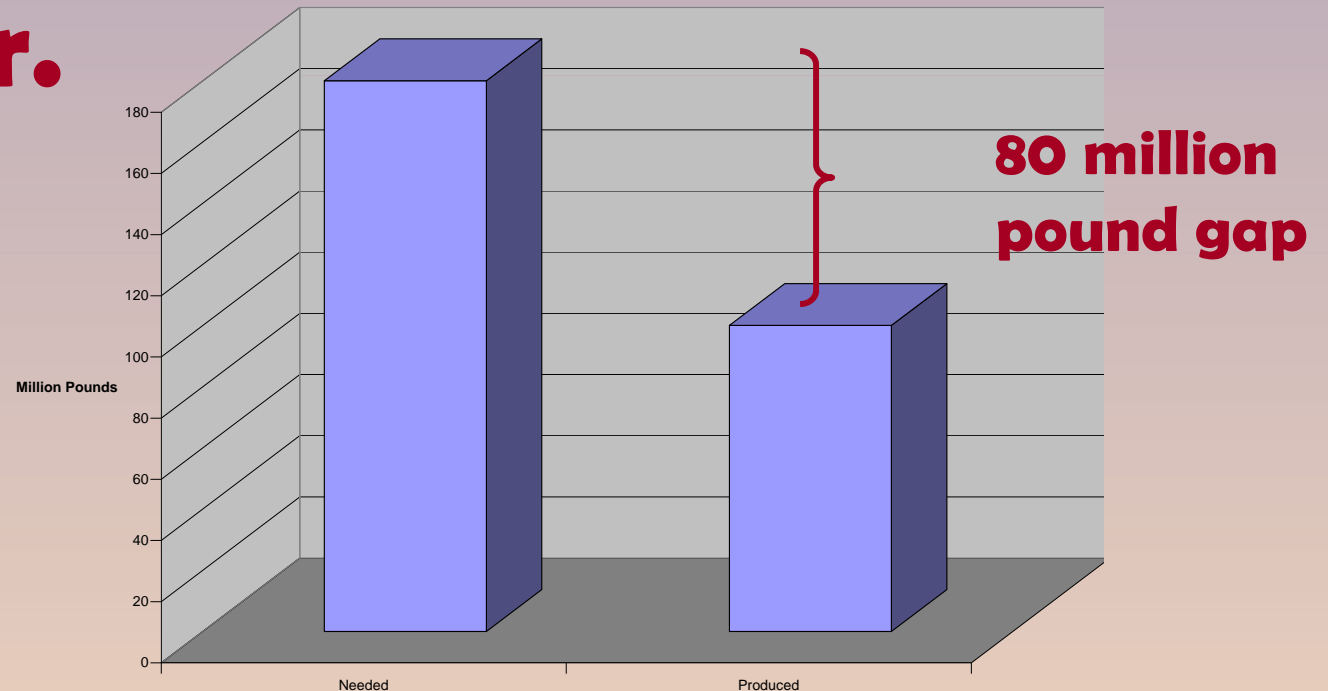
World Nuclear Power Consumption



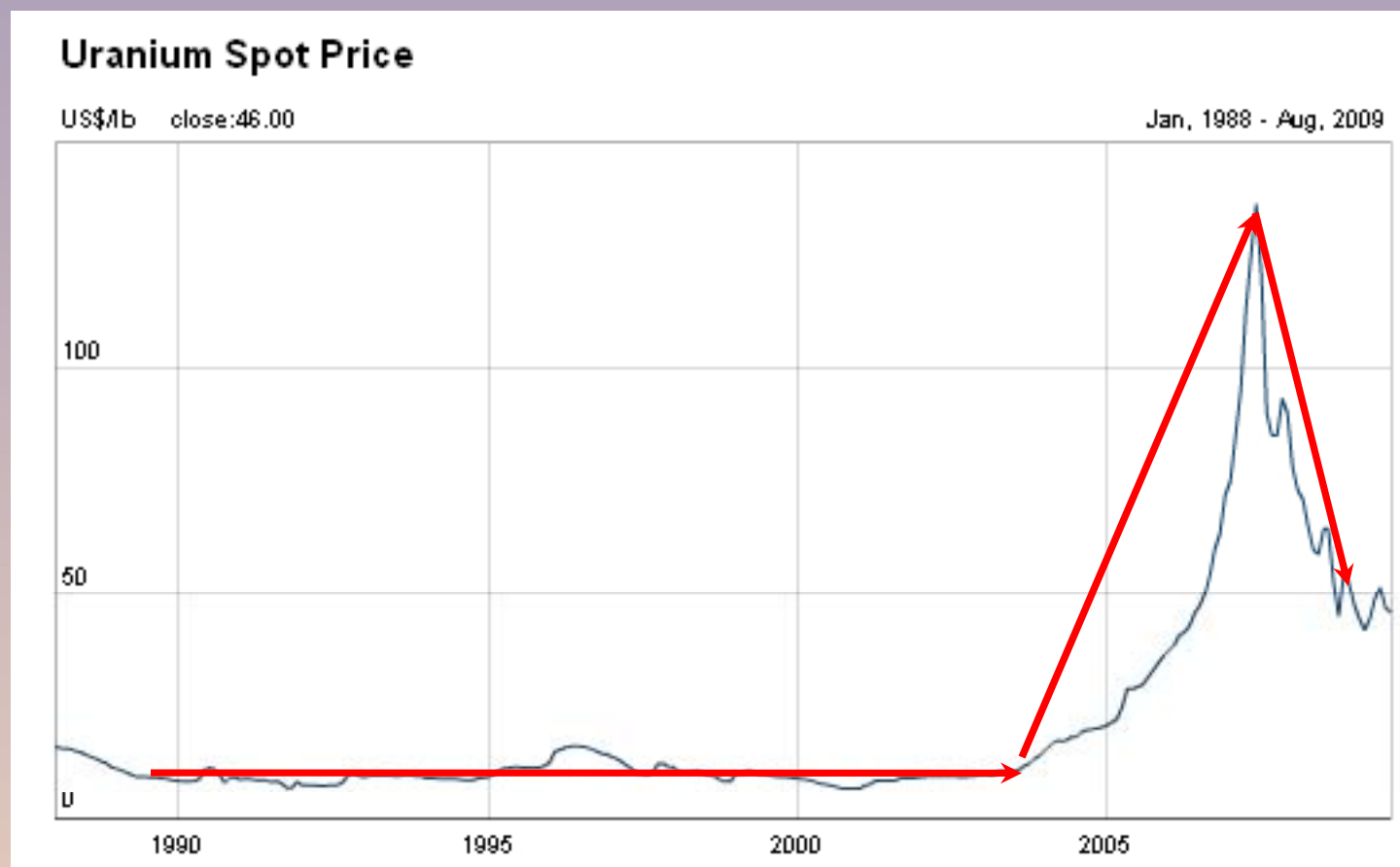
COLORADO GEOLOGICAL SURVEY



The world's existing 436 nuclear reactors currently need 180 million pounds of uranium each year.



Uranium prices

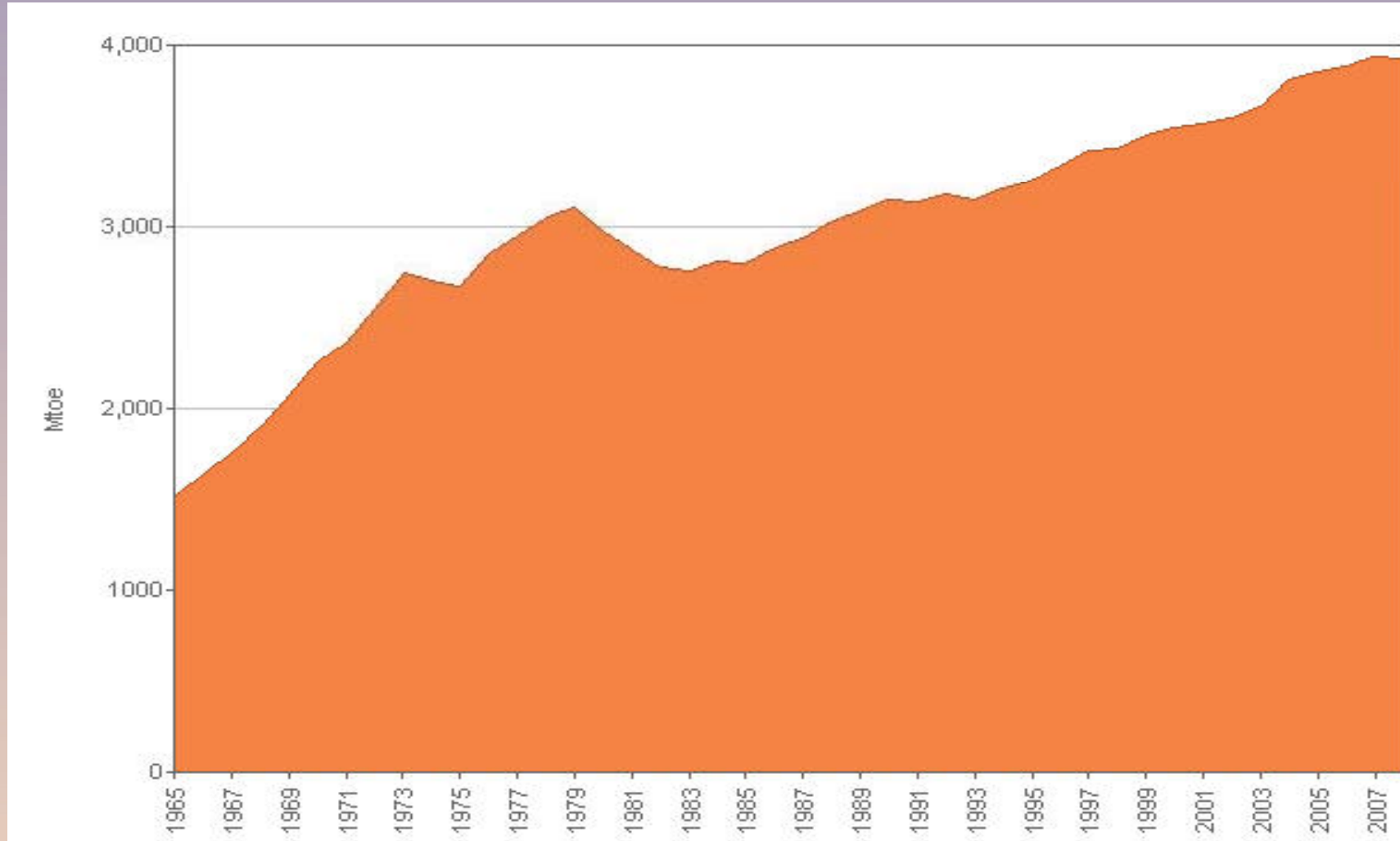


Source: Cameco

COLORADO GEOLOGICAL SURVEY



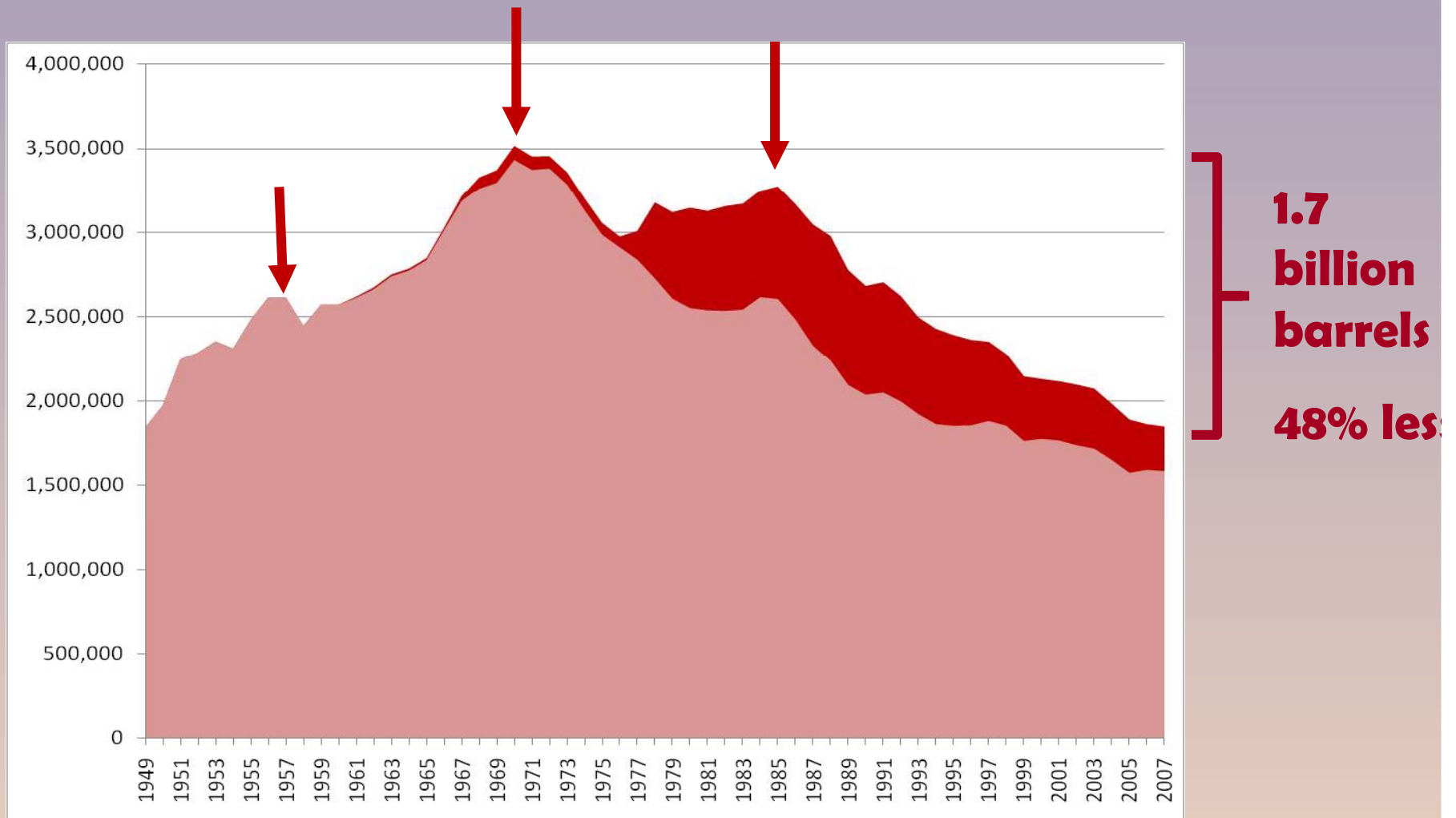
World Oil Consumption



COLORADO GEOLOGICAL SURVEY



OIL- U.S. Production

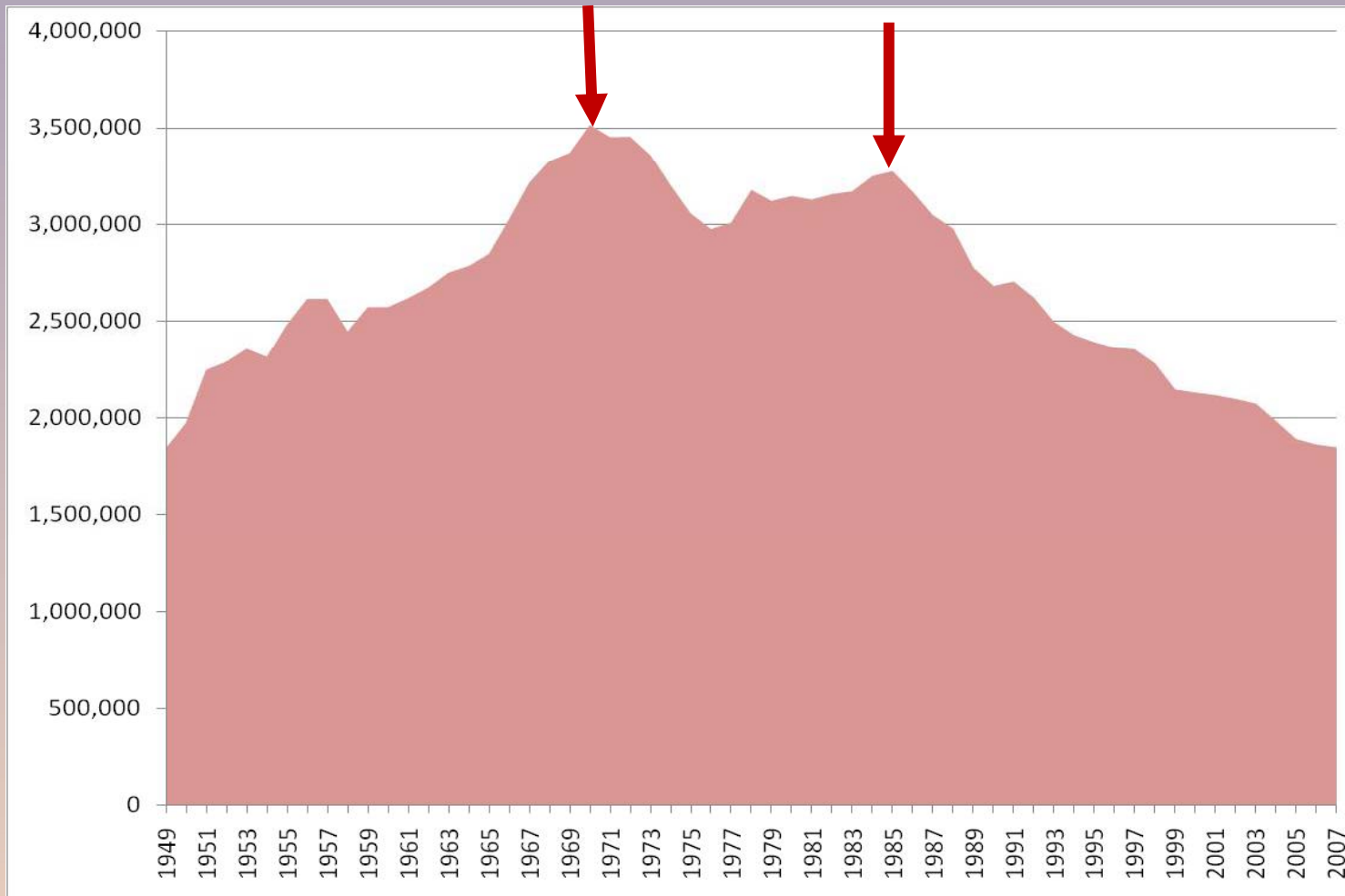


Source: EIA

COLORADO GEOLOGICAL SURVEY



OIL- U.S. Production



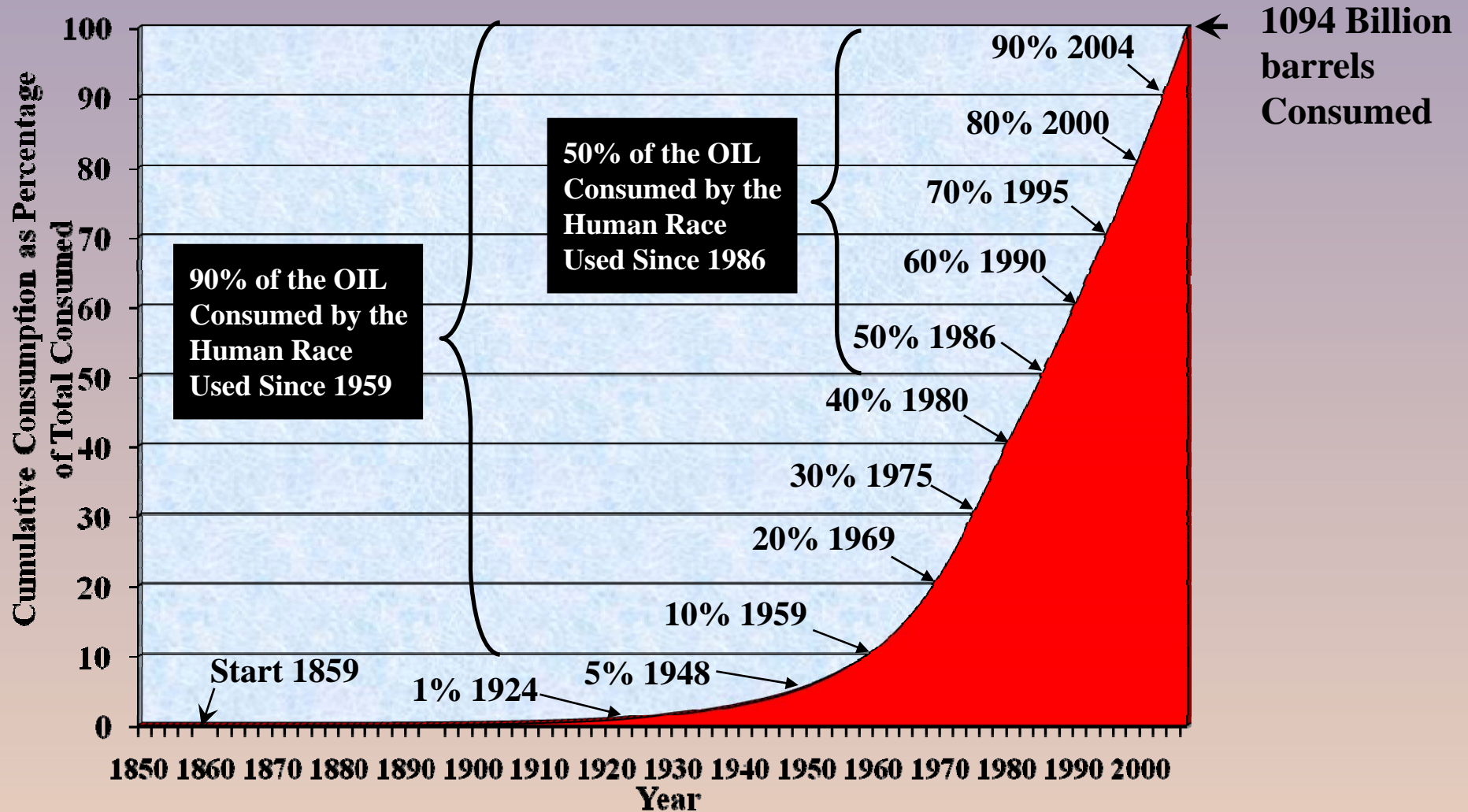
**1.7
billion
barrels
48% less**

Source: EIA

COLORADO GEOLOGICAL SURVEY



Cumulative *OIL* Consumption by the Human Race as a Percentage of Total Consumption through Yearend 2007



(data from Arnulf Grubler, 1998; BP Statistical Review of World Energy, 2008)

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COLORADO GEOLOGICAL SURVEY



IEA says existing fields have 3.7% decline in 2007

IEA says existing fields have 6.7% decline in 2008

At 5% decline rate

In only five years

The world will need

19 million barrels!

COLORADO GEOLOGICAL SURVEY

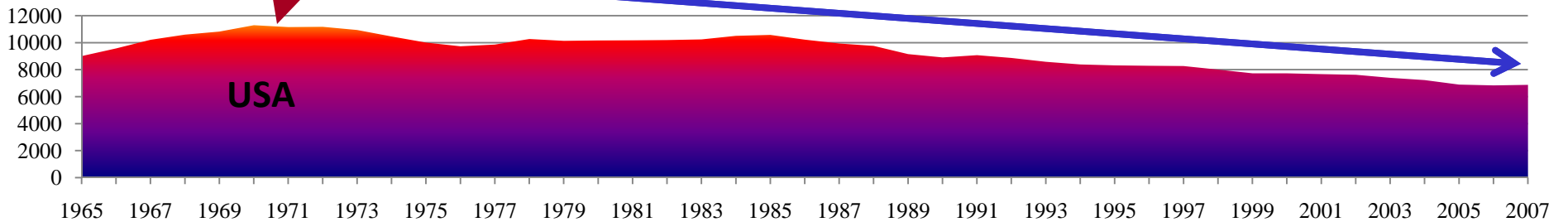


1 of 65 producing countries

USA

Peak 1970

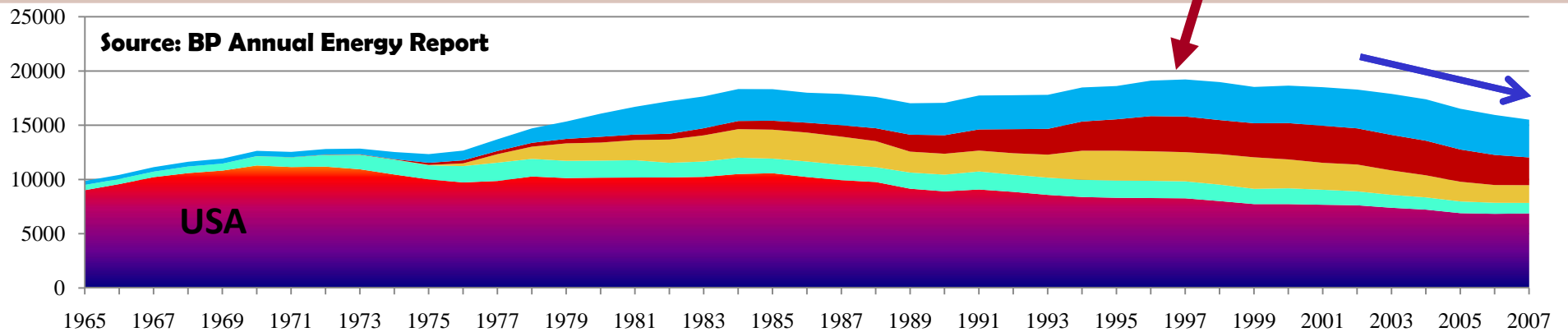
Source: BP Annual Energy Report



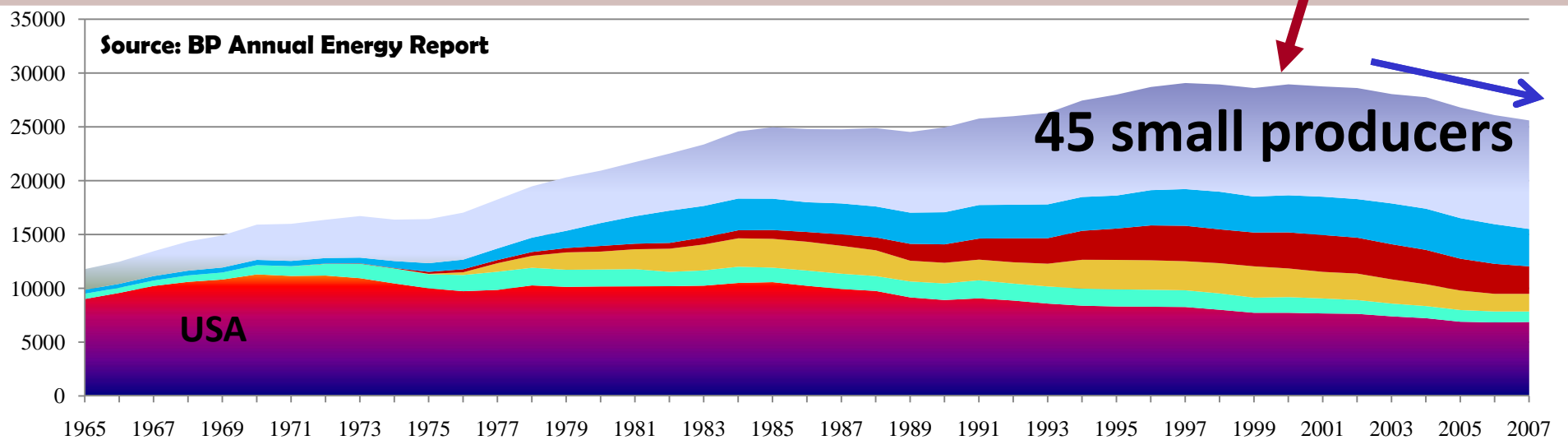
5 of 65 producing countries

Mexico
Norway
UK
Indonesia

Peak 1997



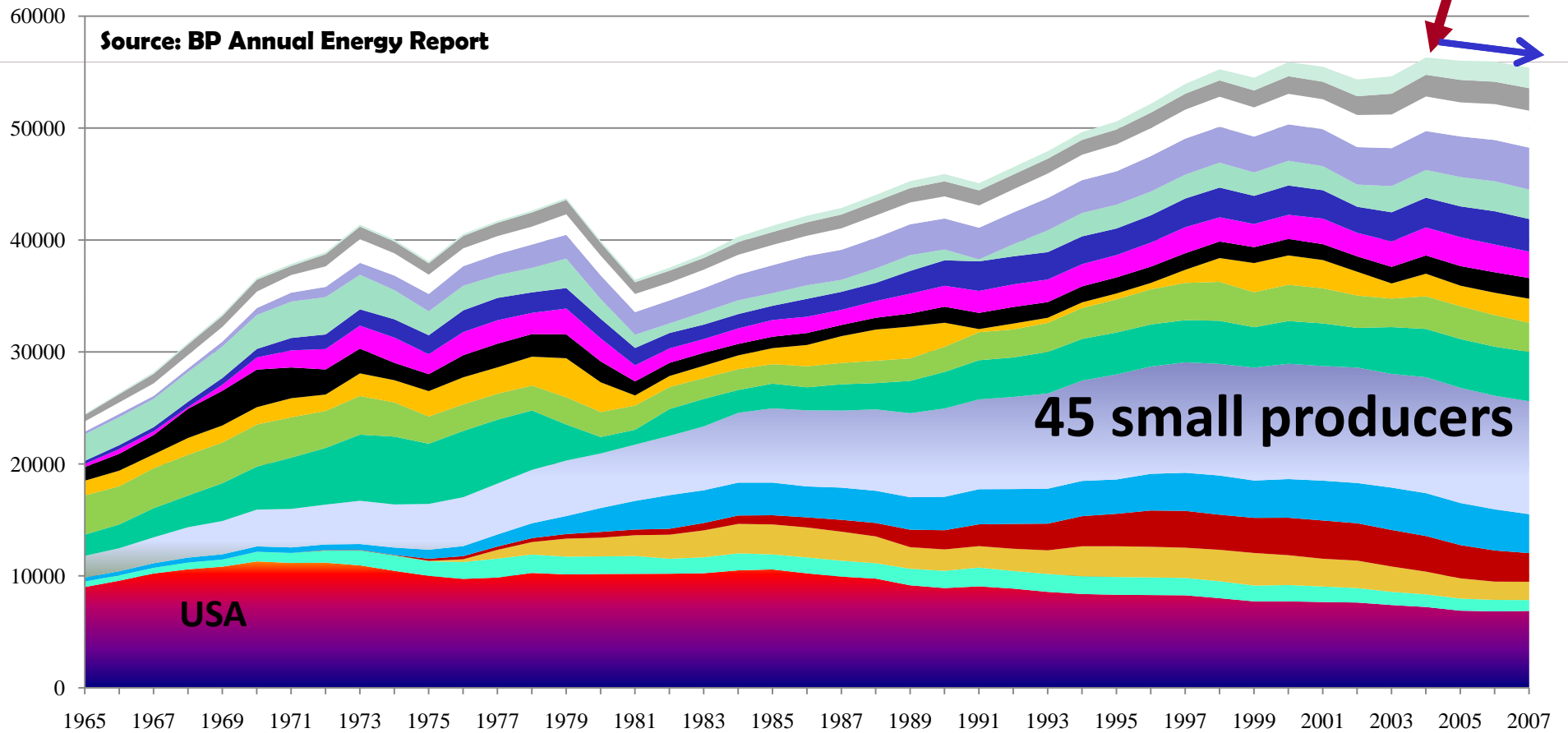
50 of 65 producing countries



61 of 65 producing countries

Brazil Kuwait Iraq
Algeria UAE Venezuela
Canada Nigeria Iran
China Libya

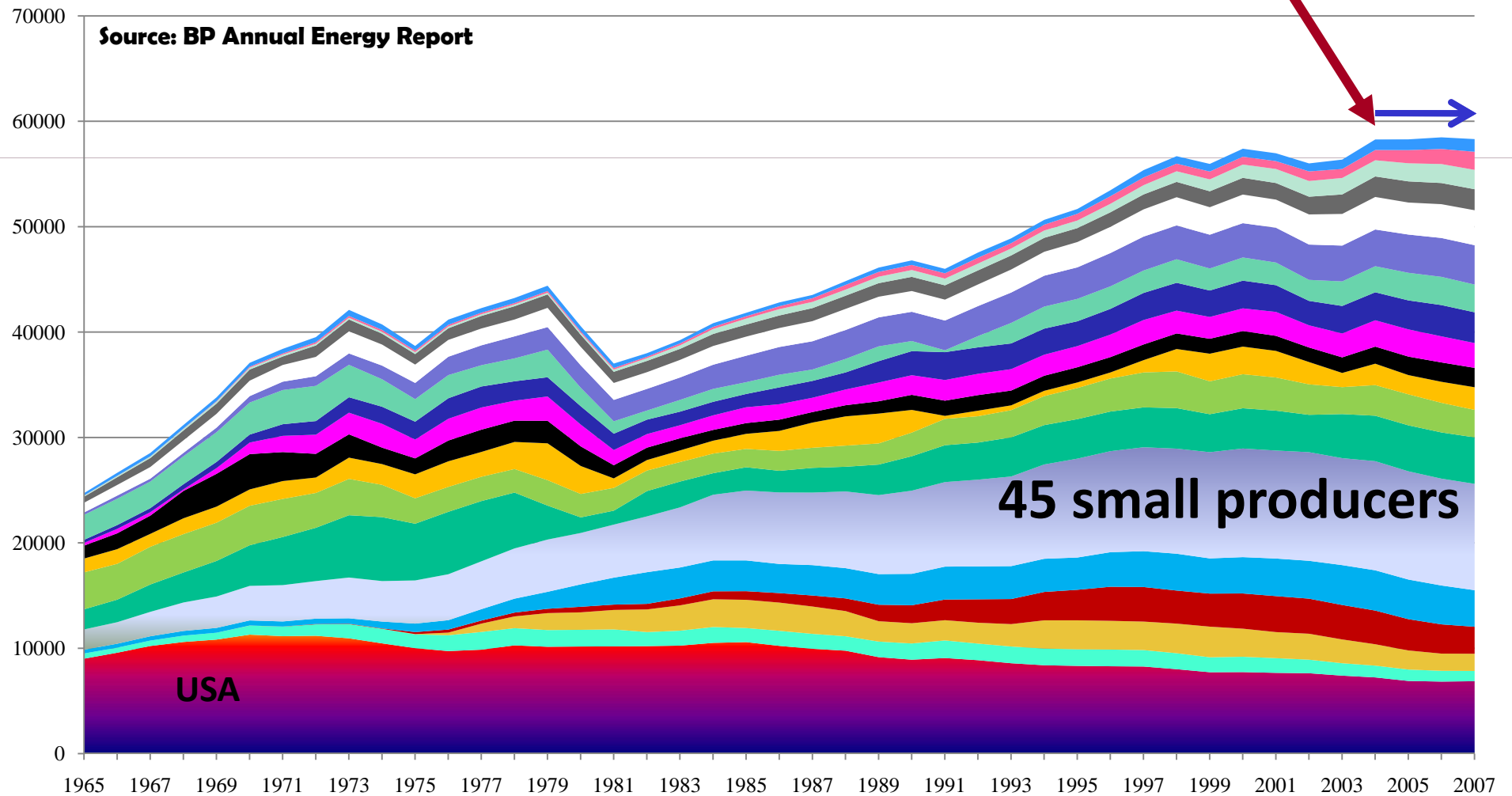
Peak 2004



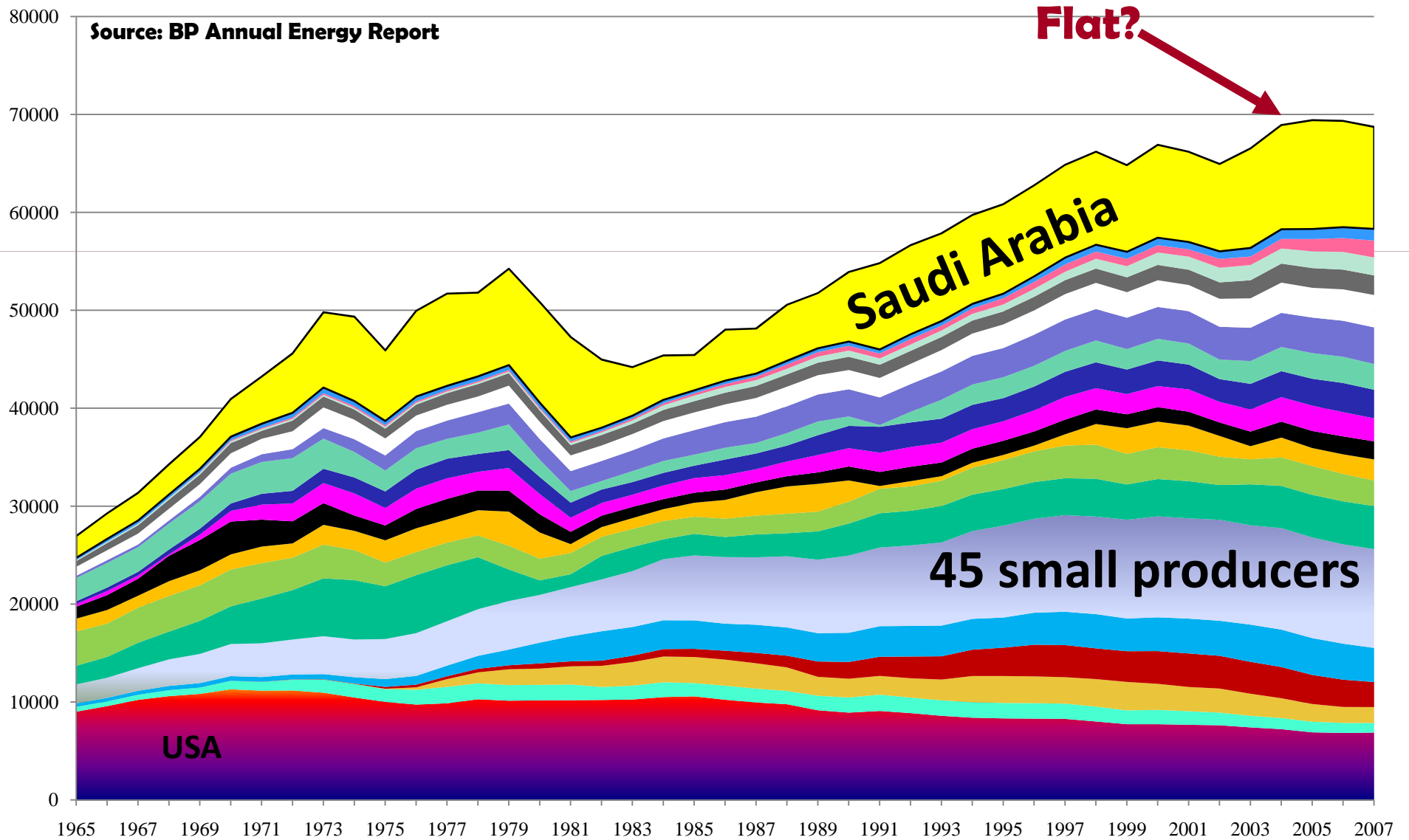
63 of 65 producing countries

Qatar
Angola

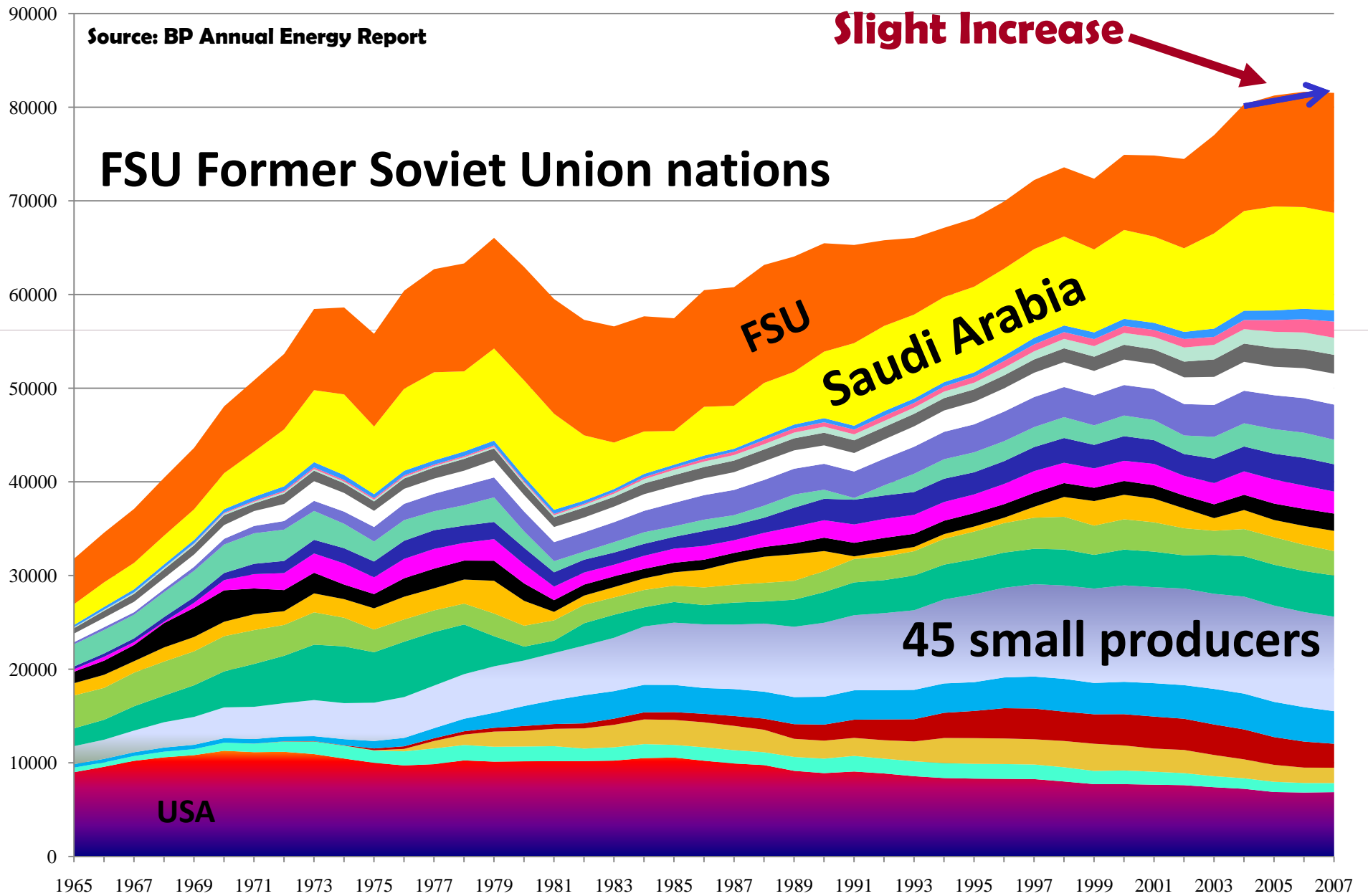
Flat 2004



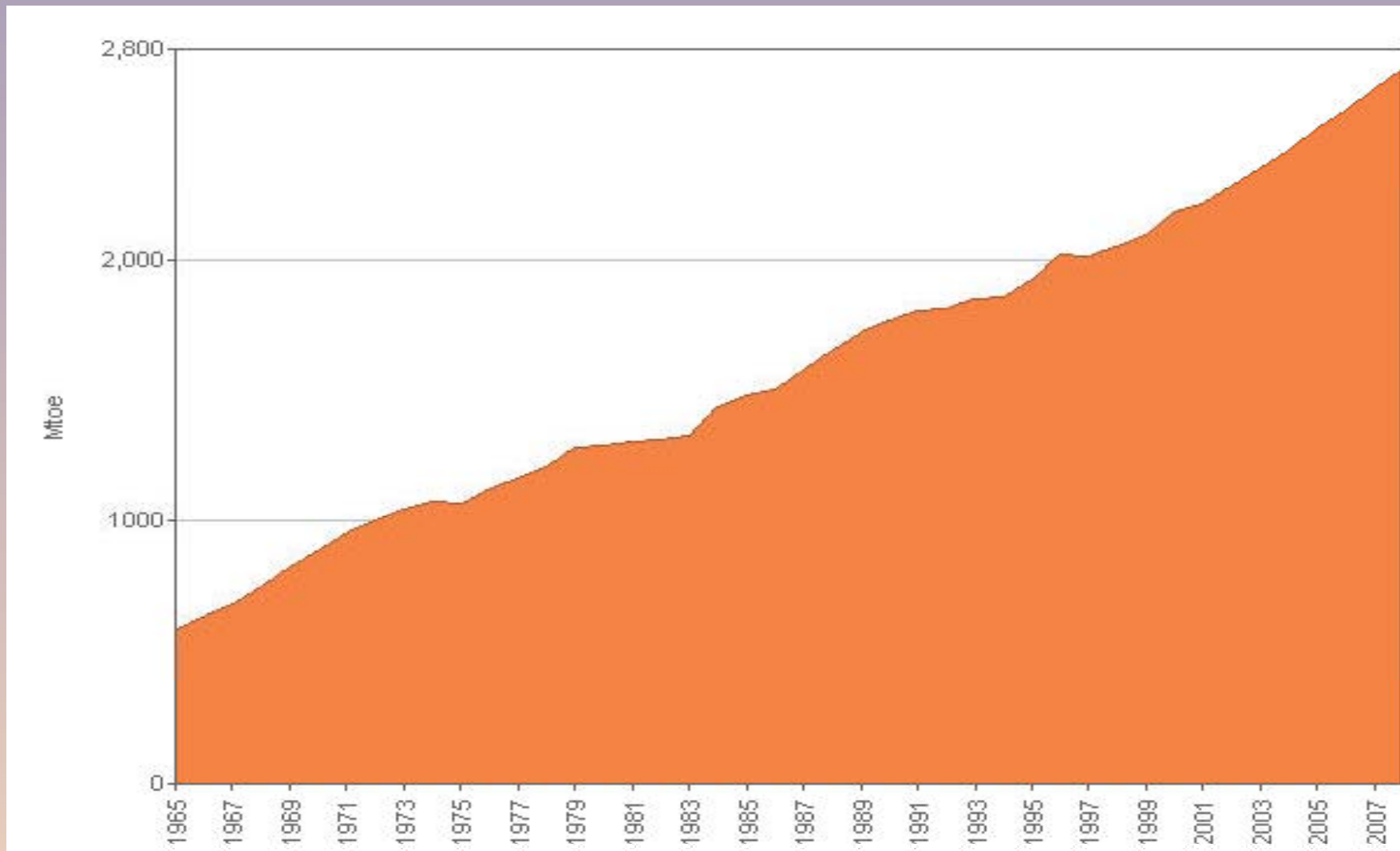
64 of 65 producing countries



65 of 65 producing countries



World Natural Gas Consumption



COLORADO GEOLOGICAL SURVEY



Natural Gas

Clean Burning!

Unlimited Supply!

Cheap!

Low Carbon Footprint!

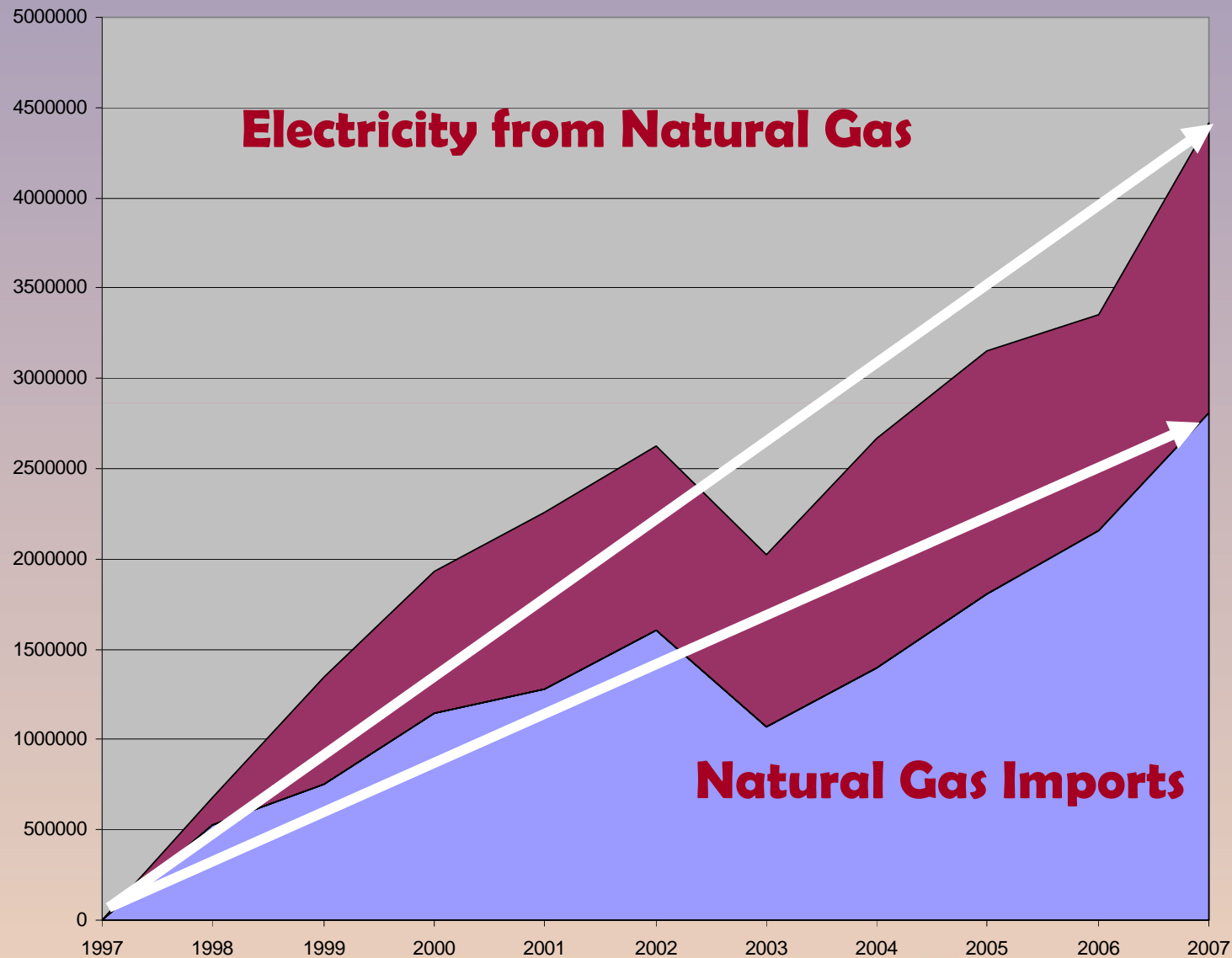


America's Silver Bullet?

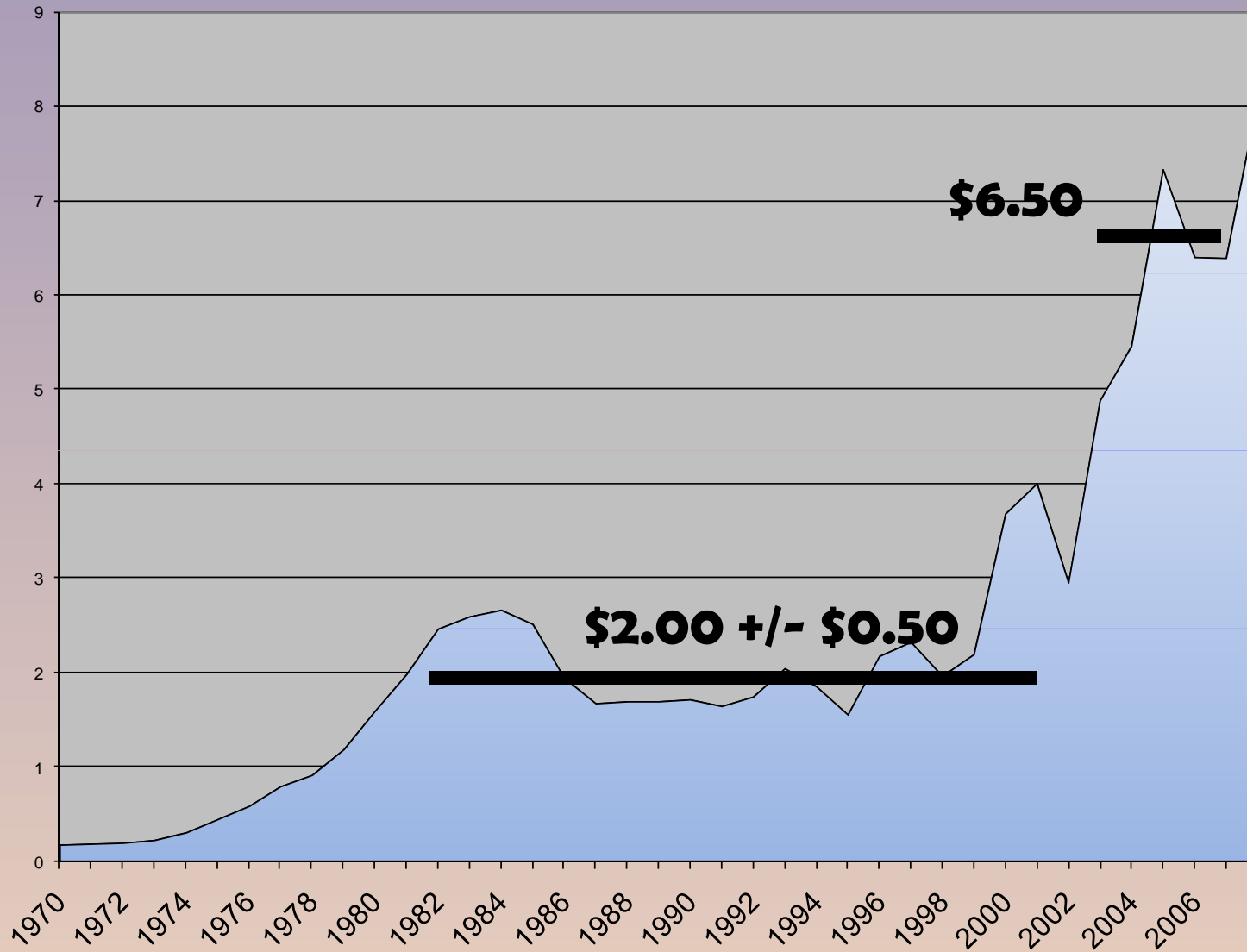
COLORADO GEOLOGICAL SURVEY



Natural Gas Electrical Generation vs Natural Gas Imports



Natural Gas Prices

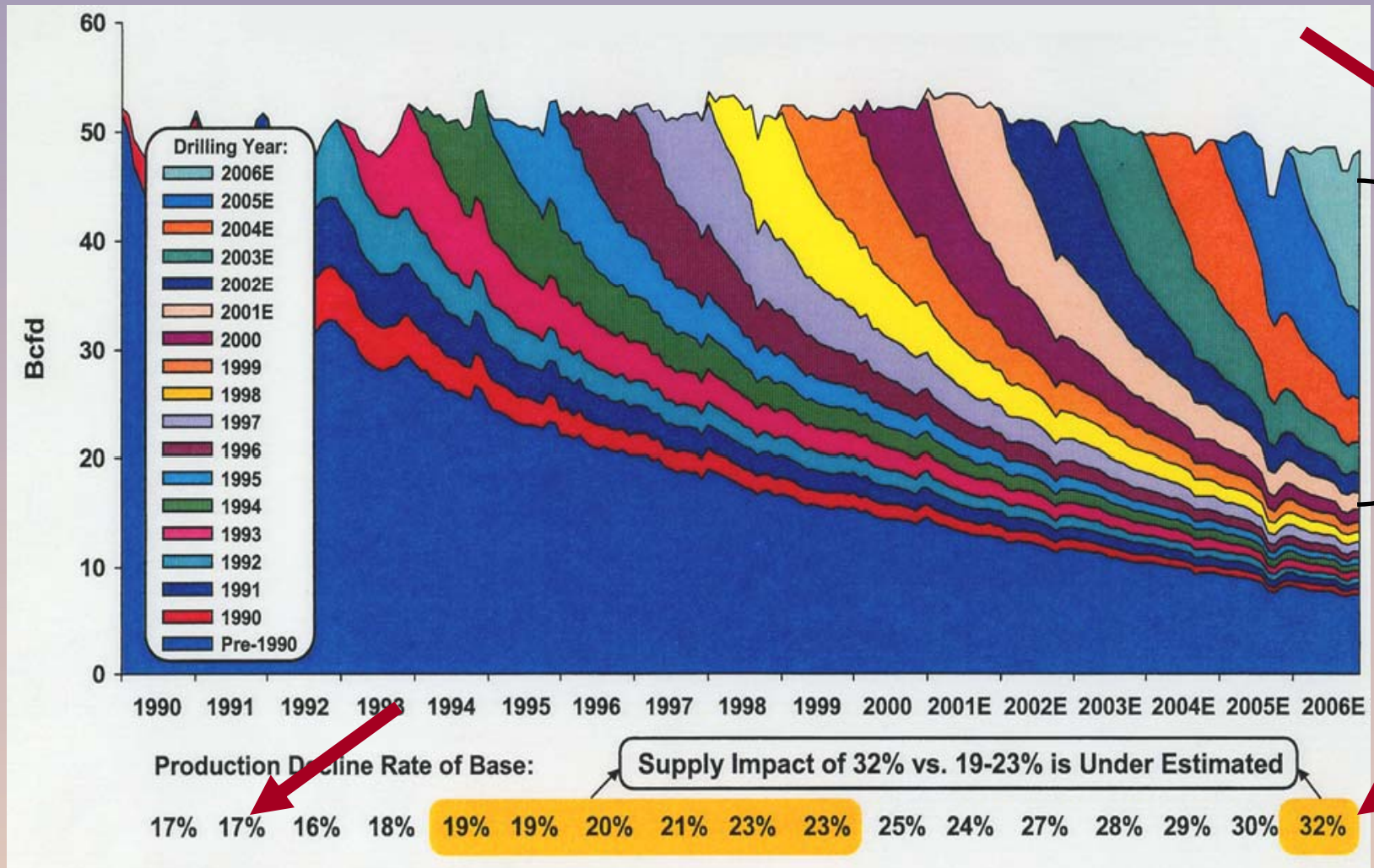


Natural Gas – America's Silver Bullet?



COLORADO GEOLOGICAL SURVEY





(data copyright IHS Energy, Diagram prepared and copyright by EOG Resources Inc., 2006)



Natural Gas – America's Silver Bullet?



COLORADO GEOLOGICAL SURVEY





Oil



Conservation



Natural Gas



Wind



Solar



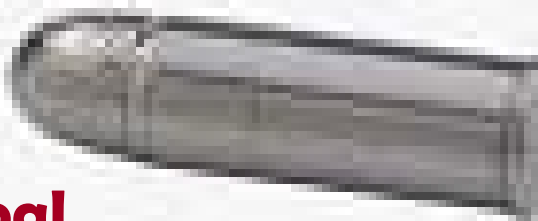
Geothermal



Biomass



Efficiency



Coal



Hydro

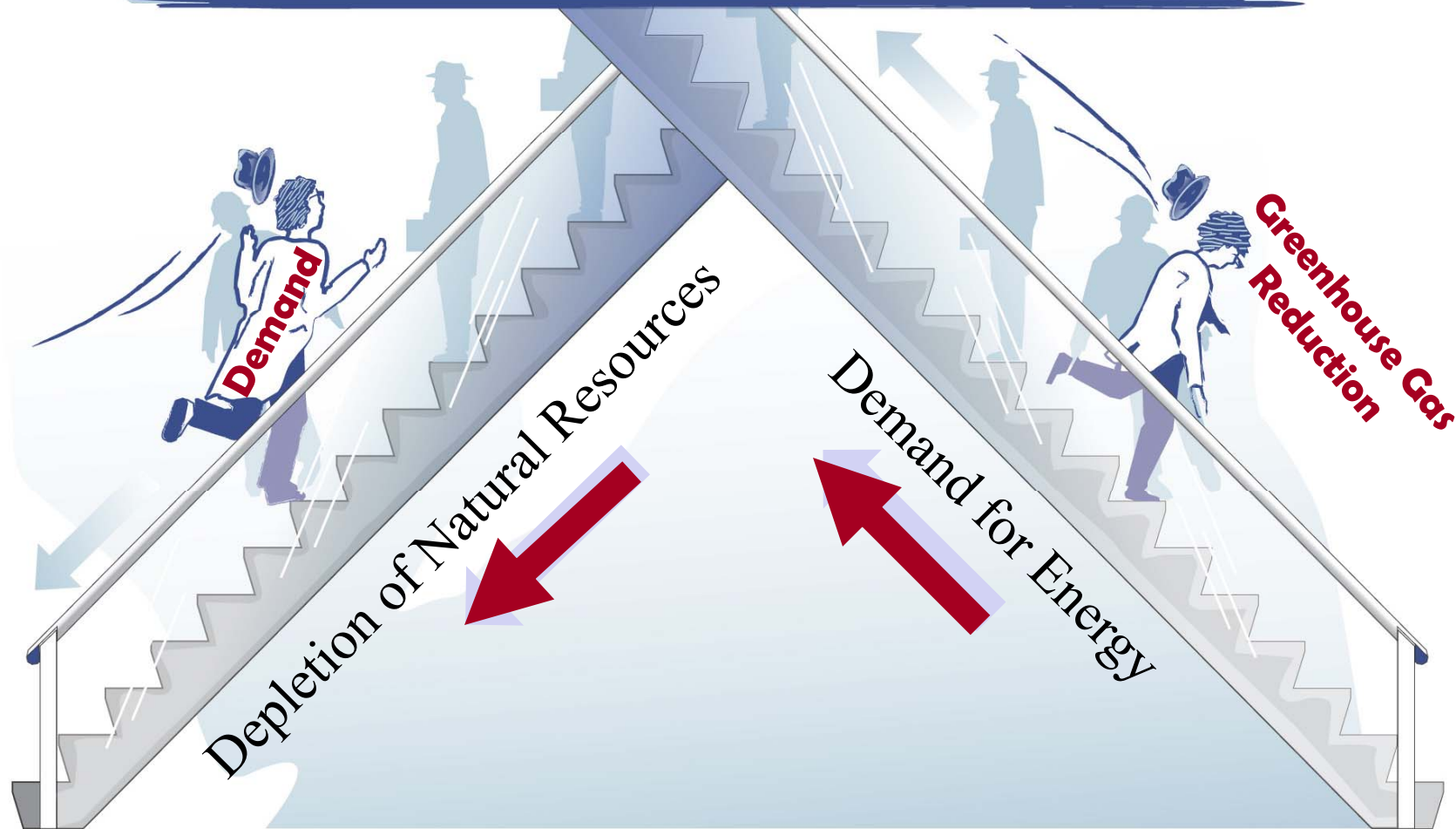


Nuclear



The Escalator Dilemma

Natural Forces are Working Against Our Goals



COLORADO GEOLOGICAL SURVEY



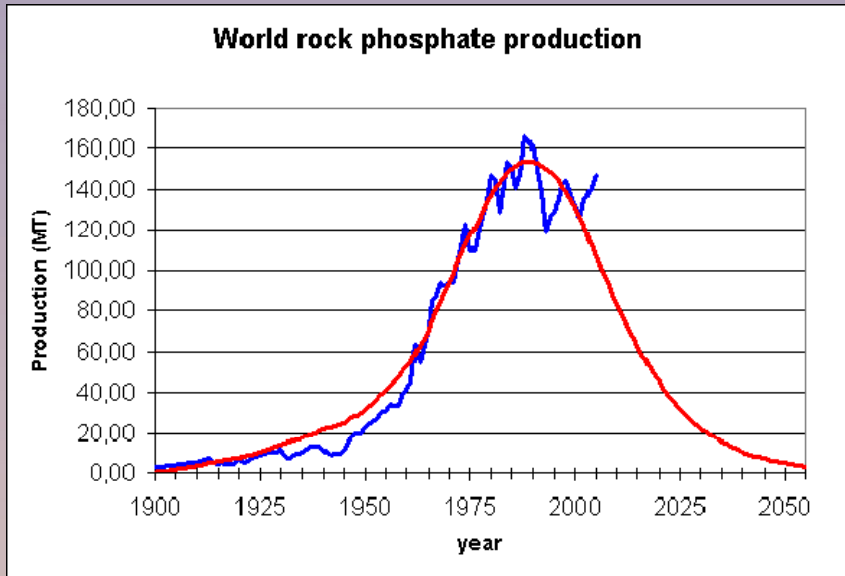
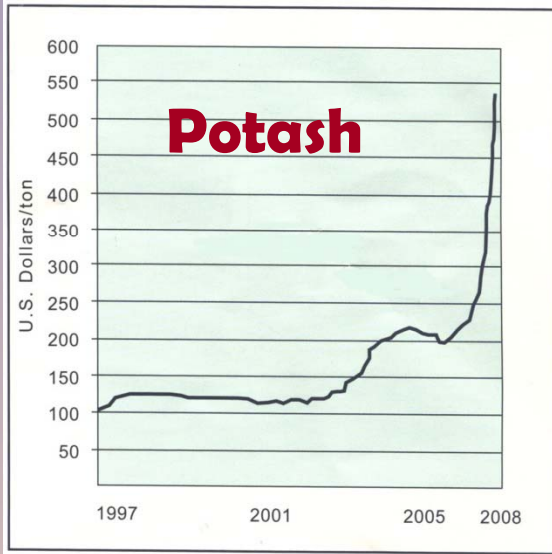
The End!

Of the talk, that is.

COLORADO GEOLOGICAL SURVEY



Fertilizers



\$50/ ton > \$200/ ton in 2008



Sulfur

Nitrogen urea \$1000/ ton.

\$50/ ton > \$500/ ton in one year