



Fossil Fuel Reliance

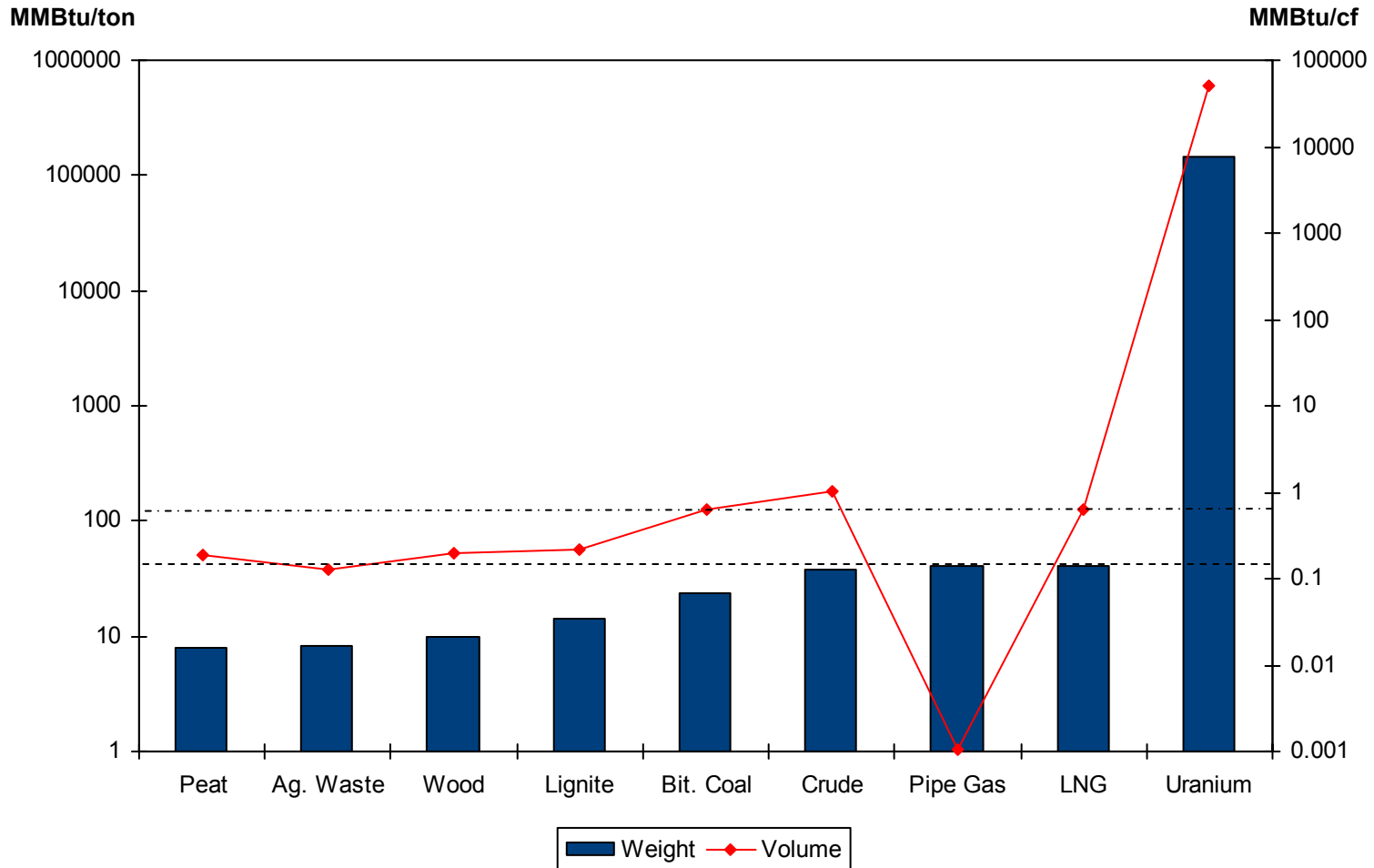
Changes Are Coming, or Are They?

25th Annual North American Conference USAEE/IAEE
Denver, Colorado
September 18, 2005

FOSSIL ENERGY CONTRIBUTIONS

- Put Renewable Back into Renewable Energy
- Created “Sea Change” in Movement of Goods and People
- Critical Factor in Improving World Living Standards

Energy "Densities"



ENERGY SUPPLY OBSERVATIONS

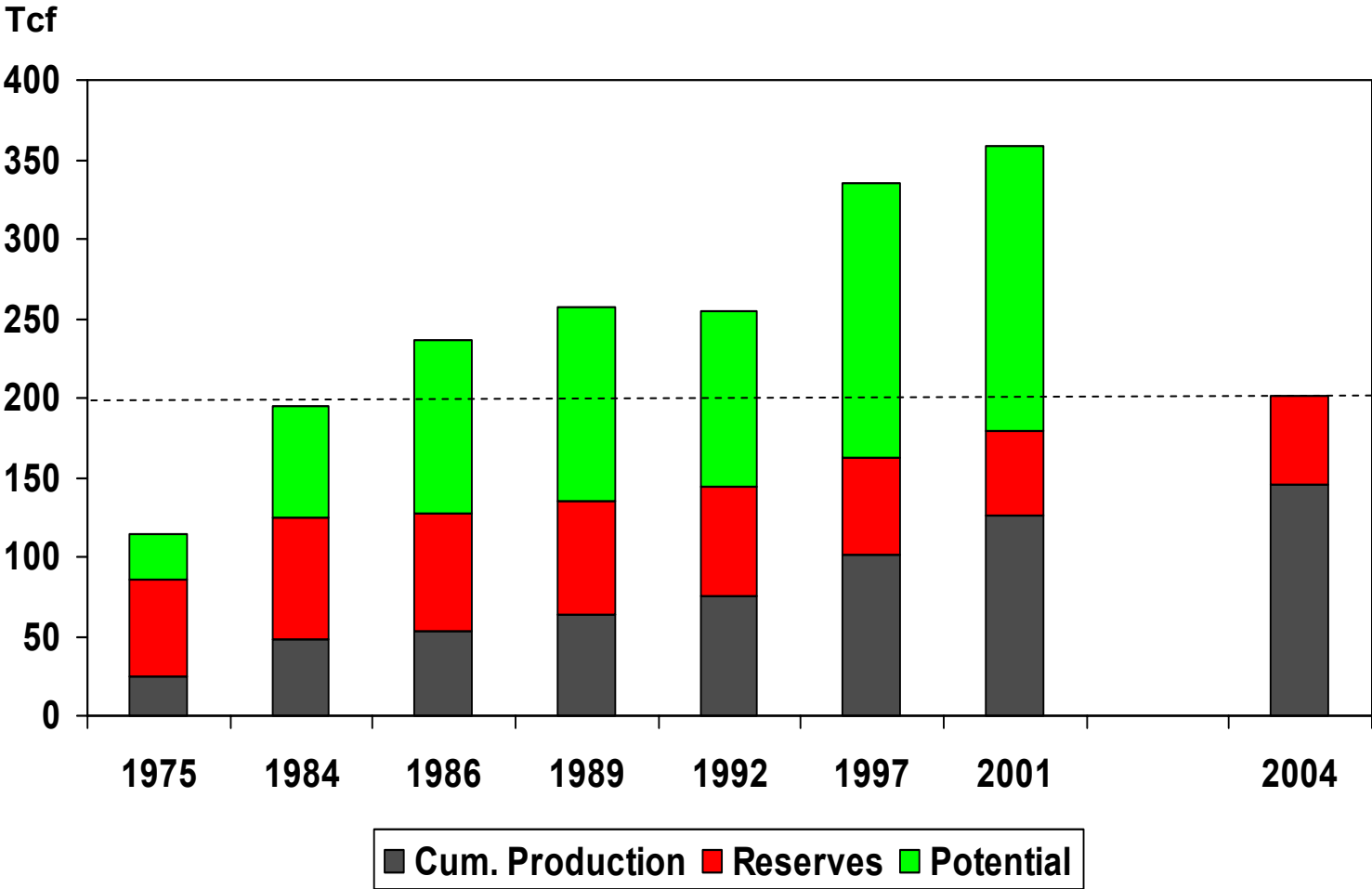
- Combustion Alternatives to Fossil Fuels Require More Effort (Expense) Save Uranium
- Critical Question:

Can Fossil Energy Output Continue to Grow?

Mark Twain on Resource Availability

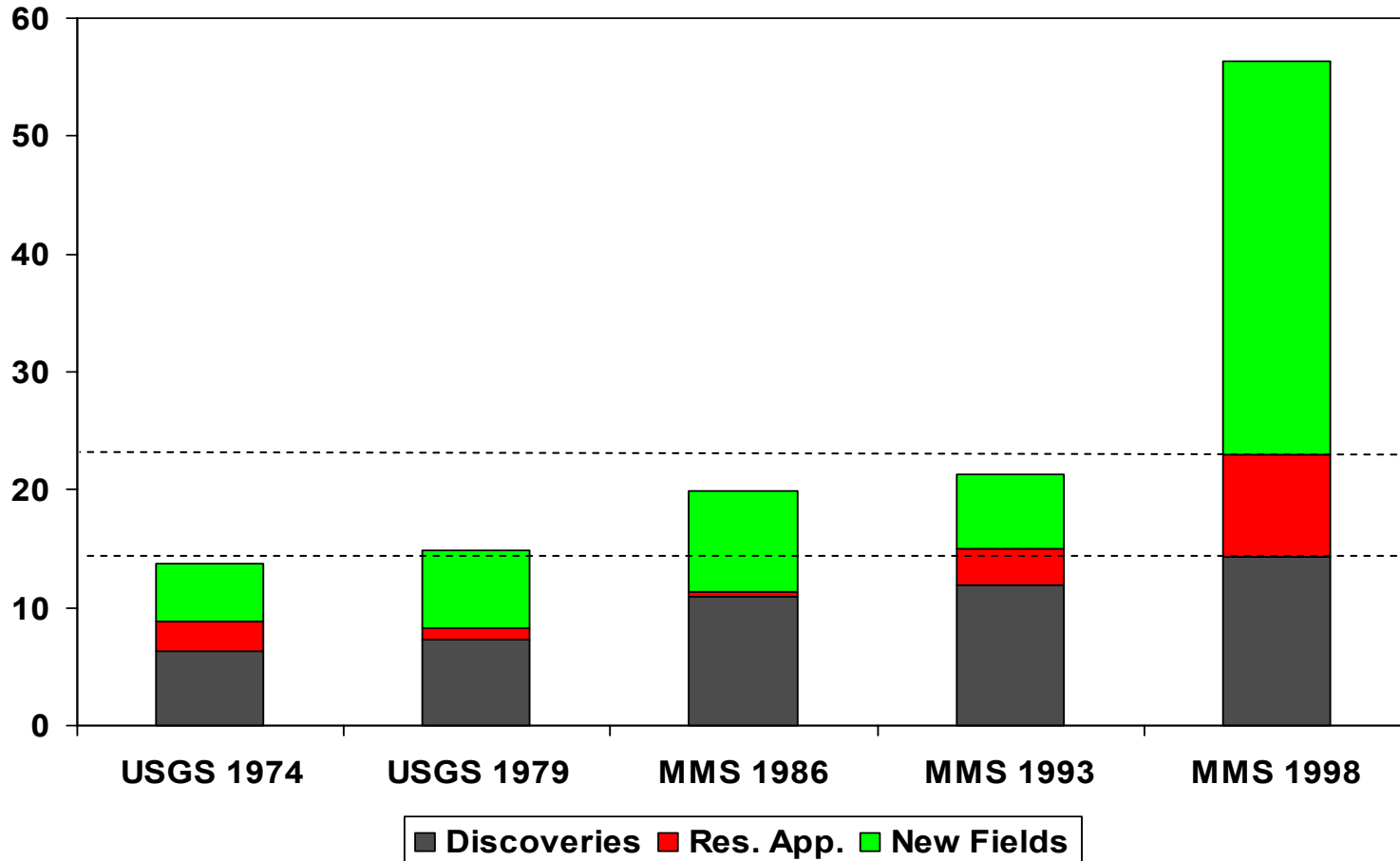
Rumors of our rapidly depleting fossil fuel resource base are greatly exaggerated.

Western Canada Gas Resource Dynamics

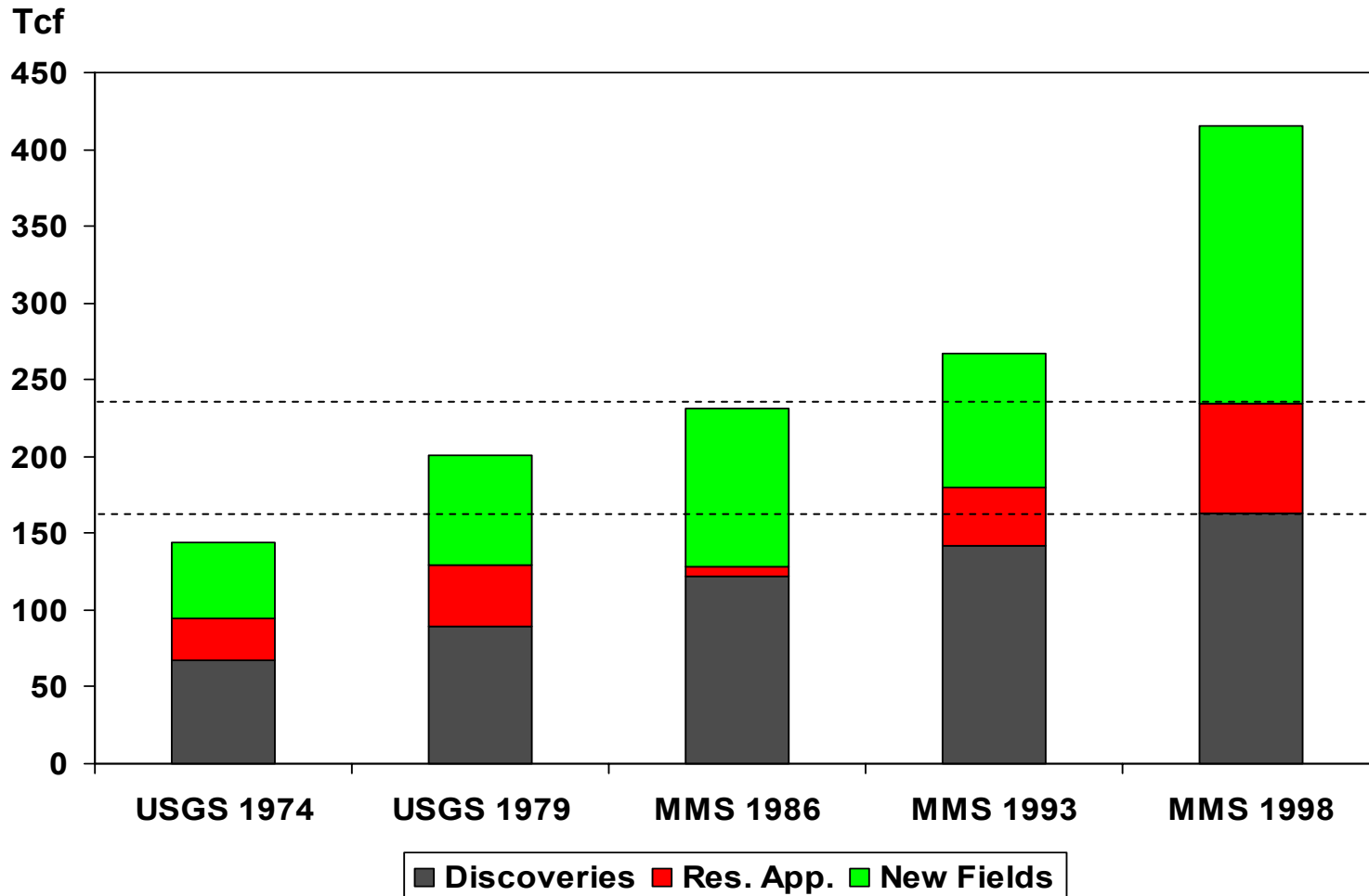


Oil Resource Base Dynamics Western Gulf of Mexico

Billion bbl

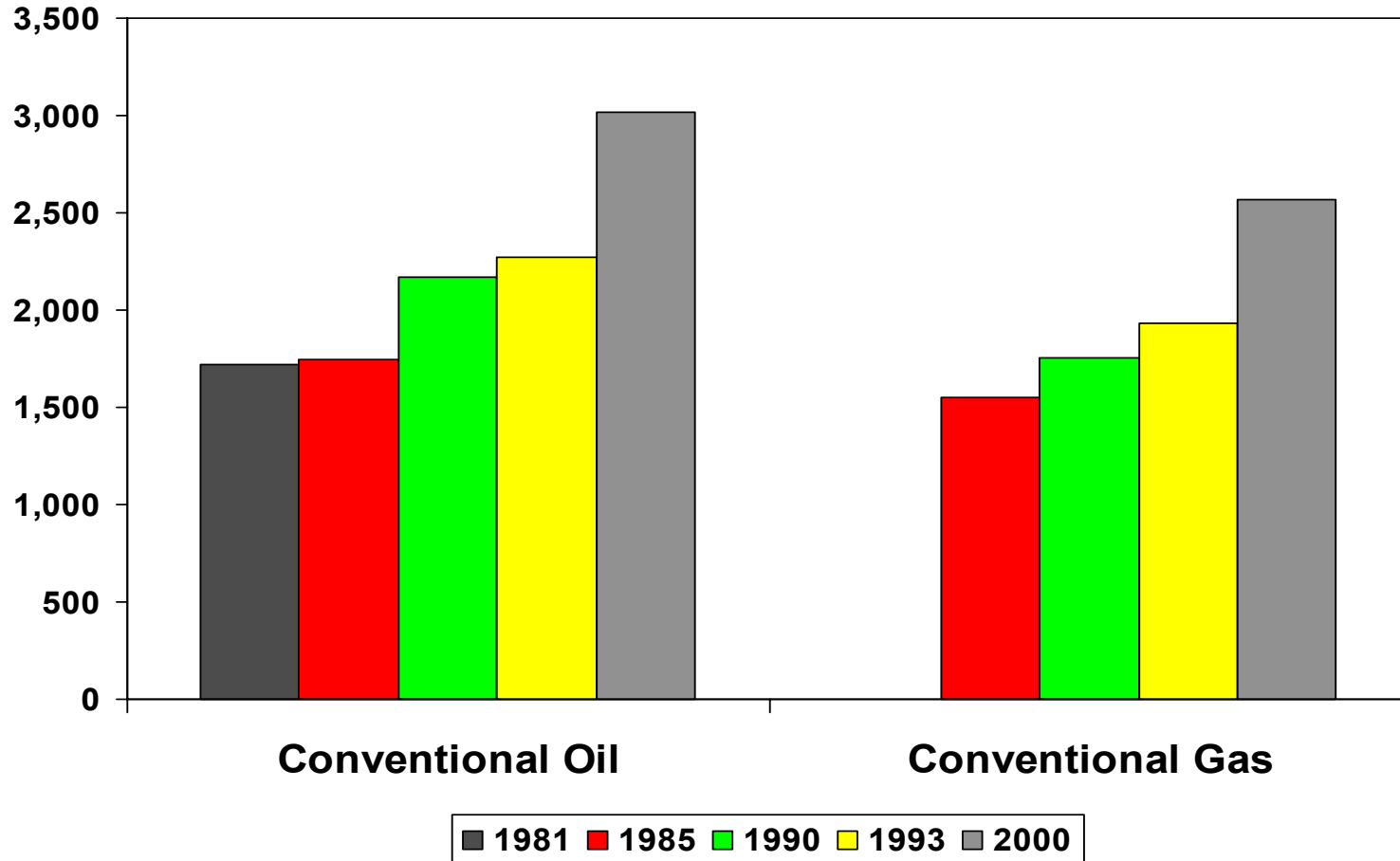


Gas Resource Base Dynamics *Western Gulf of Mexico*

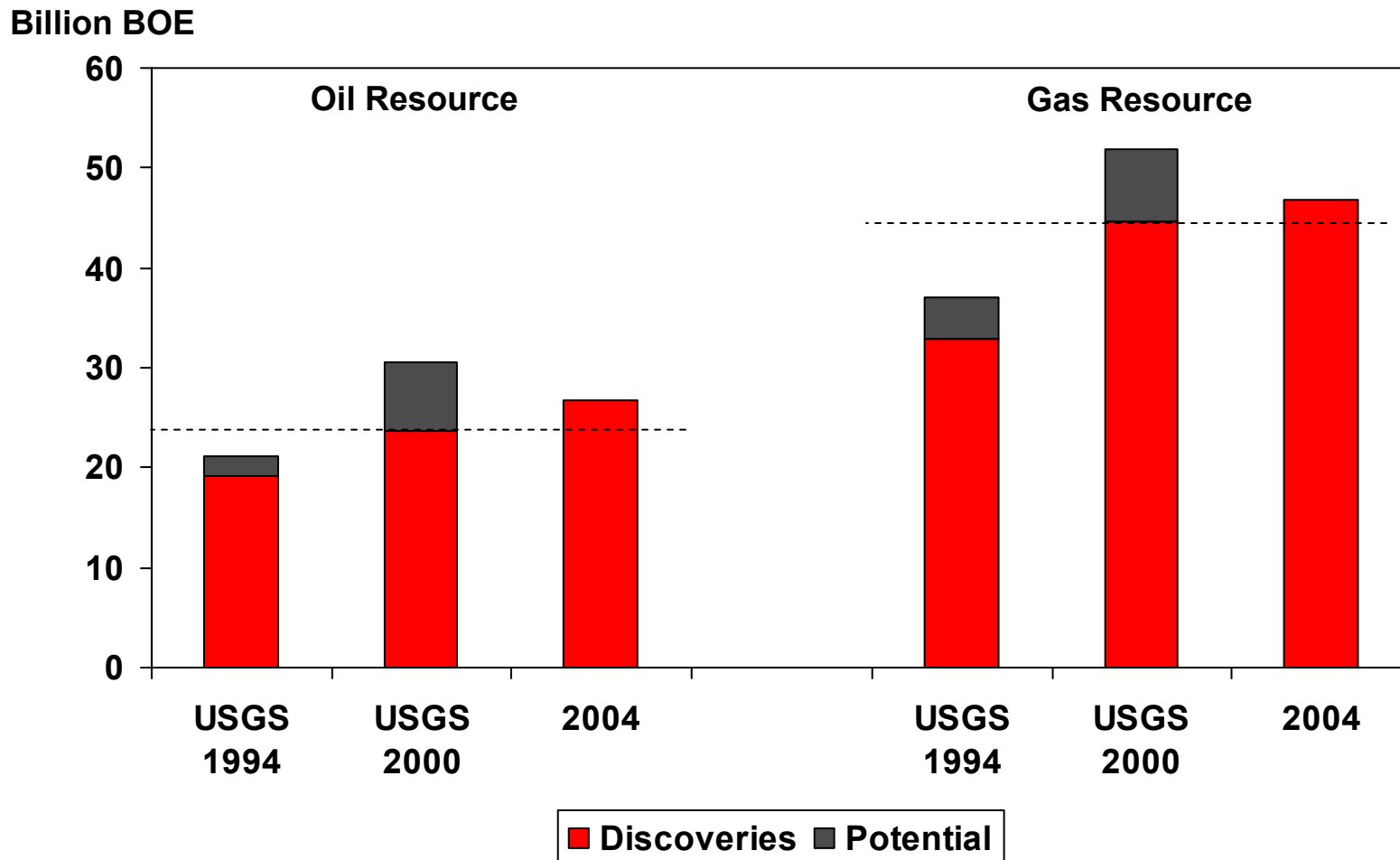


USGS World Resource Estimate Dynamics

Billion BOE

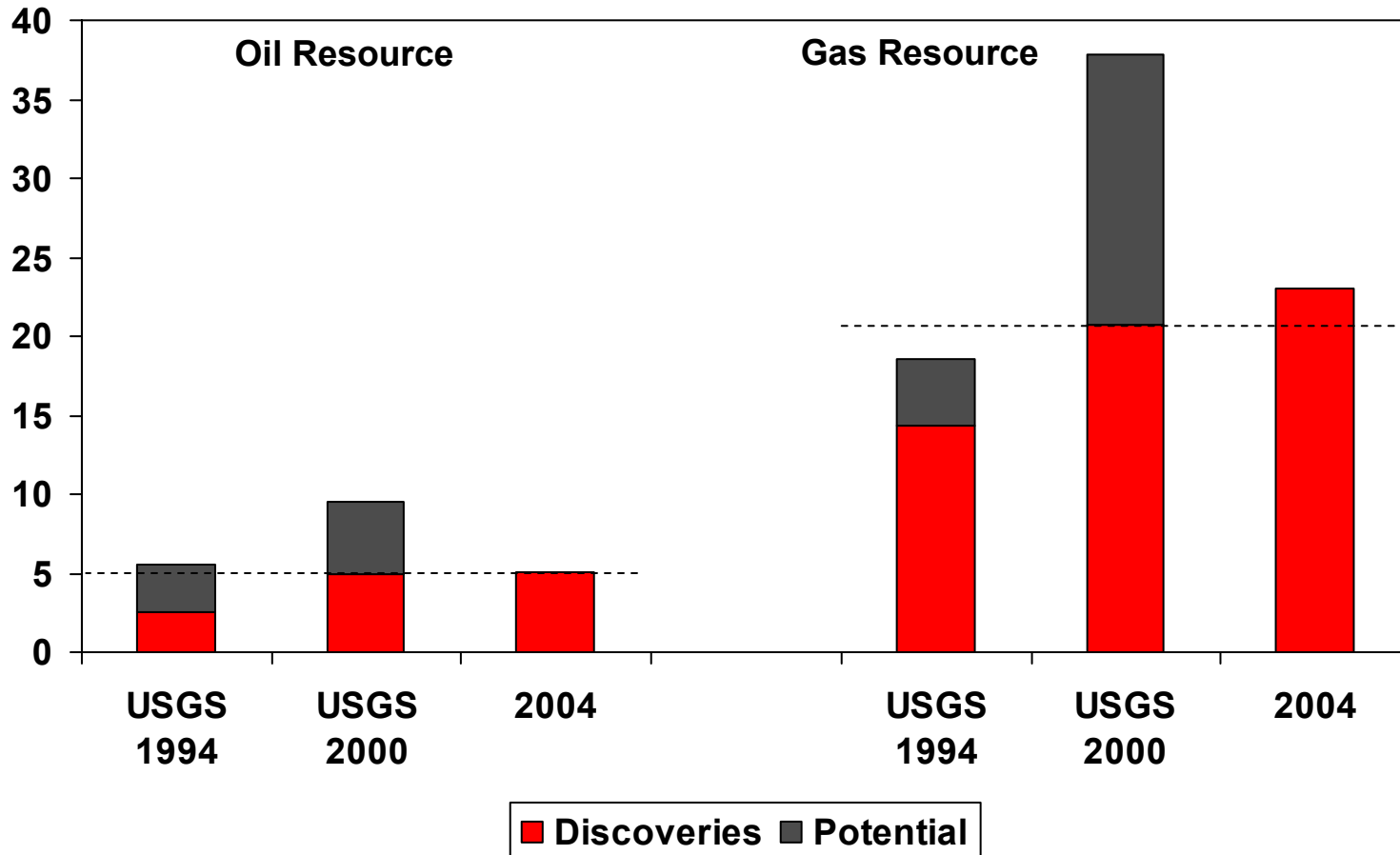


Algeria Resource Dynamics



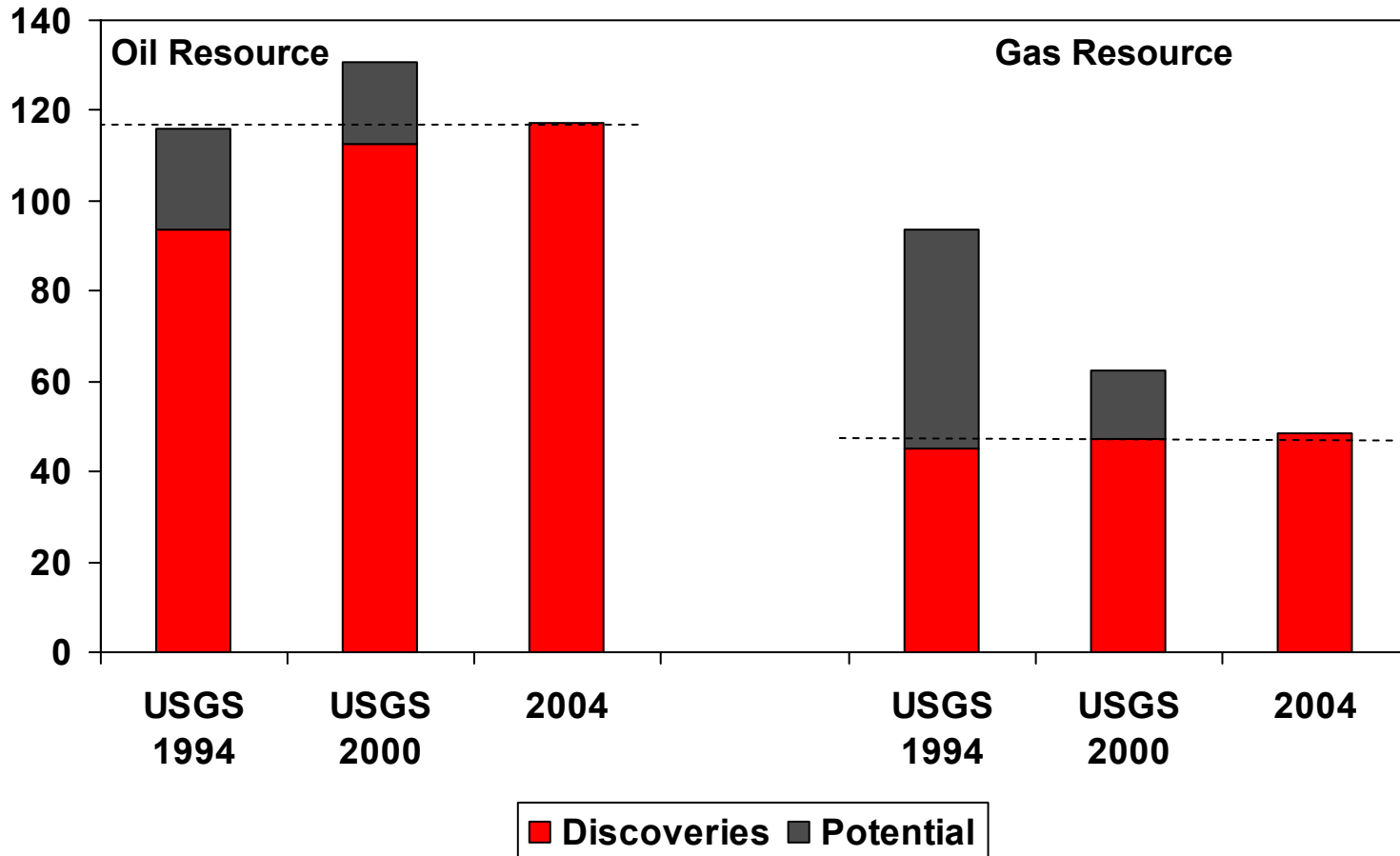
Australia Resource Dynamics

Billion BOE



Venezuela Resource Dynamics

Billion BOE



RESOURCE OBSERVATIONS

Conventional Oil and Gas

- Ultimate Resource Estimates Probably Less Final than Reserve Estimates
- Ultimate Resources not “Ultimate,” Only Current Perceptions
- Significant Discoveries More Likely to Expand than to Deplete Ultimate Resource Expectations
- Limited Discoveries as Likely due to Limited Activity as Limited Prospects

Shakespeare on Resource Availability

Our depleting resource base, dear Brutus, is not
in our stars, but in ourselves.

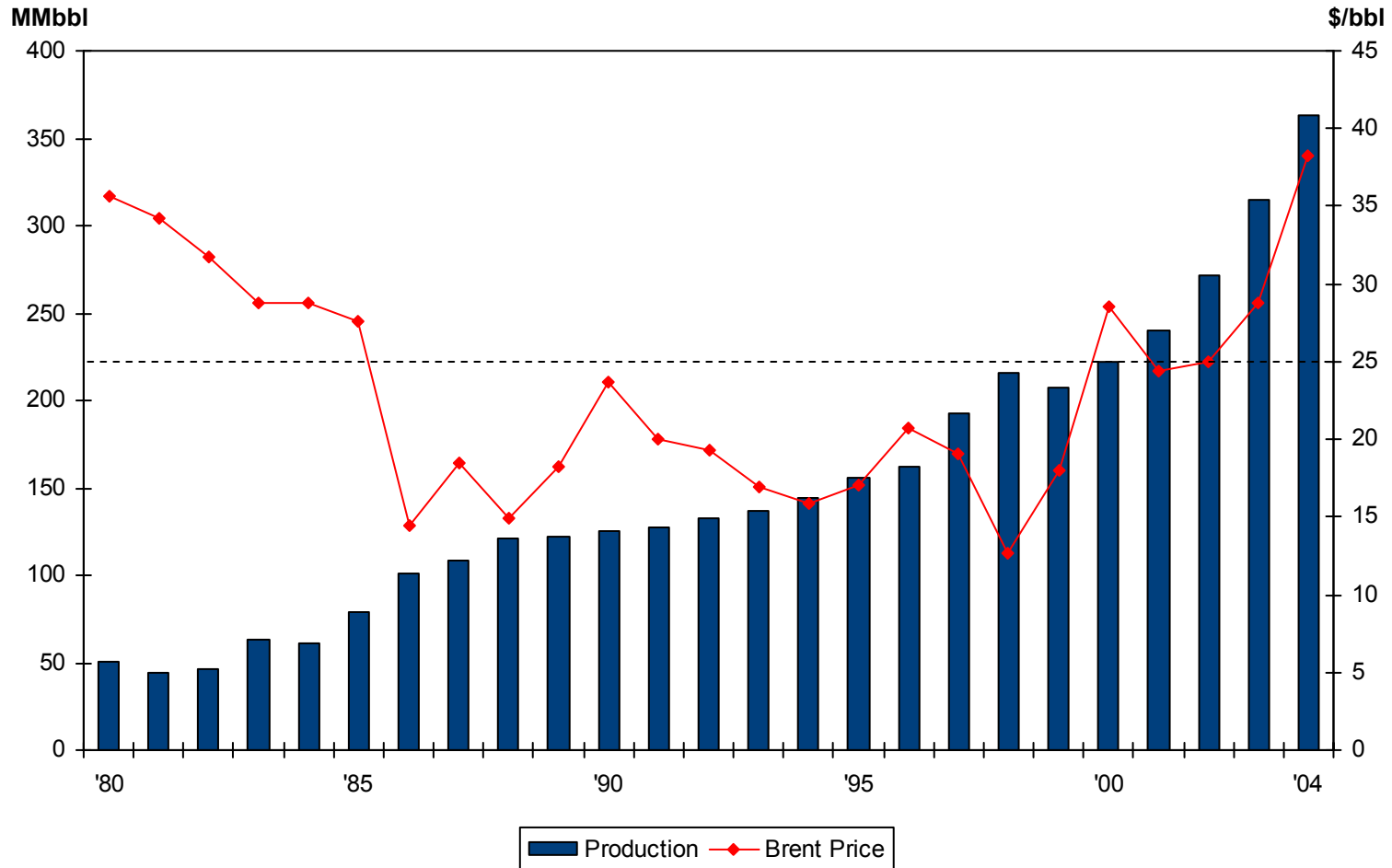
UNCONVENTIONAL OIL RESOURCES

North America

- High Grade Western U.S. Oil Shale (>25 gallons/ton)
 - Identified 418 billion barrels
 - Possible 50 billion barrels
- Lower Grade Western U.S. Oil Shale (10-25 gallons/ton)
 - Identified 1,400 billion barrels
 - Possible 600 billion barrels
- Alberta Tar Sands (25 gallons/ton)
 - Production 3.6 billion barrels
 - Reserves 5.7 billion barrels
 - Resource 314.5 billion barrels
- World Reserves (2004) – 1,189 billion barrels

Canada Tar Sands Production

Oil Price Effects



North America Tar Sand and Oil Shale

- What about Oil Shale?
- “Lower Grade” Alberta Tar Sands Past Production Expansion “Supportable” at Prices below \$30/barrel
- Possible Return of North America as Major Oil Producer with Oil Shale and Tar Sands Resource Development

Wallace Pratt on Resource Availability

Oil is first found in the mind.

Tug McGraw on Resource Availability

You gotta believe!!!!

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