



Shale Oil - The New Strategic Petroleum Reserve

Stephen Sewalk and Paul Chinowsky



History

- Until 1947 the United States was a major petroleum exporter.
- Imports would increase significantly from 1948 through the 1970's.
- In 1973-74 prices quadrupled and then tripled again in 1979.
- These rapid price increases resulted in industry shifting away from petroleum and in the governments realizing their vulnerability.
- The initial shock of an oil embargo, resulted in the US studying the concept of a Strategic Petroleum Reserve.

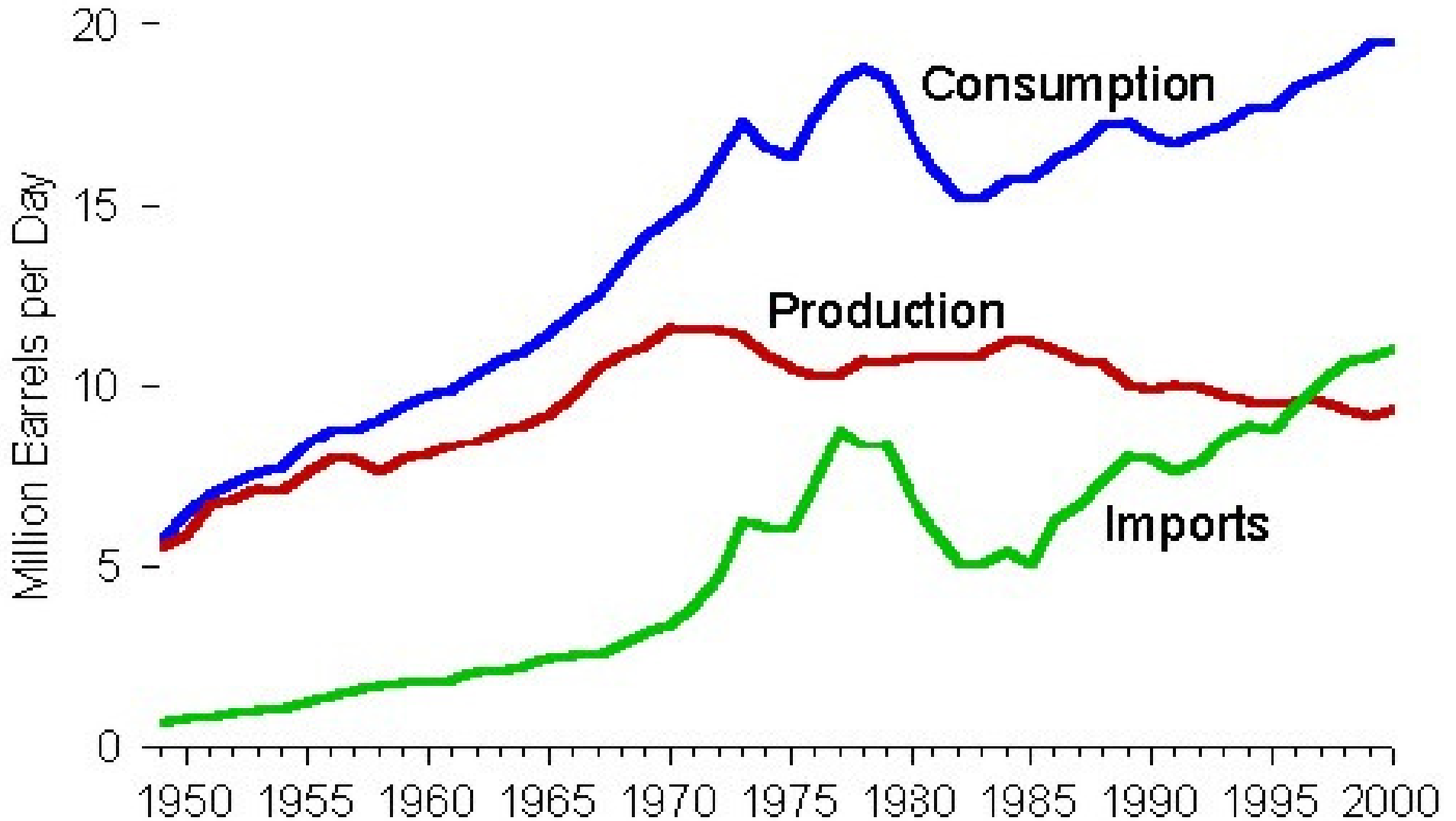


Strategic Petroleum Reserve (SPR)

- Formulated following the 1973 energy crisis.
- Protect US national and economic security by developing a reserve to replace 'interrupted' petroleum imports.
- The original plan called for 1 billion barrels in storage.
- Current capacity of the SPR is 727 million barrels, of which approximately 715 million barrels are currently in storage.
- With the price of oil at \$147/barrel in 2008, the value of the petroleum in the SPR at peak was worth \$105.1 billion.
- Today at a price of approximately \$70 to \$75/barrel the SPR reserves are worth between \$50.1 and \$53.6 billion.



Consumption, Production and Imports of Petroleum (USA)





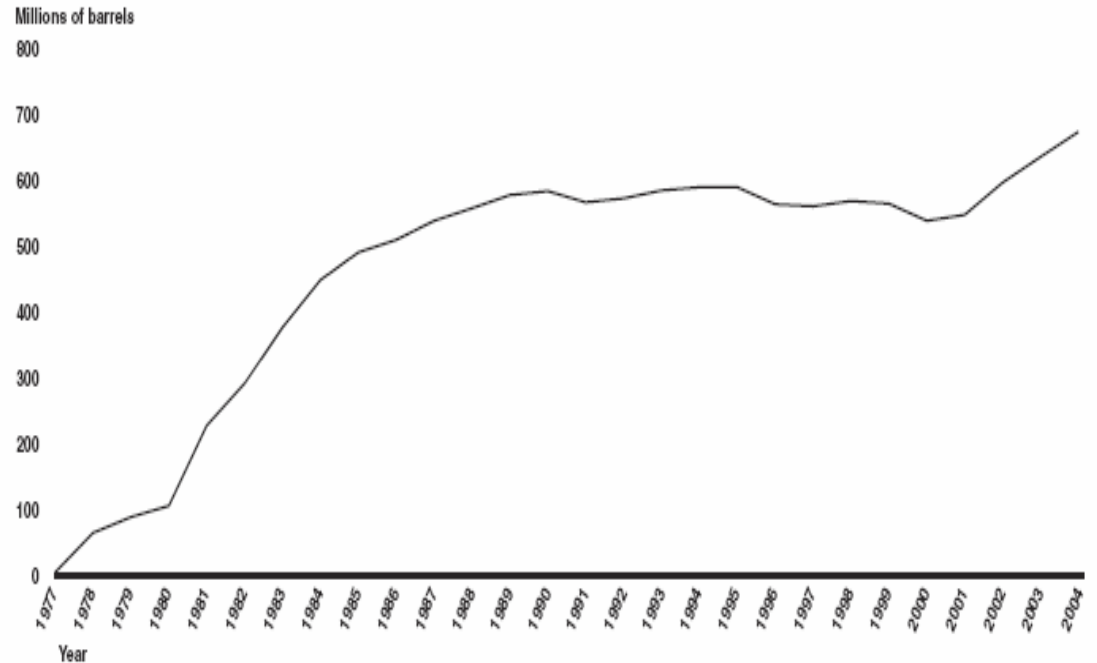
Strategic Petroleum Reserves

- US is not the only country with an SPR
- These include:
 - Japan (estimated reserves of 320 million barrels),
 - Korea (76 million barrels),
 - Germany (approximately 90 days of imports) as well as France and Italy (all 3 pool reserves), and newcomers
 - India (started a small reserve in 2004 with an eventual goal of 45 days imports by 2016) and
 - China (estimated reserves to be at 272 million barrels by 2010).
- Key though is that all these reserves have a limited time frame for production...a long-term event would deplete these reserves w/in 3-6 months (depending on production capacity)



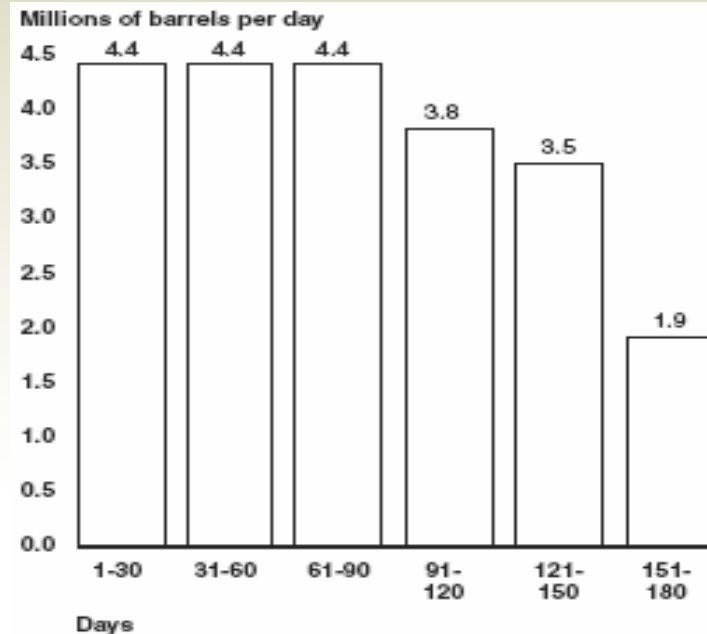
US Strategic Petroleum Reserve

- US has spent \$26.3 billion (\$45.2 billion in today's \$) to build, maintain, fill & manage.
- At peak imports of 12-13 MMBD (2007/08) the SPR would provide 50-55 days of imports
- Physical production limitation of 4.4 million barrels per day for 3 months.
- Production then declines as reserves deplete.



Source: GAO analysis of EIA data.

Note: Congress authorized the SPR in 1975, but filling the reserve did not begin until 1977.

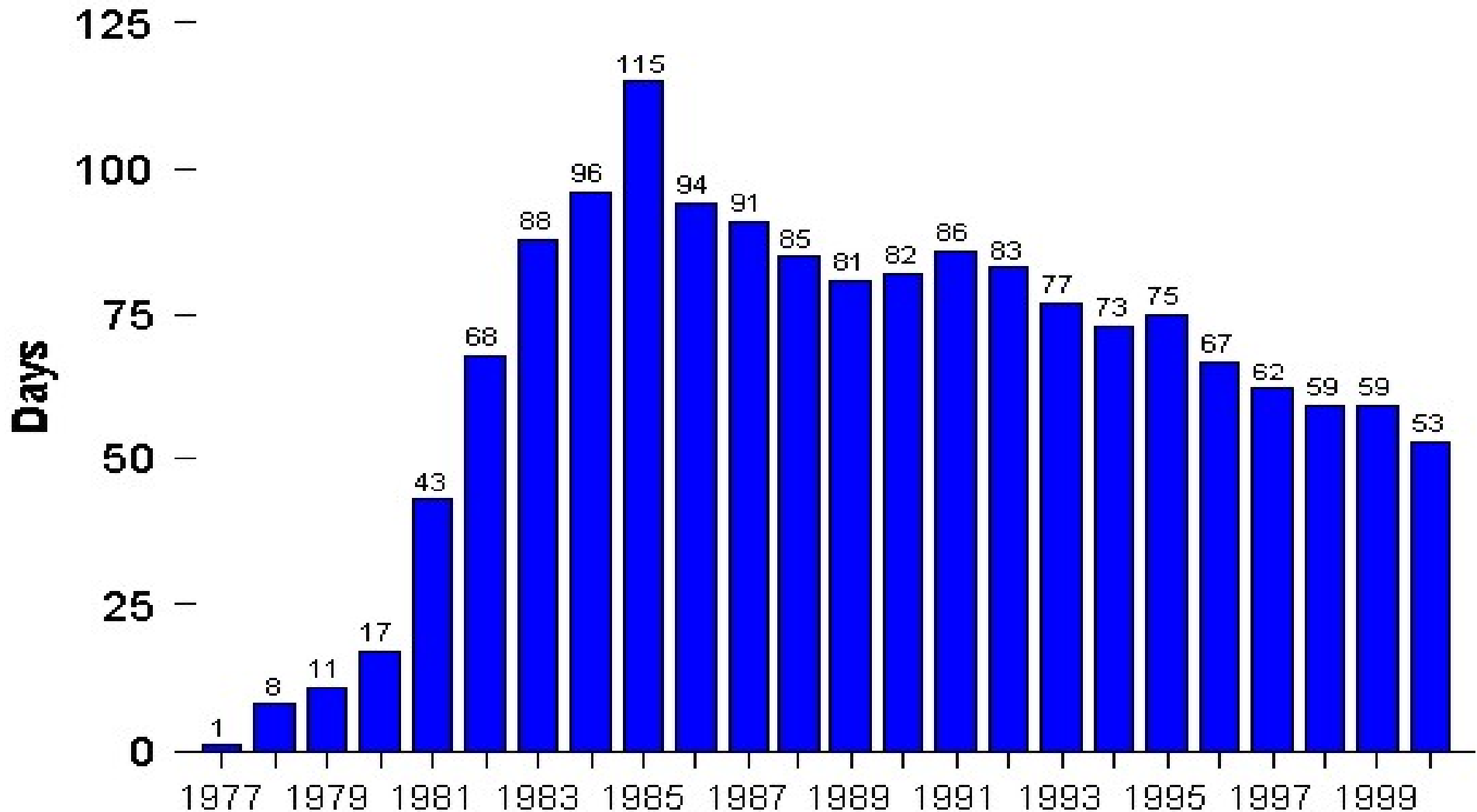


Source: DOE's Office of Petroleum Reserves.

GAO-06-872 Strategic Petroleum Reserve



SPR Stock as Days Worth of Net Imports



<http://www.eia.doe.gov/emeu/aer/eh/frame.html>

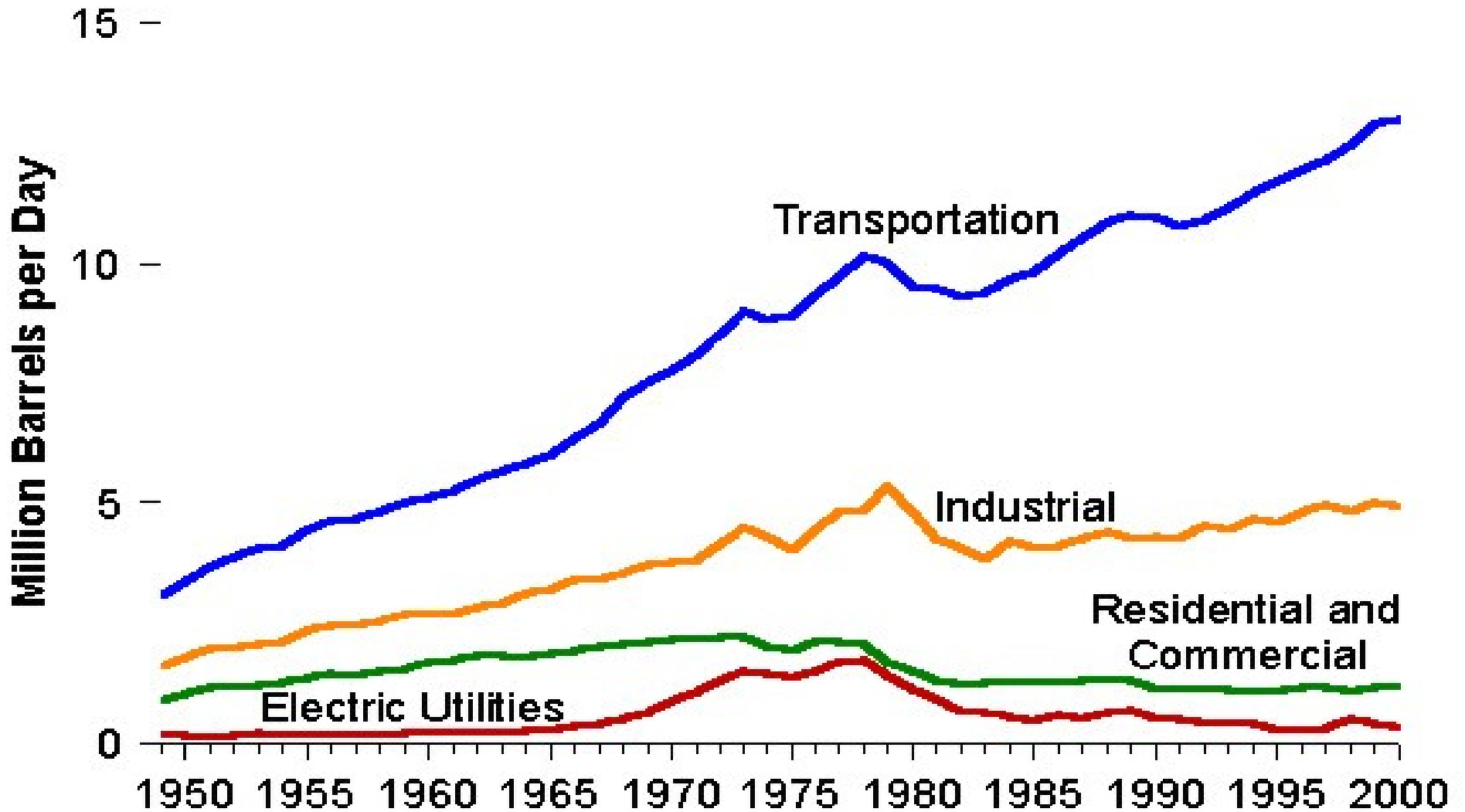


Why has the Import Coverage Declined as Reserves have Increased?

- US domestic oil production peaked in 1971, and has steadily declined, and
- US domestic consumption increased significantly, especially in the transport sector, where sizeable quantities of alternatives to fuels derived from oil are almost non-existent.
- The combination of declining production and increasing consumption lead to significant increases in imports.



Petroleum Consumption by Sector





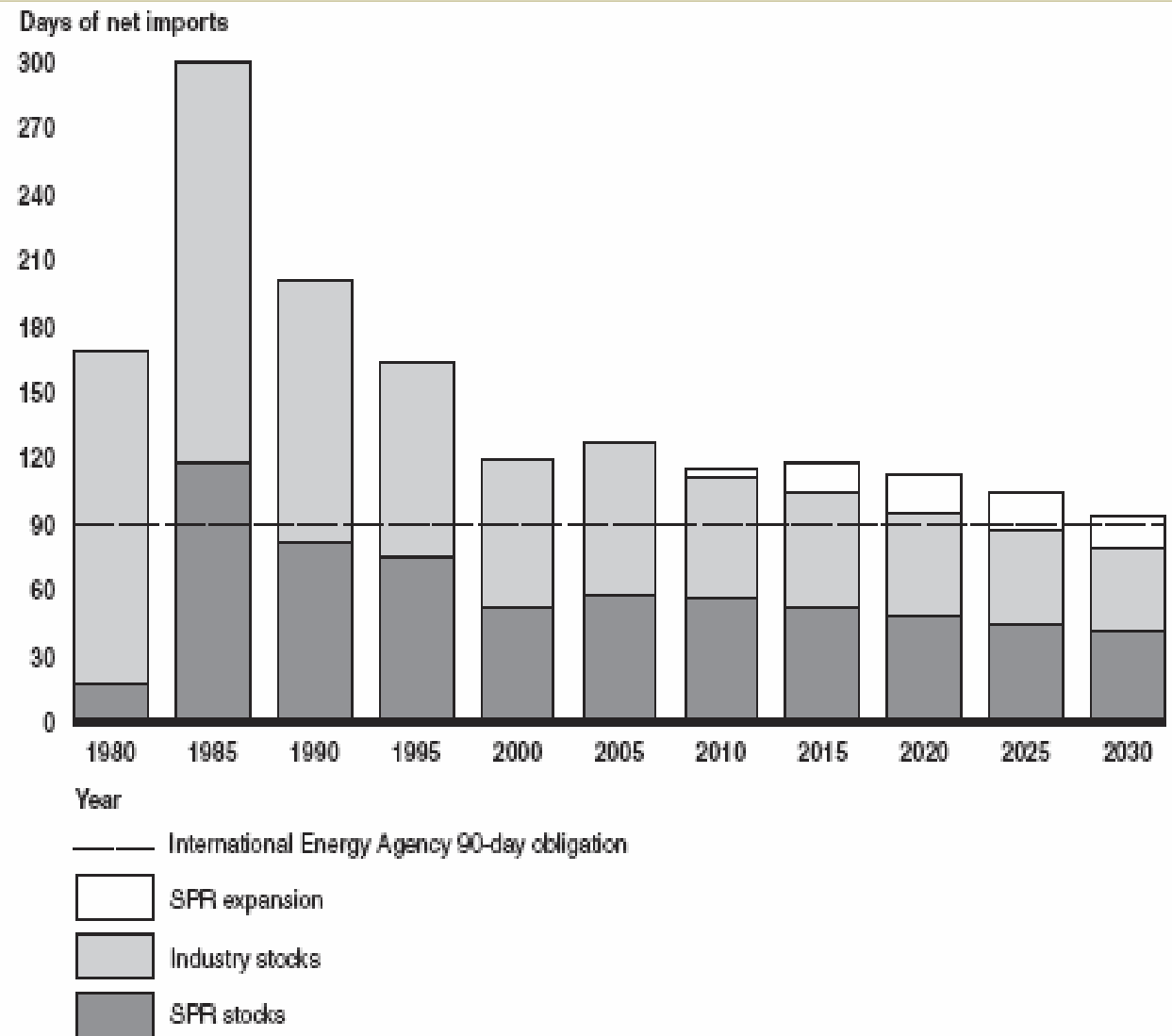
SPR Use

- During the first Iraq Gulf War, 30 million barrels were released from the reserve.
- Hurricane Katrina, approximately 22 million barrels were released.
 - Key problem – crude oil storage does not equal refined products
- As prices soared above \$100, \$120 and almost \$150/barrel
 - US and other countries were put in a ‘hopeless’ position
 - Did not want to use their reserves to moderate prices
 - Fear that in so doing they would increase their own vulnerability (reserve depletion)
 - Prices could skyrocket even higher (if there are no strategic reserves)



US Current and Estimated Compliance with IEA Obligation to Hold Reserves

- US and other OECD countries agreed to hold a minimum of 90 days of reserves to cover net imports.
- These are met with public and private storage.
- US needs to expand its reserves to 1 billion barrels.



Source: DOE's Office of Petroleum Reserves.

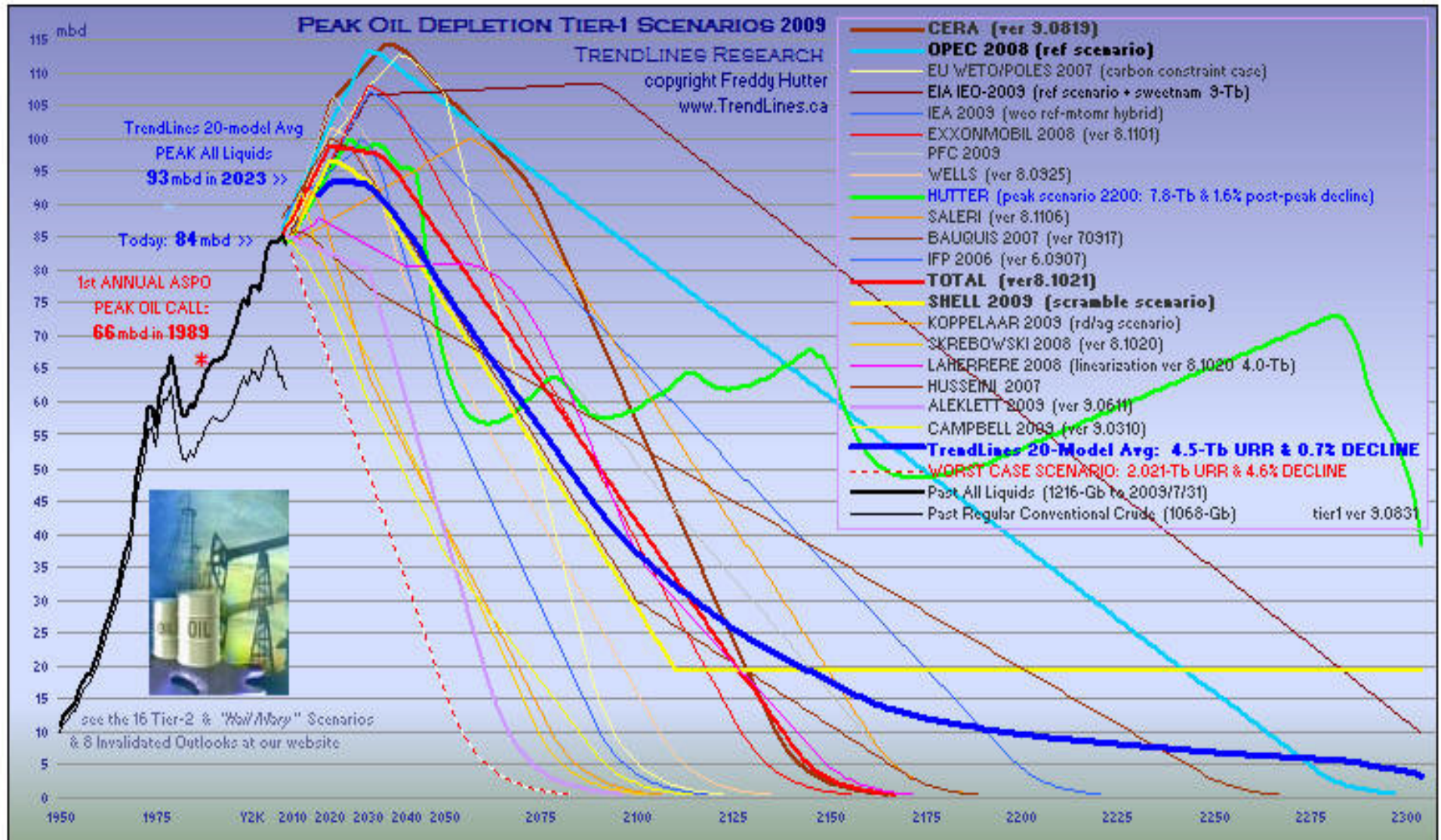


Peak Oil

- Peak oil is the concept that global oil production will peak at some point in time in the relatively near future.
- The estimates for this date range from today to sometime in the next several years.
- Concern that stated reserves are either potential resources or significantly inflated and do not reflect reserves that could actually be produced.
- Over 50 countries are believed to have peaked in their conventional oil production.



Peak Oil



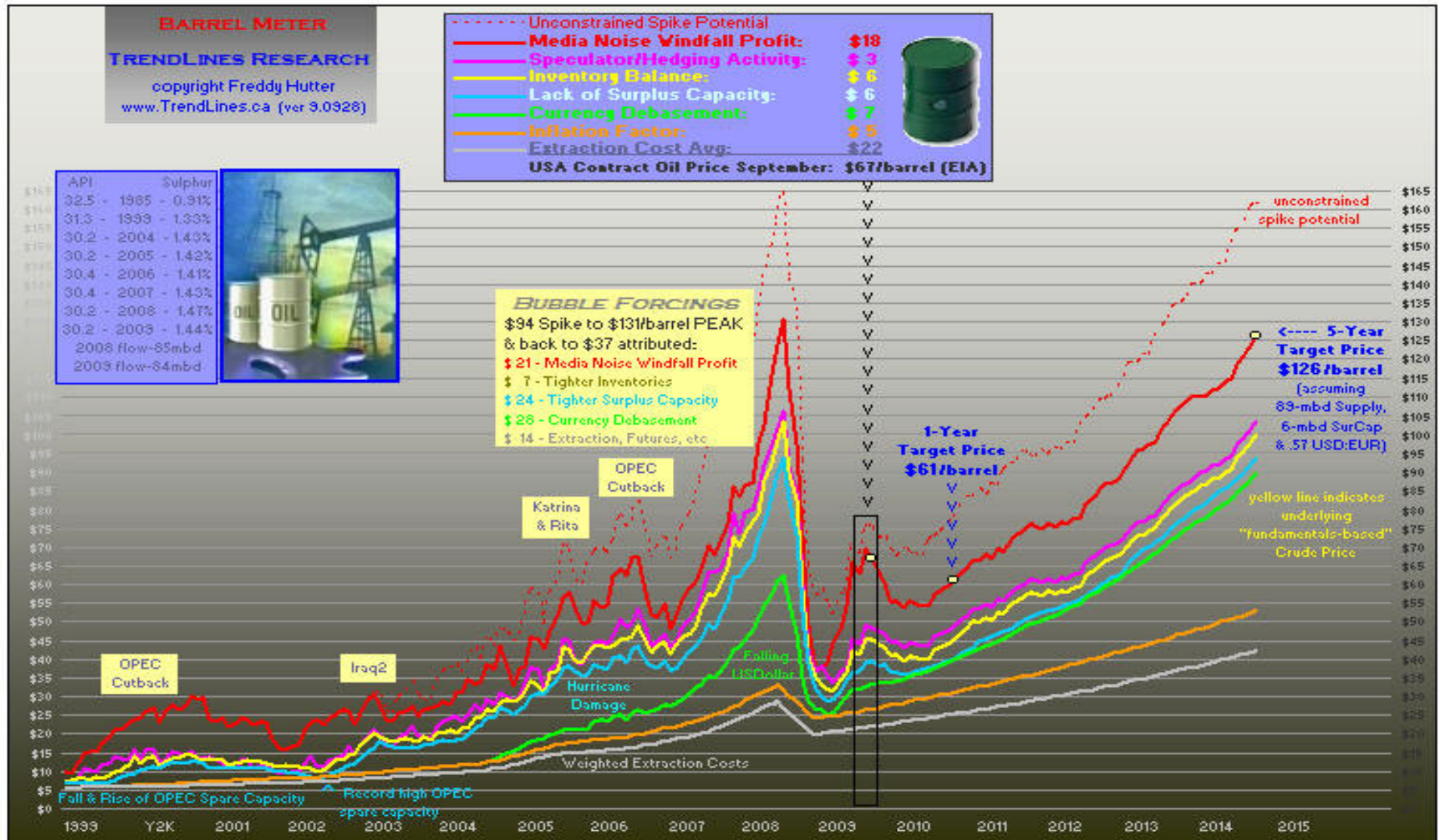


Peak Oil Concerns

- Significant price spikes which could severely weaken the global economy
- Cause a rush for resources resulting in situations which could lead to war
- Typically when oil fields peak, production proceeds to decline fairly rapidly, with decline rates of 3-10% per year being typical
- A shortfall of 1-2% in global production can and has lead to increases of 30-300% in the price of oil.



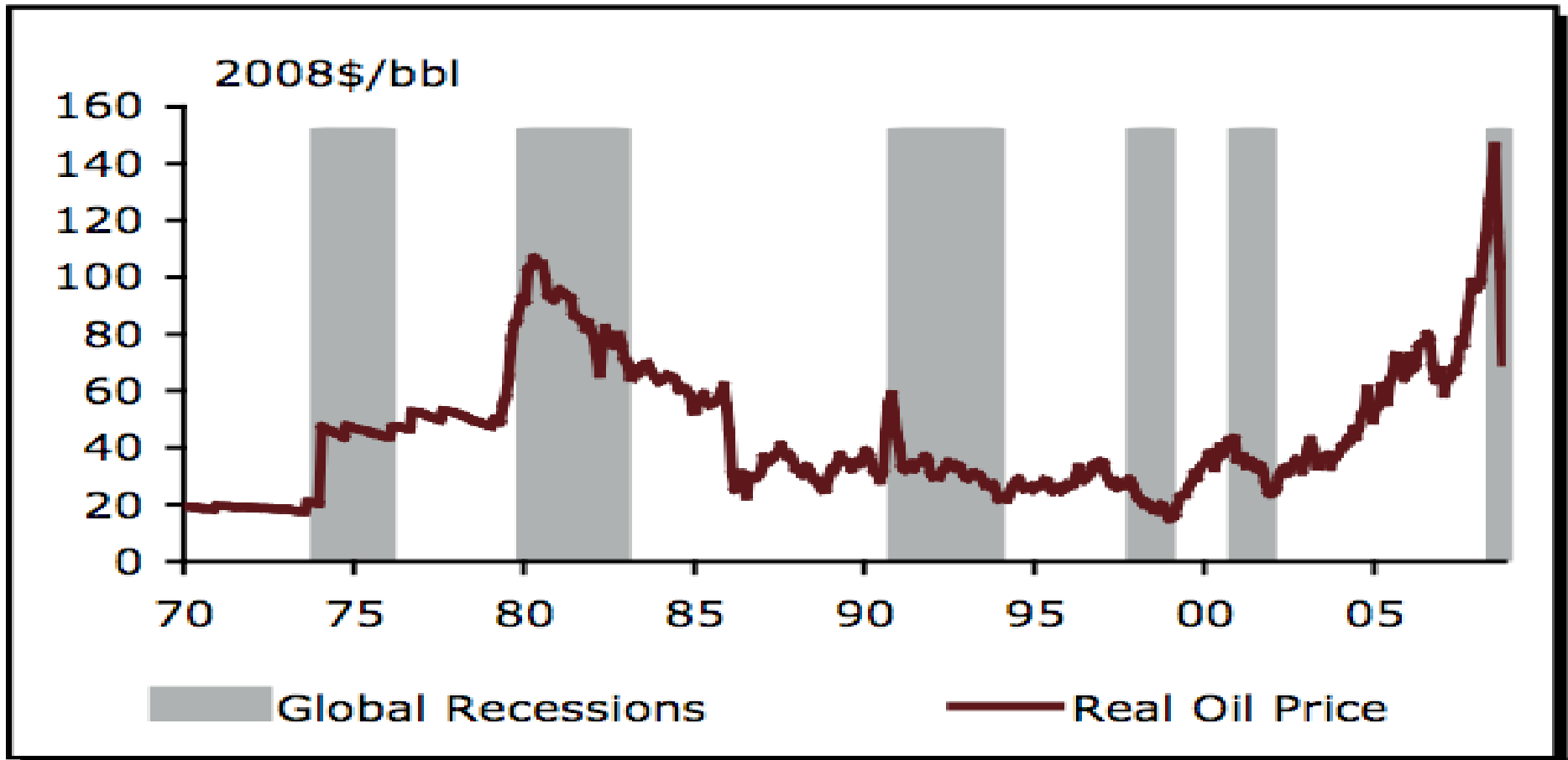
Peak Oil and the Price of Oil





The Price of Energy and Economic Growth

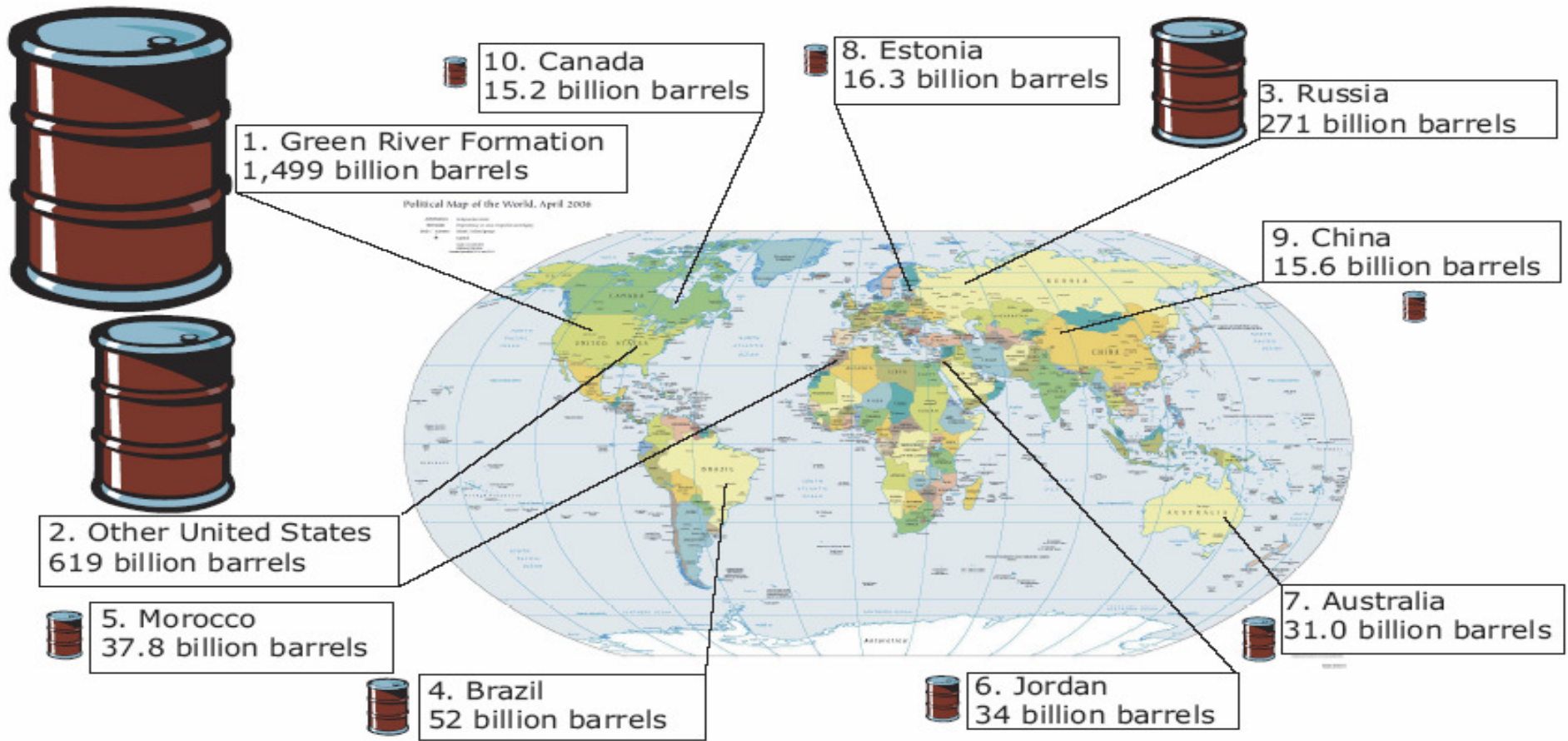
Past Recessions and Oil Spikes





Shale Oil – An Alternative

- The largest deposits of shale oil (96%) are based in the US, Russia and Brazil. The US alone accounts for over 70% of the total resource base.
- Shale oil is produced in Estonia, Russia, Scotland, Brazil, China, Australia and Germany.





Why Develop Shale Resources

- Use them as a new strategic petroleum reserve
 - Develop them specifically for this purpose,
- Shale oil produced in-situ results in a very light hydrocarbon
 - Akin to diesel or gasoline without the “processing” and “transport” emissions,
- Allow us to expand the technology knowhow
 - Both shale oil production as well as alternative energy resources, and
- Provide excellent stimulus for the economy
 - Construction and Energy industries would benefit
 - Indirectly so would all of the other industries in terms of jobs and projects
 - Enhancing national and economic security.
- Development of 2-4 MMBD capacity within 4-6 years
 - Cost of \$70-\$120 billion.
 - This can be expanded to 8-10 MMBD within 8-12 years
- Pay by selling off the current SPR when oil prices are high.
 - Refilling with market purchases and shale oil when prices decline



Benefits

- Investment covered by planned selling of current SPR
- Investment by the Government in National & Energy Security
- Significant increase in all jobs (300k+)
- Creates a 'long-term' production capacity to manage emergencies as well as price "panic"
- Within 4-6 years surge capacity is 8.4 MMBD while sustained capacity is 4 MMBD. This can be further increased over time.
- Strategy could include producing 15-25% of capacity to pay for all costs and ensure that traditional SPR is always full. This would finance eventual expansion to 10-12 MMBD.



Conclusion

- Shale can become the New Strategic Petroleum Reserve
- Government should build based on
 1. stimulus,
 2. national and economic security,
 3. dynamic SPR with real 'unlimited' capacity,
 4. buys time to transition to low carbon/low GHG 'global economy, especially with concern of peak oil,
 5. investment in alternative and nuclear energy technology
- Investment can pay for itself - sell oil during times of high prices.
- By producing at 15-25% of capacity, keeps all systems working and finances expansion to 10-12 MMBD
- Shale produced using geothermal, solar, wind, and nuclear power (long-term) would result in lower emission gasoline compared with imported oil while adding 'green' energy to the power grid