Is Our Energy System "Sustainable?"

International Regulators' Offshore Safety Conference
U.S. Department of Interior, MMS
December 4, 2007
Miami, FL

By
Matthew R. Simmons
Chairman
Simmons & Company International

An Accurate Definition Of Key Words

"Energy System":

i. The complex assets needed to explore, develop and produce oil and gas.

ii. The integrated series of infrastructure needed to extract oil and gas from reservoirs, transport via pipelines and tankers, process in refineries, store in tank farms and finished terminals.

"Sustainability": Sustain:

i. Support, bear the weight of, esp. for a long period.

ii. Endure, stand, bear up against.

iii. Maintain or keep going continuously.

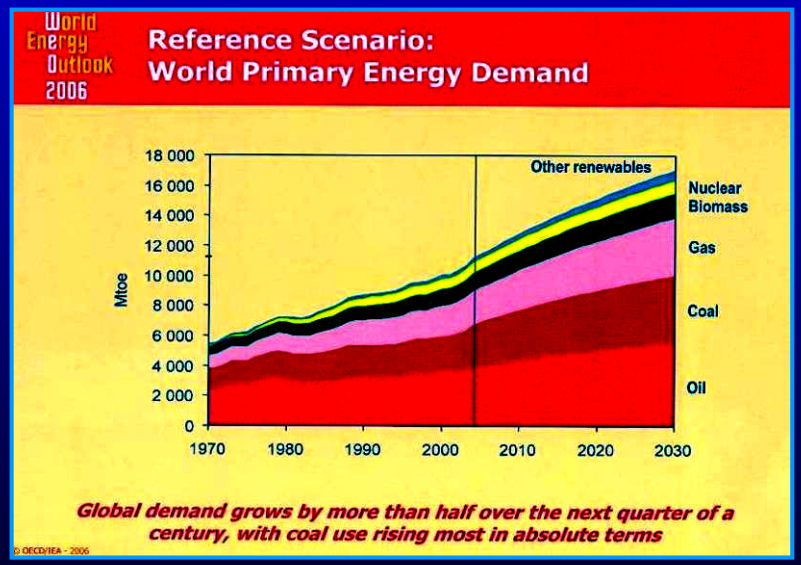
Certain Facts Are Hard To Ignore

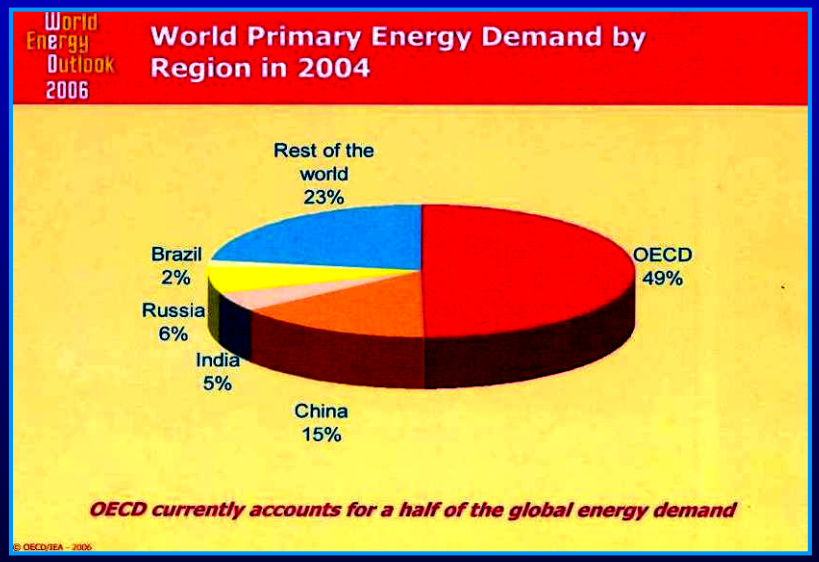



- Our energy system is aging.
- Reservoirs are finite resources. The more one uses, the sooner it is gone.
- The long value chain from rigs to well-bore casings to pipelines, etc. are all built of steel.
- As steel corrodes as it ages.

How Important Is This Sustainability Issue?

- It is vital to the world's "well being."
- Oil and gas represents 60% of global energy.
- Future demand growth seems exponential as developing countries' economies grow.





SIMMONS and COMPANY
INTERNATIONAL

An Inconvenient Energy Truth: The System Is Very Old

17% of global crude supply comes from 10 super-giant oil fields.

Giant Oil Field	Discovery Date	Current Production (Est.) '000 Barrels/Day
Ghawar (Saudi Arabia)	1948	4,500 (?)
Cantarell (Mexico)	1976	1,400
Burgan (Kuwait)	1938	1,300 (?)
Daqing (China)	1959	900
Kirkuk (Iraq)	1927	900 (?)
Rumalia (Iraq)	1951	900 (?)
Shaybah (Saudi Arabia)	1968	700 (?)
Safaniyah (Saudi Arabia)	1951	700 (?)
Zuluf (Saudi Arabia)	1965	700 (?)
U.L. Zakum (U.A.E.)	1963	600 (?)
Total		12,600

Source: World's Giant Oilfields by Matthew R. Simmons, 2001 White Paper ≠ Current Estimates "Best Guesses"

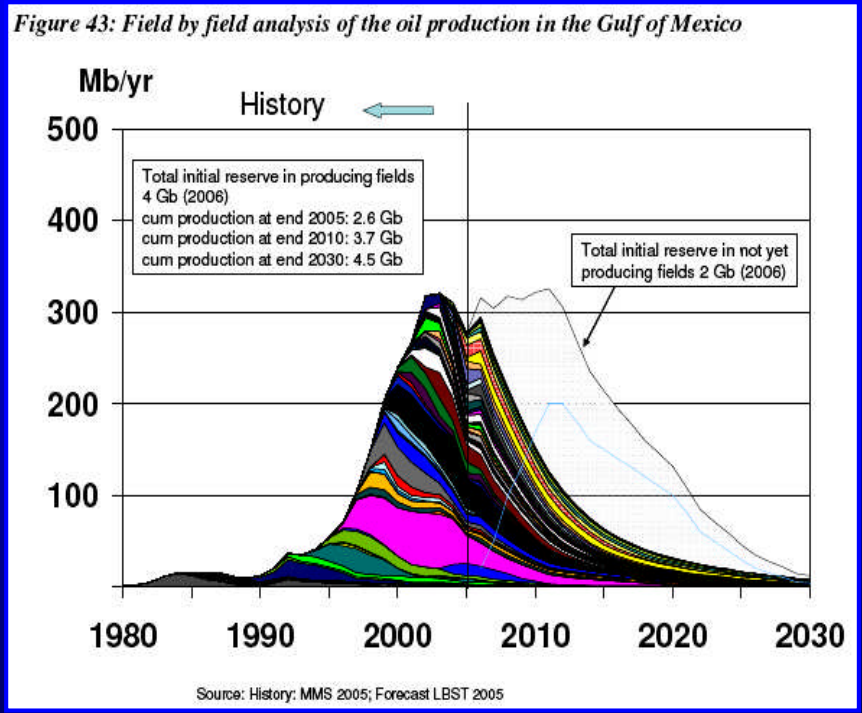
SIMMONS and COMPANY INTERNATIONAL

The System Is Old (Cont'd.)

- Western Siberia, Alaska's North Slope and the North Sea were last giant frontier basin discoveries:
  - All are now "mature" basins
  - North Sea was offshore oil's "best-in-class" asset circa 1970 – 1980s (now rusty, too)
- Area-wide leasing in Gulf of Mexico depleted oil and gas outside deepwater.
- There is no data on average age of average offshore platforms.

Even The Newest Fields Are Aging Fast

- Deepwater era began in Gulf of Mexico in early 1990s.
- When a new field comes on stream, it peaks and declines fast.
- No limit to drilling in deepest waters.
- There seems to be limit in good prospects.



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

SIMMONS and COMPANY
INTERNATIONAL

Offshore Oil And Gas Is Vital To Sustaining Energy Supplies

- Since 1980 growth in offshore oil fueled over 100% of total growth in crude supplies.
- As water depths of oil produced grew, production had to be drained "overnight."
- Latest generation offshore projects are costly and production does not have long life.
- A $2 – 4 billion project is now normal.

- Kashagan (Caspian Sea) estimated to cost $137 billion.

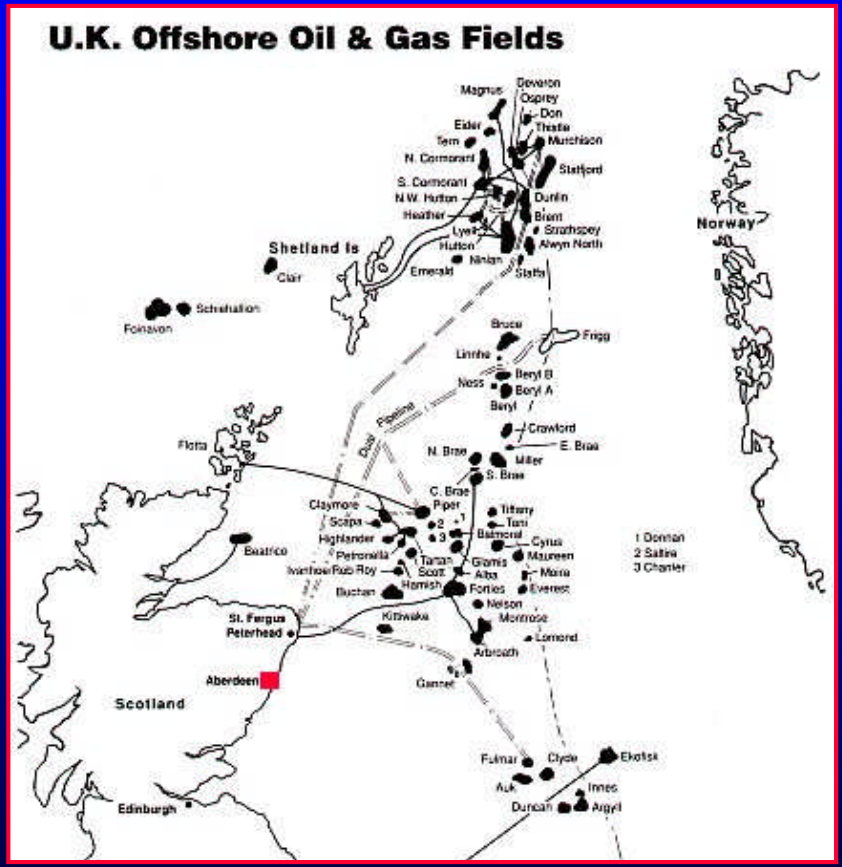
The Offshore Drilling Fleet Is Too Old

- The pool of high quality offshore rigs totals ≈500.
- The average age in 2007 is 25 years.
- When is an offshore rig too old?

- How will the industry ever rebuild this fleet?

UK's North Sea Assets Are Too Old

- UK safety watchdog group issued a stunning warning (November 2007).
- Results came from 3 year investigation on 100 offshore structures (rigs, FPSO, platforms and boats).
- Findings were troubling:
  - "Over half in poor condition; in need of significant repair"
  - Most are approaching or beyond original design life
- "Aging assets threaten lives in and also sustainability of North Sea."



SIMMONS and COMPANY
INTERNATIONAL

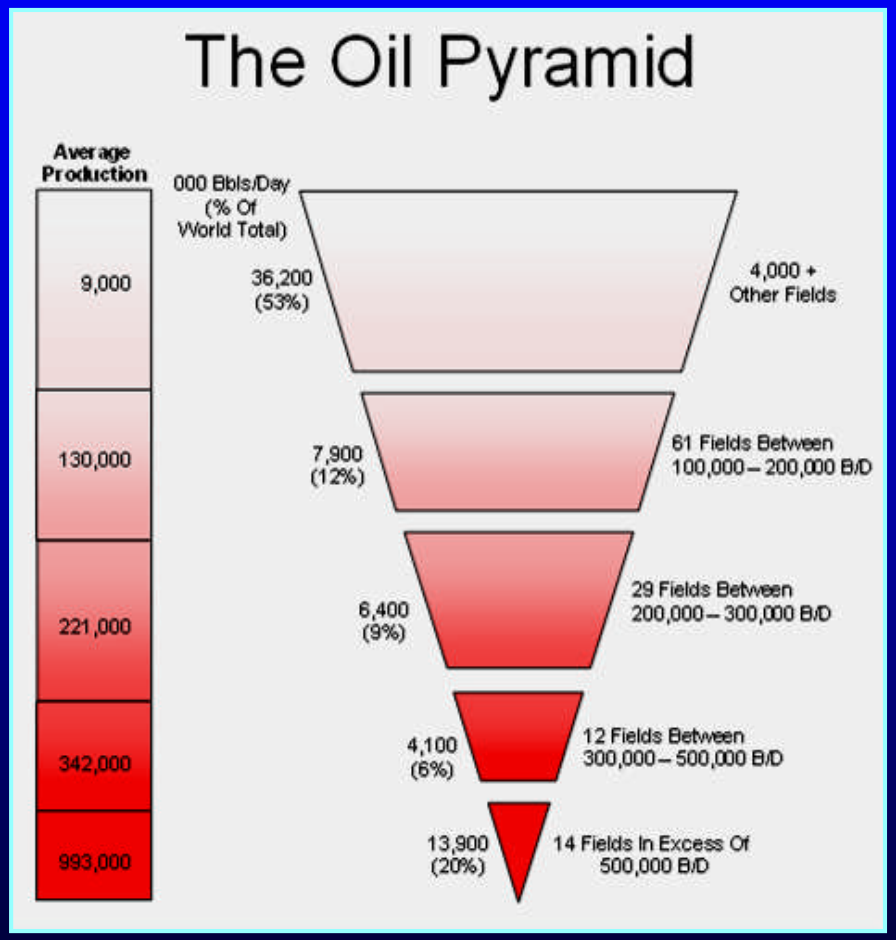
It Takes A Long Time To Drill A New Deepwater Well

- The Jack Field discovery (GOM) opened up a “new frontier.”
- Brazil’s recent Tupi discovery “found” largest field to date.
- Neither have enough well bores drilled to accurately guess each field’s size.
- Wells in both discoveries take 7 – 12 months to drill.
- The “easy era” of offshore oil and gas is over.

New Discoveries Dwindled And Size Dwindled Ever More

Descending Size of Giant Oilfields

Date of Discovery	Number of Discoveries	Average Current Production Per Field *(000 barrels per day)*
Pre-1950's	19	557
1950s	17	330
1960s	29	242
1970s	24	236
1980s	15	176
1990s	11	126



Source: World's Giant Oilfields by Matthew R. Simmons, 2001 White Paper

SIMMONS and COMPANY INTERNATIONAL

Data Is Skimpy On Age Of Land-based Energy Assets

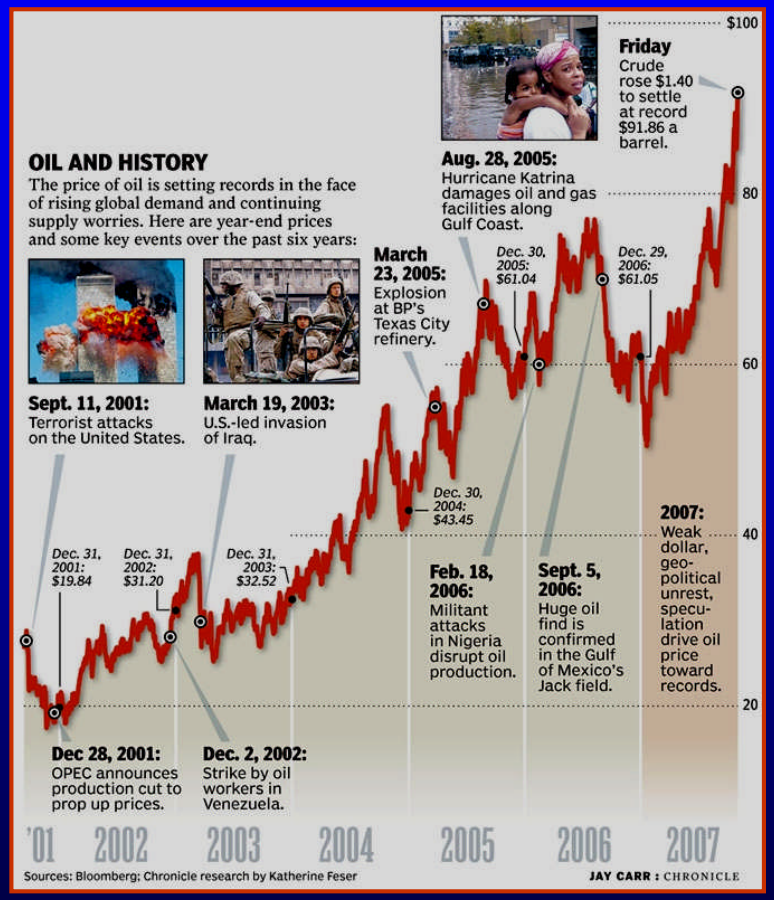
- Most existing underground pipelines are now beyond original design life.
- Maintenance occurs when leaks become visible.
- Oilfield Depression (1982 – 1999) forced massive downsizing and cost-cutting.
- First cost cuts tends to be maintenance.

In The Background Comes Risk Of “Peak Oil”

- Optimists argue Peak Oil is decades away.
- They also argue that a production plateau then ensues.
- Their optimism is “faith based” and has little hard supporting data:
  - “Reserve endowment is abundant”
  - “Technology increasing recovery rates”
  - “Non-conventional oil will take place of light sweet crude”
- The pessimists case is data driven:
  - The timing of Peak Oil is the only controversy
  - Consensus is between 2005 - 2012

Was Rise In Oil Prices A "Market Signal?"

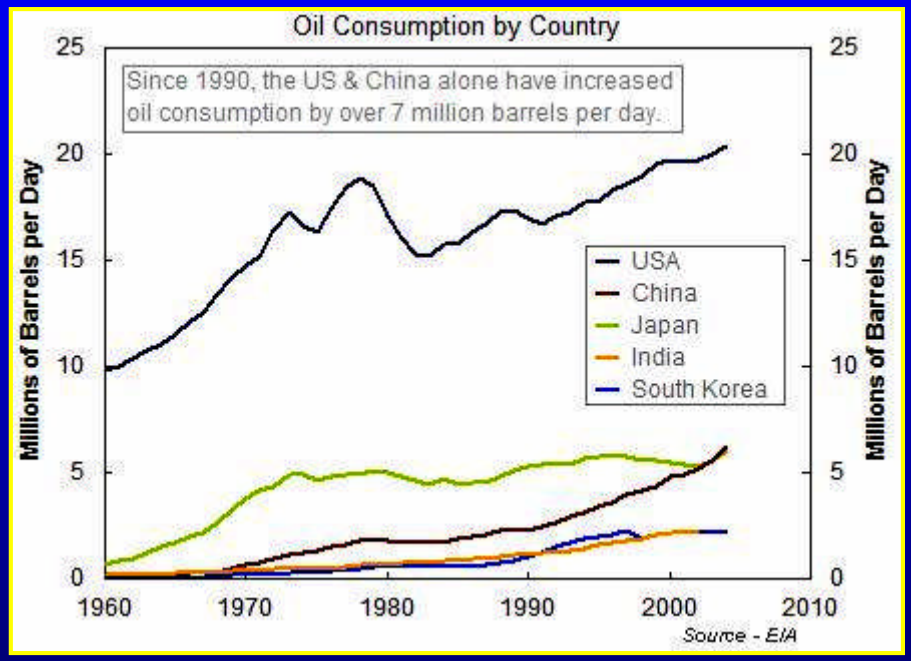
- Many oil pundits argue "No."
- Blame prices on many factors:
  - Speculation
  - Fear
  - Geopolitics
  - Typical commodity "cycle"
- Optimists argue fundamentals shout out that, "we have ample supplies and prices will fall."



Source: Graphic by Jay Carr.

What The Real Fundamentals Say

- Rising oil demand fooled everyone.
- Demand growth seems insatiable.
- Oil supply woes became pandemic.
- Technology created accidental just-in-time supply.
- Too many oil basins peaked.
- Stock (inventory) liquidation became last gasp supply.



What Is Driving Oil Demand Growth?

Mobility and Prosperity

Mobility

Growth In Oil Use Seems Inexhaustible

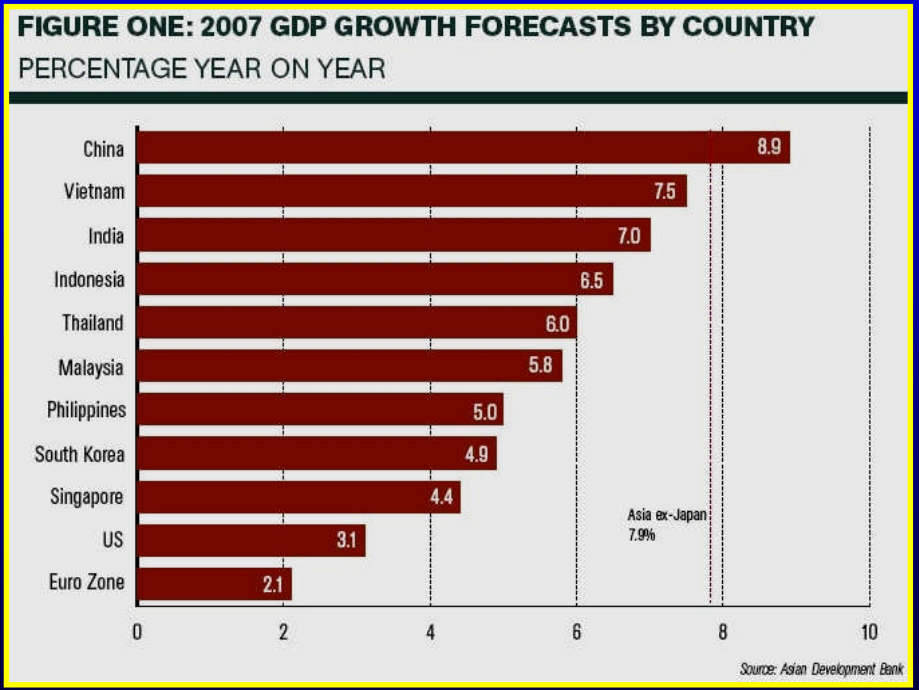
- EIA, IEA, World Bank, et al. project steady growth through 2020 – 2030.
  - Estimates range by various scenarios
  - All end up with oil demand ≈115 to 125 million Bbls/day in 2025.
- Disparity of vehicles drives this growth:

	Population	No. of Vehicles	Vehicles per 1,000 people
	------- In Millions -------		
North America	437	280	641
Western Europe	532	252	472
OECD Pacific	200	92	462
OECD Total	1,169	624	534
FSU/Eastern Europe	341	62	182
Developing Economies - China	1,314	23	18
Rest of the World	3,579	184	51

Source: OPEC's World Oil Outlook, 2007 (2004 Data)

SIMMONS and COMPANY INTERNATIONAL

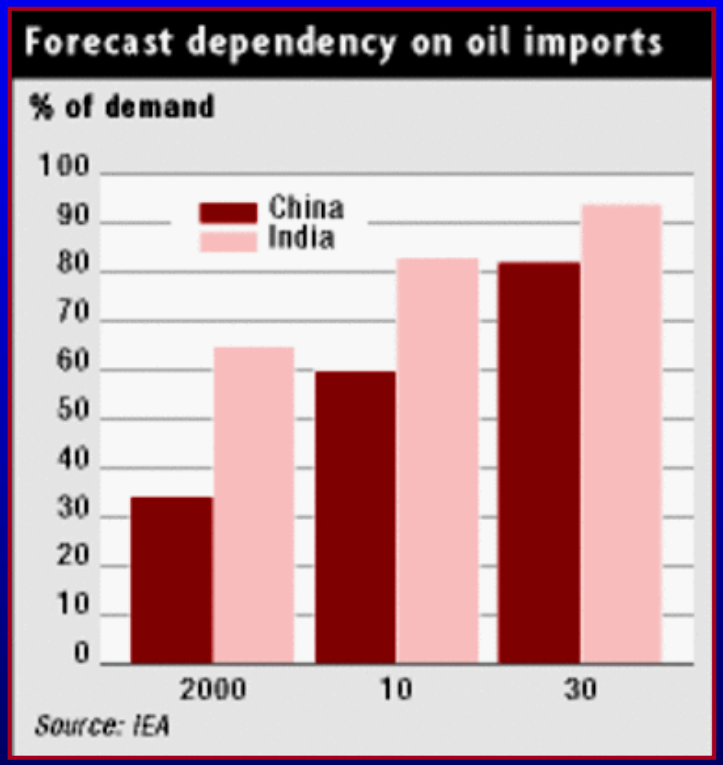
Prosperity



SIMMONS and COMPANY INTERNATIONAL

How High Can Oil Demand Grow?

- There is no glass ceiling.
- Best experts predict oil demand exceeding 115 mmb/d by 2020.
- 115 – 130 mmb/d still leaves India and China as energy paupers.
- High prices do not kill demand.



But, oil use can never exceed oil supply.

SIMMONS and COMPANY
INTERNATIONAL

Has Peak Oil Arrived?

- EIA data quietly says, “Yes.”
- Energy Watch Group* says, “Yes.”
- Dr. Sadad Al-Husseini says, “Yes.”
- Boone Pickens says, “Yes.”
- ASPO China creation endorsed, “Yes.”

Many “yes” votes are weeks old.

Table 11.1b. World Crude Oil Production: Persian Gulf Nations, Non-OPEC, and World

(Thousand Barrels Per Day)

Year	Persian Gulf Nations	Canada	China	Egypt	Mexico	Norway	Former U.S.S.R	Russia	United Kingdom	United States	Total Non OPEC	World
1973 **Average**	20,668	1,798	1,090	165	465	32	8,324	NA	2	9,208	24,888	55,679
1975 **Average**	18,934	1,430	1,490	235	705	189	9,523	NA	12	8,375	25,892	52,828
1980 **Average**	17,961	1,435	2,114	595	1,936	486	11,706	NA	1,622	8,597	32,802	59,558
1985 **Average**	9,630	1,471	2,505	887	2,745	773	11,585	NA	2,530	8,971	37,554	53,966
1990 **Average**	15,278	1,553	2,774	873	2,553	1,630	10,975	NA	1,820	7,355	36,822	60,492
1995 **Average**	17,208	1,805	2,990	920	2,618	2,766	NA	5,995	2,489	6,560	35,735	62,385
1996 **Average**	17,367	1,837	3,131	922	2,855	3,091	NA	5,850	2,568	6,465	36,582	63,752
1997 **Average**	18,095	1,922	3,200	856	3,023	3,142	NA	5,920	2,518	6,452	37,320	65,744
1998 **Average**	19,337	1,981	3,196	834	3,070	3,011	NA	5,854	2,616	6,252	37,456	66,966
1999 **Average**	18,667	1,907	3,195	852	2,906	3,019	NA	6,079	2,684	5,881	37,599	65,922
2000 **Average**	19,892	1,977	3,249	768	3,012	3,222	NA	6,479	2,275	5,822	38,482	68,495
2001 **Average**	19,098	2,029	3,300	720	3,127	3,226	NA	6,917	2,282	5,801	39,014	68,101
2002 **Average**	17,794	2,171	3,390	715	3,177	3,131	NA	7,408	2,292	5,746	39,919	67,168
2003 **Average**	19,063	2,306	3,409	713	3,371	3,042	NA	8,132	2,093	5,681	40,724	69,448
2004 **Average**	20,787	2,398	3,485	673	3,383	2,954	NA	8,565	1,845	5,419	41,537	72,512
2005 January	21,285	2,330	3,561	658	3,351	2,720	NA	8,870	1,775	5,441	41,358	73,231
February	21,355	2,298	3,570	658	3,349	2,809	NA	8,920	1,771	5,494	41,516	73,514
March	21,405	2,172	3,594	662	3,252	2,867	NA	8,925	1,802	5,561	41,641	73,842
April	21,565	2,300	3,584	659	3,409	2,864	NA	8,888	1,771	5,556	41,920	74,140
May	21,375	2,360	3,611	656	3,441	2,795	NA	8,900	1,743	5,581	42,082	74,298
June	21,485	2,330	3,646	656	3,425	2,398	NA	9,026	1,643	5,460	41,558	73,916
July	21,695	2,339	3,654	658	3,082	2,715	NA	8,990	1,625	5,240	41,143	73,757
August	21,655	2,372	3,668	655	3,414	2,643	NA	9,140	1,342	5,218	41,169	73,818
September	21,915	2,262	3,623	659	3,367	2,663	NA	9,170	1,518	4,204	40,413	73,399
October	21,525	2,462	3,649	664	3,221	2,577	NA	9,230	1,612	4,534	40,885	73,497
November	21,425	2,548	3,621	667	3,311	2,645	NA	9,210	1,543	4,837	41,425	73,980
December	21,325	2,645	3,520	647	3,388	2,683	NA	9,240	1,645	4,984	41,803	74,268
Average	21,501	2,369	3,609	658	3,334	2,698	NA	9,043	1,649	5,178	41,401	73,807
2006 January	21,175	2,595	3,670	654	3,372	2,657	NA	9,030	1,707	5,106	41,579	73,759
February	21,375	2,504	3,662	657	3,311	2,620	NA	9,040	1,639	5,045	41,412	73,647
March	21,250	2,411	3,710	651	3,350	2,610	NA	9,150	1,597	5,045	41,396	73,489
April	21,250	2,531	3,680	663	3,370	2,407	NA	9,170	1,590	5,128	41,496	73,591
May	21,050	2,341	3,712	655	3,329	2,535	NA	9,190	1,500	5,161	41,386	73,154
June	21,305	2,336	3,700	607	3,287	2,365	NA	9,260	1,392	5,160	40,979	73,061
July	21,680	2,512	3,716	620	3,232	2,571	NA	9,240	1,453	5,102	41,627	74,076
August	21,710	2,543	3,670	630	3,252	2,430	NA	9,330	1,202	5,059	41,185	73,760
September	21,360	2,601	3,659	640	3,258	2,338	NA	9,350	1,354	5,037	41,239	73,462
October	21,135	2,602	3,658	660	3,173	2,380	NA	9,450	1,482	5,106	41,798	73,814
November	20,805	2,658	3,682	615	3,163	2,466	NA	9,320	1,504	5,105	41,772	73,404
December	20,695	2,669	3,710	619	2,978	2,508	NA	9,420	1,472	5,166	41,751	73,305
Average	21,232	2,525	3,686	639	3,256	2,491	NA	9,247	1,490	5,102	41,470	73,544
2007 January	20,471	2,578	3,658	616	3,143	2,431	NA	9,420	1,510	5,196	41,768	73,045
February	20,351	2,618	3,739	614	3,148	2,454	NA	9,460	1,654	5,147	42,126	73,317
March	20,440	2,694	3,685	612	3,182	2,391	NA	9,473	1,554	5,178	42,013	73,260
April	20,489	2,634	3,749	609	3,182	2,427	NA	9,369	1,566	5,218	42,084	73,537
May	20,489	2,585	3,781	649	3,110	2,181	NA	9,390	1,564	5,240	41,750	73,054
June	20,398	2,580	3,826	679	3,206	1,921	NA	9,440	1,495	5,139	41,638	72,827
July	20,503	2,572	3,643	679	3,166	2,327	NA	9,460	1,436	5,120	41,730	73,218
August	20,457	2,709	3,746	679	2,843	2,135	NA	9,390	1,228	4,976	41,056	72,512

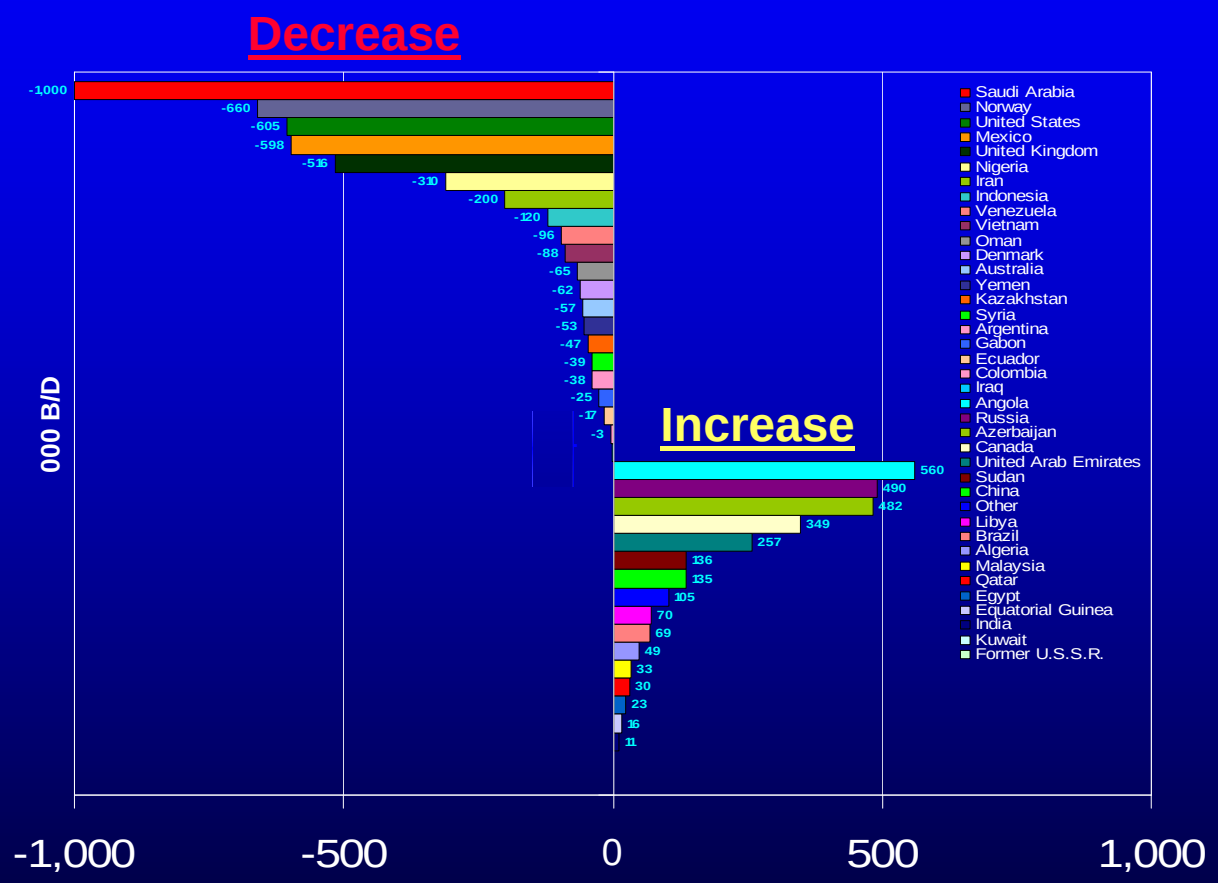
Source: EIA - November 2007 Monthly Energy Review

SIMMONS and COMPANY INTERNATIONAL

*Energy Watch Group – an independent German consulting firm reports to Parliament.

Why EIA's Reported Crude Output Slipped

- Only a few key producers grew in last 27 months.
- Too many large producers declined.
- Few "advancers" have much advance left.
- Most decliners see decline accelerating.
- Overcoming a 1.7 MMB/D gap is stiff challenge.



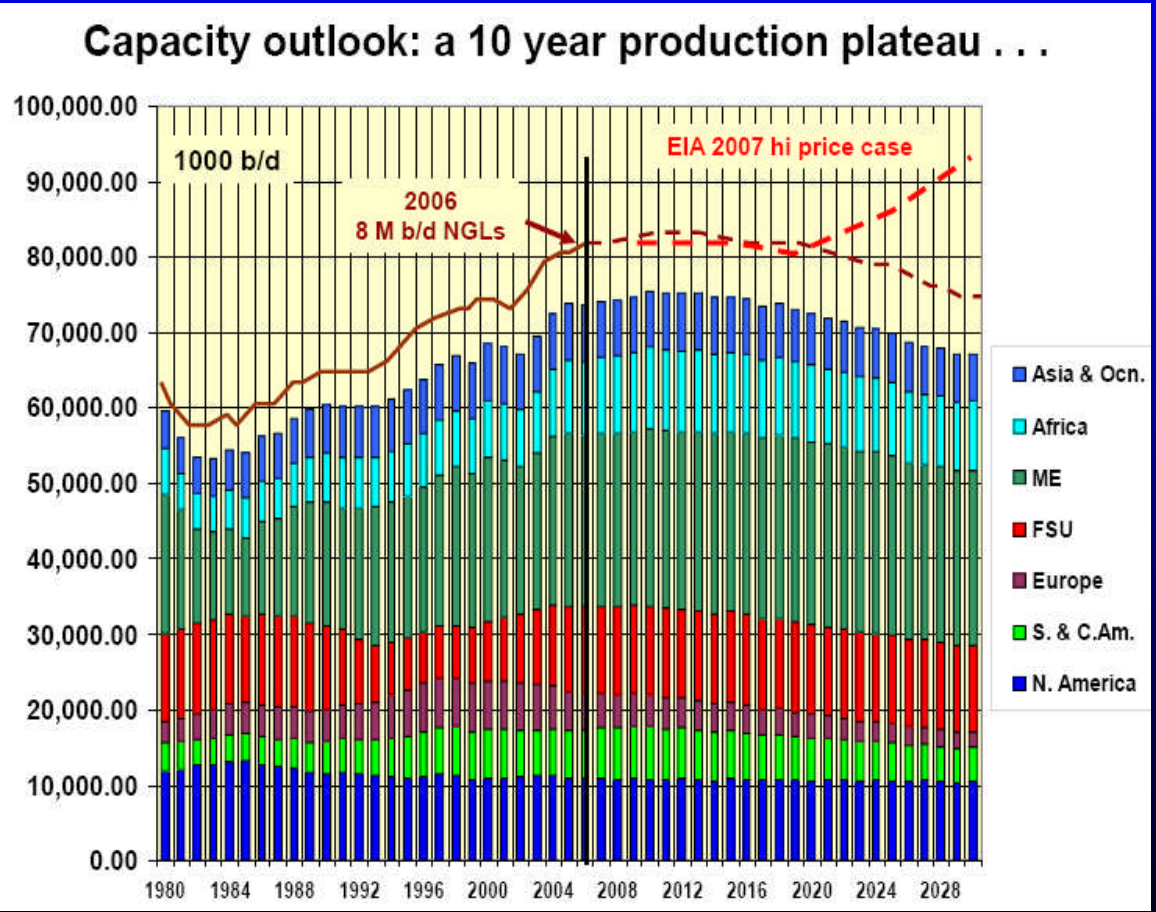
Source: EIA –International Petroleum Monthly November 5, 2007

SIMMONS and COMPANY
INTERNATIONAL

Dr. Sadad Al-Husseini's Comments On Peak Oil

(Oil And Money Conference – October 31, 2007)

This represents "best case" as it assumes all new projects are successful.



SIMMONS and COMPANY
INTERNATIONAL

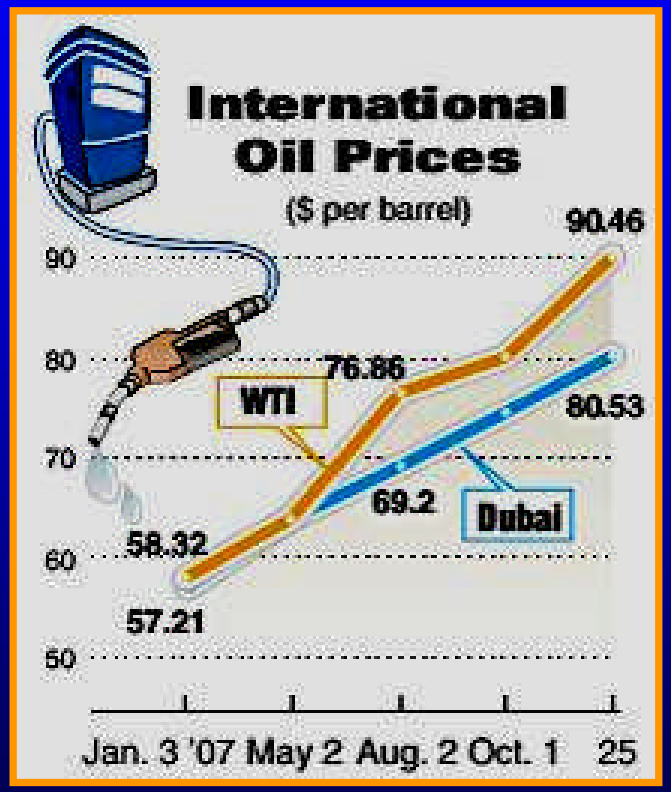
Biggest Peak Oil Risks

- We use up all spare capacity.
- Pressing maximum production accelerates decline rates.
- Stock liquidation is not sustainable and dangerous.
- Rusty infrastructure threatens already declining supplies.

All risks are real, none can be quantified.
But our energy system is too old.

How High Can Oil Prices Go?

- $100 mmb/d = $.15 per cup.
- Consumers in Europe, Australia and New Zealand have been paying $250 - $300 per barrel for oil.
- Oil was a miracle product:
  - Created transportation fuel that traveled
  - Created global prosperity



- We used most of our highest quality of oil at two cents per cup.

Does Recent Oil Price Slump Signal Good News?

- Past price "collapses" encouraged optimists they were right.
  - Price collapses prove to OPEC we need less oil
  - Price signals scare project planners

SIMMONS and COMPANY INTERNATIONAL

Past Oil Price Collapses Have Been Short Lived

- The rise in oil prices from $10 to $99/barrel has seen many peaks followed by declines.
- Thus far, the declines have been short-lived.
- Decline valleys have shortened over past 24 months.

Where short-term oil prices head is a mystery.

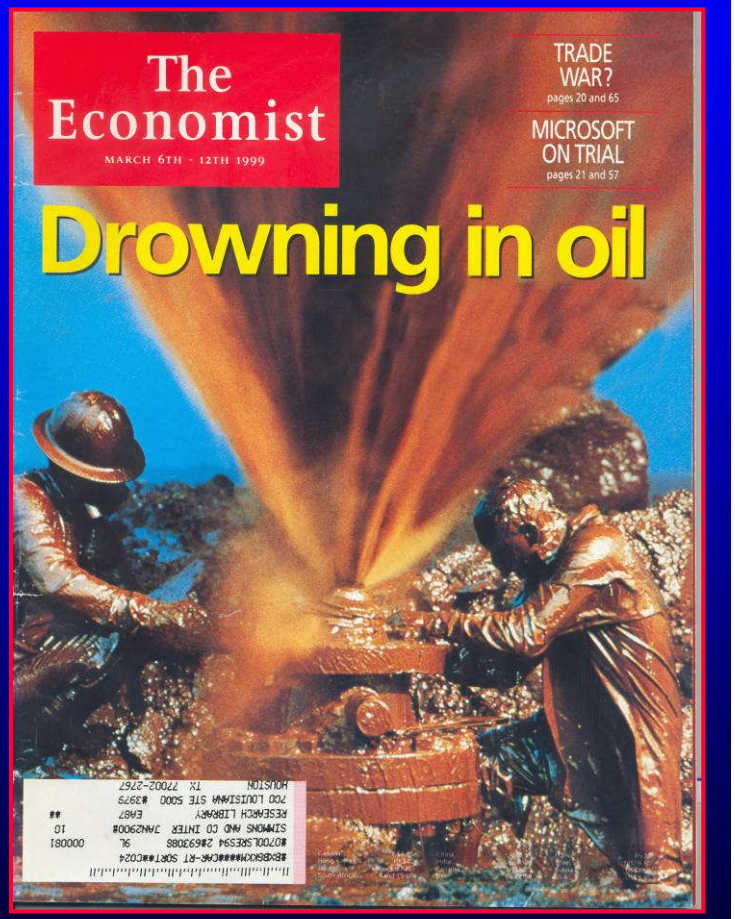
Need for long-term price rises is clear.

High Oil Prices = Good News

- Low oil prices dampen any new supply efforts.
- Low oil prices stimulate added demand (absent rationing).
- High prices create massive excess “wellhead cash.”
- How these petro-dollars are reinvested is crucial.
- Spending must include:
  - Rebuilding energy infrastructure (ASAP)
  - Middle East oil producing countries investing in their economies to close the rich-poor gap and create a genuine middle-class society

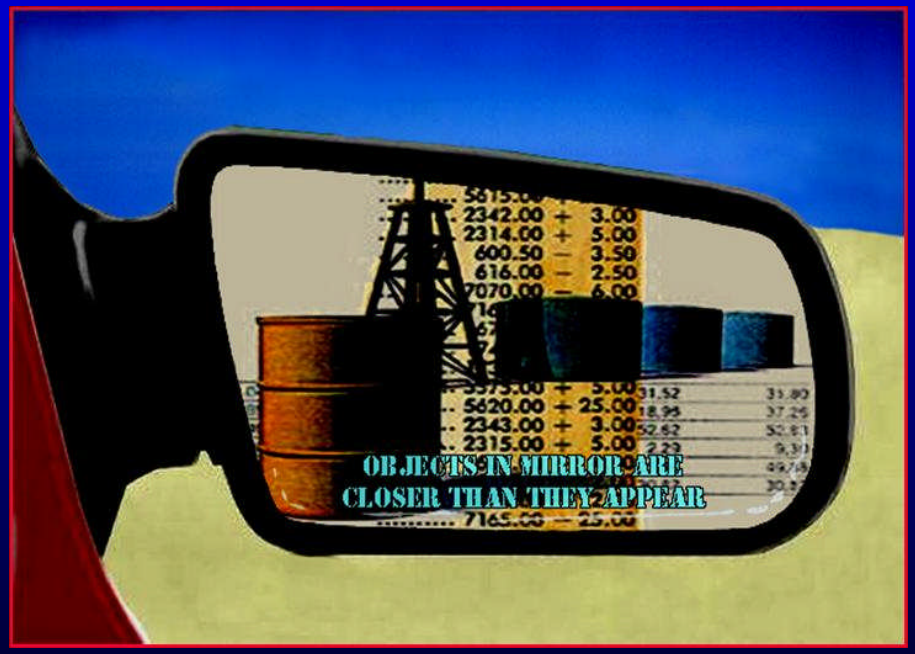
Did The World Fall Asleep At The Energy Wheel?

- Experts assumed oil demand growth had peaked (1988 - 1995).
- New technologies were supposed to create glut (1995 - 2007).
- "Drowning in Oil" (The Economist cover story March, 1999) codified wisdom that oil prices were headed to $5.
- The driver was dreaming and did not see the oncoming wall (police report after the accident).



It Is Easy To Miss An Approaching Crisis

"Revolutions, before they happen, appear to be impossible and after they occur they appeared to have been inevitable."



Source: Alexis de Tocqueville - 1800s

SIMMONS and COMPANY
INTERNATIONAL

SIMMONS & COMPANY INTERNATIONAL

Investment Bankers *to the* Energy Industry

For information and/or copies regarding this presentation, please contact us at (713) 236-9999 or lrussell@simmonsco-intl.com. This presentation will also be available on our website www.simmonsco-intl.com within seven business days.