

Mideast Democracy and \$100 Oil

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Geopolitics, not Geology, is driving the energy future



Impact on Oil & Gas Operations from Katrina and Rita

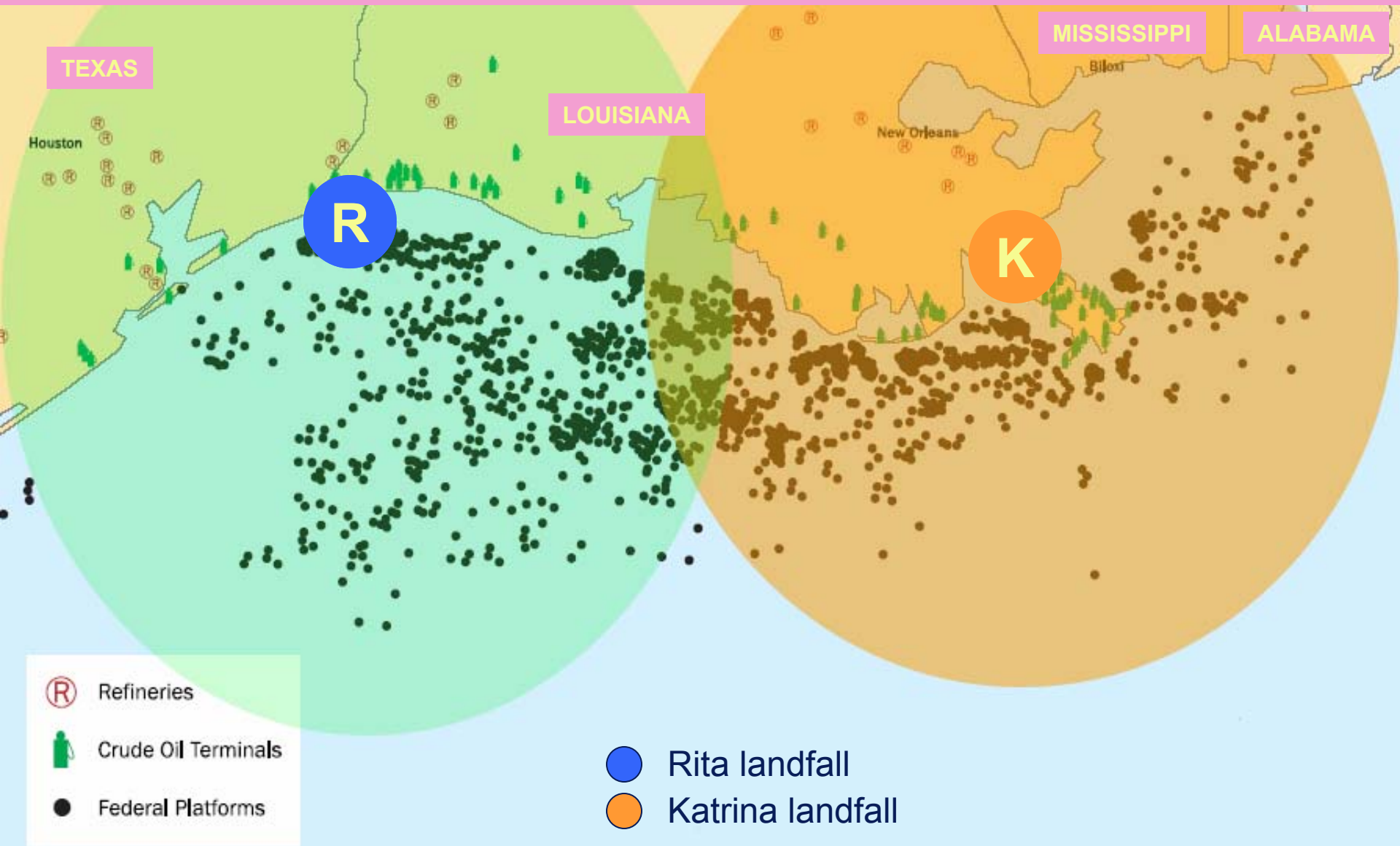
August 30

- Gulf Oil & Gas Production
 - ◆ 26% of U.S. oil
 - ◆ 18% of U.S. gas
- Gulf Refineries
 - ◆ 11% capacity shutdown
 - ◆ 17% reduced runs (by 8/31)
- Pipelines
 - ◆ No electricity to major crude and product pipelines feeding Northeast and Midwest
- LOOP
 - ◆ Operations suspended
 - ◆ 8.5% of crude imports lost

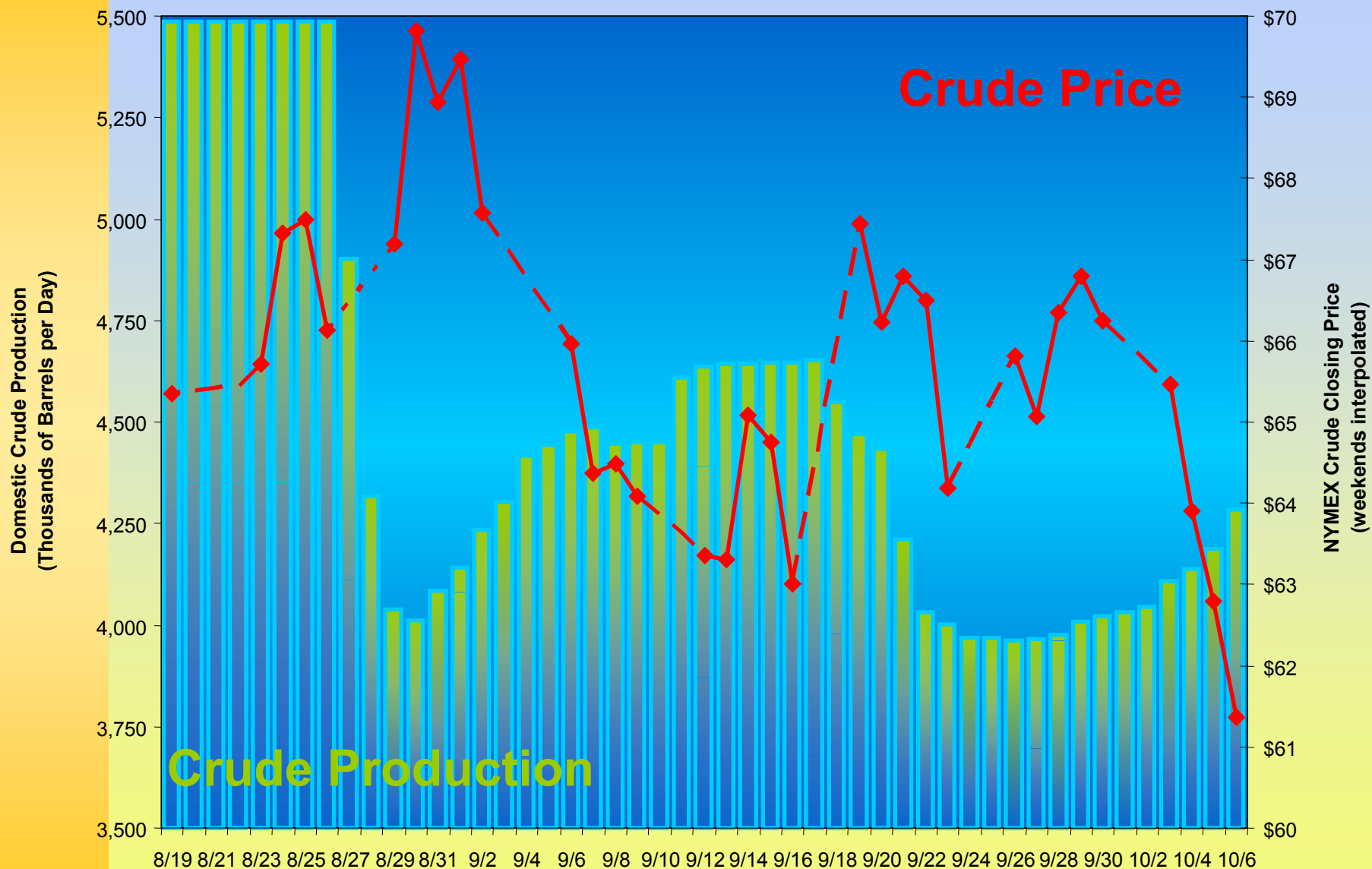
October 6

- Gulf Oil & Gas Production
 - ◆ 22% of U.S. oil
 - ◆ 12% of U.S. gas
- Gulf Refineries
 - ◆ 5% shutdown (Katrina)
 - ◆ 15% shutdown or restarting (Rita)
- Pipelines
 - ◆ Operational, but many at lower rates
- LOOP
 - ◆ Operating

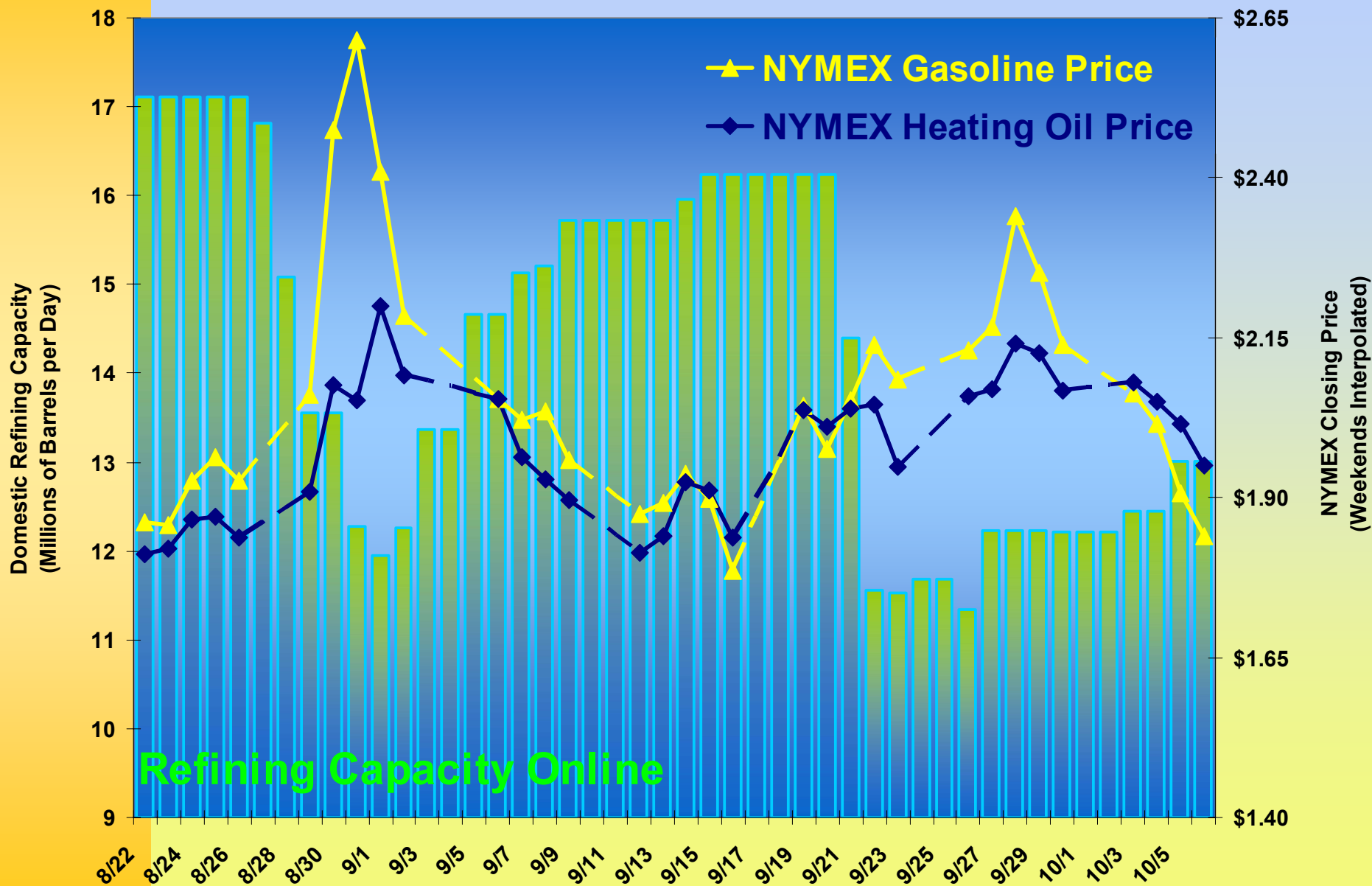
Hurricanes Rita, Katrina And Gulf Oil & Natural Gas Operations



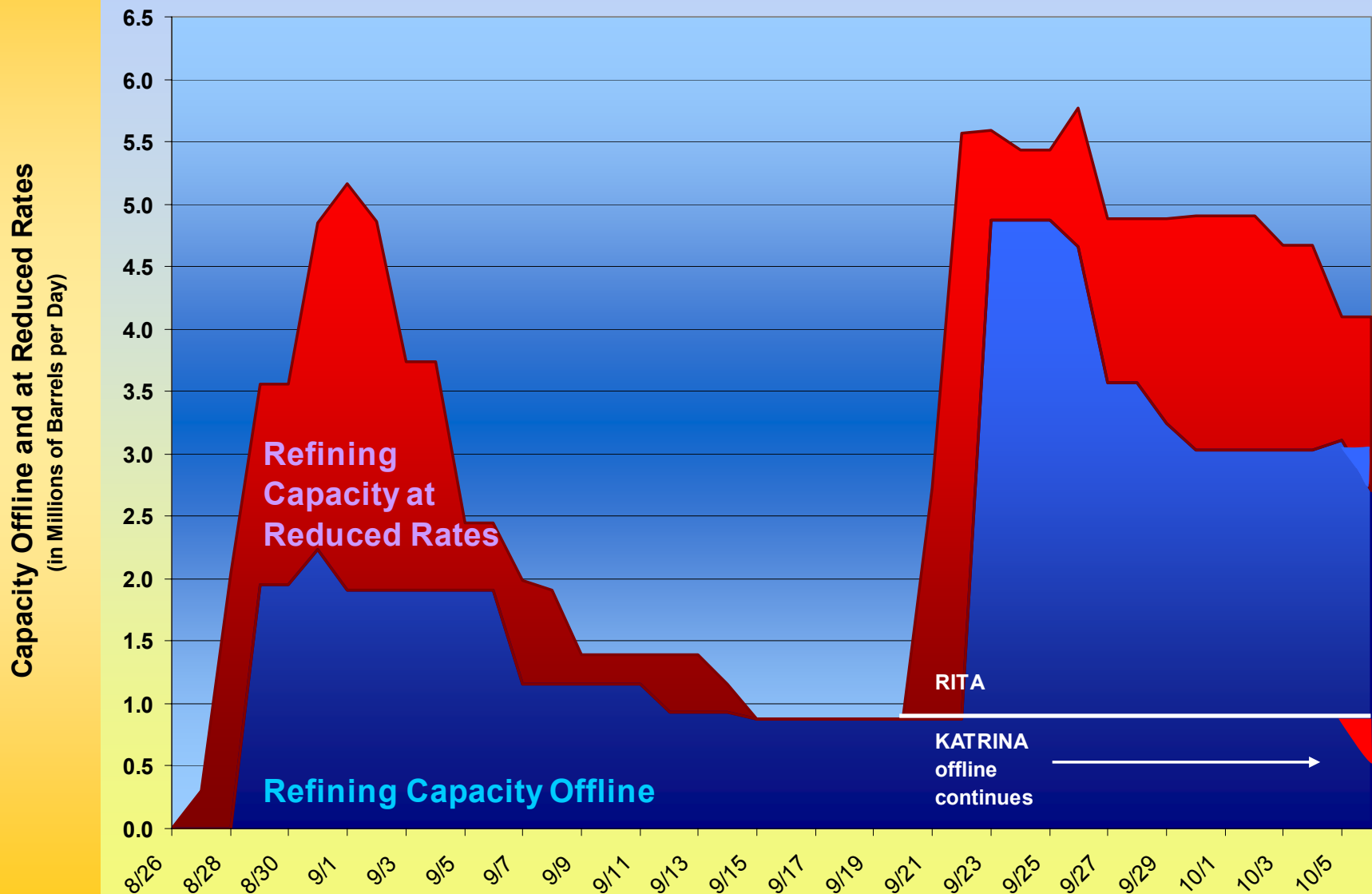
Crude production and prices before and after Katrina and Rita



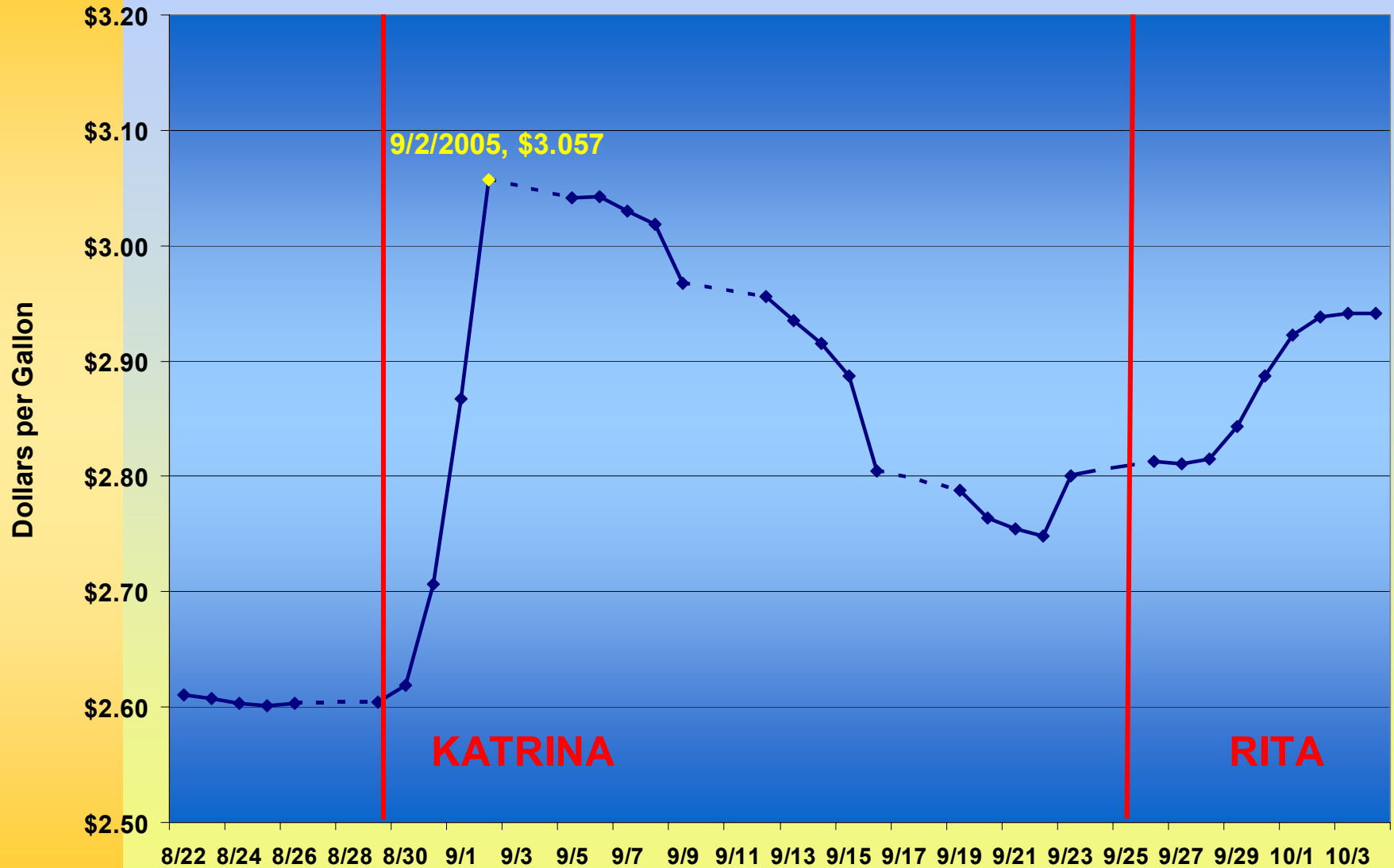
Refining capacity and prices before and after Katrina and Rita



Refining capacity offline and additional capacity running at reduced rates



Retail gasoline prices before and after Katrina and Rita



Source: AAA Daily Fuel Gauge Report

Gasoline Demand Increases as a Result of Rita and Katrina Evacuations

- Regional gasoline demand 4-5 times the normal amount
 - National demand 6% higher than for week of labor day and 20% higher for than usual for the time period
 - Demand increase is possibly influenced by change in consumer inclination. A consensus change from half-tank to full-tank can cause a market-pressuring near term increase in demand.
- Demand increase combined with uncertainty of future supply, refinery outages, and inventory levels can influence retail price

Relationship between US Crude Oil and Retail Gasoline Prices

WTI			Retail Gasoline	
\$/bbl			\$/gallon	
\$	10.00	→	\$	0.89
\$	20.00	→	\$	1.21
\$	30.00	→	\$	1.52
\$	40.00	→	\$	1.83
\$	50.00	→	\$	2.11
\$	60.00	→	\$	2.39
\$	70.00	→	\$	2.66
\$	80.00	→	\$	2.91
\$	90.00	→	\$	3.15
\$	100.00	→	\$	3.38
\$	110.00	→	\$	3.60
\$	120.00	→	\$	3.80

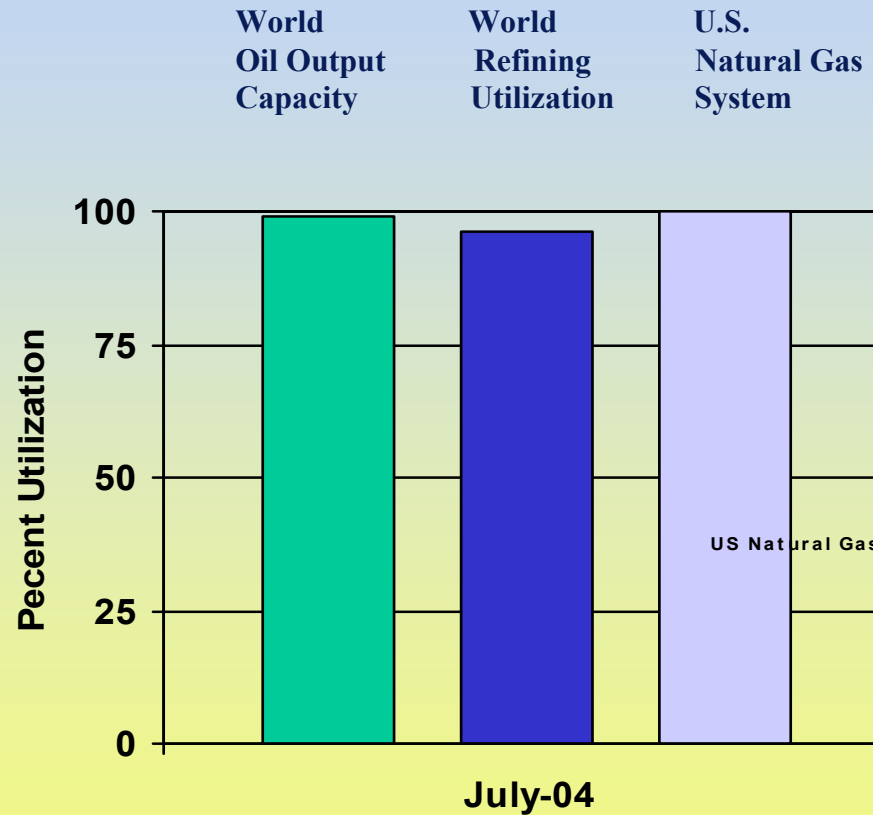
Note: These figures represent national averages. There could be regional variation as well as variation caused by other factors such as changes in gasoline inventories, refinery outages, and unexpected changes in demand.



Oil Crises and Petroleum Security

	October 1973	August 1990	September 2005
Reason for Crisis	<ul style="list-style-type: none"> - Fourth Middle East war - Embargo by Arab oil producers 	<ul style="list-style-type: none"> - Iraq invades Kuwait 	<ul style="list-style-type: none"> - Hurricane Katrina
Supply decrease period	6 months	7 months	Unknown
Supply decrease magnitude	<ul style="list-style-type: none"> - 4.3-4.5 million b/d (2 months) - 2.2-2.6 million b/d (2 months) 	<ul style="list-style-type: none"> - 5.0-5.3 million b/d (2 months) - 4.0-4.7 million b/d (3 months) 	<ul style="list-style-type: none"> - 1.4-1.5 million b/d (initially) - 900,000 b/d (9 days)
Excess production capabilities	About 3.75 million b/d	About 6.20 million b/d	About 0.9-1.4 million b/d
No. of days of petroleum stocks in OECD	Public - 0 Private - 70 days	Public - 25 days Private - 61 days	Public - 31 days Private - 54 days
Petroleum market structure	<ul style="list-style-type: none"> - Majors posting price system - Majors' rights in long term crude contracts 	<ul style="list-style-type: none"> - Market-linked pricing system - Active oil futures market - Term contracts tied to spot transactions 	<ul style="list-style-type: none"> - Market linked pricing system - Active oil futures market - Term contracts tied to spot transactions

Industry is near or at capacity



Refinery Utilization Rates, 1980-2003 (in percentages)

	1980	1985	1990	1995	2000	2003
US	72.4	77.6	85.5	91.5	92.3	90.1
EU-15	63.1	69.1	86.0	92.4	93.6	91.2
Japan	71.2	66.0	79.5	83.3	82.4	86.6
FSU	82.6	77.2	74.3	51.0	53.0	63.5
China	83.7	78.9	74.4	67.5	78.0	85.2

OPEC production capacity has fallen, not increased, since 1979

OPEC Production and Spare Capacity, 1979-2003 (mmb/d)

Member Country	1979	1983	1990	1997	1998	2000	2001	2003	2005
Saudi Arabia	10.84	11.30	8.00	9.65	9.80	9.50	9.90	10.15	10.30
Iran	7.00	3.00	3.10	3.70	3.70	3.75	3.80	3.80	4.00
Iraq	4.00	1.50	3.60	2.30	2.80	2.90	3.05	2.20	1.80
Kuwait	3.34	2.80	2.40	2.40	2.40	2.40	2.40	2.50	2.60
UAE	2.50	2.90	2.20	2.40	2.40	2.40	2.45	2.50	2.40
Qatar	0.65	0.65	0.40	0.71	0.72	0.73	0.75	0.75	0.82
Venezuela	2.40	2.50	2.60	3.45	3.30	2.98	3.10	2.50	2.50
Nigeria	2.50	2.40	1.80	2.00	2.05	2.10	2.30	2.30	2.30
Indonesia	1.80	1.60	1.25	1.40	1.35	1.35	1.30	1.15	0.90
Libya	2.50	2.00	1.50	1.45	1.45	1.45	1.45	1.45	1.60
Algeria	1.23	1.10	0.75	0.88	0.88	0.88	0.88	1.15	1.35
Total	38.76	31.75	27.60	30.34	30.85	30.44	31.38	30.45	30.57
Call on OPEC	34.01	16.65	22.20	27.59	25.85	30.04	28.23	29.20	29.87
Spare Capacity	4.75	15.10	5.40	2.75	5.00	0.40	3.15	1.25	0.70

Opec can replace all Asian economic crisis Demand bumps
Iraqi/Kuwait oil in 1990 leaves extra capacity in 1998 up against capacity

China will be a key factor, this year, next year, every year

- China's oil demand is expected to rise 7.2% per annum through 2025, with oil in the transport sector rising 5.3% per annum. China's transport fleet of 4.3 million registered cars and 10.2-million registered trucks compares to 128.7-million cars and 87.9 million trucks in the U.S.
- Projections are that total Chinese petroleum product demand rising from 5-mmb/d in 2001 to 7.6-mmb/s in 2010, 9.2-mmb/d in 2015, 11.0-mmb/d in 2020 and 12.8-mmb/d in 2024
- Last year, China's economic growth was close to 10%



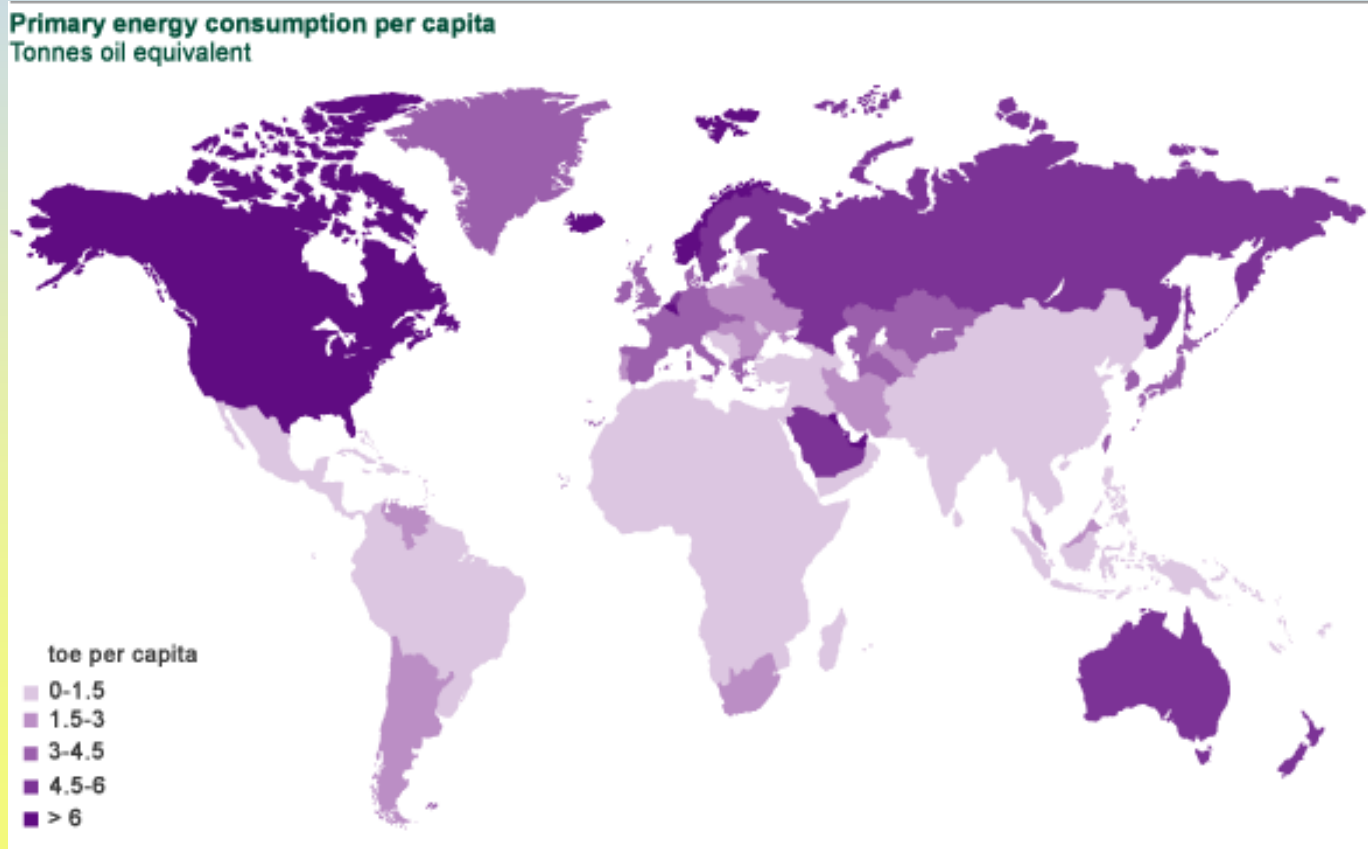
Country

Brazil
China
Germany
India
Japan
United States

Total Primary Energy Consumption Per Person (2002) (Million BTU)

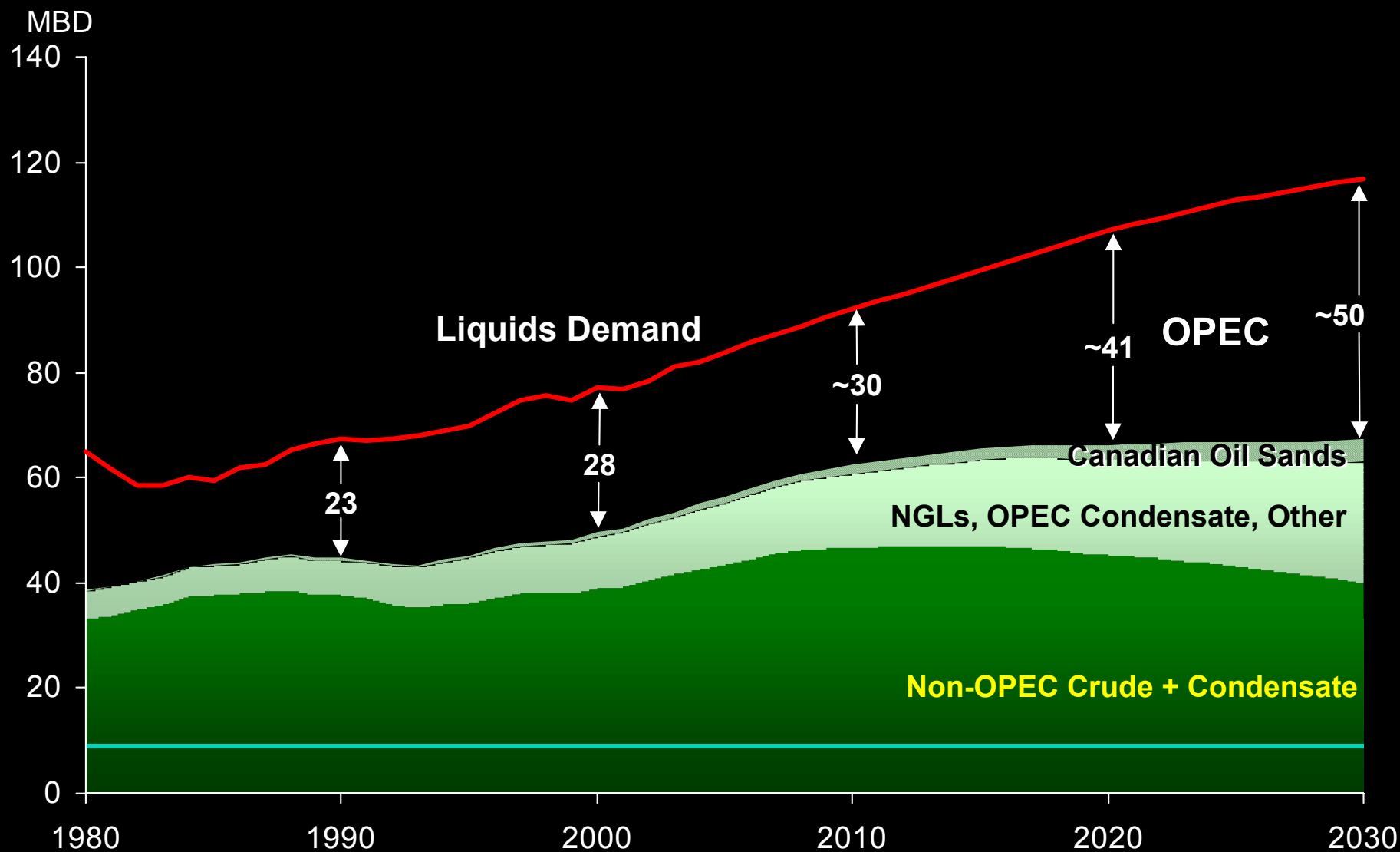
48.7
33.3
173.1
13.3
172.3
339.1

Source: EIA



Source: BP
16

World Liquids Production Outlook



Ranking Risks

- Saudi Arabia –Political Uncertainties
- Middle East –Period of Great Political Transition; Shiism vs Sunni Islamists
- Future of U.S. role in Iraq
- Arab-Israeli Conflict
- U.S.-Iran
- Russia – Putin and the Statists
- Latin America: Populism and Increased Chinese Presence
- Asia Pacific promise: Conflict resolution?
- Africa: Greater U.S. priority, Geopolitical competition from China
- China: Economic Bubble
- EU Increasingly Challenge U.S. Global Leadership; Push Environmental Agenda

Political Transition: Shiism vs Sunni Mainstream, Might a Conflict Erupt?

“The real danger is in the division that is being projected between the Arabs of Iraq, dividing them into Shias and Sunnis, especially a separate entity for both...this is a recipe for bringing the countries around Iraq into conflict themselves. You have Iran on one side which will come in with the Shias. We have the Turks on the other side who will come in to fight with the Kurds, and the Arabs will definitely be dragged into the fight on the part of the Sunnis.”

“Several years ago, we fought a war with the United States and Saudi Arabia in order to save Iraq from the occupation of Iran. Now it seems that Iran is being handed Iraq on a golden platter. So this is something that the U.S. must think about. Unless the Sunnis and Shias are brought together in a majority government to hold the country together, it will disintegrate into civil war. And then, the whole region will also disintegrate and conflicts that we have not dreamt of in the past will be facing the international community.”

--HRH Prince Saud Al Faisal Bin Abdulaziz Al-Saud, Saudi Foreign Minister at the Baker Institute on September 21, 2005

Political Transition: Shiism vs Sunni Mainstream, Might a Conflict Erupt?

Iraq's Interior Minister Bayan Jabor Solagh speaking on Iraqi Television responds to Prince Saud's remarks saying he would be forced to lay bare more facts if Saudi Arabia continued its interference, stressing on what he called human rights violations in Saudi Arabia and the kingdom's treatment of 4 million Shias as third class citizens. He said the Saudis should "create a democratic system and give freedoms, and not grant rights just in dribs and drabs, saying that maybe a woman can drive a car but she can only work within limits in the workplace...We call for democracy and freedom in all the Arab nation," Solagh said. "We were surprised by this unjustified attack... which they made instead of acting to solve the problem of the Shias in Saudi Arabia who are considered second class citizens."

After his comments, Solagh's brother was kidnapped by armed men in Baghdad, in a move the interior minister said was aimed at pressuring him personally.

Saudi Arabia

From Osama Bin Laden's Letter to the
American People:

"You steal our wealth and oil at paltry prices because of your international influence and military threats. This theft is indeed the biggest theft ever witnessed by mankind in the history of the world."

--Osama Bin Laden

In December 2004, called on the faithful to attack oil facilities as part of the jihad against the West

Problem of Public Diplomacy

According to Pew Center Polls:

Over half of Muslims believe American War on Terror is designed to “gain control oil supplies”

Will Saudi Arabia continue to play the marginal producer role?

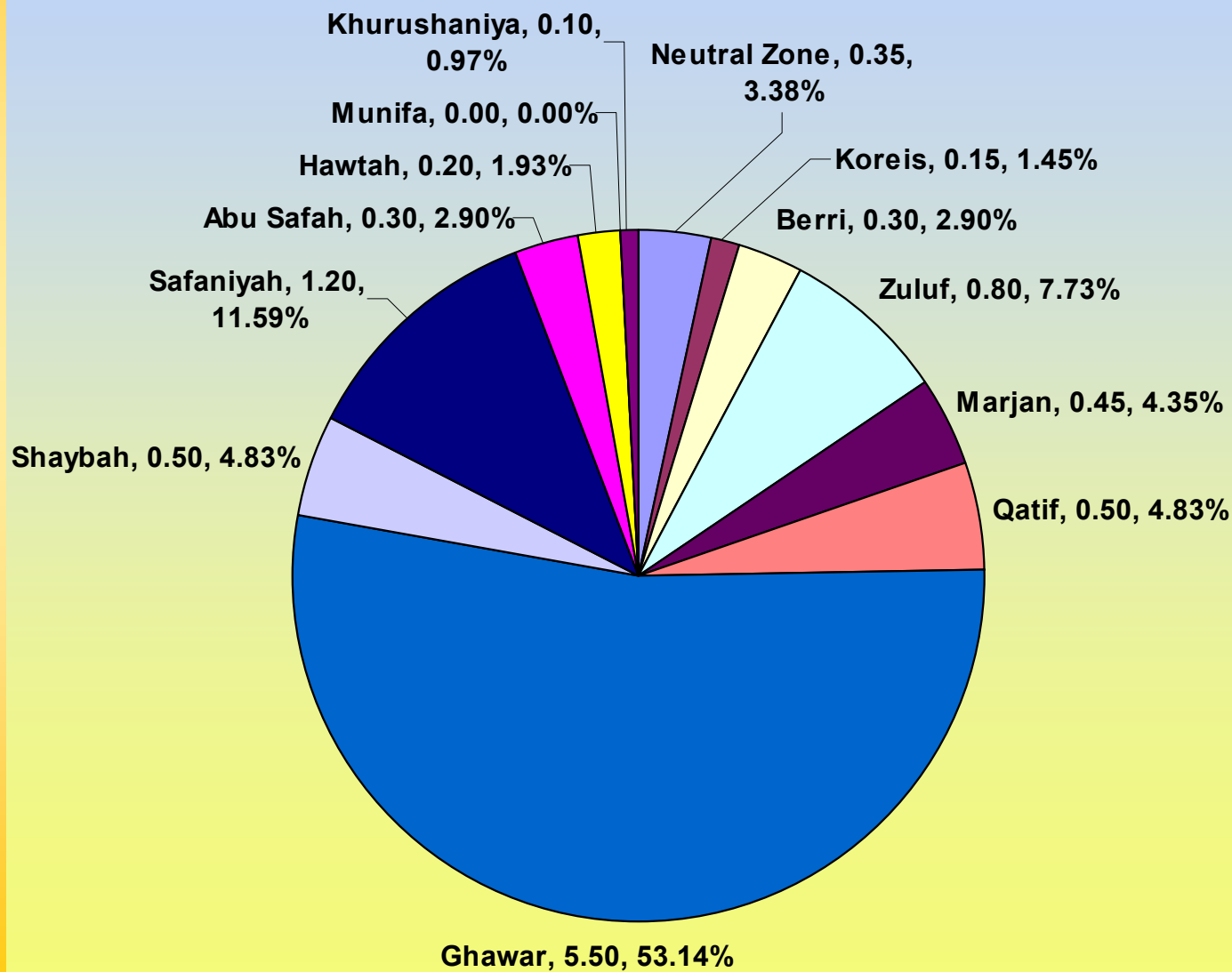
Three questions:

- ◆ Political will: will the kingdom continue to favor stable prices?
- ◆ Political stability: are facilities at risk?
- ◆ Domestic oil monopoly: will it continue to perform? Money, management, personnel, proper planning?

New expansions taking place but could be less than needed to meet the future

2004 Saudi Oil Field Production

Key: Field, million barrels/day, % of total production





Saudi “Mega Projects”

• Munifa

- January 2004; was offline
- Could produce up to 1 million bpd

• Abu Safah & Qatif

- Completed late 2004 at a cost of \$4 billion
- Capacity of 500,000 b/d

• Khursaniyah

- \$3 billion budget approved
- January 2004: produced 100,000 b/d
- By 2007: Aramco claims will reach 500,000 b/d

• Khoreis

- \$5 billion budget approved
- January 2004: produced 150,000 b/d
- By 2009: Aramco claims will increase production to 1-1.2 million b/d

• Haradh

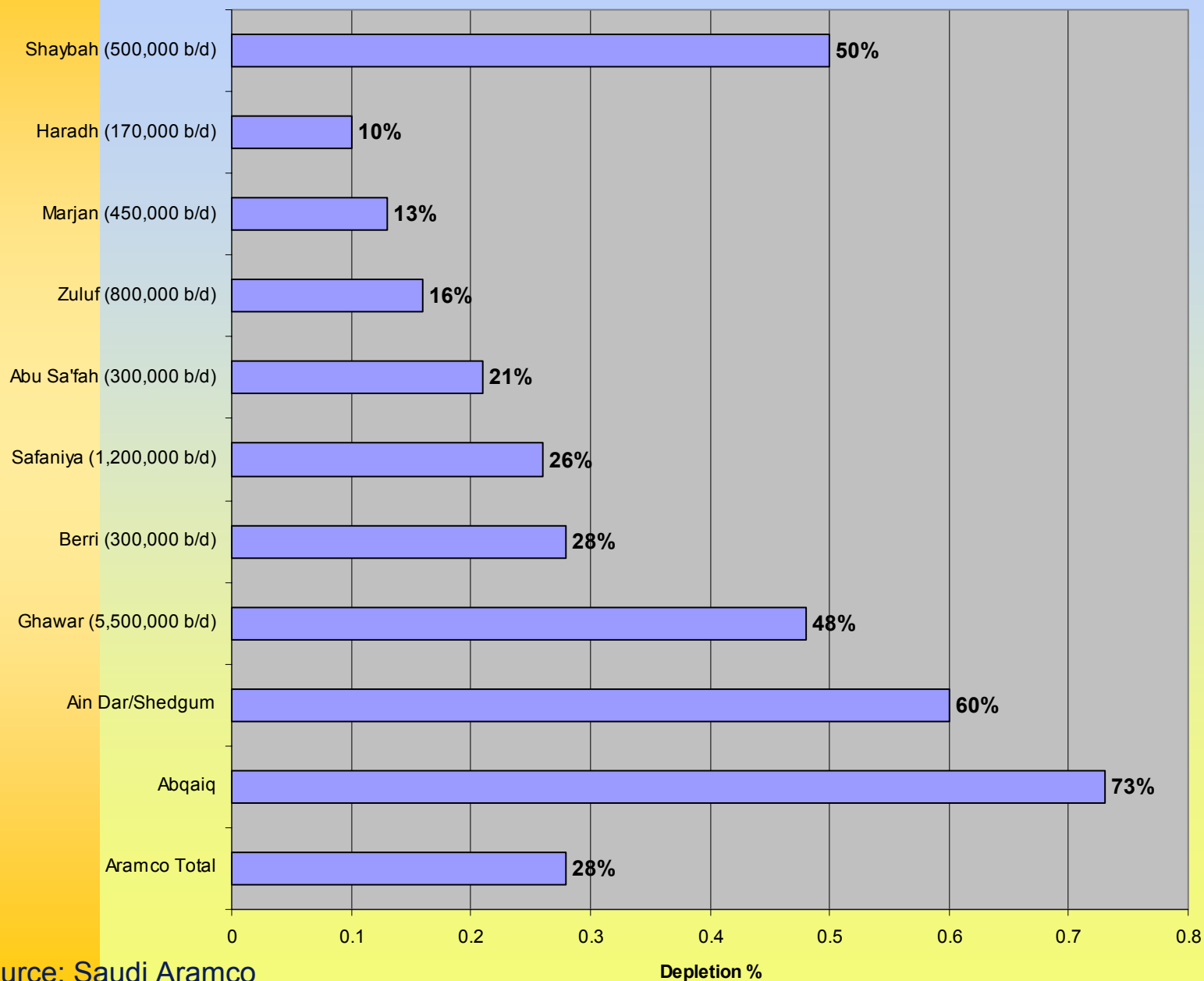
- Inaugurated January 2004, estimated cost of \$1 billion
- January 2004: produced 170,000 b/d
- By 2006: expected to expand to 300,000 b/d

• Shaybah

Estimated cost of \$1 billion

- By 2008: additional 400,000-500,000 b/d?

Saudi Oil Field Depletion Rate



Saudi New Production Contributing to 11 million b/d Capacity in 2009

Oil Field	Grade	New Capacity (b/d)	Date
Abu Safah & Qatif	Arab Light & Extra Light	500,000-550,000	2004-2005
Haradh	Arab Light	300,000	2006
Khursaniyah	Arab Light & Extra Light	500,000	2007
Shaybah	Arab Extra Light	400,000-500,000	2008
Khoreis	Arab Extra Light	1.0-1.2 million	2009
Total		2.7-3.05 million	\$12-15 billion in investments

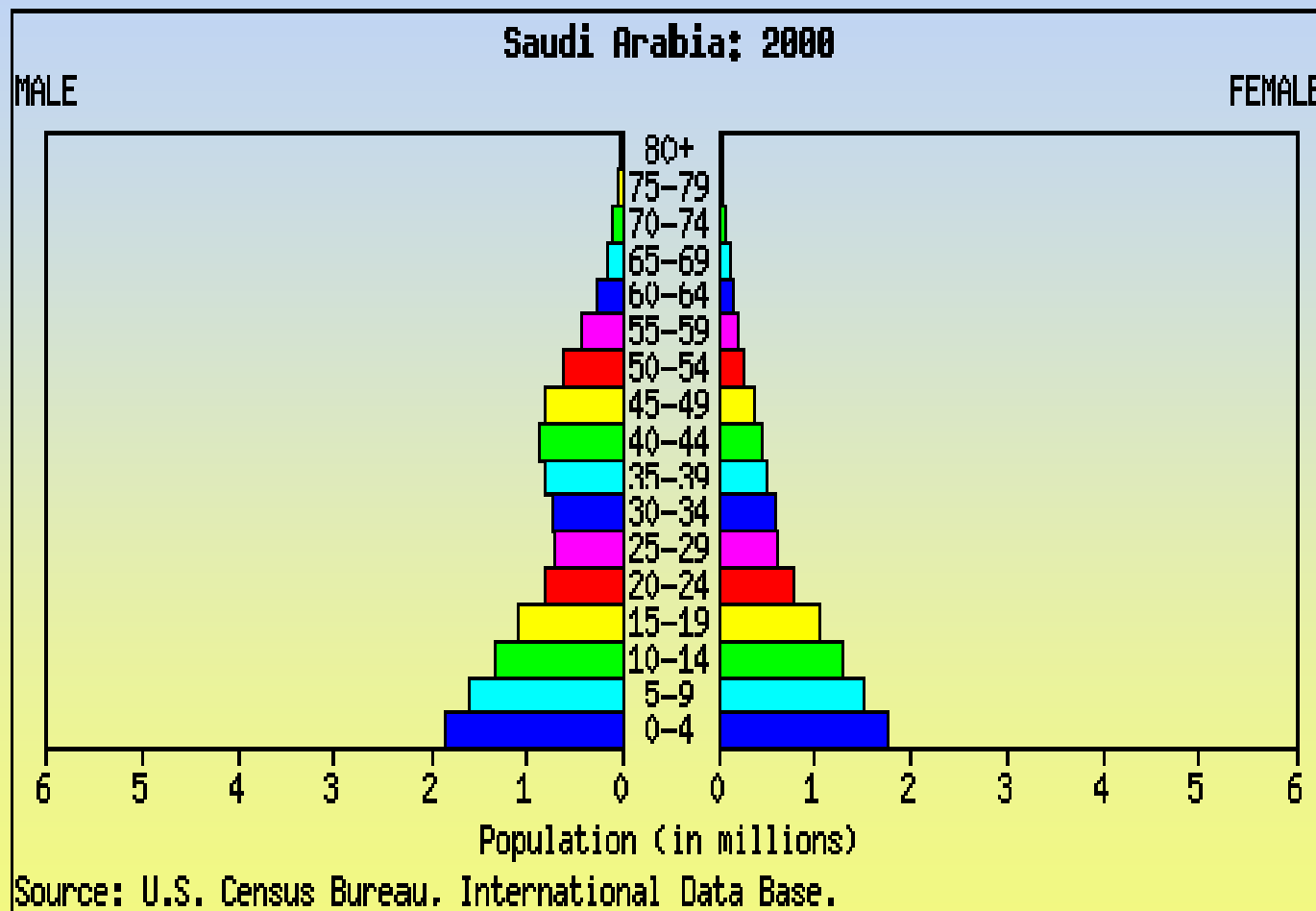
10,300,000 b/d Estimated sustainable capacity in mid-2005
+ 2,300,000 b/d Added by 2009
- 1,600,000 b/d Natural decline curve 2005-2009

11,000,000 b/d Estimated sustainable capacity by 2009

Saudi Arabia

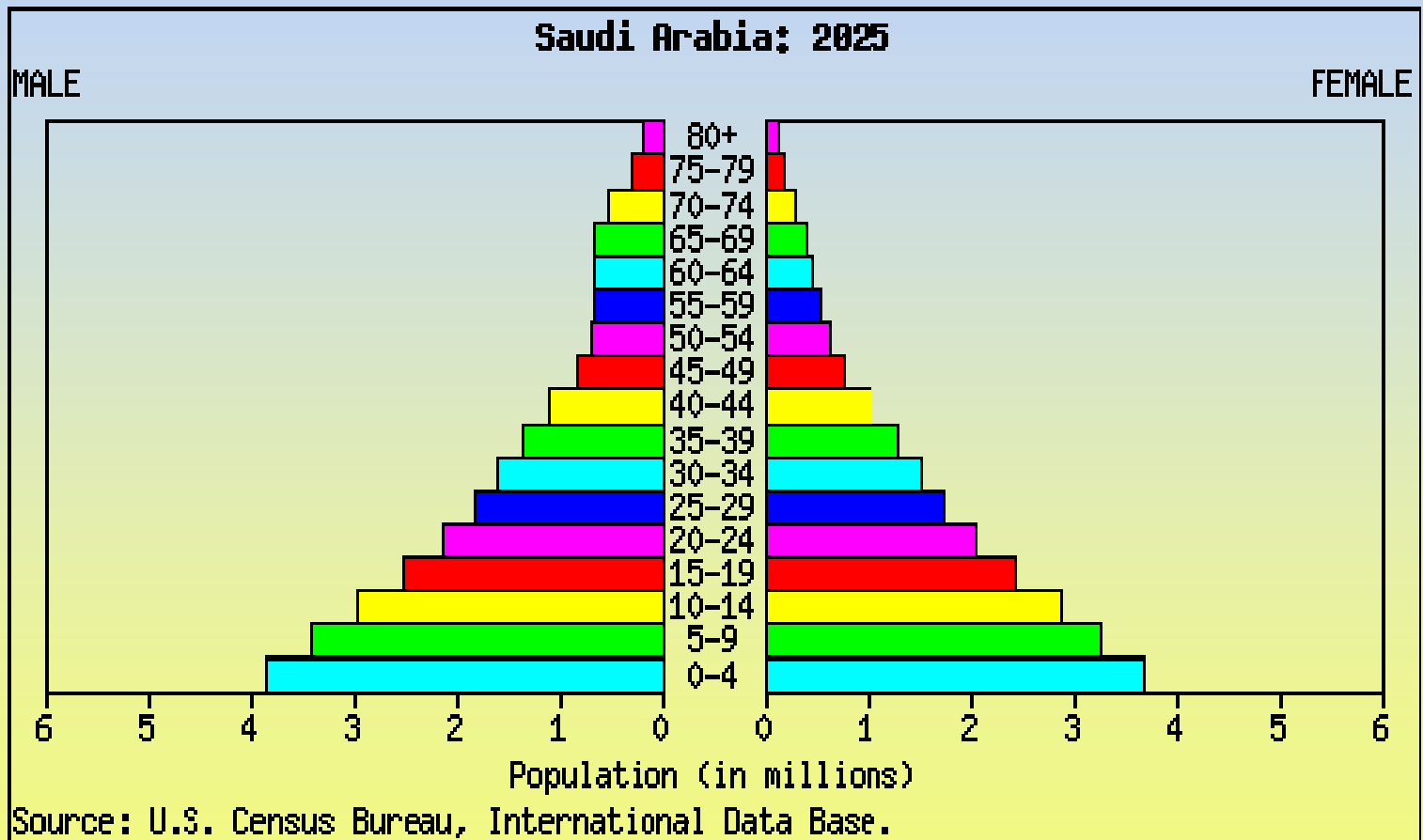
- Stability in Saudi Arabia will be a driving factor behind the future of oil price volatility.
- Current demographic trends will encourage Saudi Arabia to seek higher oil prices for domestic political reasons.
 - ◆ Per capita income has fallen since 1980 and is expected to continue.
 - ◆ The kingdom will need increasing amounts of money to meet basic social services.

Saudi Population 2000



Saudi population 2025

U.S. Census Bureau Projections



Persian Gulf

Demographics, Politics = Higher Prices

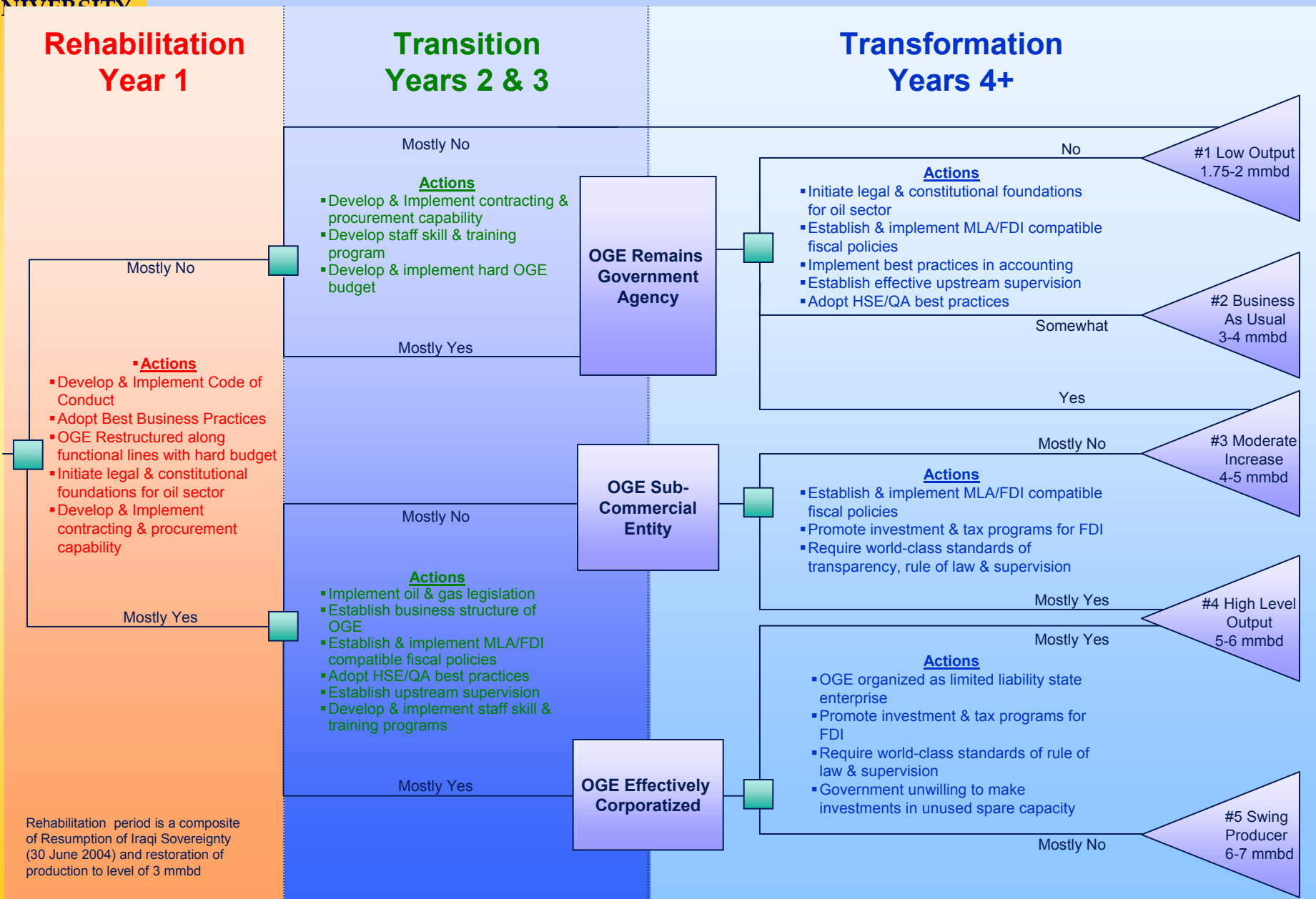
Saudi Arabia

- ◆ Populist pressures for higher prices
- ◆ Democratization won't necessarily lead to moderation in oil pricing policies
- ◆ Succession problems inside Saudi oil industry as well as inside Royal family
- ◆ Political reform may make capacity expansion more difficult to implement (ala Venezuela)

Iraq

- ◆ Populist pressures for higher prices
 - ◆ Democratization won't necessarily lead to moderation in oil pricing policies or privatization in oil sector
 - ◆ Political reform/transition may make capacity expansion more difficult to implement
-
- It can not be taken as given that Saudi or Iraqi oil production capacity will definitely cover long term demand growth. Political factors will play a critical role in determining the ability and willingness of Saudi Arabia and Iraq to meet rising demand.

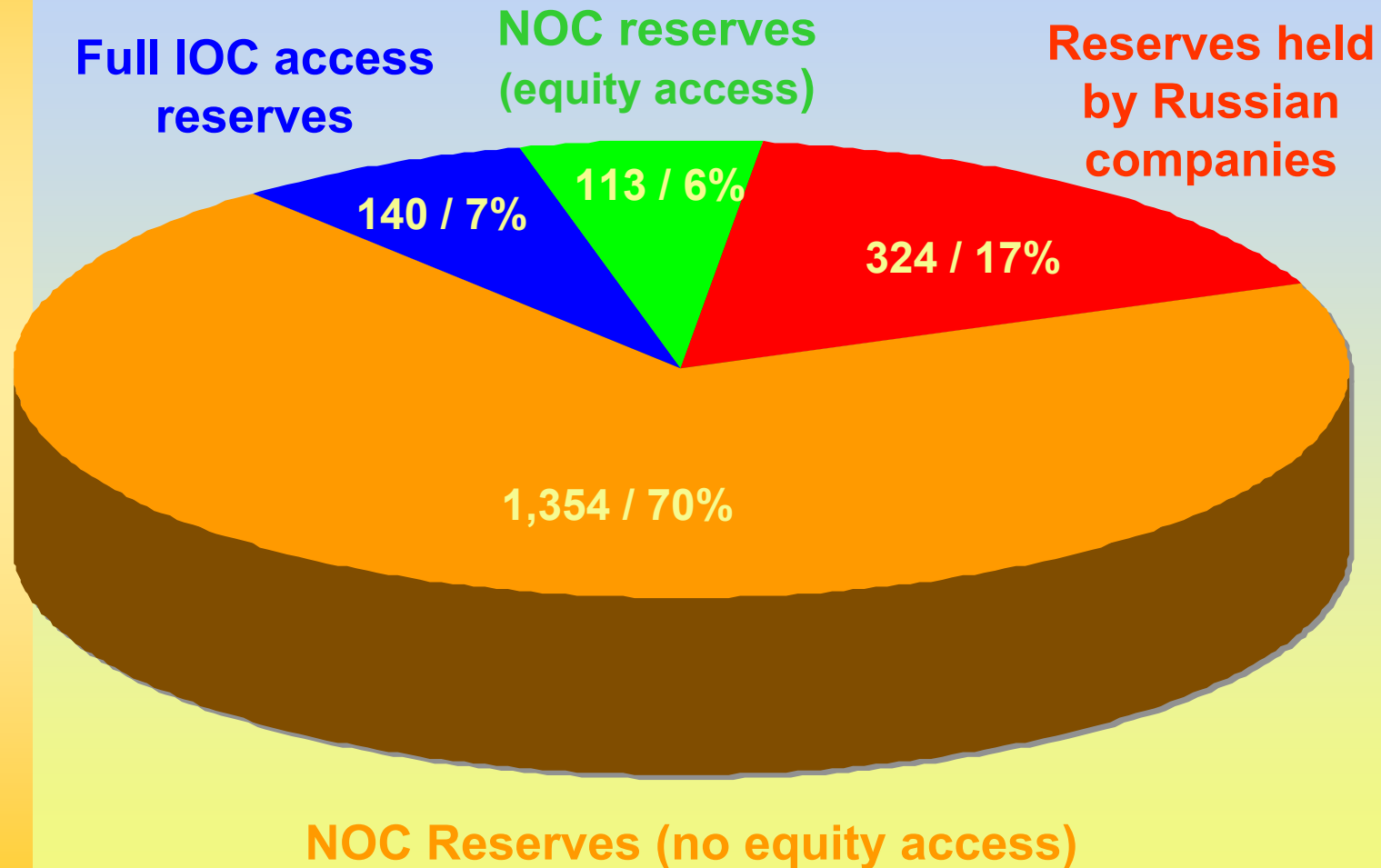
Figure 0.1: Iraqi Oil Regime Timeline and Scenario Analysis



Key Findings: The Energy Dimension In Russian Global Strategy

- Russia is entering a potentially historic moment of opportunity as a world energy superpower
- The potential for strong growth in oil production is real
 - ◆ Oil exports could rise by over 2 million b/d by 2008 based on known resources and existing cash flow
 - ◆ But increases would have to come mainly from production areas controlled by Lukoil, Yukos, TNK and Surgutneftegas
- Kremlin's plans to reorganize the industry could dampen level of increase by disrupting speedy implementation of plans to remove infrastructure constraints or by causing a slow down in capital expenditures and project development
- Russian oil production gains slowing, at 9 million b/d, up only 200,000 b/d from year ago levels

Access to Oil & Gas Reserves Constrained



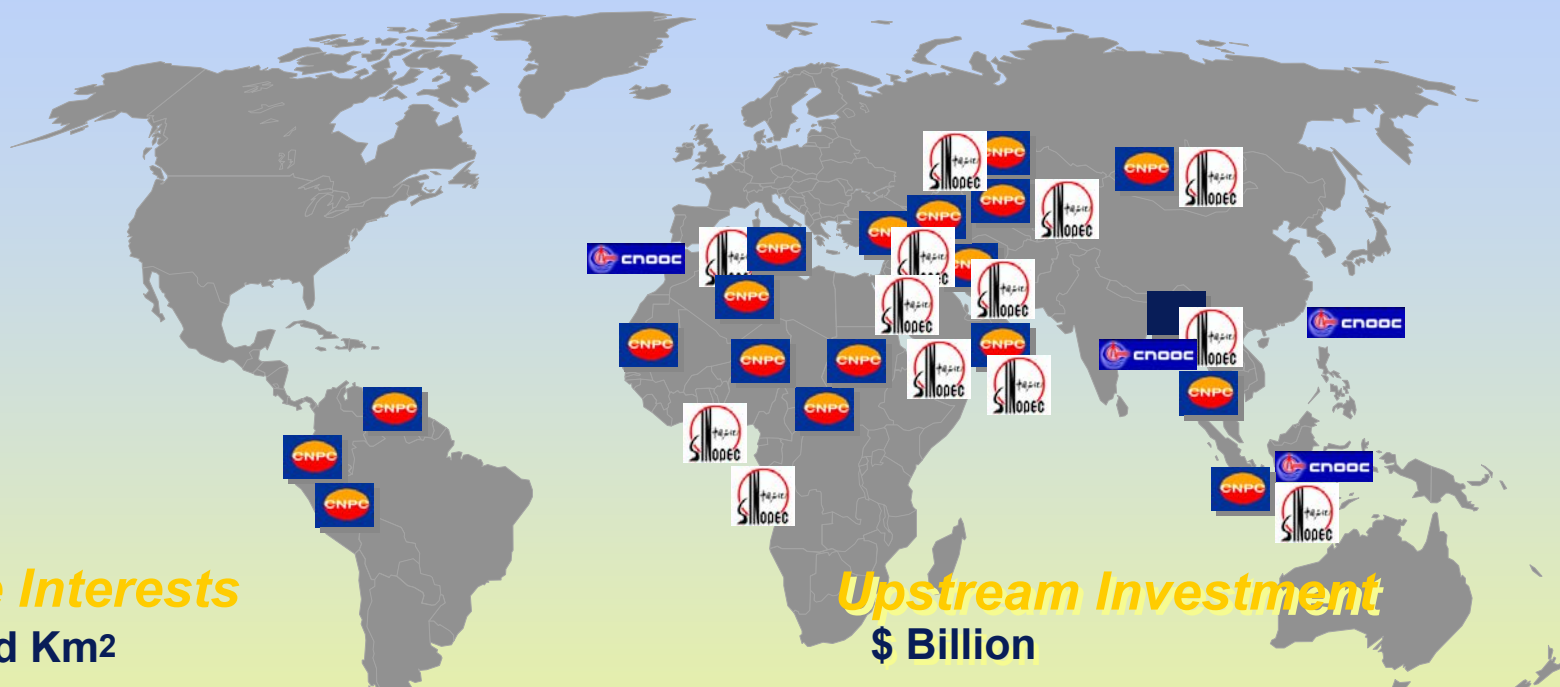
National Oil Companies

Dominating Key Assets:

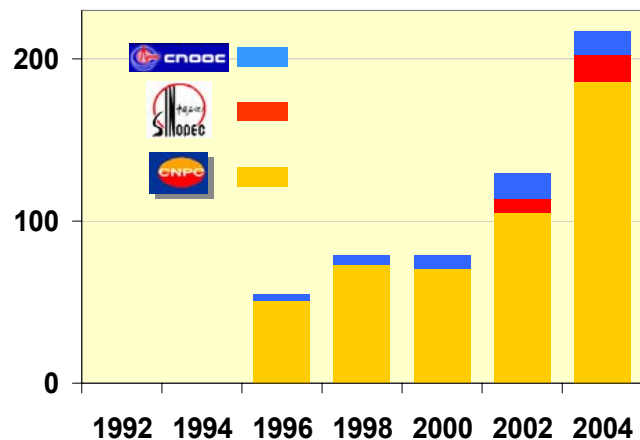
Increasingly Going International

PIW Rank	Company	Country	State-Ownership (%)	Reserves				Output				Ref. Capacity		Product Sales	
				Liquids (Mil.bbl)		Gas (Bcf)		Liquids (kb/d)		Gas (MMcf/d)		1,000 b/d		1,000 b/d	
				Rank	Vol.	Rank	Vol.	Rank	Vol.	Rank	Vol.	Rank	Vol.	Rank	Vol.
1	Saudi Aramco	Saudi Arabia	100	1	259,400	4	230,600	1	9,045	7	6,900	8	2,246	7	2,569
3	NIOC	Iran	100	2	125,800	2	940,900	2	3,852	6	7,640	14	1,524	10	1,618
4	PDV	Venezuela	100	5	77,800	6	148,000	5	2,500	12	4,000	4	3,085	8	2,500
10	Petro China	China	90	14	10,997	18	41,147	10	2,120	20	2,407	12	1,990	11	1,548
19	Lukoil	Russia	8	10	15,977	20	24,473	15	1,622	65	364	17	1,151	17	1,094
20	NNPC	Nigeria	100	8	21,153	10	105,836	8	2,166	46	677	36	445	40	306
21	Petronas	Malaysia	100	22	7,136	11	98,960	26	731	11	4,172	44	357	35	381
22	INOC	Iraq	100	3	115,000	9	110,000	17	1,330	75	239	32	588	32	440
24	Gazprom	Russia	73	11	13,561	1	988,400	49	221	1	52,244	59	178	55	100
25	Yukos	Russia	-	13	11,853	46	4,579	16	1,619	66	333	20	1,007	23	732
26	Sinopec	China	55	31	3,257	53	2,888	24	742	57	514	7	2,666	13	1,525
27	Statoil	Norway	84	42	1,789	29	13,886	25	740	24	1,921	43	365	29	548
28	Surgutneftgas	Russia	-	23	6,771	31	11,804	21	1,085	30	1,343	45	347	46	261
29	Rosneft	Russia	100	34	2,400	7	137,670	37	393	45	678	55	203	34	400
30	ONGC	India	95	30	3,711	26	16,309	33	557	19	2,486	61	139	54	133

Chinese National Oil Company Activities

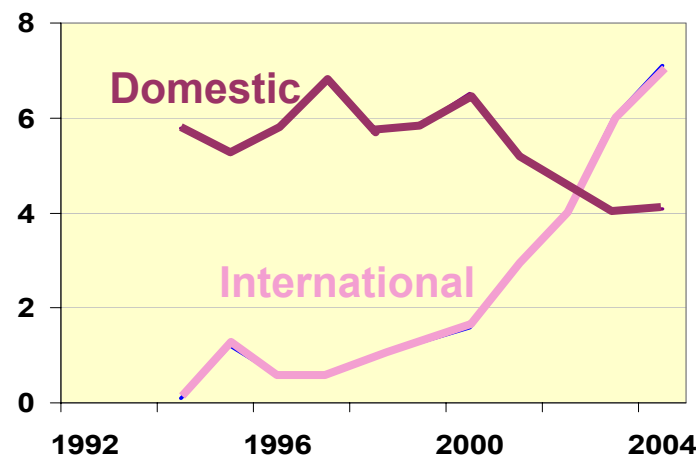


Acreage Interests
Thousand Km²



2004

Upstream Investment
\$ Billion



Unconventional oil and gas

- Oil shale and tar sands costs are falling
 - ◆ These sources could become more important if political stability in the Middle East deteriorates; Canadian unconventional production up 220,000 b/d this year
- Rapid growth in coal bed methane in the last decade
 - ◆ In 2001, about 40 Bcf of the 134 Bcf of methane liberated from underground mines was recovered, compared with 13.8 Bcf recovered in 1990
- Gas to liquids finding its time; Qatar plans to produce 400,000 b/d by 2012
- Coal may also provide substitutes for gas and oil

Technologies on the Horizon

Should governments finance Energy R&D and subsidize technology?

Energy Efficiency: Important immediate strategy but can't fully eliminate long term CO₂ problems

- NEEDED: Breakthrough technologies- Nano-science to play a key role: Electricity, storage, transport
- Handling CO₂ if it can't be eliminated: Carbon Sequestration

One World Energy Scheme for 30-60TW in 2050: The Distributed Store-Gen Grid

- Energy transported as **electrical energy** over wire, rather than by transport of mass (coal, oil, gas)
- Vast electrical power grid on continental scale interconnecting ~ 100 million asynchronous “local” storage and generation sites, entire system continually innovated by free enterprise
- “Local” = house, block, community, business, town, ...
- **Local storage** = batteries, flywheels, hydrogen, etc.
- **Local generation** = reverse of local storage + local solar and geo
- Local “buy low, sell high” to electrical power grid
- Local optimization of days of storage capacity, quality of local power
- **Electrical grid does not need to be very reliable, but it will be robust**
- Mass Primary Power input to grid via HV DC transmission lines from existing plants plus remote (up to 2000 mile) sources on TW scale, including vast solar farms in deserts, wind, NIMBY nuclear, clean coal, stranded gas, wave, hydro, space-based solar... “**EVERYBODY PLAYS**”
- **Hydrogen is transportation fuel**