

# **THE PEAKING OF WORLD OIL PRODUCTION: IMPLICATIONS, OPPORTUNITIES & PITFALLS**

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# BACKGROUND


- **Who are we?**
  - Scientist/engineer & economist
  - Analyzing peak oil for over 5 years
  - Both with 35 years+ experience in energy in industry, government, & academia
  - No political agenda & nonpartisan
  - Independent consultants, with no conflict of interest
  - Extensively involved in National Academies energy studies
- **Why is peak oil important?**
  - Either occurring now or will soon
  - Economic consequences will be extreme & long lasting
- **Why should you care now?**
  - The issue is brewing & could burst into the public at any time
  - Candidates not prepared and / or wrong could be hurt

# VARIOUS REALITIES

- **Climate change mitigation is front & center now, but peak oil is percolating up**
  - + Growing numbers of items in the media
  - + Recognized in the Administration
  - + Growing interest on Wall Street
  - + Google Peak Oil -- 4 million items
- **When peak oil hits the public consciousness, a duplication of the 1973 & 1979 oil shocks is likely:**
  - + Public panic
  - + Rush for supplies, leading to instant shortages
  - + Major negative reactions on Wall Street
  - + Recession, unemployment, inflation, etc.
  - + Technological realities will come into sharp public focus

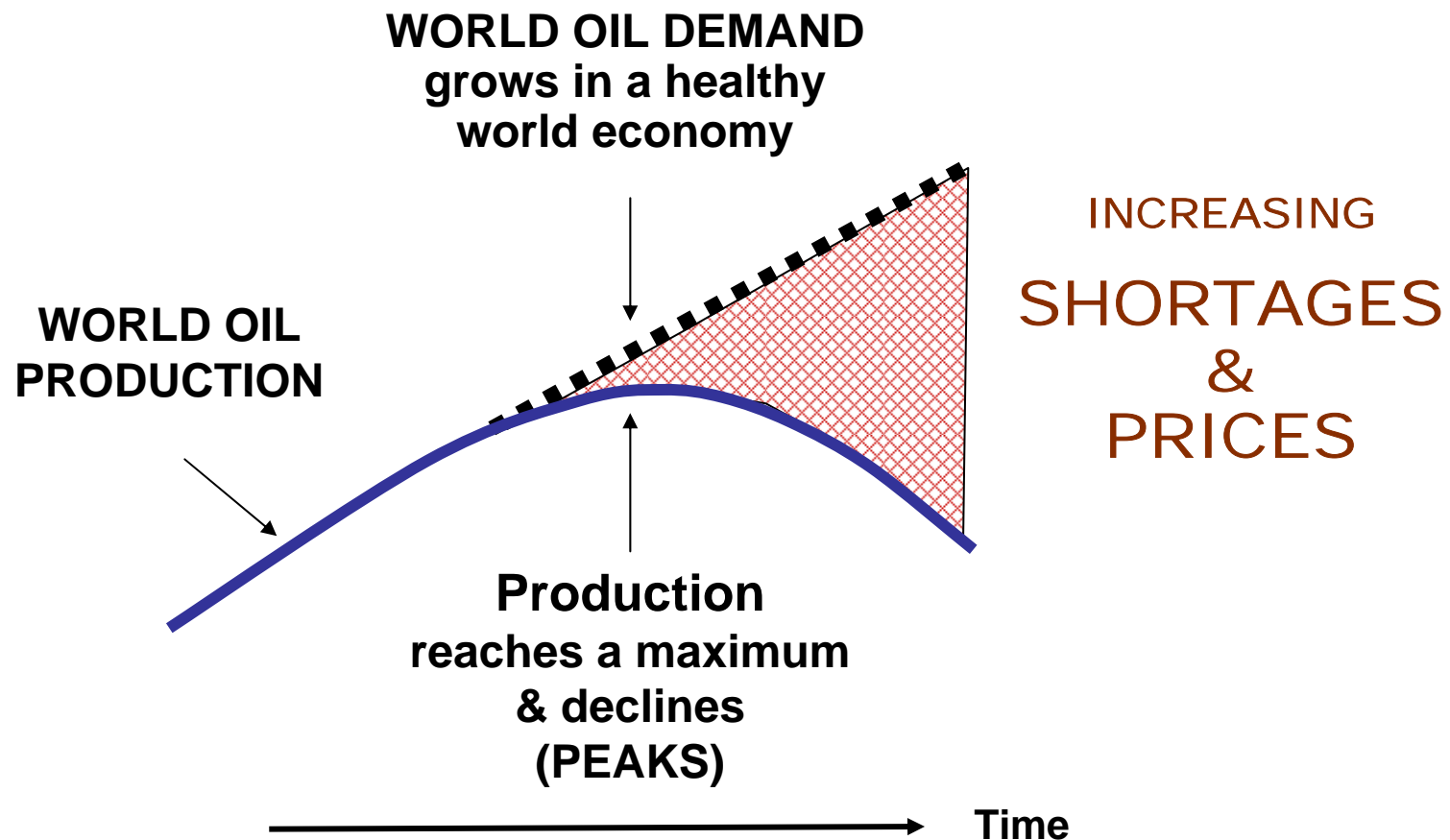
**No quick fixes**

# THIS PRESENTATION

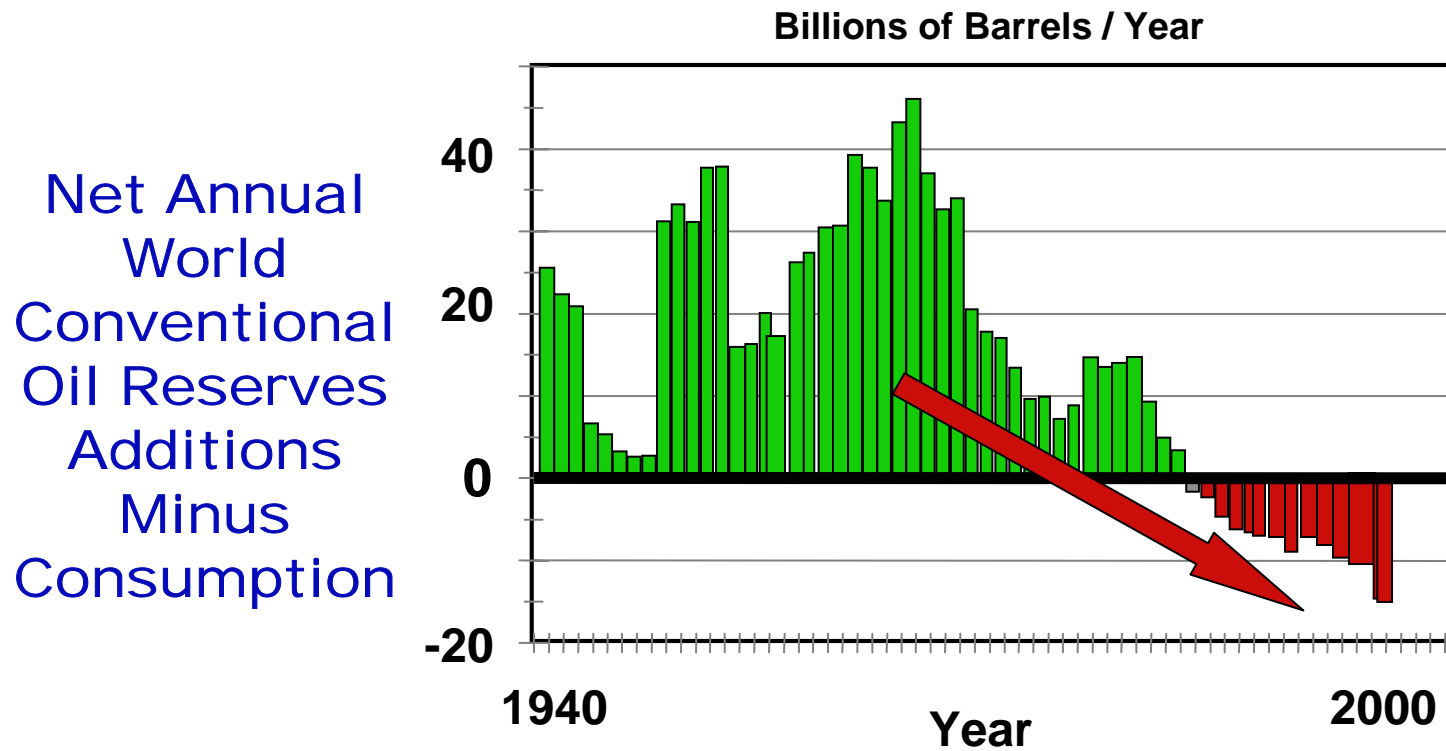
- **About peaking** 
- **Timing**
- **Some perspectives**
- **Mitigation options that could work & others that will not**

# PEAKING: SUPPLY FALLS SHORT OF DEMAND

(Notional)

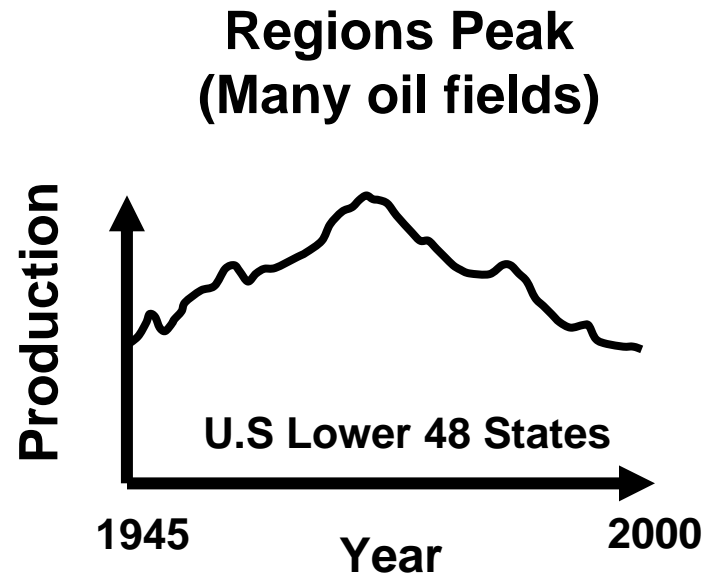
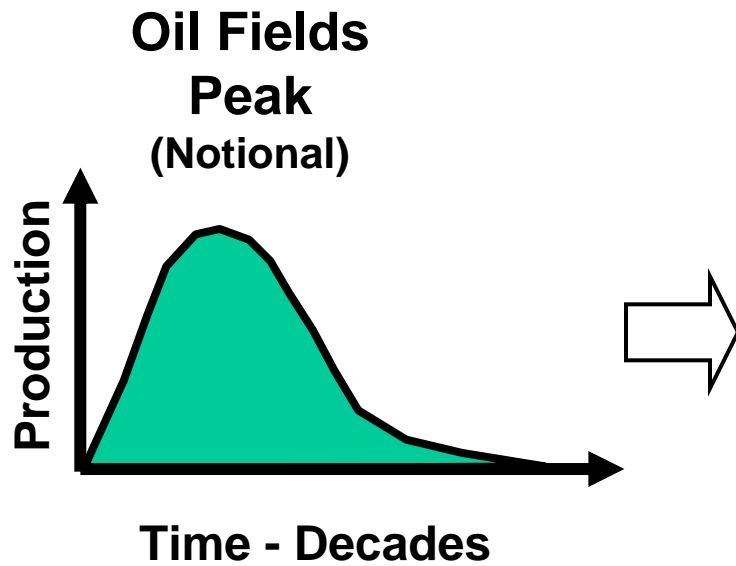


# THE WORLD HAS BEEN CONSUMING MUCH MORE OIL THAN IT HAS BEEN FINDING.



**Peak production lies ahead.**

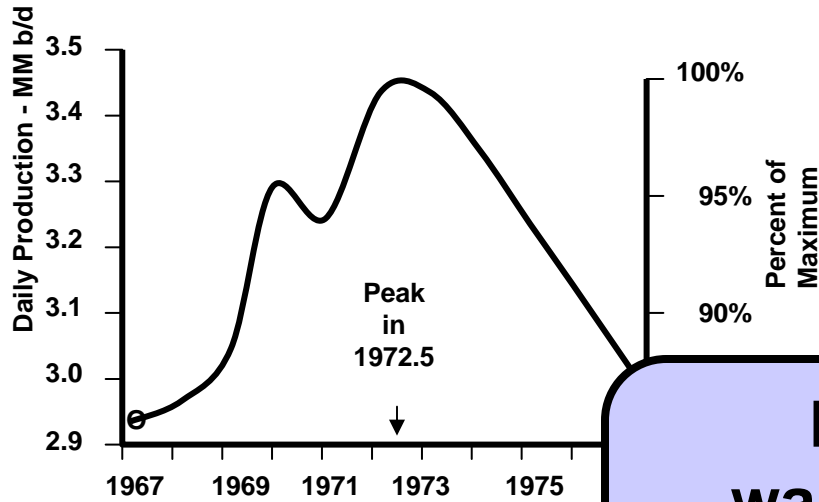
# PEAKING IS NATURAL



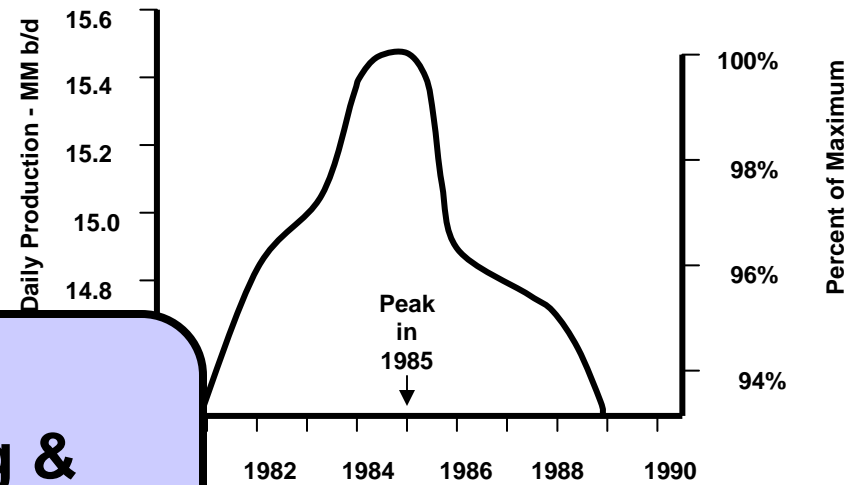
**The world  
will peak  
(All regions)**

# EXAMPLES OF OIL PEAKING

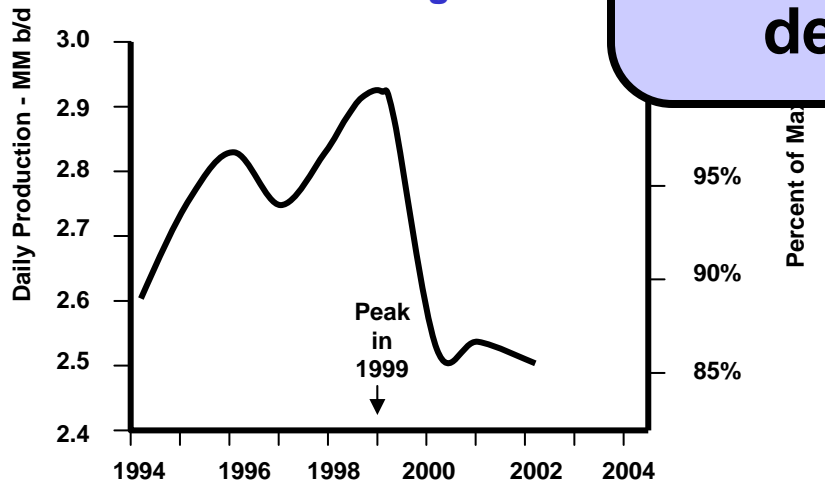
## Texas



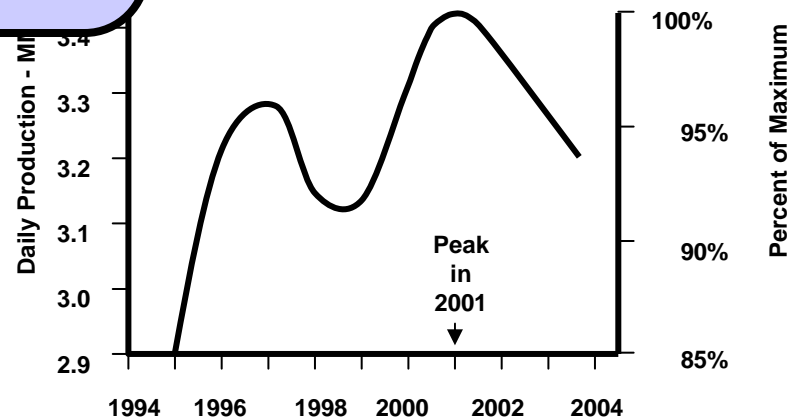
## North America



## United Kingdom



## Norway



**Little warning & rapid declines**

# ROYAL SWEDISH ACADEMY OF SCIENCES

14 October 2005

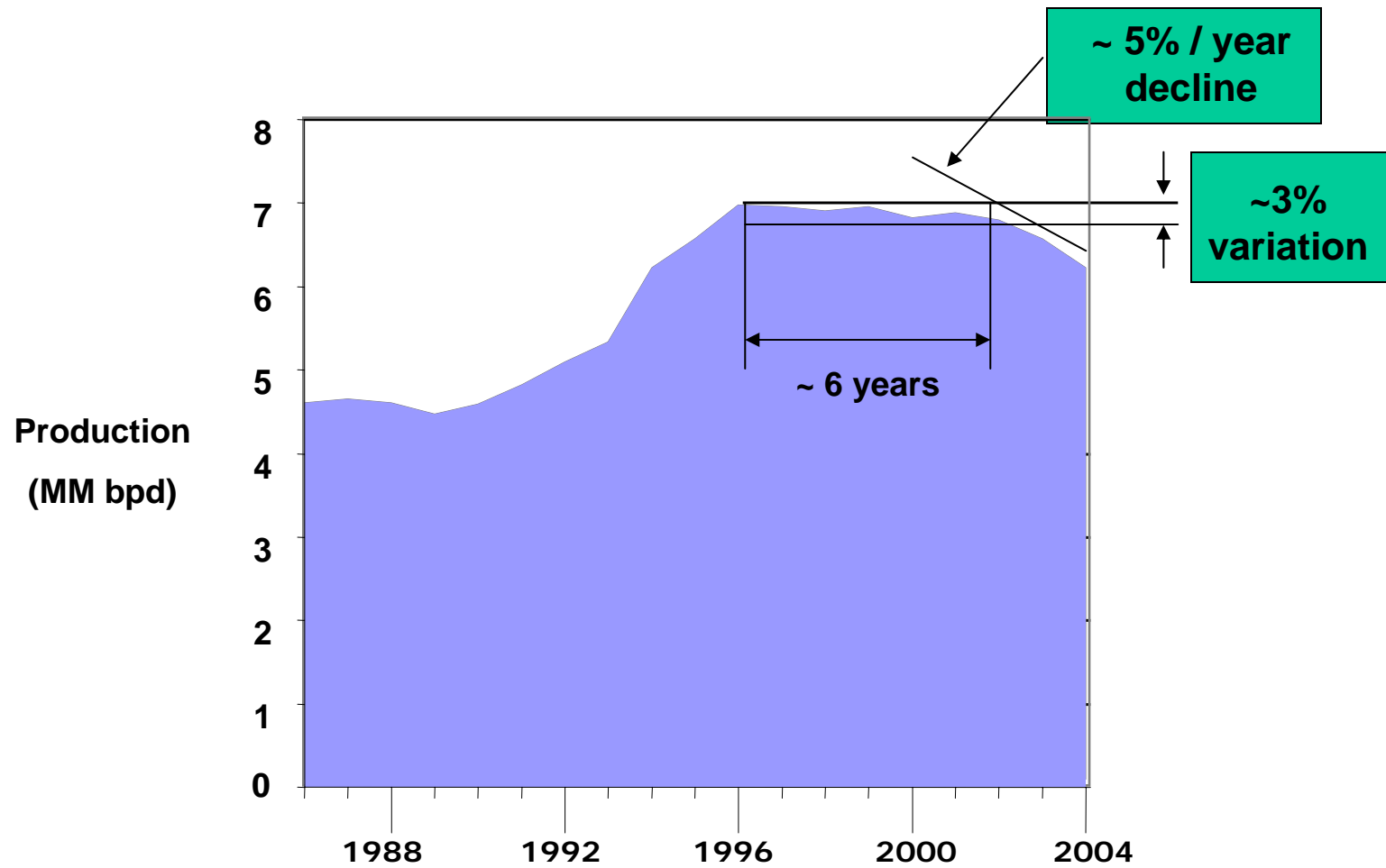
**54 of the 65**

**most important oil-producing countries have declining production (past peak)...**

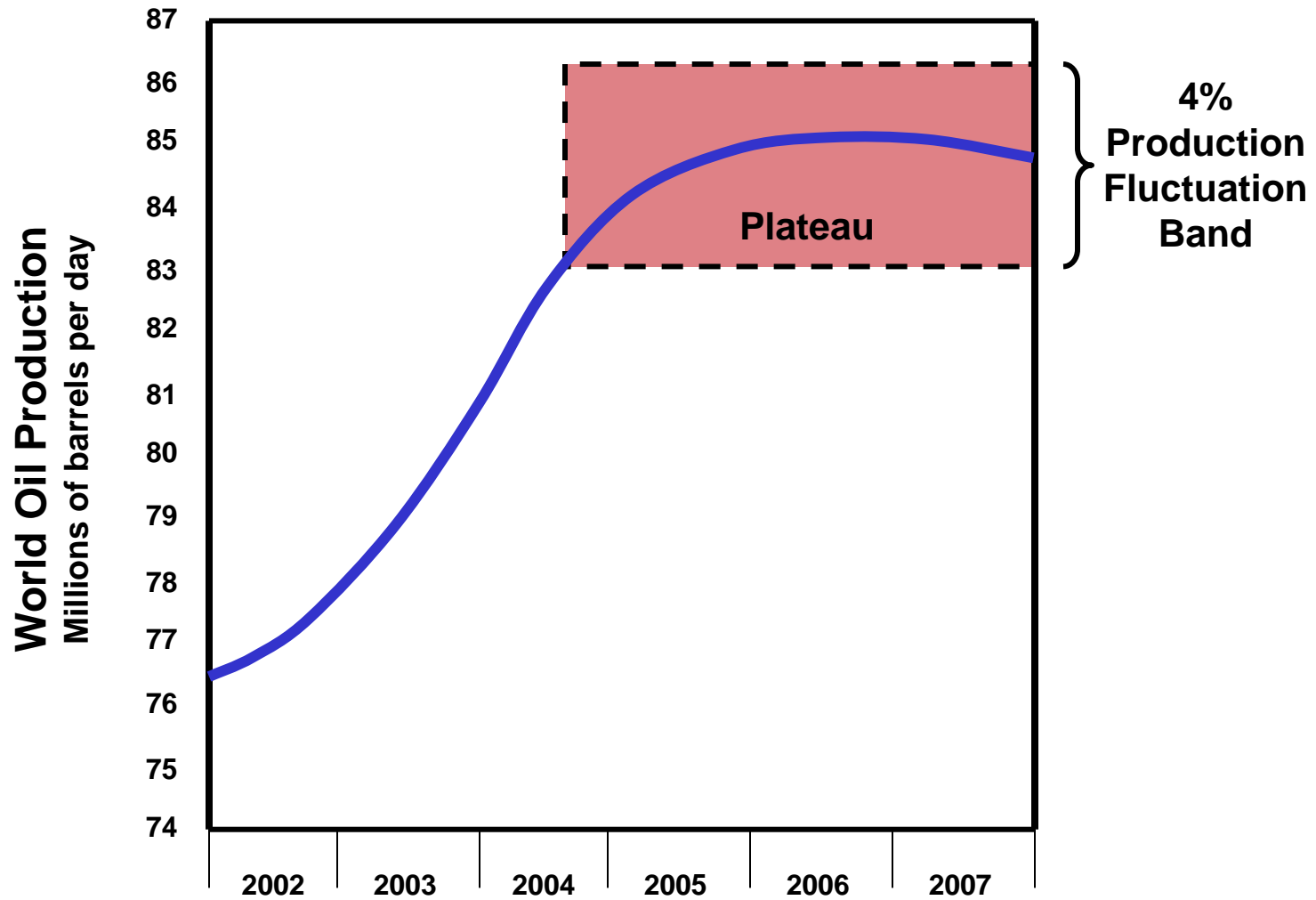
**(The) rate of discoveries of new reserves is less than a third of the present rate of consumption (in the world).**

# LEVEL PRODUCTION IS POSSIBLE FOR A WHILE

European Oil Production  
(Plateau, then decline)



# WORLD LIQUID FUEL PRODUCTION



# HOW MIGHT OIL SHORTAGES IMPACT?

- The **1973 & 1979 BRIEF** oil interruptions caused....

+ Inflation

+ Unemployment

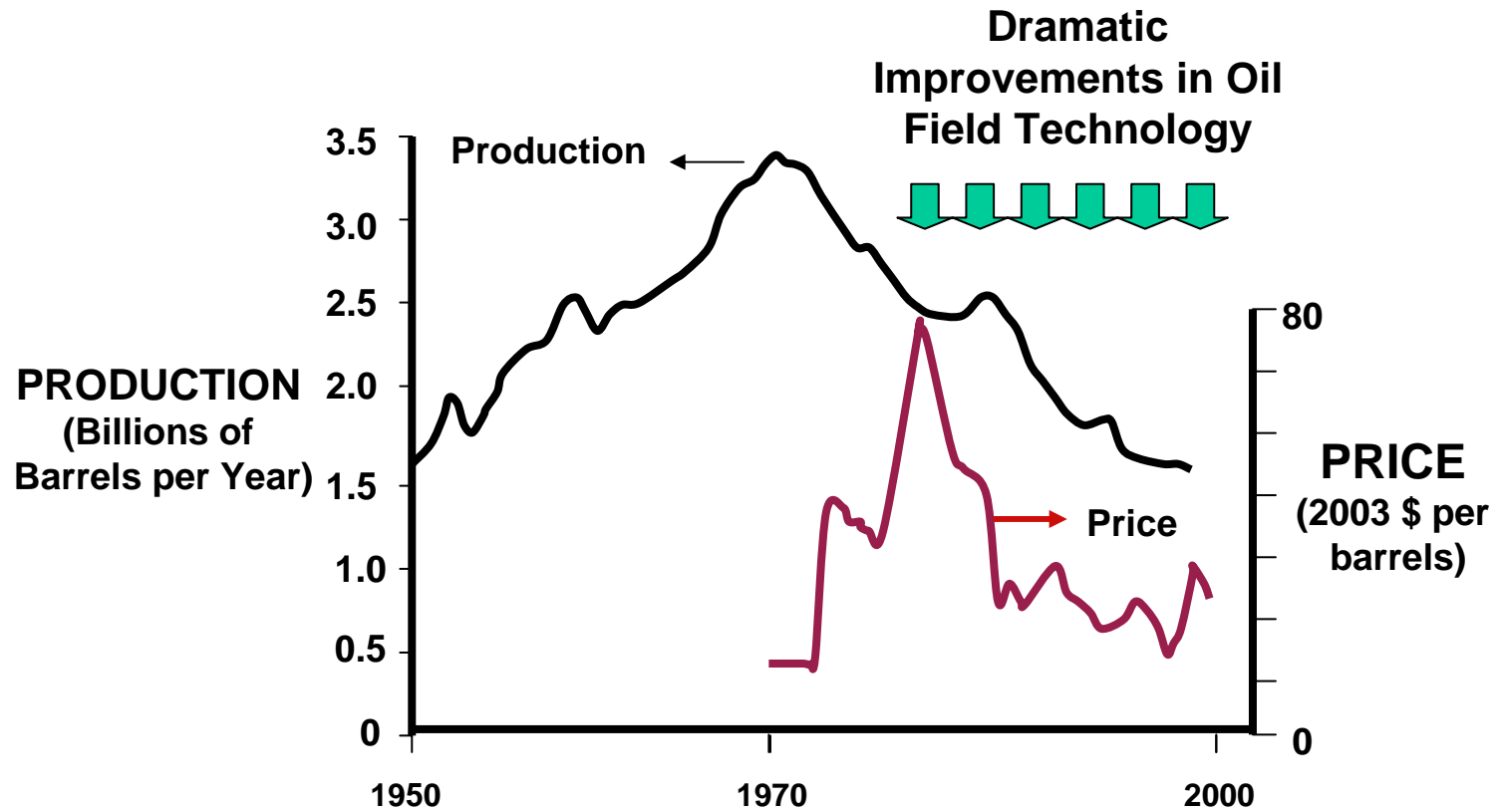
+ Recession

+ High interest rates

World oil peaking won't be BRIEF.

# TECHNOLOGY & PRICE WILL NOT SAVE US

## U.S. Lower 48 States

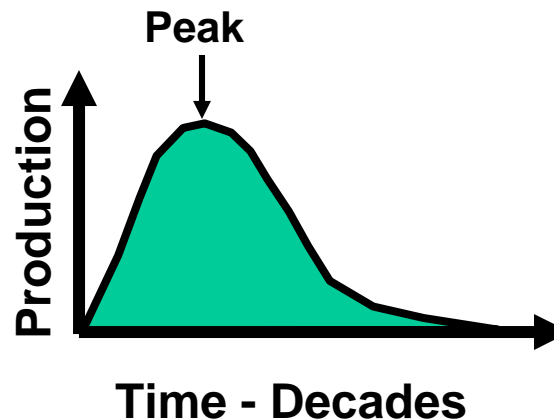


**Trends were not reversed.**


# THE PROBLEM

It's **Liquids Supply**,  
not simply "energy."

Peaking is **maximum production**.  
It's not running out.



# THIS PRESENTATION

- About peaking
- Timing 
- Some perspectives
- Mitigation options that could work & others that will not

# WORLD MAXIMUM OIL PRODUCTION FORECASTS

	• <b>Pickens, T. Boone</b> (Oil & gas investor).....	2005	} ~ Now
	• <b>Deffeyes, K.</b> (Retired professor & retired Shell).....	2005	
	• <b>Westervelt, E.T. et al.</b> (US Army Corps of Engrs).....	At hand	
	• <b>Bakhtiari, S.</b> (Iranian National Oil Co. planner).....	Now	
	• <b>Simmons, M.</b> (Oil expert & businessman).....	Very soon	
	• <b>Bentley, R.</b> (University energy analyst).....	Around 2010	} 5 years
	• <b>Campbell, C.</b> (Retired oil company geologist).....	2010-2011	
	• <b>Skrebowski, C.</b> (Editor of Petroleum Review).....	2010-2011	
	• <b>Pang, X</b> (China Petroleum Univ.).....	Around 2012	
	• <b>Meling, L.M.</b> (Statoil oil company geologist).....	A challenge around 2011	
	• <b>Volvo Trucks</b> .....	Within a decade	} 8-13 years
	• <b>de Margerie, C.</b> (Oil company executive) .....	Within a decade	
	• <b>Husseini, S.</b> (Retired Saudi Aramco).....	2015	
	• <b>Merrill Lynch</b> (Brokerage / Financial).....	Around 2015	
	• <b>West, J.R., PFC Energy</b> (Consultants).....	2015-2020	
	• <b>Maxwell, C.T., Weeden &amp; Co.</b> (Brokerage)..	Around 2020 or earlier	
	• <b>Wood Mackenzie</b> (Energy consulting).....	Tight balance by 2020	
	• <b>ExxonMobil</b> (Oil company).....	No sign of peaking	} 20+ years
	• <b>CERA</b> (Energy consulting).....	After 2030	
	• <b>EIA</b> .....	After 2030	
	• <b>International Energy Agency</b> .....	After 2030	

## **PRESIDENT BUSH:**

**"If they [Saudi Arabia] don't have a lot of additional oil to put on the market, it is hard to ask somebody to do something they may not be able to do."**

January 15, 2008. ABC's Nightline.

**Does the Bush Administration understand peak oil?  
Bodman to NPC says "yes." Will peak oil then emerge in  
the presidential campaign?**

# WARNINGS ON PEAK OIL


## EU:

- Oil crisis of the 1970s presented a discrepancy between oil supply and demand of only 5%.
- In a post-peak oil scenario, gap could widen by 4% annually, leading to a 20% gap within five years.

## IEA:

“This energy future (WEO 2006) is not only unsustainable, it is doomed to failure [because of] underinvestment in basic energy infrastructure... In short, we are on course for an energy system that will evolve from crisis to crisis.” Claude Mandil, IEA Executive Director.

# THIS PRESENTATION

- About peaking
- Timing
- Some perspectives 
- Mitigation options that could work & others that will not

# JUST ANOTHER “ENERGY CRISIS”?.....NO!

- **It’s liquid fuels, not “energy.”**
- Oil is the lifeblood of the modern world. It fuels over 95% of transportation.
- The transportation sector worldwide is huge, expensive & has a long lifetime. It cannot be replaced quickly.
- For some forms of transportation (e.g., airplanes, heavy trucks) there is no substitute for liquid fuels.
- There will be no quick fixes for this problem, on either the demand side or the supply side.

# CAN'T WE MUDDLE THROUGH?... NO!

- The scale of the problem is enormous & transitioning will be unlike any yet faced by modern industrial society.
- Previous energy transitions, from wood to coal and from coal to oil, were gradual and evolutionary.
- Major compromises will be required.
- The shock factor will take a significant & lasting toll, along with growing world oil shortages & growing GDP declines.

# THE TWO SHORTAGES IN THE 1970s CREATED STAGFLATION & RECESSION



**Those were short-term  
disruptions.**



## **WON'T THERE BE PLENTY OF TIME TO ADDRESS THE PROBLEM?.....NO!**

- The immensity of the problem & the expected decline rate means that the problem will run away from us.
- Our crash program mitigation analysis (DOE) indicated that we are probably too late now to avoid misery.
- Viable mitigation options exist., but they're not what many people think.
- The market has not started to address the problem & may not until the last minute.

# THE HUGE SIZE OF U.S. TRANSPORTATION FLEETS ILLUSTRATES THE SIZE OF THE MITIGATION PROBLEM

Fleet	Size	Median Lifetime (Years)	Cost to Replace Half the Fleet (2006 \$)
Automobiles	140 million	17	\$1.6 trillion
Light Trucks, SUVs, etc.	90 million	16	\$1.3 trillion
Heavy Trucks, Buses, etc.	7.5 million	28	\$1.7 trillion
Aircraft	8,500	22	\$0.3 trillion

# TRANSPORTATION EQUIPMENT CHANGES

Efficiency improvements possible:

Large in some fleets, smaller in others,

but

**Change is slow & expensive.**

**Fuel must be provided for existing fleets.**

# THIS PRESENTATION

- About peaking
- Timing
- The Character of the Problem
- Mitigation options that could work & others that will not ←

# OPTIONS OF LITTLE SHORT TERM VALUE

<u>Option</u>	<u>Reasoning</u>
- Nuclear	} ..... <b><u>ELECTRIC / NOT LIQUID FUELS</u></b>
- Wind	
- Solar	
- Hydrogen.....	Neither ready nor economic
- Biomass.....	Not economic
- Shale Oil.....	Not commercial

# MITIGATION OPTIONS VIABLE NOW

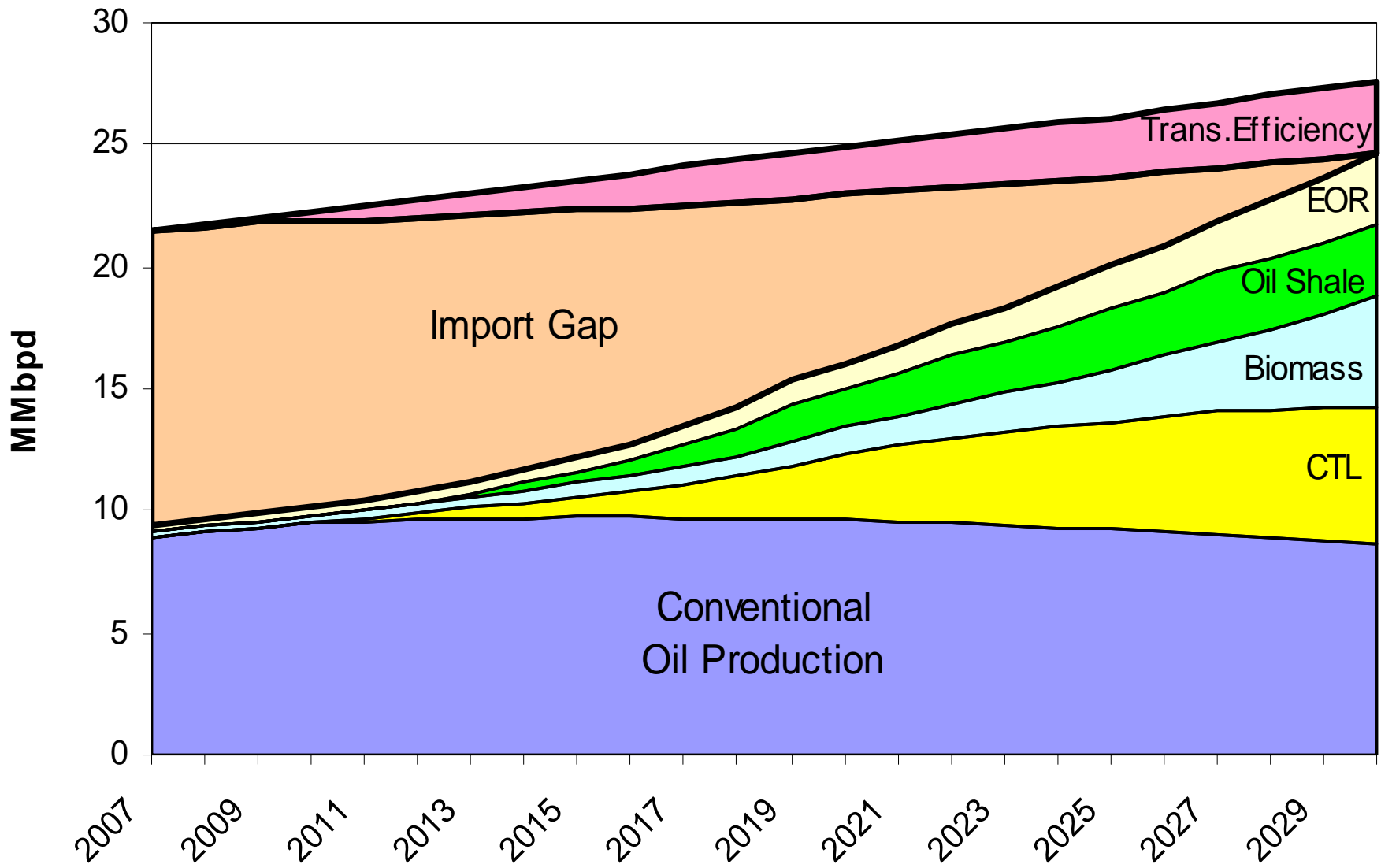
**Implementation** is critical in the near-term (10-30 years)

- **Vehicle Fuel Efficiency**
- **Gas-To-Liquids (GTL)**
- **Heavy Oil / Oil Sands**
- **Coal Liquefaction**
- **Enhanced Oil Recovery (EOR)**

Used in our 2005 DOE crash program mitigation study.

# A PATH FOR THE U.S. ?

(Southern States Energy Board)



# OF U.S. RENEWABLES ONLY CELLULOSIC BIOFUELS MIGHT HELP

- Potential of corn-based ethanol is not energy efficient & created the food versus fuel problem.
- Cellulosic ethanol is more complex, difficult, & expensive than corn-based ethanol.
- Industrial cellulosic ethanol technology does not exist.
- **BEWARE PROMISES VS REALITY -- REMEMBER CORN ETHANOL**



# WHERE PEOPLE & ORGANIZATIONS STAND ON PEAK OIL

## **Those who are sounding the warning:**

IEA, Chevron, Shell, Jim Schlesinger, Boone Pickens, Matt Simmons, the Corps of Engineers, Total Oil, Volvo Trucks, the Chinese, Statoil, 13D Research, and a number of retired oil company geologists.

## **Who who deny an imminent problem:**

OPEC, DOE EIA, CERA, ExxonMobil, and fewer and fewer others.

# GOVERNMENT INTERVENTION REQUIRED

- Economic & social implications of oil peaking would otherwise be much more chaotic.
- **The 1970s and 1980s experience offer important guides** as to government actions that are desirable & undesirable.
- **Leadership will be critical.**
- Burden of mitigation will fall on industry.
- Governments will have to provide support, incentives, and facilitation.

# SUMMARY

- The peak oil problem will overshadow all others.
- Peaking may be happening now; if not, then “soon.”
- Successful mitigation will require time because of the magnitude of the problem.
- **There will be no quick fixes.**
- **Presidential candidates must be prepared to respond or risk being blindsided.**



**1973 & 1979 --Think about it!**