

# Competition and the New Landscape

*Opening Plenary Session*

## Speakers

*Michelle Foss, Univ. of Texas at Austin*

*Jacques Beaudry-Losique, US DOE*

*Aamir Farid, Shell Deer Park Refinery*

*Terry Welch, Dow Chemical Co.*

## Moderator

*John C. Chen, AIChE President*

**Texas Technology Showcase**

**Galveston, TX**

**December 6, 2006**

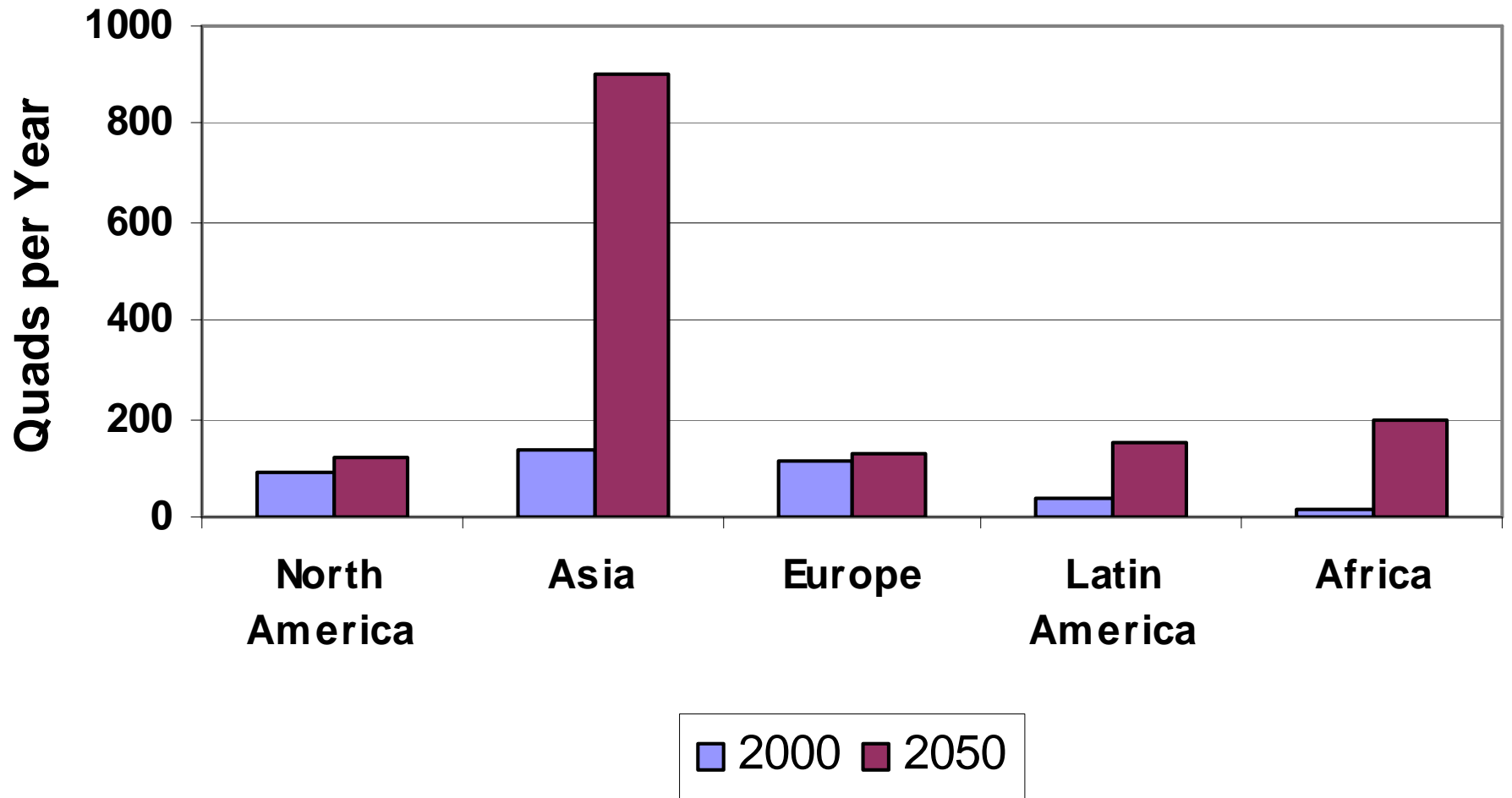
# The New Landscape

*Overarching Societal Challenge for the Century ---*

**Ensure sufficient energy for the world,  
with concomitant  
to environmental sustainability**

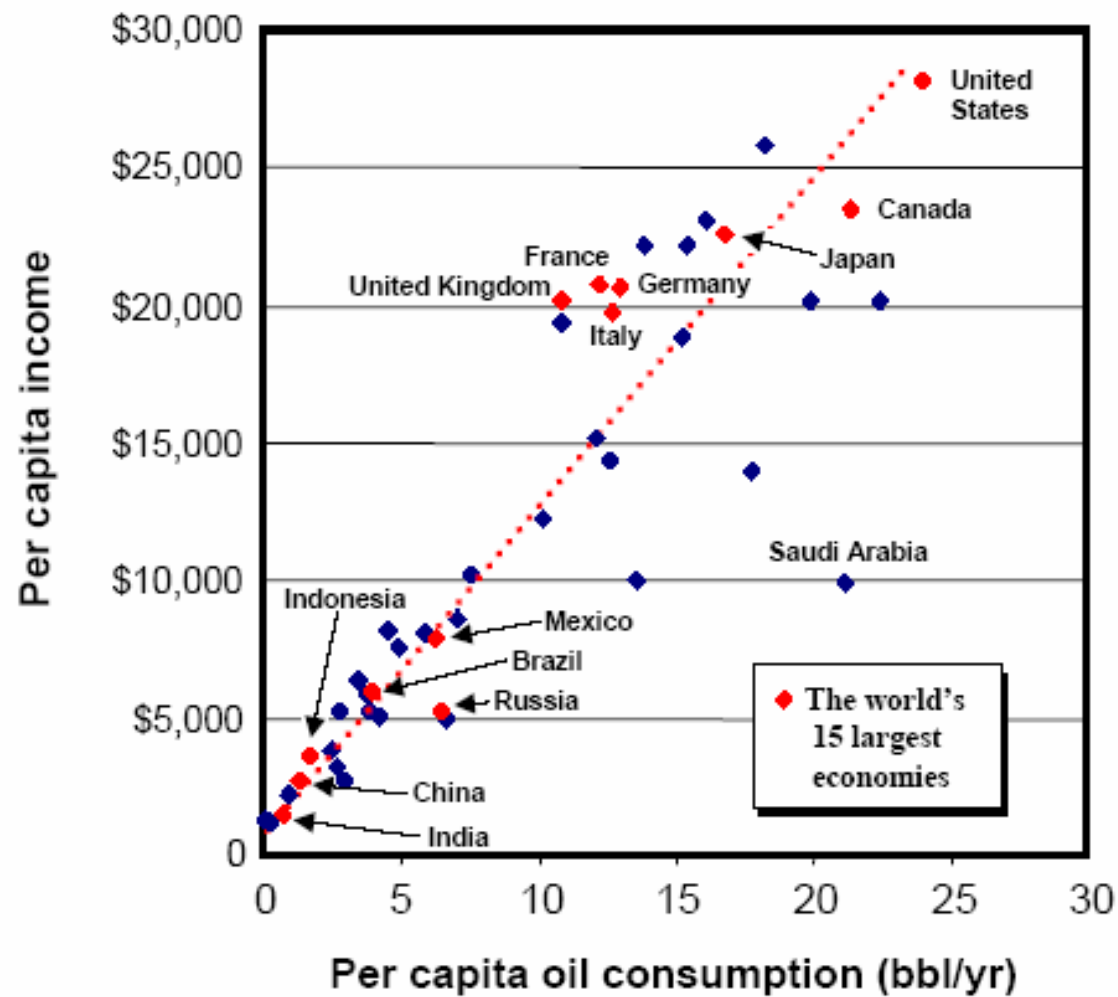
# World's Energy Need

Q/Yr: 2000    2050  
          385        1500



1 Quad =  $10^{15}$  BTU

# Energy Consumption as an Indicator of the Wealth of Nations



# Life Expectancy of Recoverable Fossil Fuel Reserves

(At 2006 prices)

## Years of Reserve Life

@ Current Rate

@ Projected Rate

<b>Oil</b>	<b>30-50</b>	<b>20-40</b>
<b>Natural Gas</b>	<b>50-70</b>	<b>40-50</b>
<b>Coal</b>	<b>400-450</b>	<b>90-?</b>
<b>Oil Shale</b>		<b>(30-60)</b>
<b>Tar Sands</b>		<b>(40-80)</b>

# Some Key Features

## Scope

**Consider just transportation energy:**

**Currently 1/3 of 385 Q/Yr = 128 Q/yr**

**Target 1/10 of 1500 Q/Yr in 2050**

**Carbon conversion required =  $150 \times 2 \times 10^7$  T/Yr  
=  $3 \times 10^9$  T/Yr carbon**

**Current carbon processing in CPI =  $1.1 \times 10^8$  T/Yr**

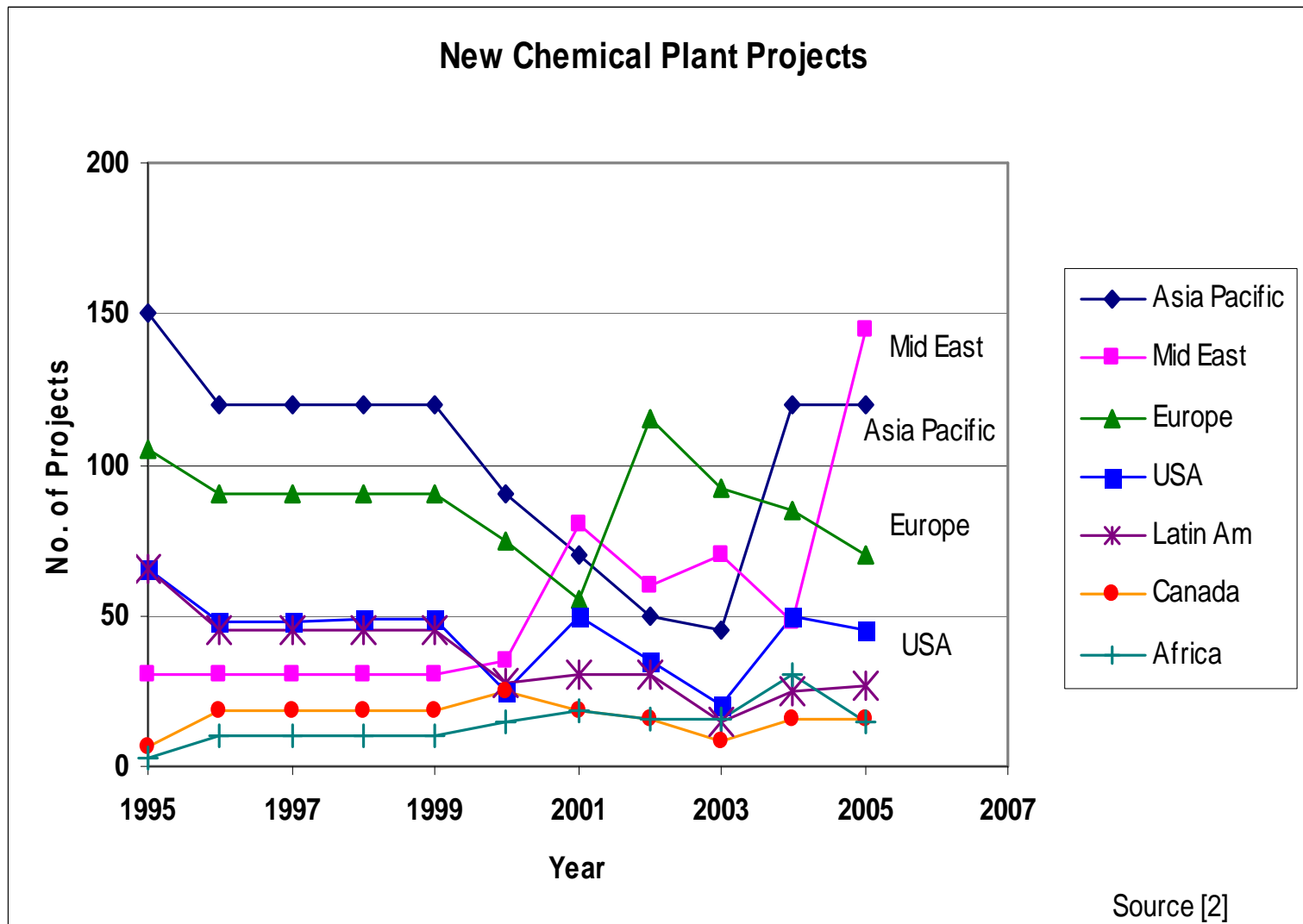
**Additional chemical infrastructure required:**

$$3e9 / 1.1e8 = 29X$$

**29 times current CPI -- a huge undertaking!**

# Globalization

Consider location of new petrochemical plants:



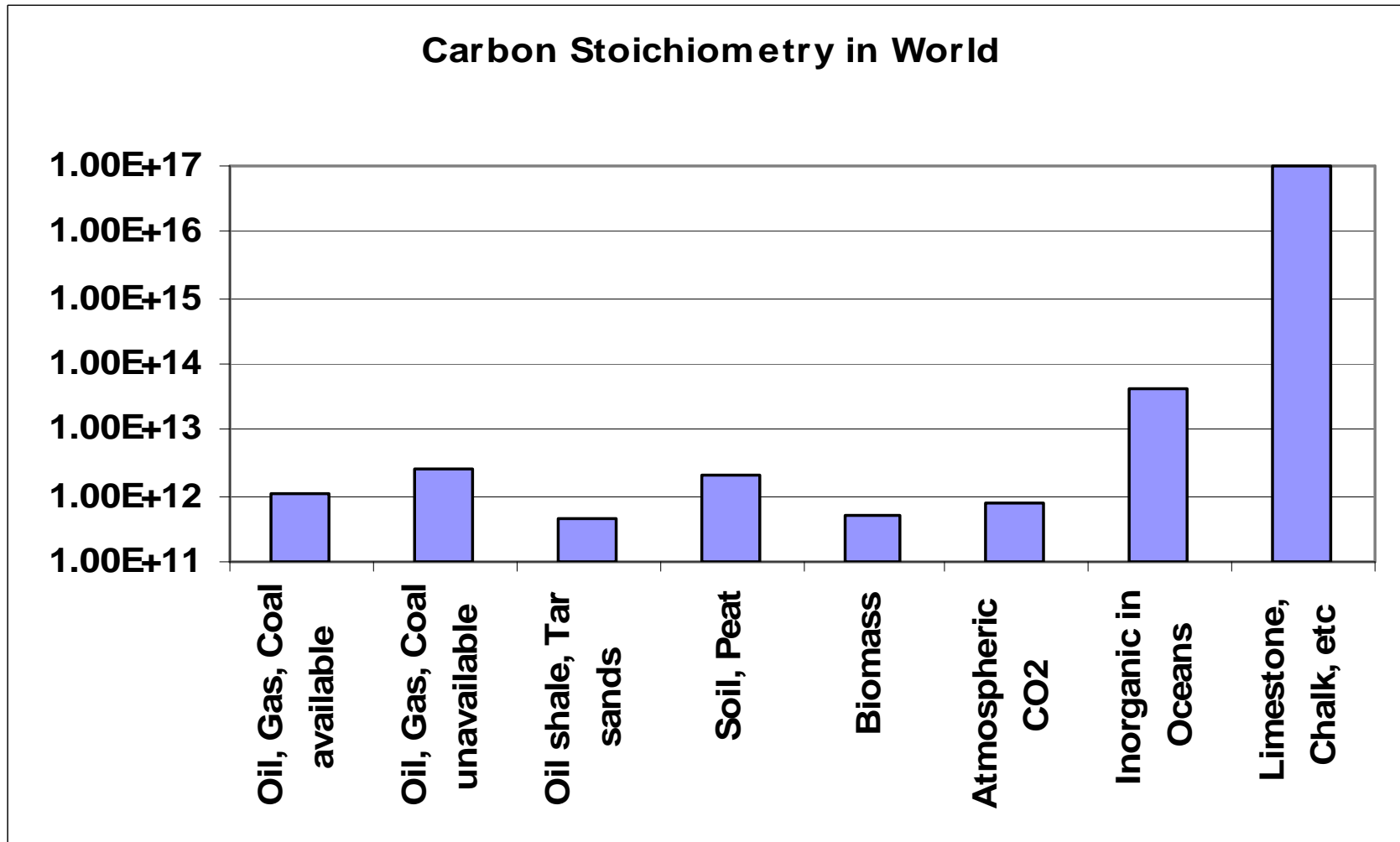
# Chemical Plant Projects 2005 vs. Avg of 2000-02

	<u>Change</u>
<b>Middle East</b>	<b>149%</b>
<b>Asia Pacific</b>	<b>71%</b>
<b>USA</b>	<b>23%</b>
<b>Latin America</b>	<b>- 8%</b>
<b>Africa</b>	<b>- 8%</b>
<b>Europe</b>	<b>- 14%</b>
<b>Canada</b>	<b>- 18%</b>



# Sustainability

Consider Carbon stoichiometry:



## **Issues and Questions**

- **Energy Supply and Use**
- **Environmental Sustainability**
- **Globalization**
- **Competitiveness**

**Our panel will address these from national, regional, and industrial perspectives.**