STRATEGY, FORECASTING AND FUTURE CAPITAL INVESTMENT

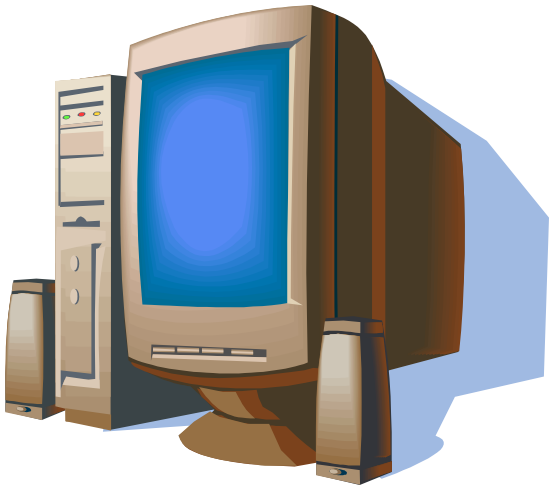
Rice Global E&C Forum Roundtable: JUNE 13, 2008

JP CHEVRIERE

FIGURE 1: SHORT HISTORY OF FORECASTING

PAST

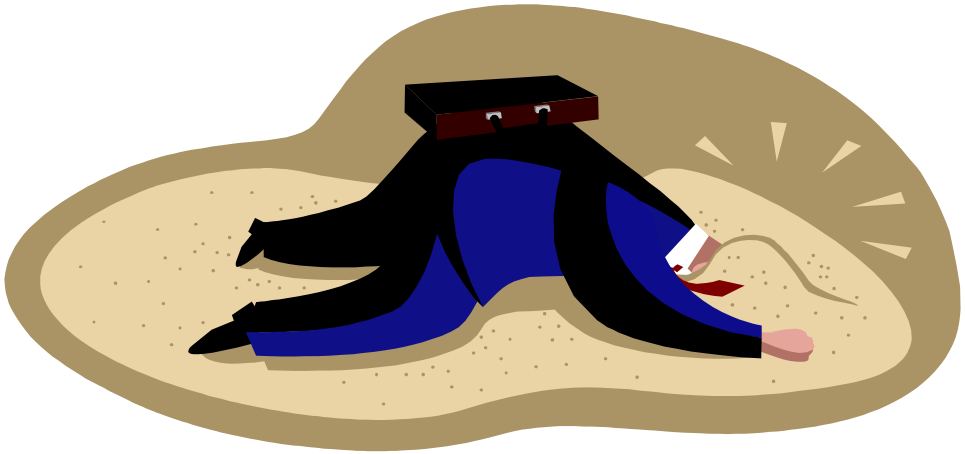
TODAY



THE DEFINITION OF INSANITY IS TO DO REPEATEDLY THE EXACT SAME THING AND EXPECT A DIFFERENT OUTCOME

- We (Oil And Services Industries) Keep Trying Classical Forecasting Again And Again And Keep On Failing.

FIGURE 2



FORECASTING: NOTORIOUSLY WRONG

- From 1980 To 2000 DOE Crude Forecasts Not Correct Once Within A Margin Of 10%!
- If Forecasting Doesn't Work, Then What?
- Strategic Planning Necessary Because We Cannot Predict Or Forecast The Future.
- Strategic Planning Is A Process For Taking Decisions With Varying Degrees Of Risk And With Some Knowledge About Their Futurity.
  - This Means Making Commitments And Actions.
  - This Means Systematic Feedback To Test Our Vision About The Future.

WHY DOESN'T FORCASTING WORK?

- Because Dynamic Non-Linear Systems are impossible/difficult to analyze. The hydrocarbon industry is a non-linear System.
- In Dynamic Systems a small factor can make a major difference.

LINEAR VS. NON LINEAR

- Mathematically, A linear function satisfies the properties of
  - **Additivity**
  - **Homogeneity**

  EXAMPLE: F(x)=C

- In mathematics a non-linear function does not satisfy the superposition principle. A non linear function or system exists where the variables to be solved for cannot be written as a linear sum of independent components.

- Dynamics of a pendulum for example is a non-linear function.

$$\frac{d2O}{d+2} + \sin O = O$$

- Non linear systems are of interest to us because most physical systems like the hydrocarbon or engineering industries are inherently non-linear. The weather is non-linear and a simple change in one part of the system produces complex and mostly unpredictable effects throughout.

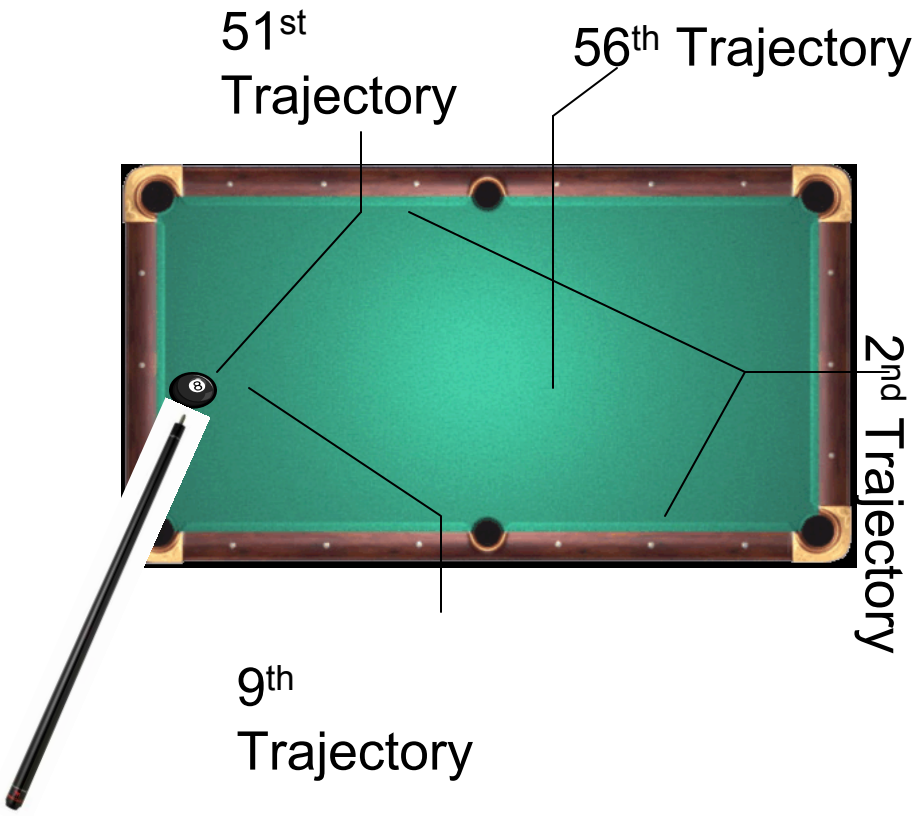
HENRI POINCARE: THE LIMITS OF FORECASTING

- Poincare introduced the concept of nonlinear dynamic systems where small effects can have big consequences.

- Poincare reasoned that as you projected into the future you will need an increasing amount of precision, about the dynamics you are modeling.

- Problem: Near perfect precision in initial data is almost impossible thus your forecast degrades abruptly and massively over time.

THE POOL TABLE EXAMPLE



Legend

- Billiard ball at rest- Mass
- Resistance of table
- Force of cue on billiard ball

RESULTS AND CONCULSIONS

- Easy to calculate what happens on the first hit on the billiard ball.
- Calculating the second hit requires more precise data as regards the initial conditions– the mass, coefficient of resistance and the intitial force of impact on the cue ball.
- To correctly calculate the trajectory and position of the billiard ball after the 9^{th} bound off a cushion you need to take into account the gravitational pull of someone standing next to the pool table.
- Finally to calculate the position and trajectory of the billiard ball after 56 bounds would require taking account in the calculation every single element in the universe. Even an electron 1 billion light years away.

SHOCKING EXPLOSIVENESS

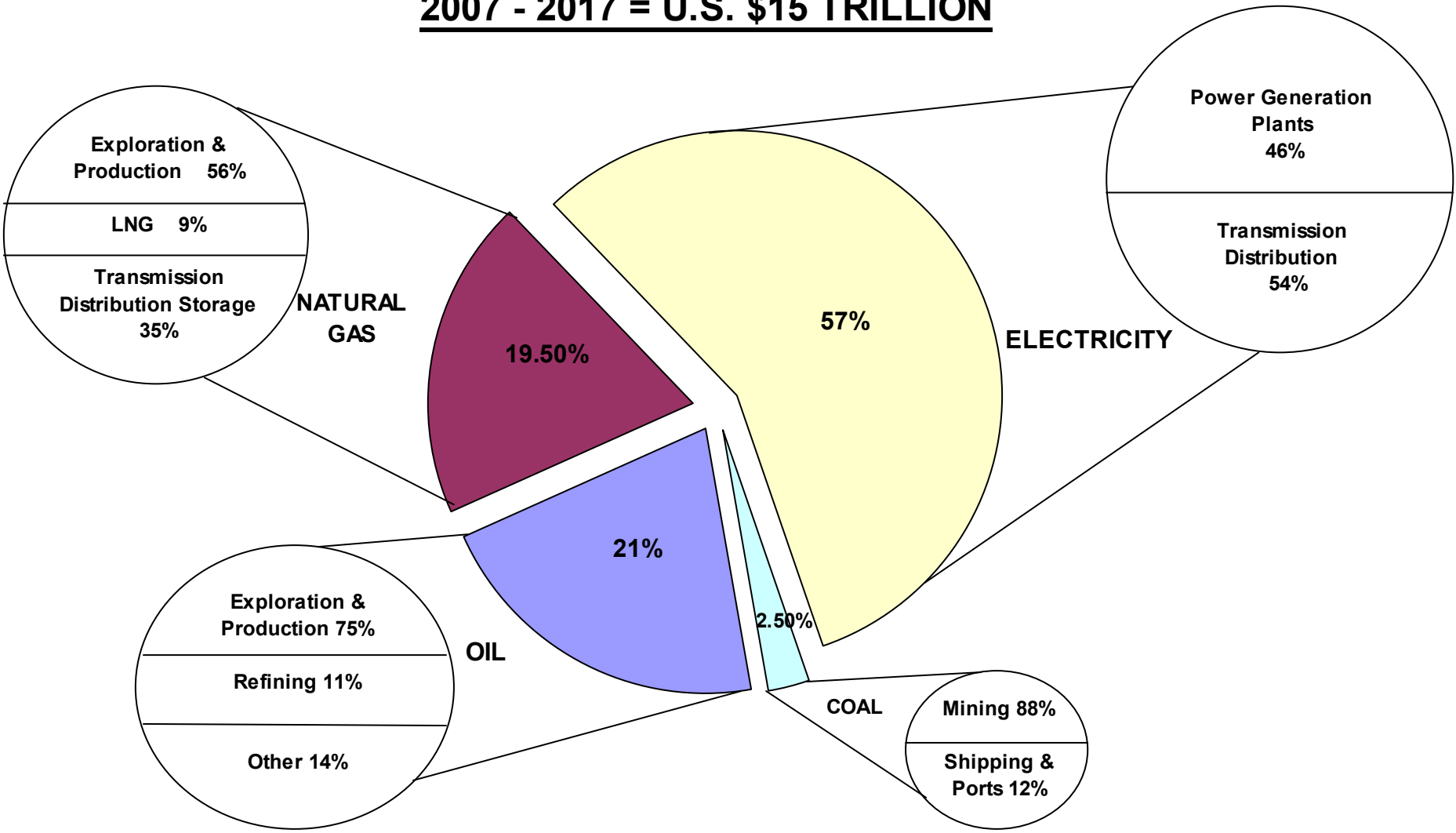
- If all these calculations are required to forecast the movements of an inanimate billiard ball then what is needed to forecast the decisions and destiny of the human population inhabiting the hydrocarbon industry?

DYNAMIC FACTORS IMPACTING THE FUTURE

- **Factors That Can Impact The Shape Of The Hydrocarbon Future Including Capital Spending.**
  - Factors That Must Be Monitored As Part Of A Strategic Planning System.
    - **FACTOR #1 – INTER-FUEL COMPETITION**
      - ⇨When the price of a product or service increases, demand falls and customers seek substitutes.
      - ⇨Recent sharp increase in natural gas is spurring the investment in coal and nuclear power.
      - ⇨In 2003, the consensus forecast was that 500 coal plants would be built in the U.S. over the decade. Today, the realistic forecast in our view is for 850 coal plants over the next decade.

- **Figure #3 Depicts Our View Of The Total Energy Investment Over The Next Decade. This Is The Foundation Stone For Deriving Capital Spending In The Future In Global Hydrocarbon Engineering & Construction Industry.**

FIGURE 3: TOTAL WORLD ENERGY INVESTMENT
2007 - 2017 = U.S. $15 TRILLION



INTER-FUEL TOTAL ENERGY INVESTMENTS

- **Continued Trend In Inter-fuel Competition From Coal Could Change Capital Investment Allocation to other Energy Sources.**

TABLE 1: PROJECTED COAL DEMAND

(MILLIONS METRIC TONS)

REGION	2007	2017	2025	% CHANGE
U.S.A	1,201.92	1,406	1,567	30.3%
W. Europe	542.9	497.9	463	-14.7%
CIS	443.7	439.7	436	-1.7%
China	1,767.7	2,316.3	2,757	56%

(Source: Transmar Consult, Coal Council)

FACTOR #2: INCREASING CAPITAL COSTS LEADING TO DIMINISHING RESULTS

- Huge Increases In E&P Costs Since 2001 Leads To Little Increase In Production Levels In Either Oil Or Gas.
  - **Fast Growth Of Cost Inflation In Labor, Equipment And Materials.**
  - **Petroleum Industry CAPEX Grew By 95% Between 2000 – 2005.**
  - **Cost Inflation Impacts Both CAPEX And OPEX.**
- Huge Increase In CAPEX Insufficient To Meet Production Growth Objectives.

FIGURE 4: THE RELATIONSHIP BETWEEN CAPITAL INVESTMENT AND INCREASED LIQUID PRODUCTION

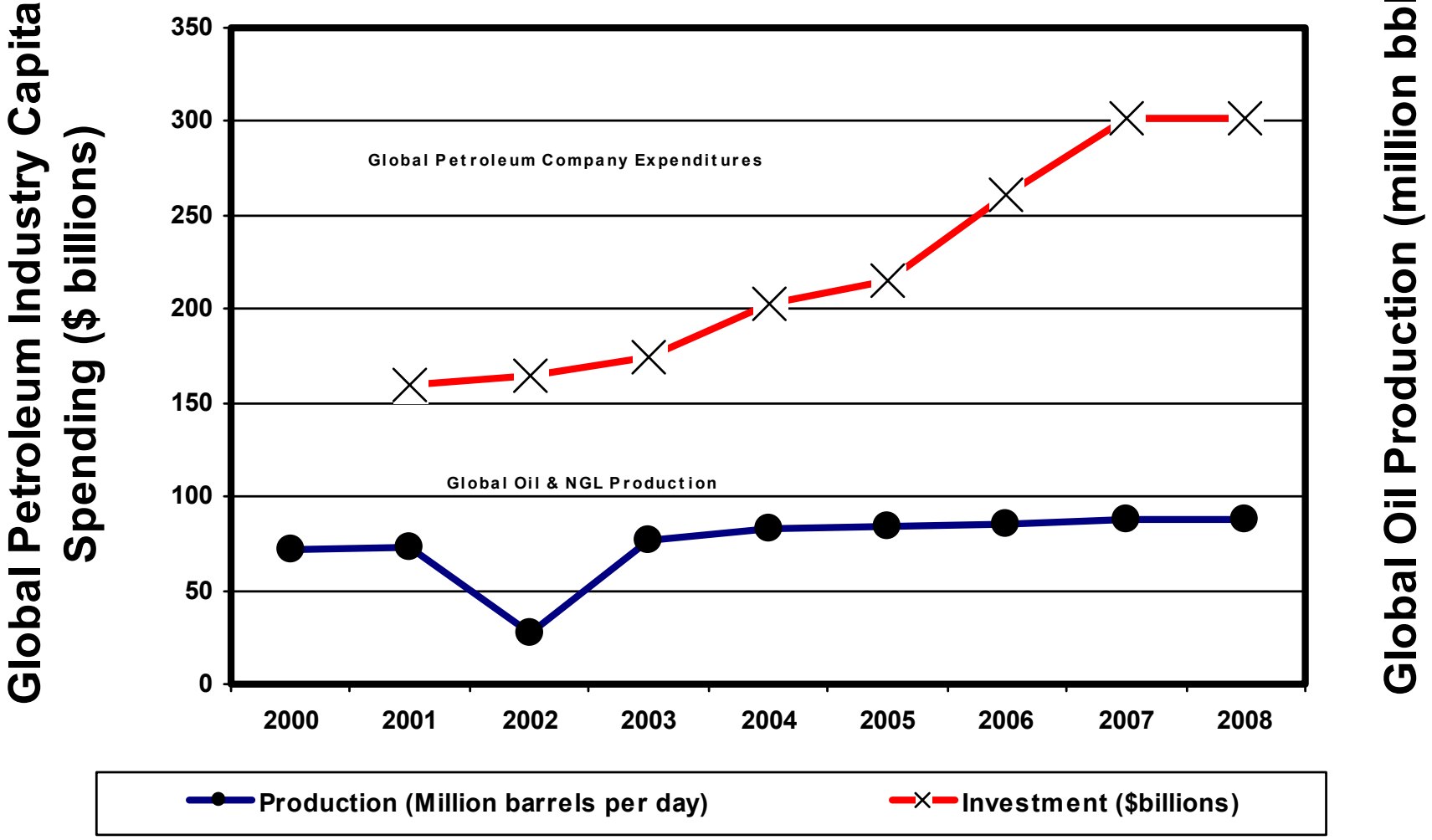
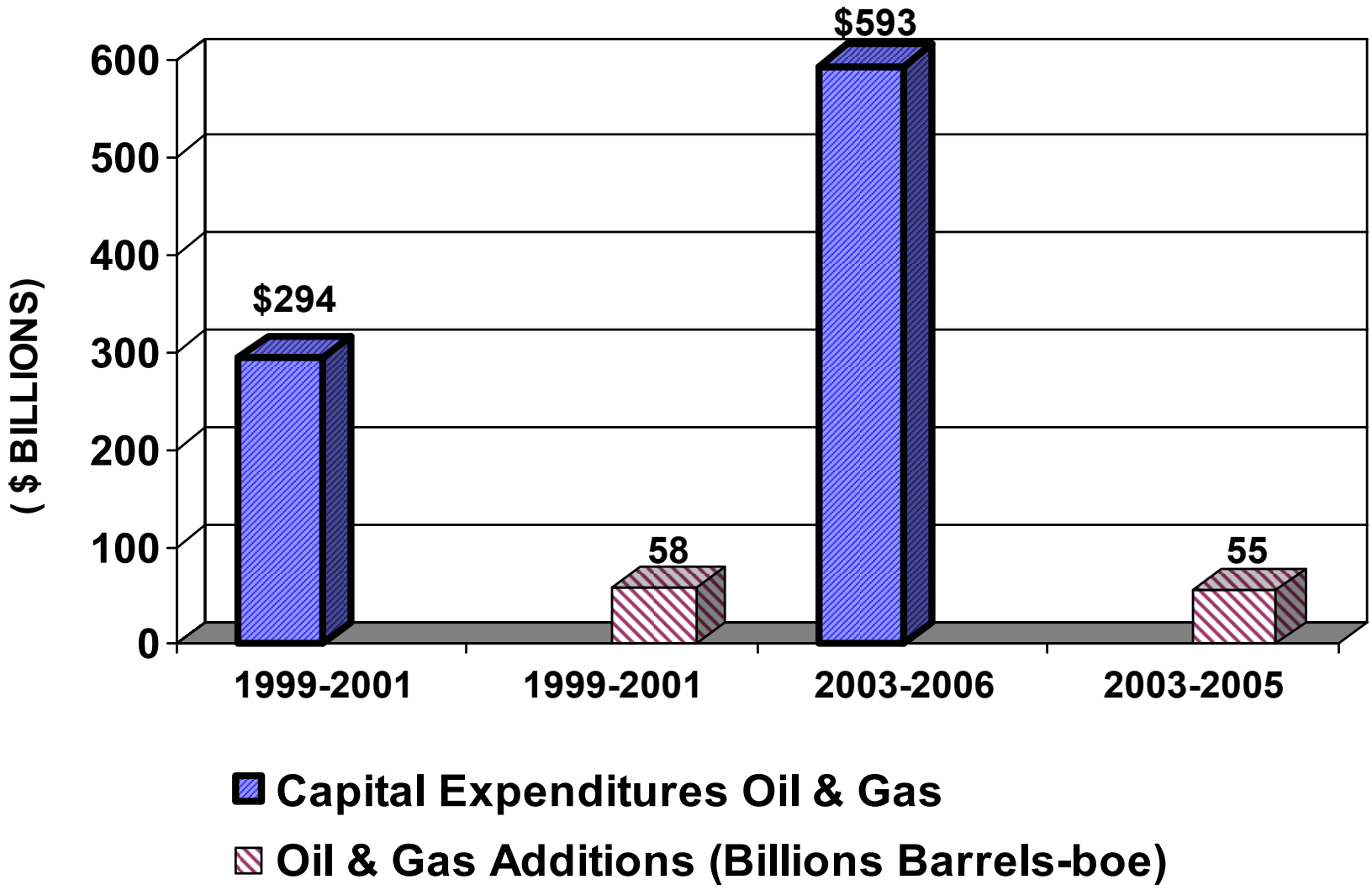


FIGURE 5: THE RELATIONSHIP BETWEEN CAPITAL INVESTMENT AND OIL AND GAS RESERVE ADDITIONS



FACTOR #3: THE INCREASING ROLE OF POLITICS IN ENERGY

- Politics Is Increasingly Impacting The Petroleum Industry And Capital Investment Budgets.
  - Causing not just CAPEX changes but brings a large amount of inefficiency with cost overruns and schedule delays.

"There is little doubt that a wave of nationalism within the producing countries is impeding project execution…"

Total – Senior Upstream Executive

"The influence of politics is increasingly important in the oil and gas project world. It makes for inefficient projects and many delays because of the need for political approvals."

B.P. America – Senior Procurement Executive

FACTOR #4: THE CHANGING ROLES OF THE PETROLEUM COMPANIES

- IOCs – Trying to find elephants and work with NOCs through technical superiority.
- Independents – Picking up the crumbs – going international.
- NOCs – Dominating power in E&P. Control most hydrocarbon reserves.

THE UPSTREAM INDUSTRY

- We Assume That CAPEX For E&P Will Continue To Grow Strongly For 3 Reasons:

1. Galloping Cost Inflation

   From 2000 – 2005, Global Upstream CAPEX Climbed 70%. However, 65% Of The 70% went for higher labor and material costs.

2. Widespread Production Declines In Key Regions

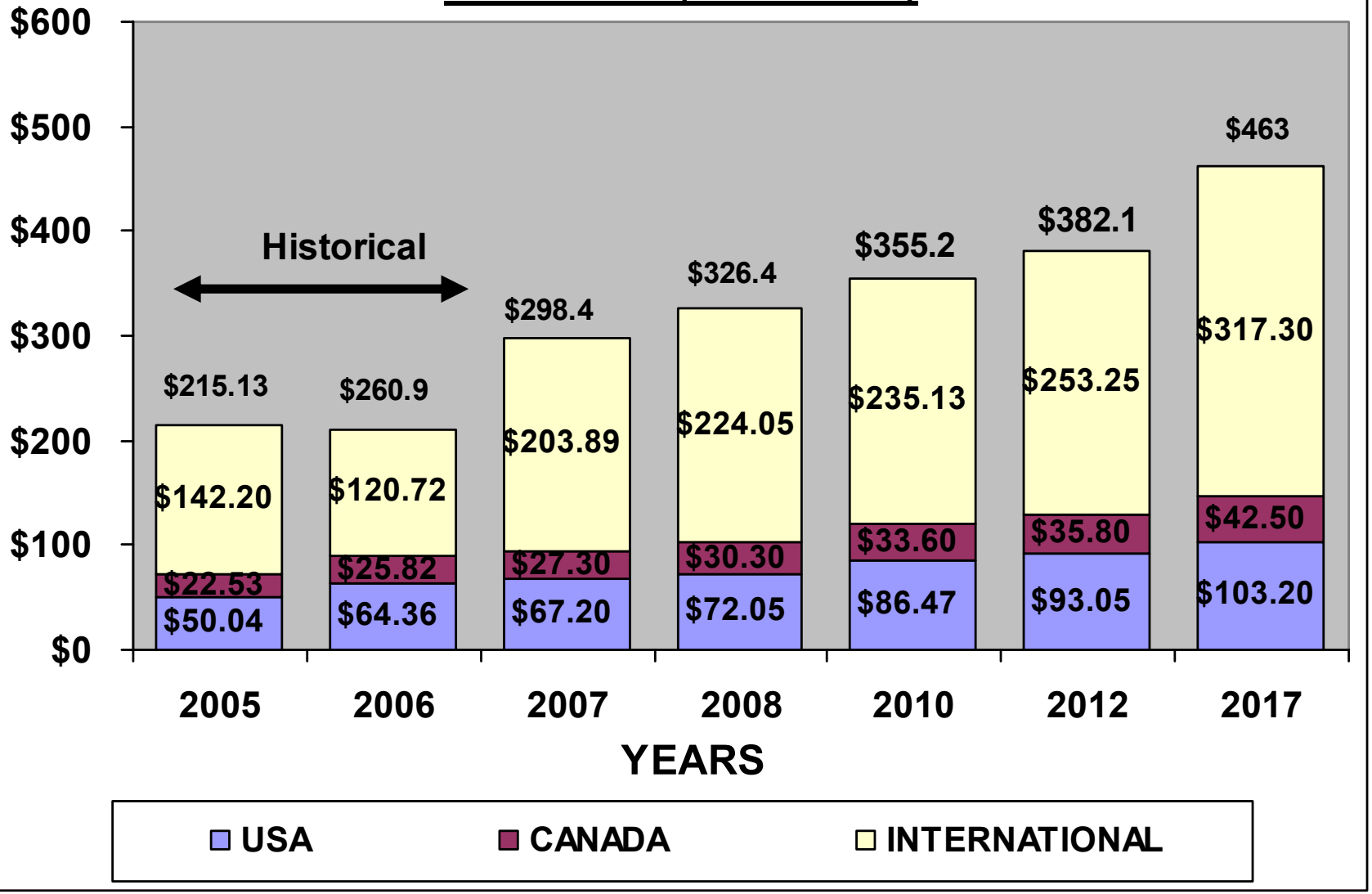
   From December 2005 to March 2007, Saudi Oil Production fell 90% or 900,000 bld. Mexico is only replacing 59% of their production.

3. Low Price Earnings and Share Price Means Worthless Stock Options

UPSTREAM CAPITAL SPENDING

- For The Decade Global E&P Capital Spending = $4.26 Trillion
  - $2.36 Trillion Oil
  - $1.9 Trillion Gas
- Significant Amounts To Be Spent By Majors For Deepwater Offshore. Very Expensive E&P Projects Requiring Sophisticated And Costly Technology.
- Significant Amounts Also Spent On Alternative Energy.

FIGURE 6: GLOBAL UPSTREAM CAPITAL SPENDING 2005 - 2017 ($BILLIONS)



UPSTREAM – OFFSHORE IS SPECIAL

TABLE 2: GLOBAL FORECAST OF OFFSHORE CAPITAL EXPENDITURES

($BILLIONS)

2010	2011	2017
$120	$138	$206

TABLE 3: PERCENTAGE OF OIL AND GAS PRODUCTION AND RESERVES BY GEOGRAPHIC AREAS - 2006

Geographic Area	Oil Production %	Oil Reserve %	Gas Production %	Gas Reserve %
Europe/Eurasia	21.7%	11.7%	38.4%	35.6%
Middle East	31%	61.9%	10.6%	40.1%
Africa	12%	9.5%	5.9%	8%

TABLE 4: UPSTREAM CAPEX – 2007 – 2017 W/O DRILLING AND EXPLORATION

	CAPEX	% of Market
REGION I – North & South America	1,210 Billions	53.10%
REGION II – Africa & The Middle East, and Europe	535 Billions	23.40%
REGION III – Asia	532 Billions	23.50%
TOTAL	**2277 Billions**	**100%**

THE FOUR DYNAMIC FACTORS IMPACTING CAPITAL SPENDING IN OIL & GAS

1. Inter-fuel Competition
2. Increasing costs diminishing results
3. Growing importance of energy politics
4. Changing role of petroleum companies – IOCs, Independents, NOCs

A FIFTH UNIVERSAL FACTOR IS THE DEMOGRAPHIC SHIFT – CAUSING WORLDWIDE TECHNICAL RESOURCE SHORTAGES AMONG THE DEVELOPED NATIONS

Demographics

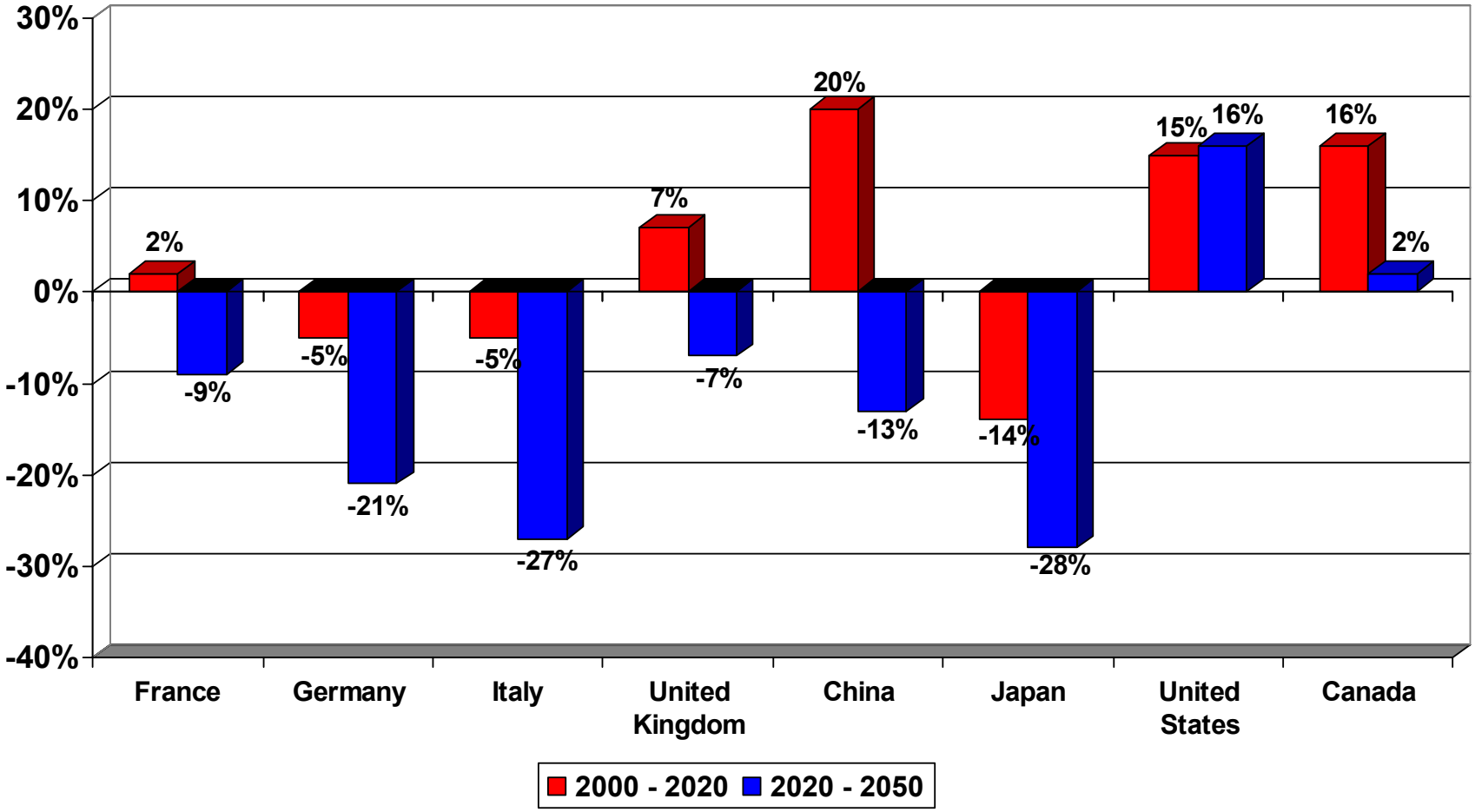
- SHORTAGES IN BOTH TECHNICAL EXPERIENCE AND NUMBERS IS CRITICAL IN DEVELOPED FIRST WORLD COUNTRIES.
  - It will get worse over the next decade.
  - In the United States, during the ’80s, there were 80,000 engineering graduates per year, today only 50,000 plus.
  - In Germany, there are now only 40,000 engineering graduates per-year, though the country could use about 60,000!

TABLE 5: DECLINING JAPANESE ENGINEERING GRADUATES

	2001	2006	2008 (est)
Total University Graduates	542,512	558,184	588,000
Engineering Graduates	103,513	96,675	86,755

(Source: Japanese Government

FIGURE 7: THE DRAMATIC RESHAPING OF THE WORKING AGE POPULATION: PERCENTAGE CHANGE: 2000 - 2020 AND 2020 - 2050 FOR 20 - 65 POPULATION



CONCLUSIONS

- Because classical forecasting doesn't work and cannot predict the future, we need to adopt a strategic planning process type approach.
  - One that monitors carefully the dynamic factors that can strongly influence capital spending.
- Need to understand that we cannot spend all the capital funds available for projects.
  - The technical resources simply do not exist to absorb the capital funds available.
  - Setting the appropriate project priorities is the key to success for Oil & Gas and technical services company.
- All this requires clear and decisive leadership. Clarity, however, is a liability if you have nothing to say and not the will to act.

CLEAR THINKING AND DECISIVE LEADERSHIP