

Starting Point – Non-Controversial Principles

1. Tackling climate change & energy security requires a comprehensive, integrated solution with well-defined goals & realistic plan to achieve
 - Attempting to address climate change without effectively managing energy costs could cause support for GHG reduction measures to quickly unravel
2. Geo-political & economic repercussions of falling short severe
 - Health & competitive position of U.S. economy in global market
 - Potential to significantly increase U.S. vulnerability, shift balance of power towards Russia/China/Iran & pull U.S. deeper into Middle East
3. Primary objectives long-term oriented
 - Urgent need to significantly reduce projected *long-term* concentration levels of Greenhouse Gases
 - Need to adjust to major changes in energy mix
 - *End of the era of low cost, abundant oil*
 - *Globalization of natural gas market -- & U.S. electricity prices*
 - *Rapid growth in renewables & improvements in energy efficiency*

Cap & Trade Has Major Limitations

- Cap & trade creates *illusion* of long-term planning
 - Long-term reduction requirement equated with long-term plan
- Strength of cap & trade: short-term optimization
 - Most efficient means of achieving CO2 reduction goals year-by-year
 - To extent banking allowed, additional savings also obtained by capturing “no brainer” (i.e., too compelling to pass up) opportunities for banking
- But – will **NOT**:
 1. Set accurate long-term price signals
 - *Instead, price signals guaranteed to be too low if goals phased in*
 2. Plan/encourage optimal level of future long-term investment, even for CO2 reduction
 - *Low prices in early years more likely to discourage*
 3. Ensure development of most cost-effective strategy for achieving twin goals of long-term CO2 reduction and reliable, reasonably cost energy supply adequate to meet needs of U.S. economy
- Urgent need to development a strategy to better achieve these goals

Need New Era of Integrated Resource Planning

- Key issues:
 - Who will take responsibility for integrated resource planning
 - How should scope be defined
- Neither Congress, U.S. Department of Energy (as currently structured) or “market” equipped to undertake
- Leadership must come from two sources:
 - State & federal regulators
 - ISOs and RTOs
- In current de-regulated, disaggregated industry, only entities with breadth of responsibility and expertise to undertake required planning function
 - Industry can contribute a great deal in the process, but not in a position to lead

Requires New Definition of Resource Planning

- Adequacy & reliability of physical equipment not the only issue
 - Outmoded, 1950's definition
- To provide reliable, affordable energy in compliance with public mandates, just as essential to focus on:
 1. Developing a plan to ensure adequate & reliable fuel supplies
 2. Protecting against prices spikes
 3. Meeting long-term CO2 reduction goals at lowest reasonable cost
- Not rational to treat fuel costs as an independent input into planning process
 - Generation options chosen will have a major impact on costs
 - Especially in carbon-constrained environment in which much of the world plans to increase use of natural gas at same time
- California taught 8 years ago that increased costs due to electricity price spikes can overwhelm potential savings from other steps to improve market efficiency
 - Fuel price spikes often primary cause – including California in 2000

Need to Match Action to Principles

- My contention: not on the right playing field yet
 - Major shift required in policy-making & public debate
- Proposed remedy:
 1. Get serious about evaluating adequacy of future U.S. energy supply in a carbon-constrained, post peak-oil world
 - Current analyzes far off the mark
 - Prevent producers and regulators from making sound decisions by giving inaccurate, misleading information
 - Requires creation of National Energy Security Supply Board – akin to Federal Reserve Board
 2. Re-focus energy supply planning to give equal emphasis to energy supply risk and price
 - Generation & transmission only ½ the equation
 - Price shocks can disrupt the economy
 - Potential geo-political implications of energy supply strategy huge & likely to increase sharply over next decade as competition increases for oil and LNG

Need to Match Action to Principles (Contd.)

3. Develop new, out-of-the box solutions to accelerate energy efficiency
 - Tinkering around edges not enough
4. Get to bottom now of role wind & solar realistically can play in next 10-15 years
 - Still room for expansion
 - But what really is required to provide back-up power using intermittent resources for a much larger % of total supply?
 - *Includes assessment of infra-structure required to store and quickly deliver much larger quantities of natural gas for back-up power & limits this places on expansion*
5. Shift primary focus of climate change debate to how to accelerate measures required to achieve large-scale reductions in emissions in a cost effective manner
 - Includes energy efficiency, next generation bio-fuels, carbon capture & storage, nuclear & electric plug-in hybrids
 - Addresses energy security at the same time

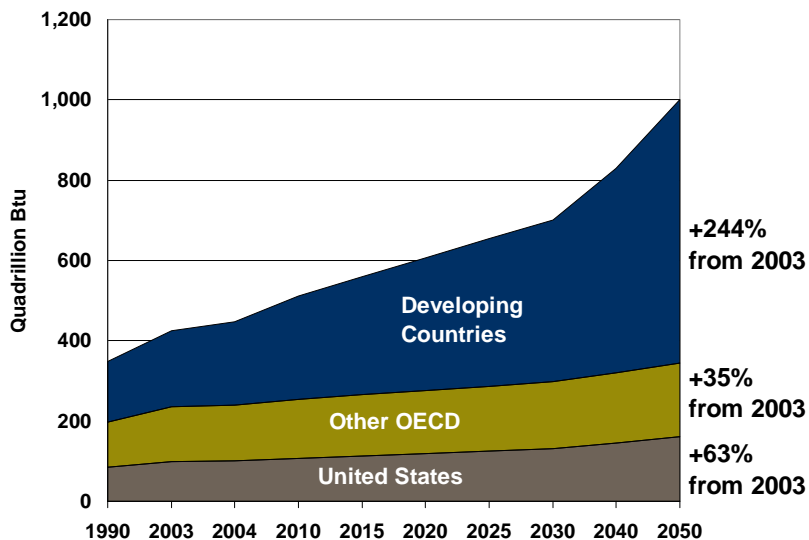
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Unprecedented Challenges/ Exceptional Risks

Energy = Lynchpin for Economic Growth

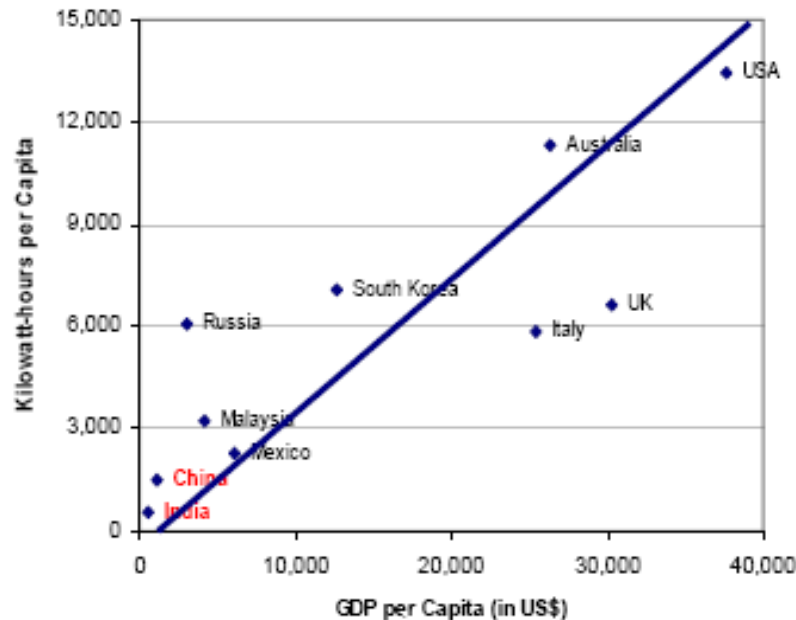
- Global energy use expected to triple by 2050
 - Driven by emerging market economies
 - Cannot join 21st century without significant growth
 - *Requires \$ 20 trillion of new infrastructure by 2030 (IEA est.)*

Expected Increase in Global Energy Use



Source: World Energy Outlook 2007

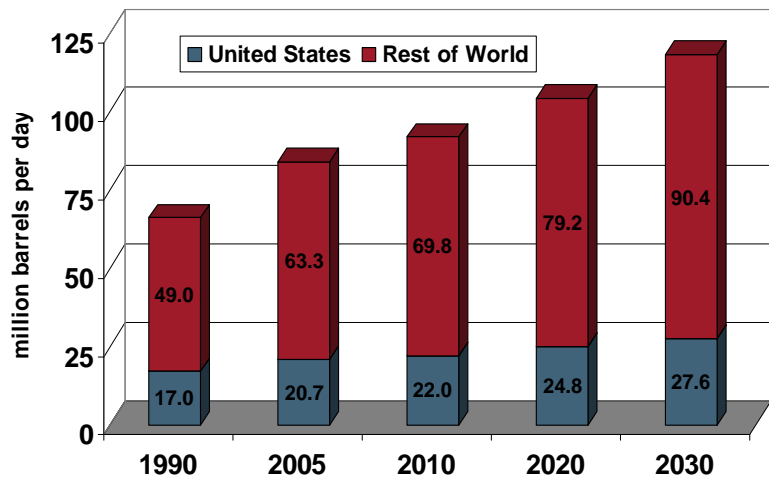
Electricity Usage per Capita



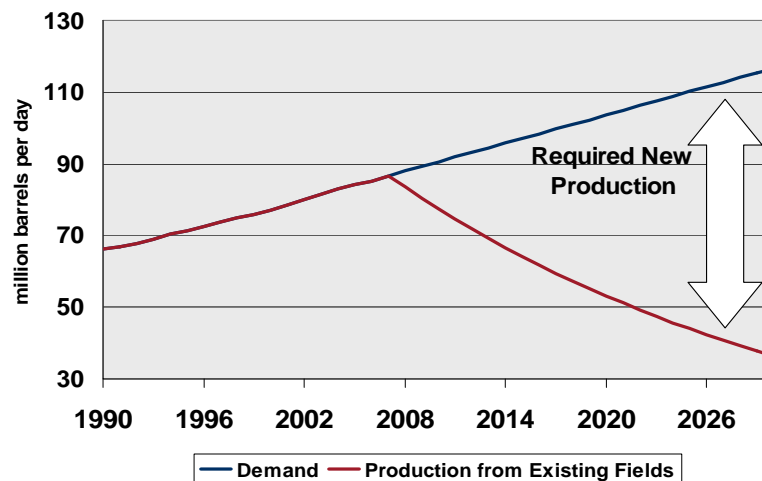
Huge Potential Gap Between Supplies & Need

- Growing recognition oil supplies likely to fall far short of needs of global economy
 - 3.2 million b/d in new supplies needed each year just to offset declines in existing fields

Growth in Global Demand



Growing Wedge Between Supply & Demand

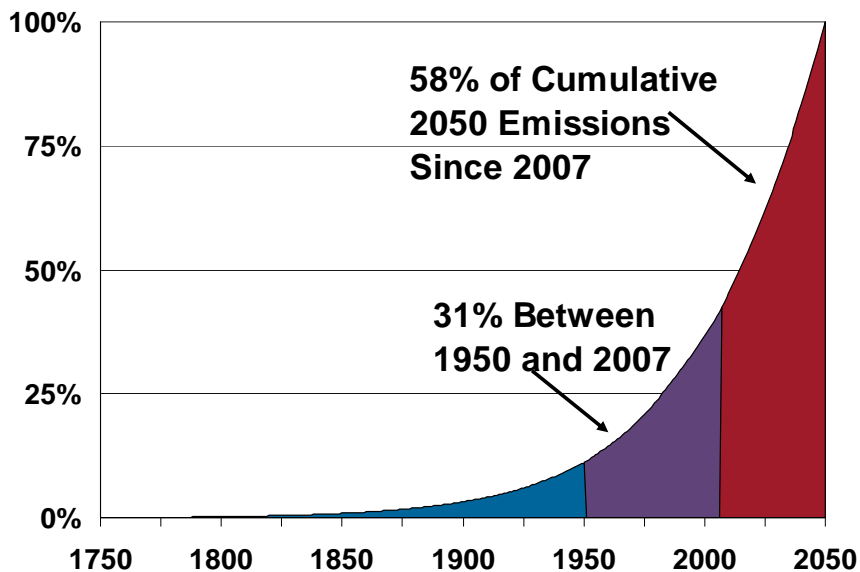


- Global LNG supply gap could be just as severe
 - Projected to account for *all* of net growth in U.S. natural gas supplies next 10 years, twice over

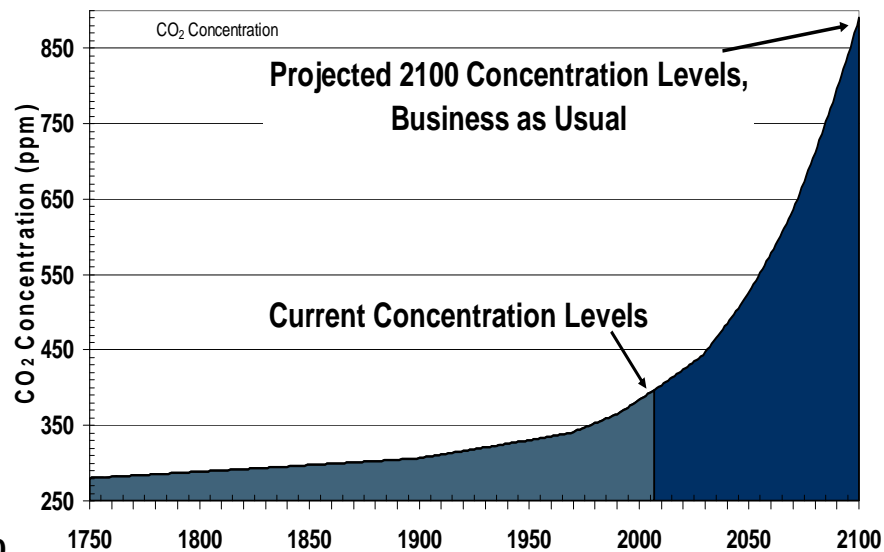
Status Quo Can't Continue

- Many discussions of climate change largely miss the point
- Continuation of "business as usual" thru 2050 not an option
 - Large scale CO2 and methane emissions have just begun
 - 50 % stay in atmosphere > 100 years
- Would "lock in" estimated 10–12 °F increase by 2100

**Cumulative Global CO2 Emissions
Business-as-Usual Scenario**



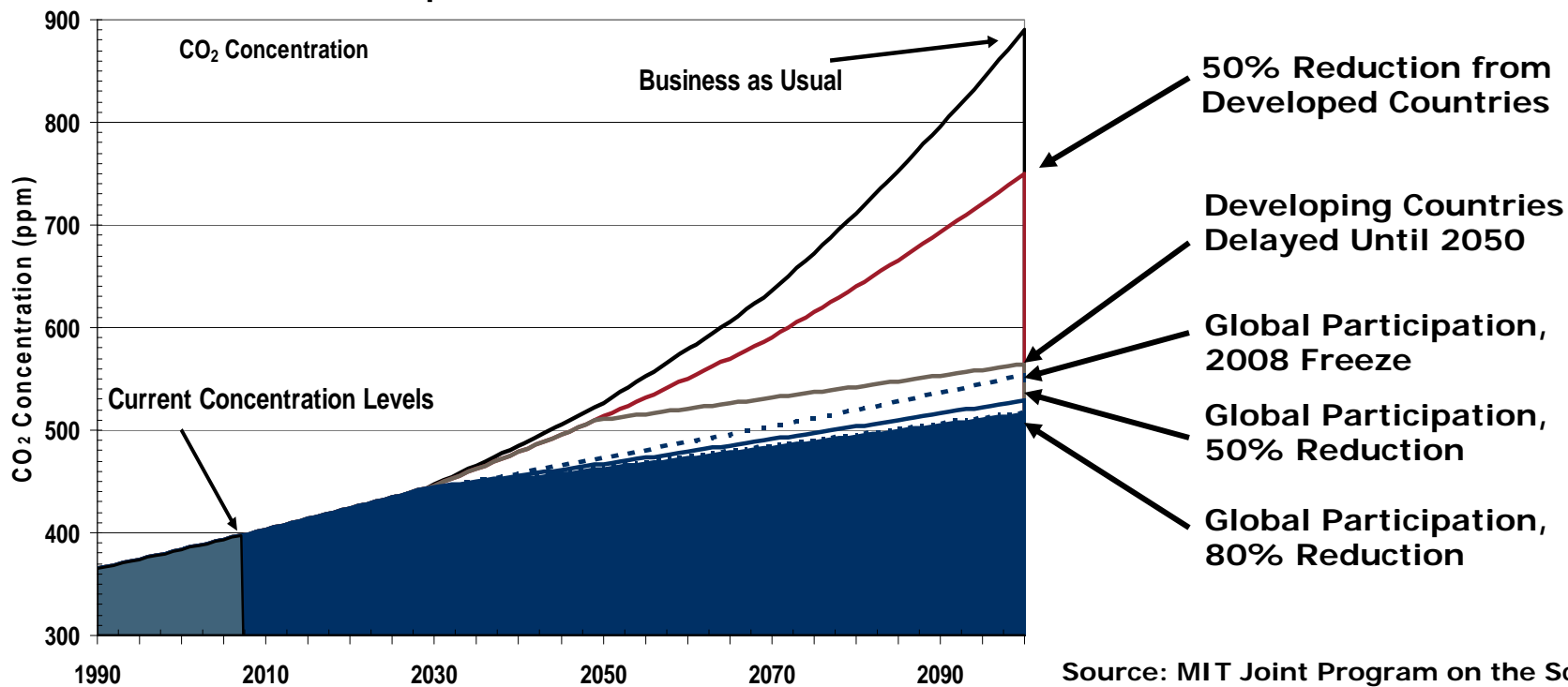
**CO2 Concentration Levels
Business-as-Usual Scenario**



Requires Huge Cuts in Future Emissions

- Requires 50 to 80 % **cut** in emissions at same time global energy use expected to triple
 - IEA estimates \$ 50 trillion cost by 2050
 - Ave. temp. still might increase by 4 -5 °F by 2100

Required Emissions Reductions



Source: MIT Joint Program on the Science and Policy of Global Change, Report No. 146

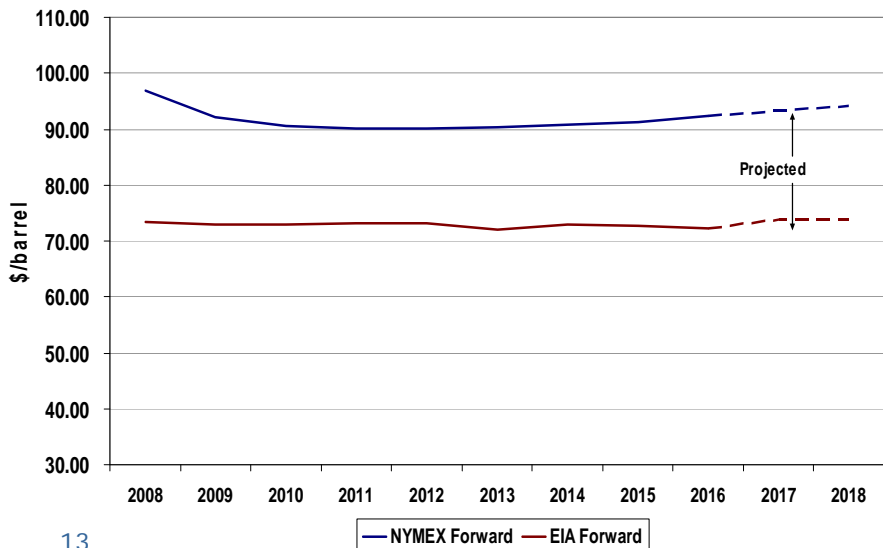
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First Step – Develop Accurate Understanding of Potential Energy Supply & Price Risks

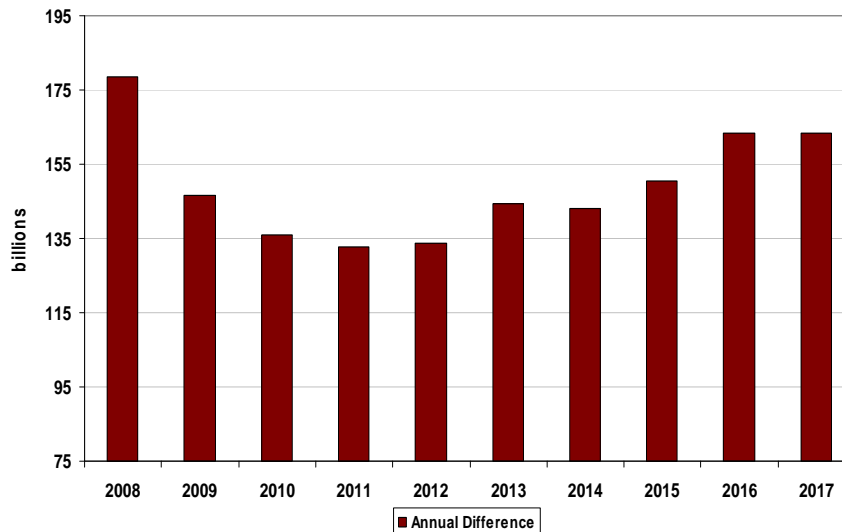
EIA Estimates Far Off the Mark

- EIA thoroughly misjudging likely future global oil supply
 - Substantial risk supply will not keep pace with global needs
- NYMEX forward delivery price curve indicates EIA under-estimating U.S. oil costs by \$1.5 trillion over next 10 years
 - Don't be surprised if its ultimately 2-3X this amount
 - Potential devastating impact on balance of payments deficit, interest rates required to finance imports

NYMEX vs. EIA Forward Curve

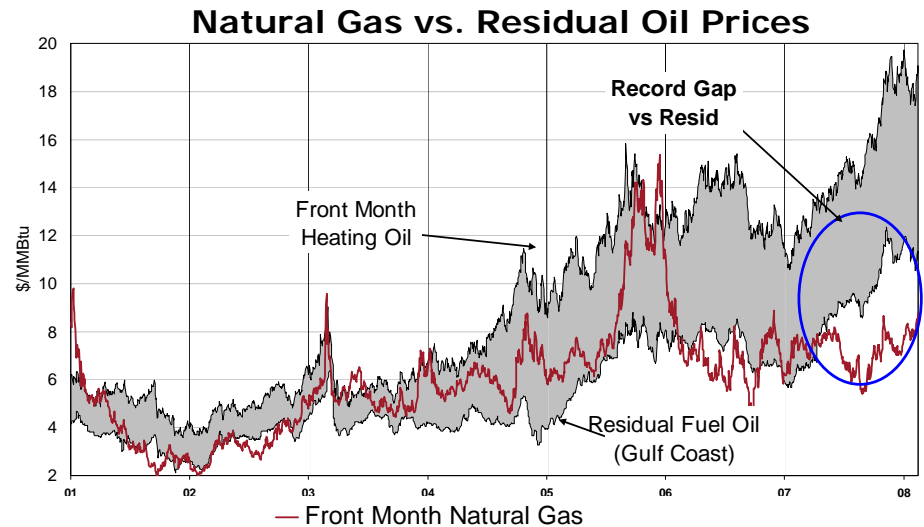
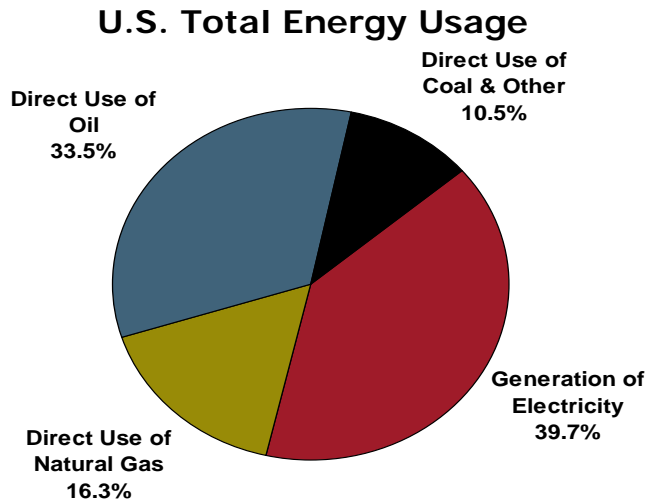


EIA vs. NYMEX Annual Cost Disparity



LNG & Electricity Risks Potentially Just as Severe

- Could prove to be “tip of the iceberg”
- Electricity & natural gas = 60 % of total U.S. energy use
 - LNG expected to be marginal source of supply in both markets

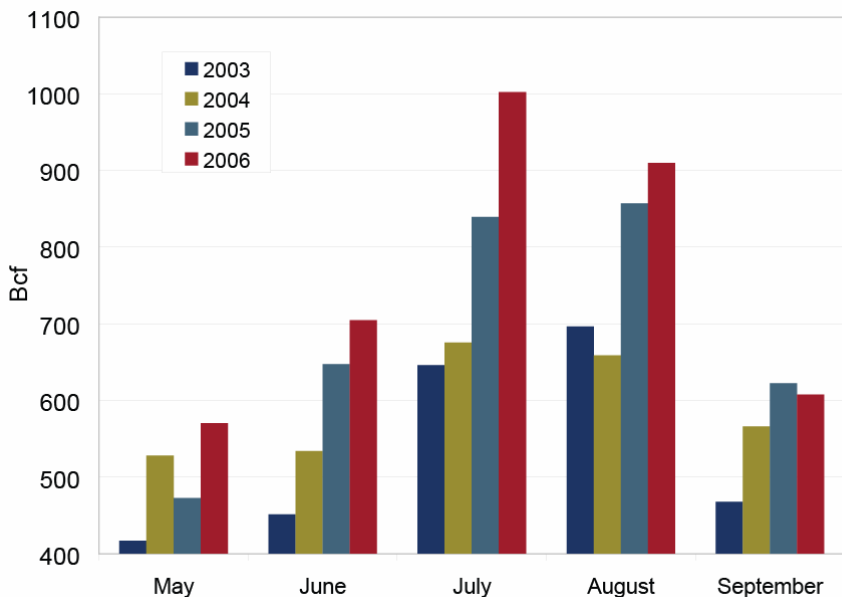


- EIA has not yet provided any reliable assessment of:
 - Future demand for natural gas in carbon constrained world
 - Potential price & supply risks associated with LNG
- **Creates huge, needless risks for U.S. energy supply strategy**

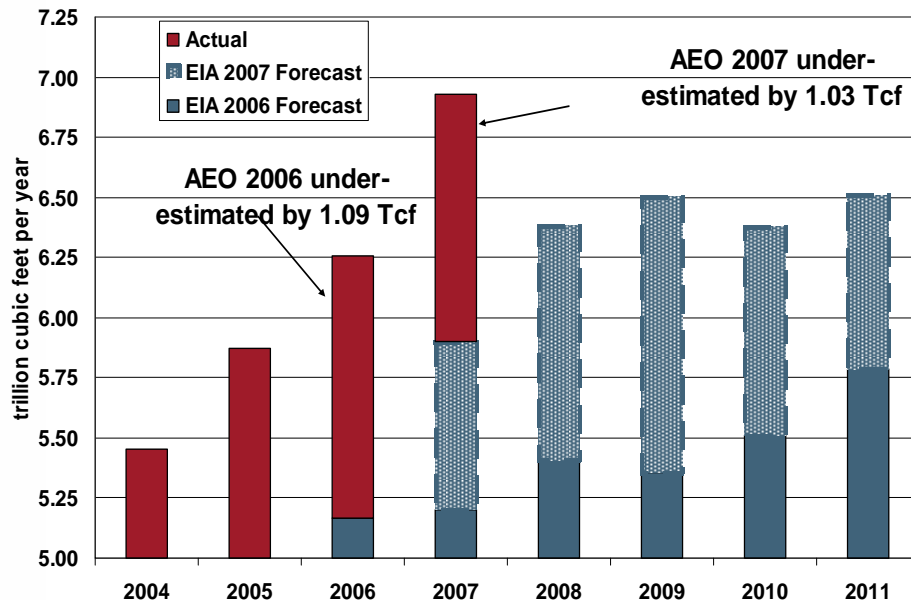
Severely Underestimates Growth in Demand

- Even in “status quo” scenario, EIA severely underestimates likely growth in power sector demand for natural gas
 - Prior to taking into account coal-plant cancellations & carbon constraints, reasonable to expect year-over-year growth of 1 Bcf/year
 - 3 Tcf/year + in 10 years
- EIA projects little or no growth next 5 years

Increases in Monthly Consumption



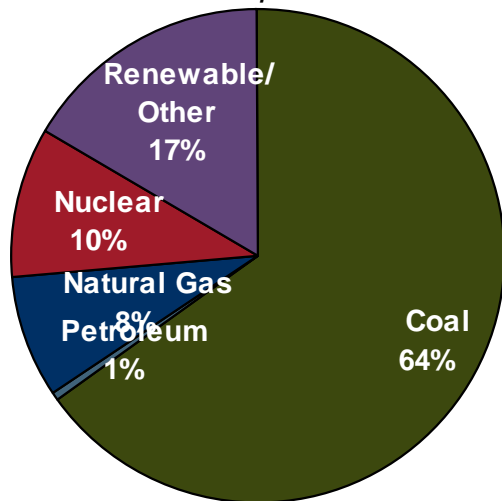
EIA Estimates of Power Sector Demand for Natural Gas



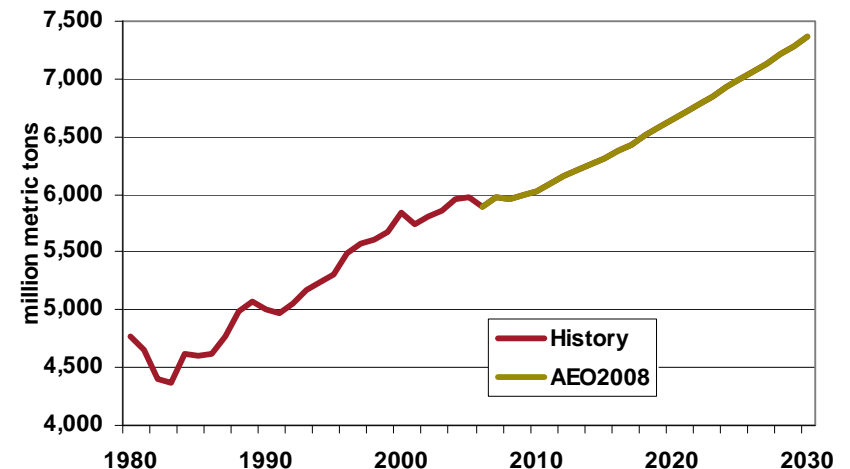
EIA Projections Difficult to Justify

- Forecasts have considerable impact, even though based upon:
 - Prices no producer believes are plausible even now
 - A future world that never will exist

EIA Projection of Incremental Generation, 2007-2030



Historic and Projected CO2 Emissions

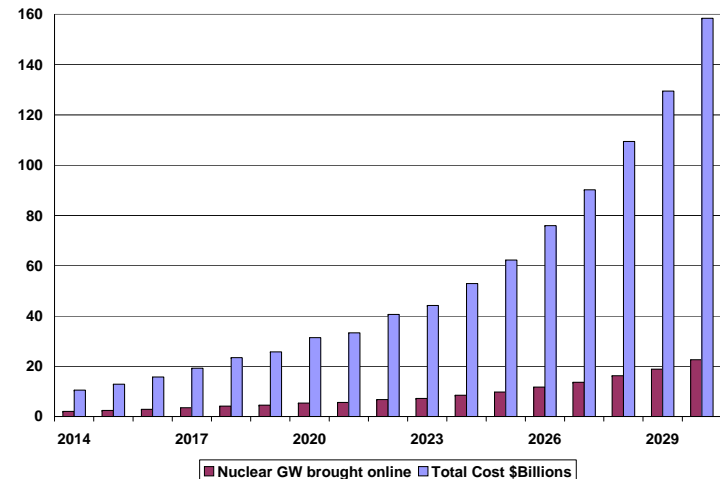


- Will drive electricity prices and cost of CO2 reduction

Analysis of McCain Lieberman No More Realistic

- Recent analysis of S. 280 profoundly flawed.
- Premised on series of indefensible assumptions, including:
 - Price & Demand for natural gas in “business-as-usual” scenario
 - No federal bio-fuels program
 - Critical assumption, since EIA relies on bio-mass as primary source of new power & insufficient resource to do both*
 - Nuclear build-out of heroic proportions
 - Requires companies with limited market cap to finance \$ trillion + construction program*
 - Nearly unrestricted availability of offsets from other countries
- Underestimates likely gas increase by at least an additional 3-5 Tcf/year

Nuclear Build-Out Required



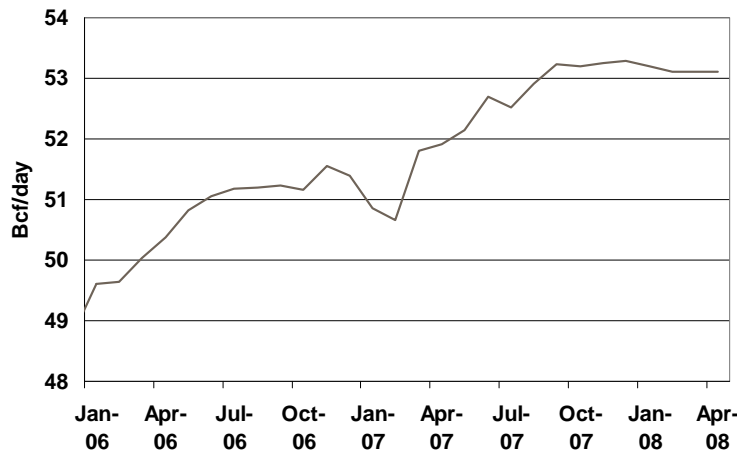
Decision-Makers Flying Blind

- Bottom line: EIA potentially understating future U.S. gas demand by as much 6 to 10 Tcf/year (16-27 Bcf/day)
 - Leaves producers, regulators without any reliable basis for decision-making
- Potential adverse consequences include:
 1. Misleading signals to both producers & end users
 2. Much higher prices than would be likely if market better informed & could better anticipate demand
 3. Risk of periodic supply shortages
 4. Rapid increase in dependence upon LNG, in a market in which supplies likely to be limited and global competition fierce
 - *Large portion of world turning to LNG as incremental source of supply at same time, as part of GHG strategy*
- Worst case scenario: much of U.S. energy supply becomes tied to global price of oil in a post-peak oil world
 - Not just transportation fuels, but electricity & natural gas

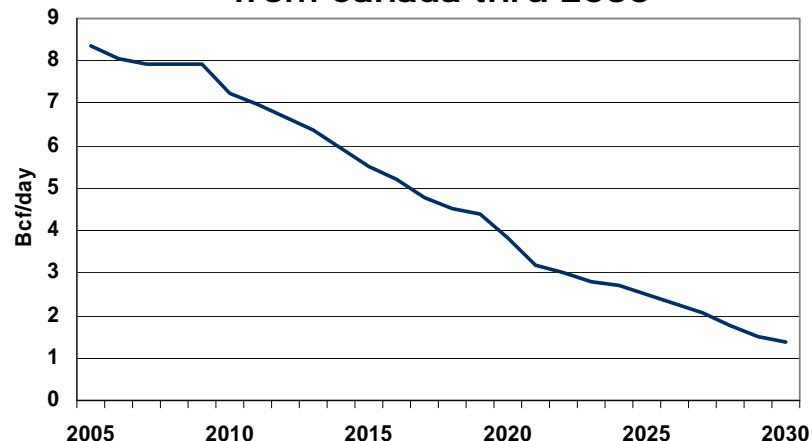
Imperative to Maximize U.S. Production

- Over past 2 years, U.S. producers have shown impressive ability to expand U.S. production
- Not a short-term phenomenon – sustainable for many years
 - Reflects expansion into new basins, success in horizontal drilling

Domestic Production of Natural Gas, 2006-8



Forecasted Natural Gas Imports from Canada thru 2030



- But huge investments & high expansion rate required to offset losses from Canada and declines from conventional fields
- Requires far more accurate demand forecasts, higher prices, longer-term contracts, more storage

High Risk Strategy

- Risks of depending upon imported natural gas as incremental source of supply for U.S. natural gas & electricity markets include:
 - Likelihood of sharp, “feast or famine” swings in supply
 - *Gas dumped onto U.S. market in times of excess supply, forcing U.S. producers to cut back on drilling*
 - *U.S. gas companies outbid by Asian or European buyers during periods of peak demand*
 - Much higher price volatility
 - Pricing increasingly tied to global oil prices
 - Periodic supply shortages – with no ready substitute
 - Far greater leverage for Russia, Iran, Nigeria and other major suppliers to global gas market
 - Significant increases in U.S. balance of trade deficit
 - Increased risks if control threatened over Straits of Hormuz

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Need to Rethink the Scope and Methods for
Integrated Resource Planning

Major Change in Focus Required

- Three fundamental changes:
 - 1. Reliability of fuel supply & fuel cost minimization should be a major focus of every resource planning effort.**
 - *Generation & transmission only part of delivery cycle*
 - *California should have taught us early in decade that fuel costs can dwarf other issues*
 - *Power plants useless if there is no fuel to run them*
 - 2. Deployment of energy efficiency measures must be greatly accelerated.**
 - *Must set far more aggressive goals*
 - *Requires out-of-the-box solutions, outside scope of regulation alone*
 - 3. Critical need nationally to assess potential constraints on ability to provide back-up power to intermittent resources.**
 - *Constraints on availability & deliverability of natural gas, required increases in storage capacity = key issues*
 - *Could significantly limit potential penetration of wind & solar*

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Don't Put Off Dealing
With Difficult Issues

Most Important Issues Largely Being Ignored

- Easy course is to focus only on renewable energy & energy efficiency
 - Not sufficient to meet long-term emission reduction goals on a global basis
- Even “cap & trade” does relatively little to accomplish long-term goals at any time in next 10 to 15 years
- Instead, essential to focus *now* on steps required to accelerate large scale long-term reductions in GHG emissions
- Menu of potential options already reasonably clear. Includes:
 - Greatly accelerated, far more aggressive energy efficiency
 - Advanced, next generation bio-fuels that don't yet exist
 - Electric plug-in hybrids and other advanced low mileage vehicles
 - Rapid deployment of next generation nuclear
 - Large-scale deployment of carbon sequestration
 - Sequestered IGCC and coal-to-liquids
- Same steps essential to energy security and avoiding energy price dislocations that could seriously weaken U.S. economy

Additional Discussion

- Article addressing issues in more detail:
 - *Climate Change & Energy Security – What's Really at Stake in the 2008 Election*
 - http://www.energypulse.net/centers/article/article_display.cfm?a_id=1651

How to Contact Andy for Questions

Mailing Address: Andy Weissman
Editor-in-Chief & Publisher, Energy Business Watch
Senior Energy Advisor
FTI Consulting, Inc.
1101 K Street NW
Suite B100
Washington, DC 20005

E-mail: Andy.Weissman@FTIConsulting.com

Office Phone: 202/589-2391

Cell: 202/744-1956

Fax: 202/312-9101

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