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Power Sessions Webcast

**What to Expect  
In the Summer of 2005 and Beyond**

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## Andy's Background

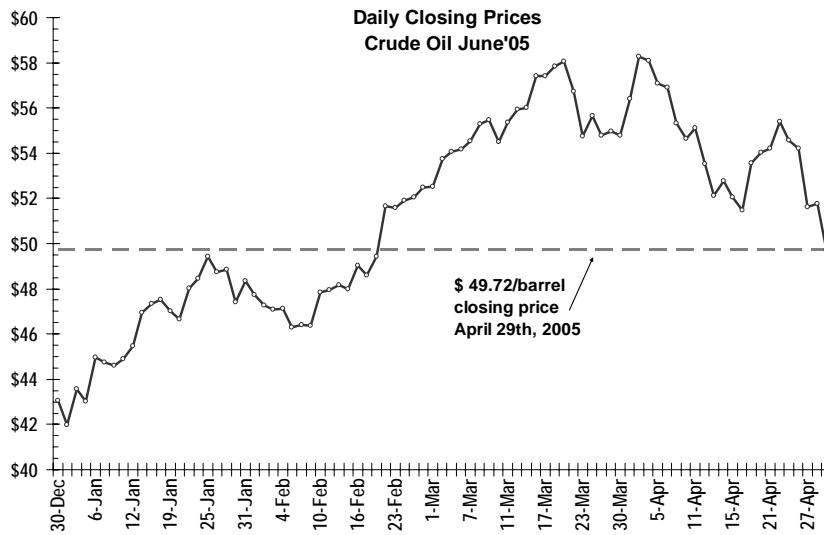
- Power industry specialist
- Has advised CEO's of major energy companies and major financial institutions on high stakes strategic issues for more than 30 years
  - Clients have included most major U.S. power companies
- Founded Energy Ventures Group, L.L.C. January 1, 2000
  - Boutique investment firm specializing in energy industry
- Manages energy sector hedge fund and provides consulting services to certain select clients
- Publishing arm, EnergyBusinessWatch.com, publishes in-depth Weekly Market Reports on natural gas market
- Presents seminars and in-house programs on oil and natural gas issues, use of energy price forecasts and strategic planning



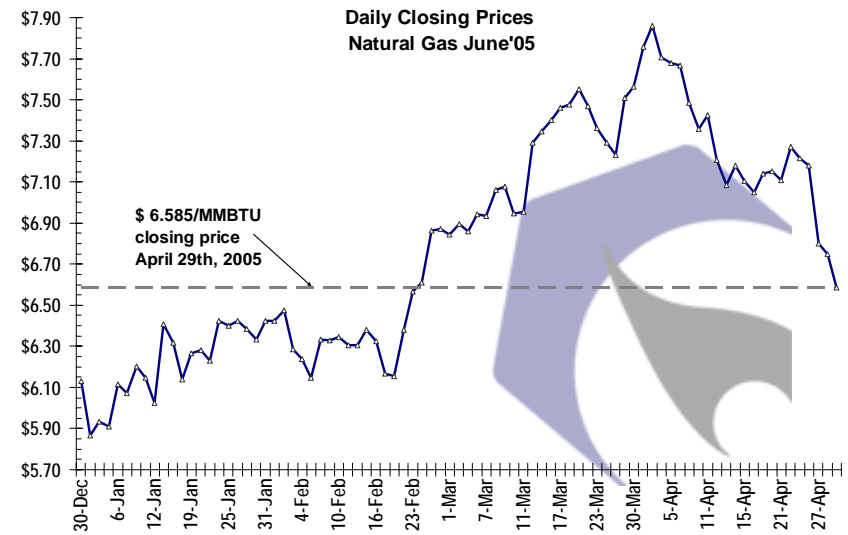
## Steep Price Increases in 2005

- Oil and natural gas prices sky-rocketed during first 3 ½ months of 2005<sup>t</sup>
  - No industry price forecaster predicted
- Steep recent pullback
- What direction will prices head in next?

### June NYMEX Crude



### June Natural Gas Futures



## Tip of The Iceberg

- Next 2-3 weeks, prices for oil and natural gas likely to depend heavily upon level of oil imports + rate of increase in refinery utilization
  - Was last week's 1.15 million barrel per day increase in crude oil imports a fluke or beginning of a trend?
- Primary drivers of this year's price increases structural, **not** short-term
  - Prices of oil, natural gas and electricity beginning to rapidly converge
- Over next 6 months, unless OPEC increases production by at least 1.1 million barrels per day:
  - Stocks of crude oil and gasoline inventories virtually certain to decline relative to historical norms
  - Oil prices likely to quickly return to this years highs – and then continue climbing
  - Natural gas (at a minimum) likely to increase in parallel
- By mid- summer, natural gas could sell at a premium relative to oil
  - Impact of summer weather on total demand for electricity = key

## Import Levels May Dictate Near-Term Price Movements

### Previous Weeks in Which Crude Imports Suddenly Jumped

Week Ended	Net Crude Imports	4-Week Average	Following Week	Decline
1/21/05	10.458 million b/d	9.933 million b/d	9.791 million b/d	710,000 b/d
2/11/05	10.434 million b/d	10.095 million b/d	9.643 million b/d	572,000 b/d
3/25/05	10.568 million b/d	10.119 million b/d	9.890 million b/d	791,000 b/d
4/22/05	10.863 million b/d	10.010 million b/d	?	?



## Prices Highly Sensitive to Weather

- Natural gas prices *far* more sensitive to weather than in prior years
  - At least when not dictated by price of oil
- ***Any forecaster that issues a single point forecast is leading you astray!***
  - Broad range of potential outcomes usually plausible
  - Planning nightmare
- Greater sensitivity to weather results from 5 factors:
  1. Supplies tight
  2. Much higher % of total demand for natural gas is highly weather-sensitive than in prior years
  3. Abnormal weather close to becoming the norm
  4. Far less potential for fuel switching than just a few years ago
    - Reduces ability to moderate swings, both up and down
  5. Not enough storage capacity to adequately buffer market
- Result: far greater potential for price swings, both up and down



## Longer Term

- Significantly higher prices may be inevitable
- By 2010, U.S. faces potential natural gas supply deficit = BTU equivalent of 1.5X current level of oil imports from Middle East
- Pricing of LNG, to extent supplies available, likely to be linked to oil
  - Marginal source of supply sets price for natural gas in U.S. market
- Reliability of natural gas supply also at risk
  - May not be adequate to operate gas-fired plants at required capacity factors
- Only a small number of major new oil supply projects scheduled to come on line in 2007 or 2008 to supplement aging fields
- Matt Simmons' new book, *Twilight in the Desert*, due out May 17<sup>th</sup> predicts that Ghawar (world's largest oil field) may soon go into rapid and irreversible decline
- Goldman Sachs \$ 105 to 135 per barrel "super-spike" estimate for oil in 2007 -2008 may turn out to be conservative
  - Equates to \$ 15 to 20/MMBTU for natural gas

## Natural Gas & Electricity Crisis, Not Just Oil

- Run-up in energy prices not only or even primarily an oil crisis
- Far more dollars potentially at stake in natural gas & electricity markets

Energy Source	Fuel Consumption	Percentage of Total U.S. Fuel Use
Generation of Electricity	38.86 Quad Btu (Incl. Use of 5.33 Quad Btu of Natural Gas and 1.20 Quad Btu of Oil)	38.9 %
Direct Use of Natural Gas by Residential, Commercial & Industrial Users	17.40 Quad Btu	17.4 %
Direct Use of Oil (Including Transportation)	38.86 Quad Btu (Incl. 2.85 Quad Btu of Natural Gas Liquids)	38.9 %
Direct Use of Coal & Other Fuels	4.69 Quad Btu	4.7 %
<b>Total U.S.</b>	<b>99.81 Quad Btu</b>	<b>100.0 %</b>

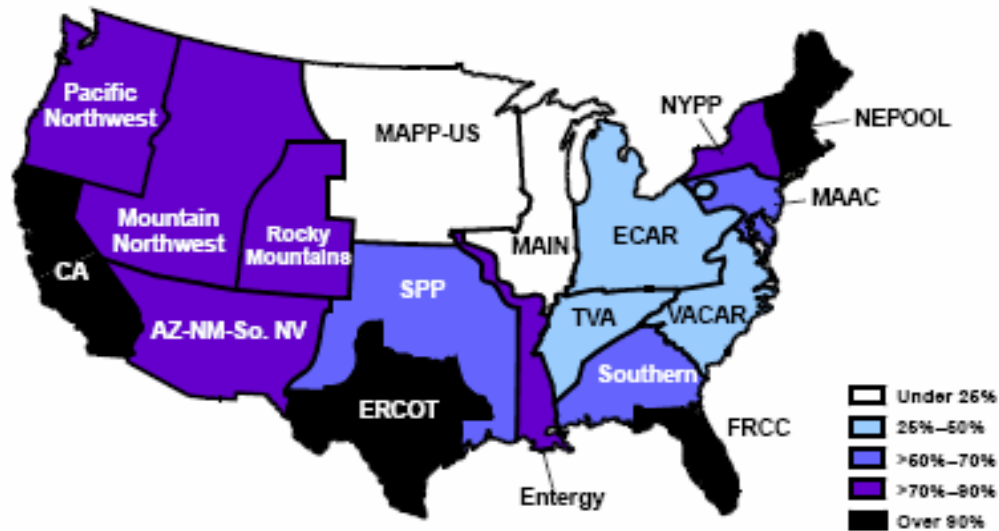
- Magnifies potential adverse impacts on U.S. economy, ability of U.S. manufacturers and agricultural producers to compete in world markets

## Natural Gas Prices Drive Wholesale Electricity Markets

- Impact of natural gas prices on wholesale price of electricity increases every year

### Natural Gas Frequently Sets Regional Price

*(Percent of time gas and oil on the margin projected in 2004)*



Source: CERA (April, 2004)

## Significant Impact on U.S. Economy

- Past 4 years have seen:
  - \$ 275 billion/year + increase in oil costs
  - \$ 100 billion/year + increase in natural gas costs
- Reduces consumer spending power, ability of U.S. companies to compete in global markets
- Federal Reserve Board estimates reduced U.S. GDP by  $\frac{3}{4}$  of 1 % in 4<sup>th</sup> quarter of 2004 alone
- \$150 billion/year + increase over past 4 years in energy contribution to balance of payments deficit
  - = 2  $\frac{1}{2}$  months current annual U.S. trade deficit (at record levels)



## Threatens Long-Term U.S. Prosperity

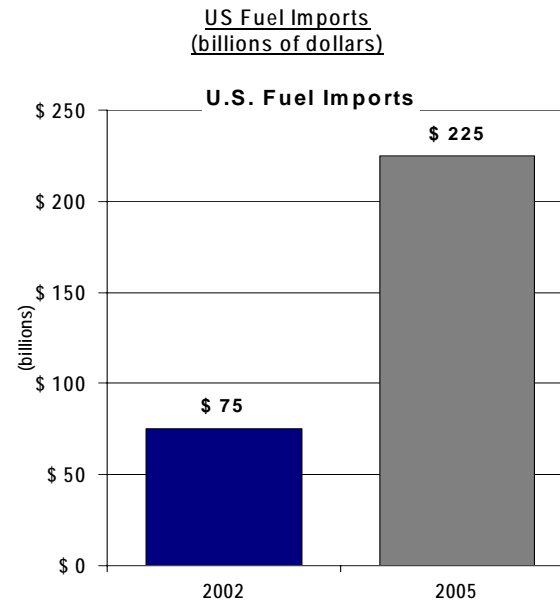
- Impact of energy costs on trade deficit = particularly serious long-term threat
  - > 30 % decline in value of U.S. dollar vs. EURO over past 2 years
  - Decline expected to continue and potentially accelerate
- Higher energy costs increase trade deficit through:
  - Rapid increase in expenditures for imported fuels (i.e., oil + LNG)
  - Decline in U.S. exports – particularly chemical industry & agricultural products (two largest exporting industries)
- At same time, higher energy costs also threaten to:
  - Increase inflation rate
  - Significantly reduce growth rate of U.S. economy
  - Cause significant job loss
  - Seriously impair ability of U.S. companies to compete in world markets





## Fuel Imports Drive Trade Deficit

- Dollar outflow to pay for imported fuels has tripled over past 4 years:



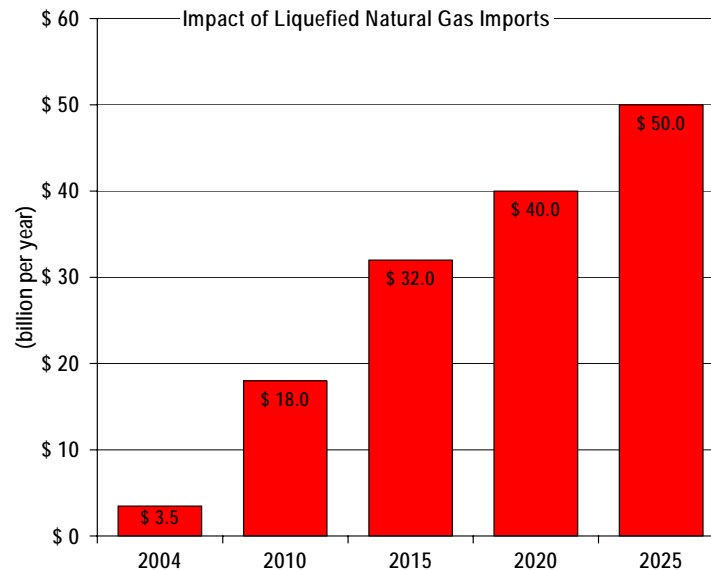
- Could double again over next 24 to 48 months



## LNG Imports Expected to Increase Sharply

- Longer term, LNG imports could add significantly to U.S. trade deficit
  - By 2020, in BTU equivalent terms, LNG imports expected to exceed current oil imports from Persian Gulf by 20 %
  - EIA estimates will account for up to 87 % of incremental U.S. natural gas supply

Potential Increase in Balance of Payments Deficit  
Due to Increased Imports of LNG





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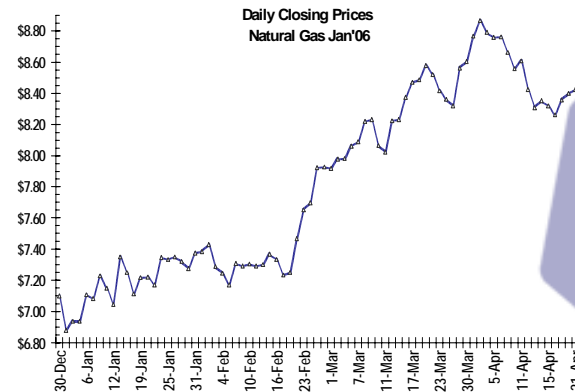
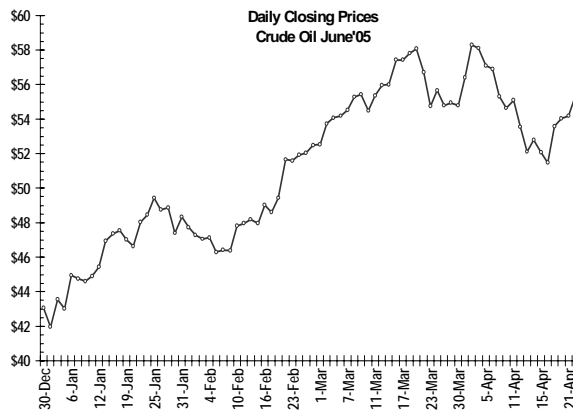
## Major Shift in Dynamics of Natural Gas Market



## Causes of Recent Surge

- Recent surge in natural gas cash market and futures prices due to:
  1. Tight overall supply/demand balance in physical delivery market
  2. Steep increase in oil prices since January 1<sup>st</sup> of this year
  3. Strong re-coupling of oil prices and price of natural gas:

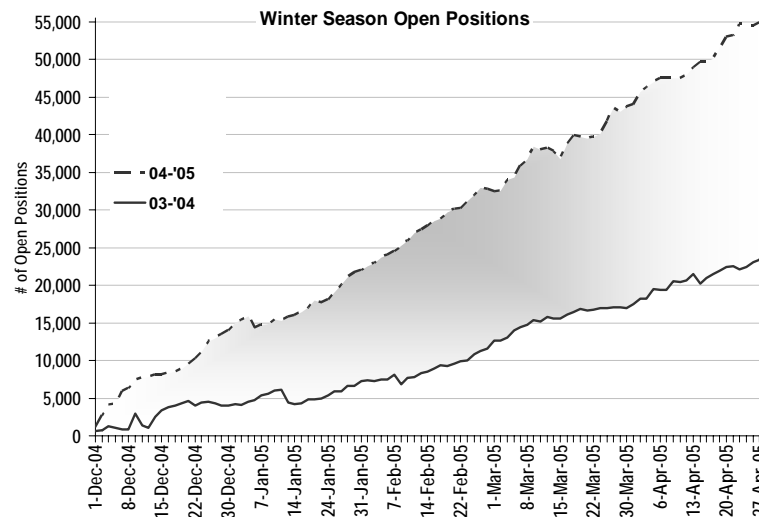
Relative Movement in Crude Prices and January 2006 Natural Gas Futures  
December 30<sup>th</sup>



## Futures Prices = Primary Driver

- Re-coupling of price of oil and cash market price of natural gas due primarily to:
  1. Expectation beginning early in 2005 that natural gas prices and oil prices would re-couple by no later than next winter
  2. Large increase in purchases of 2005-2006 winter-month natural gas futures contracts
  3. Growing importance of LNG as marginal source of supply in U.S. market in winter months/potential linkage between LNG prices and global price of oil

### Increase in Number of Open Positions Winter Month Contracts



## Drove Cash Market Price

- Winter-month contract price increases drove up cash market price
  - Created ability for marketers to lock-in guaranteed profit by selling winter month futures contracts + immediately purchasing gas and injecting into storage to cover obligations under futures contracts
- During March and April, arbitrage purchases brought entire 12-month strip into tight lock step with expected oil prices next winter
- Ironically, tight linkage has occurred even though oil prices and cash market price of natural gas largely de-coupled 7 out of past 10 months and amount of natural gas in underground storage far above last year's levels
  - Prices for oil and natural gas de-coupled almost entirely during July through November of 2004 + January and February of 2005
- LNG experience this winter also has played important role
  - Marginal source of supply sets market clearing price in U.S. market
  - During periods this winter, imports from LNG suppliers other than Trinidad largely dried up
  - U.S. outbid by European and Asian purchasers paying prices tied to oil
  - Seen as potential harbinger of developments next winter and in future years

## Deeper Causes of High Natural Gas Prices

- Longer-term, higher U.S. natural gas prices product of far-deeper causes
- Stems from collision of two tectonic plates set in motion long ago:
  1. After several decades of development, production from conventional North American sources of supply of natural gas has plateaued
    - Many fields are in rapid and irreversible decline, including key Near Shelf Region in Gulf of Mexico
    - Rate of decline could accelerate rapidly in future years
  2. At same time, amount of natural gas needed to meet the needs of U.S. economy about to explode
    - Due largely to shift to natural gas as near-exclusive fuel to meet incremental electricity needs of U.S. economy
    - Recent EIA estimates severely understate likely increase in requirements
- Absent freakishly mild summer weather, virtually guarantees continued steep increases in price of natural gas over next several years
- One of most serious threats currently facing U.S. economy
  - Potential price increases ***could significantly exceed further increases in price of oil in Btu-equivalent terms***

## Process Still Unfolding

- Decline in North American natural gas supplies over past 4 years already has:
  1. Caused natural gas prices to more than triple
  2. Driven all but highest-value, core uses of natural gas out of U.S. market
- Fuel switching capability also has fallen dramatically during past 48 months
  - Due largely to tighter NOx requirements
- But – ramp-up in power sector demand only now about to get started in earnest
  - Extent of likely increase masked by utterly unrealistic EIA estimates of likely power sector consumption of natural gas over next several years
- Resulting price increases required to balance supply and demand could shock end users, generators and regulators
- In many states, could affect electricity prices just as significantly as price of natural gas
- No easy solution
  - Especially short to medium term



## Disturbing Message

- Every published price forecast for natural gas, oil and electricity unreliable
- Estimates understate significantly potential for:
  1. Prices to rise far higher than predicted
    - Not just 10-20%, but 2-4X
  2. Downside price volatility due to:
    - Weather and/or potential significant contraction of U.S. or global economy
- Total supplies of natural gas and petroleum available to U.S. market during remainder of this decade almost certainly will not meet current estimates of projected needs
  - Not even close
- Creates planning nightmare
- One of most difficult challenges we've ever faced
- Risk of steep further price increases and supply curtailments can be ignored only at great peril





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Inventory Myths – Part I  
Misconceptions Regarding Oil



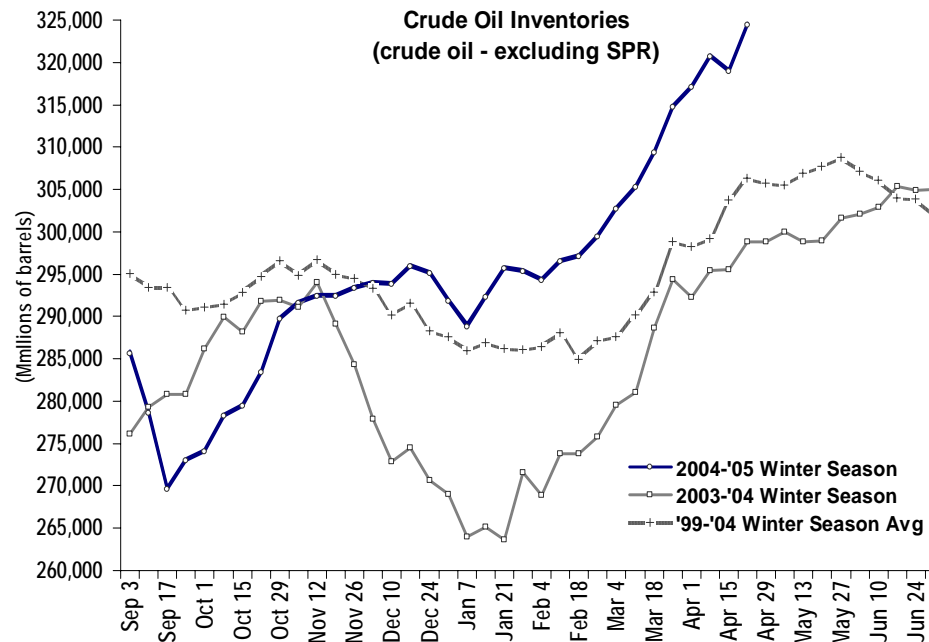
## Misguided Pundits

- Conventional wisdom = oil market adequately supplied, since crude oil stocks + gasoline inventories currently above "normal" level --measured in terms of total # of barrels
- Superficial analysis
  - Fundamentally, simply false
- Similar to concluding no risk of winter price spikes in natural gas market if end-of-Refill Season storage at normal storage
  - Then why did '02-'03 price spikes occur even though # of Heating Degree Days only 0.7 % > than historical norm?
- Comparison of inventory levels to prior norms = valid indicator when markets stable + supply growing at least as rapidly as demand
- Highly misleading when growth in demand outpacing increase in available supplies
- EIA's most recent estimate: in '05, growth in global demand will outstrip growth in available supplies by 400,000 barrels per day
  - Creates potential shortfall of almost 150 million barrels, all in 2<sup>nd</sup> half of year, even assuming a 1.1 million barrel per day increase in OPEC production over next 6 months

## Crude Inventories

- Crude inventories generally increase beginning around mid-February
- Currently 25.6 million barrels above year-ago levels:

### Crude Oil Inventories

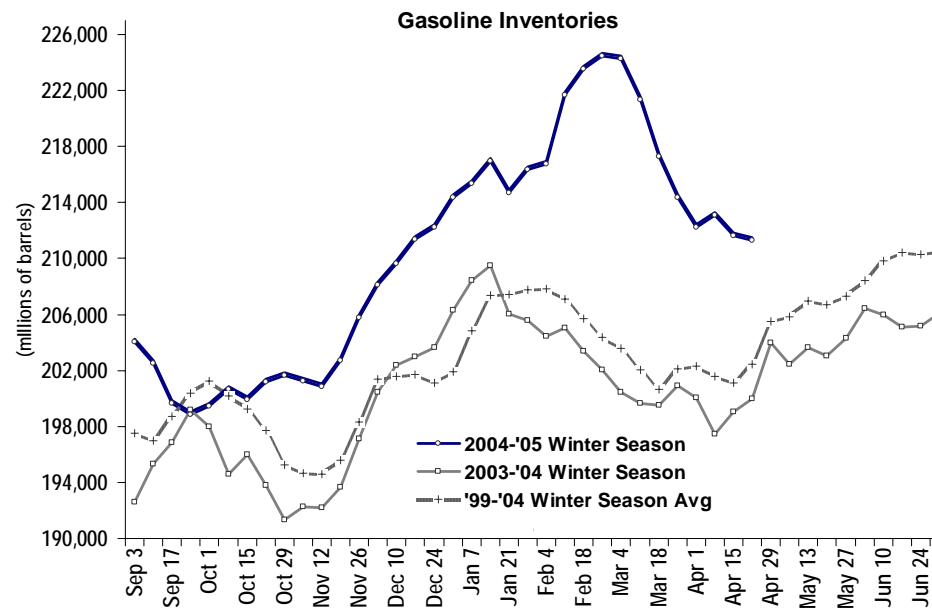


## Gasoline Inventories

- Gasoline inventories = 11.3 million barrels above year-ago levels
- But – declines 7 of past 8 weeks – dropping 13.2 million barrels

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### Gasoline Stocks

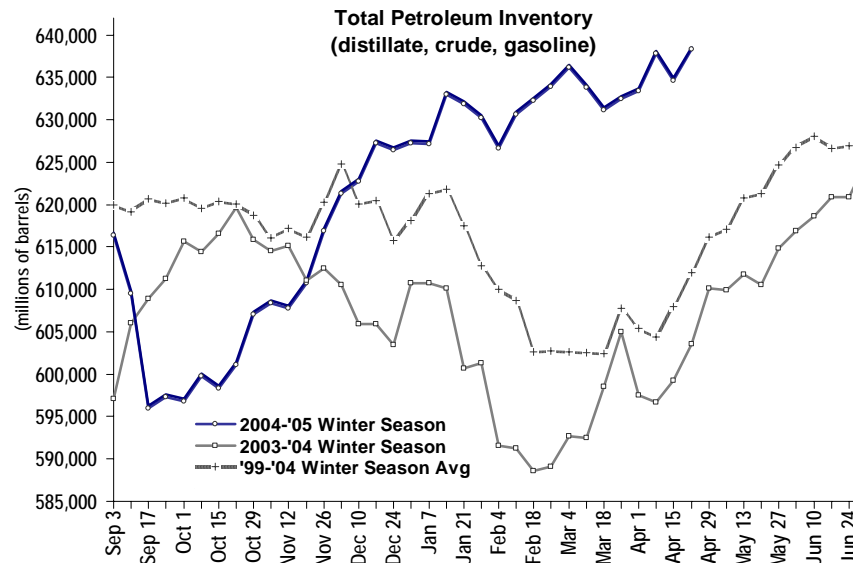


## Total Petroleum Inventories

- Over same 8-week period, total petroleum inventories have increased by only 2.5 million barrels even though usually begin increasing by mid-February
  - 1.6 million barrel *decline* prior to last week's huge surge in imports
  - 6.4 million barrel *increase* during same period last year
- Currently 36.8 million barrels above year-ago levels

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### Total Petroleum Inventories



## Analysts Should be Paid to Interpret

- Raw numbers taken out of context at a particular moment in time provide little insight into underlying trends
- Key = interpretation
- What matters = whether supplies will be adequate to maintain inventories at acceptable levels during remainder of year in market in which demand is growing more rapidly than supplies
- To assess, need to evaluate:
  - Why inventories have increased during the past 6 to 9 months
  - Whether these higher inventory levels are likely to be sustained without further price increases
  - If not, how high prices may have to rise in order to maintain inventories at acceptable levels during remainder of 2005 and in 2006
- For this purpose, projected inventory levels (assuming no further price increases) more important than current levels
- Many oil industry analysts make no effort to estimate
  - Freeze analysis at a single moment in time (i.e., now, not 3 months from now)



## Stark Realities

- Underlying pattern remarkably clear – but almost totally ignored by most analysts
- Starting in May of last year, OPEC increased production by approximately 2.0 million barrels per day
  - Sudden increase = to almost a full year's growth in global demand
  - Possible = maximum sustainable capacity any time this year
- Led to immediate jump in U.S. imports
  - Next 4 months, average of 400,000 barrels per day of crude + 250-300,000 barrels per day of finished products
- Remarkably: no net improvement in U.S. inventory levels in subsequent 4 months
- Potentially ominous indicator of what to expect in May through September of this year
  - No comparable increase in global production feasible in 2005

## Temporary Period of Improvement

- Year-over-year increase in crude inventories occurred **entirely** in 4-month period between end of 3rd week in September of 2004 and end of 3<sup>rd</sup> week in January of 2005
- In absolute terms, crude stocks increased from 269.5 million to 295.6 million barrels
  - Increase of 26.1 million barrels
  - Due in part to reduced refinery utilization after Hurricane Ivan
- Year-over-year increase even greater
  - Crude inventories had declined by 17.1 million barrels 1 year earlier
- Year-over-year, crude inventories increased from – 11.3 million barrels to + 31.9 million barrels between weeks ended 9/24/04 and 1/21/05
  - Net improvement of 43.2 million barrels
- Since that time, year-over-year crude inventories have *declined* by 6.3 million barrels
  - Despite last week's huge increase in imports



## Why Crude Inventories Temporarily Increased

- Crude inventories temporarily increased relative to year-ago levels for two principal reasons:
  1. Still in early stage of period immediately after OPEC had increased production by 2.0 million barrels per day
    - OPEC continued production at close to maximum levels all through September-January time frame (in part in response to record U.S. prices last fall)
    - During this period, growth in global demand had not yet fully absorbed OPEC's sudden, massive increase in supply
    - Permitted continued near-record levels of imports into U.S.
    - Unlike last summer (when imports high even in 2003), resulted in **huge** year-over-year increase in import levels (since prior year comps were easy to beat)
    - 143 million barrel net year-over-year increase in crude imports
    - 59.3 million barrel increase in imports of finished products
    - Net result: 202.3 million increase in total net imports of crude + finished products
    - More than offset 40 million barrel of crude production lost in Gulf of Mexico
  2. Lower utilization rate at U.S. refineries than 1 year earlier, especially during period immediately after Hurricane Ivan struck Gulf

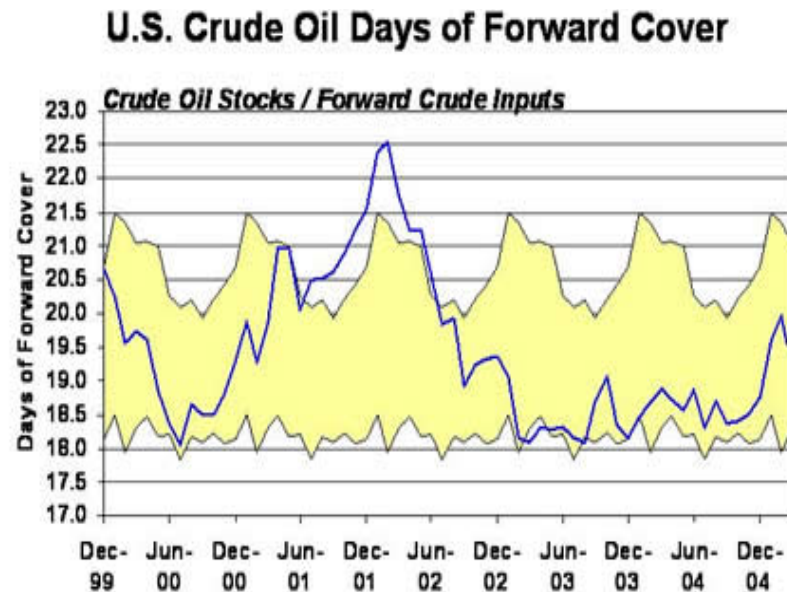


## Obvious Danger Ahead

- U.S. demand in '05 running significantly above last year's levels
- Result = to require significant increases in U.S. crude imports to simultaneously meet current needs + prevent stocks from declining
- But -- non-U.S. demand growing even more rapidly
  - Almost 2X as fast
- As non-U.S. demand continues to grow, unless U.S. outbids competitors, U.S. share of total global imports certain to decline
- Prior to last week, even with WTI crude above \$ 50 per barrel, recent U.S. imports no higher than year-ago levels this time of year
- Last year, required 2.0 million barrel per day production **increase** in May to enable U.S. to meet growth in U.S. and global demand
  - Oil prices *still* increased by more than 25 % over next 4 months
- Even larger U.S. import increases needed in 2<sup>nd</sup> and 3<sup>rd</sup> quarter of this year
- No new source of supply available to meet this need

## Putting U.S. Inventories in Perspective

- Assessed properly, in terms of days of forward cover, U.S. inventory levels over past 6 to 9 months never have been particularly high:



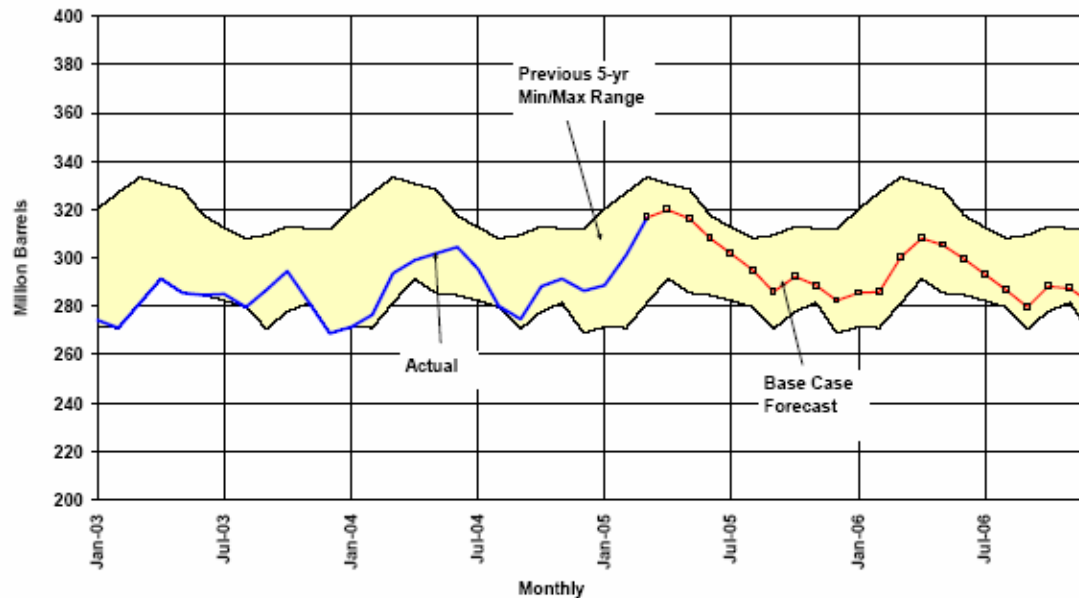
Source: EIA, This Week in Petroleum, March 23, 2005

## High Likelihood Inventories Will Deteriorate

- EIA's April Short-Term Energy Outlook (STEO) shows that even if OPEC increases production by 1.1 million barrels per day over next 6 months crude inventory levels are likely to decline significantly :

EIA's Most Recent Forecast of Crude Oil Inventories

**Figure 5. U.S. Crude Oil Stocks**

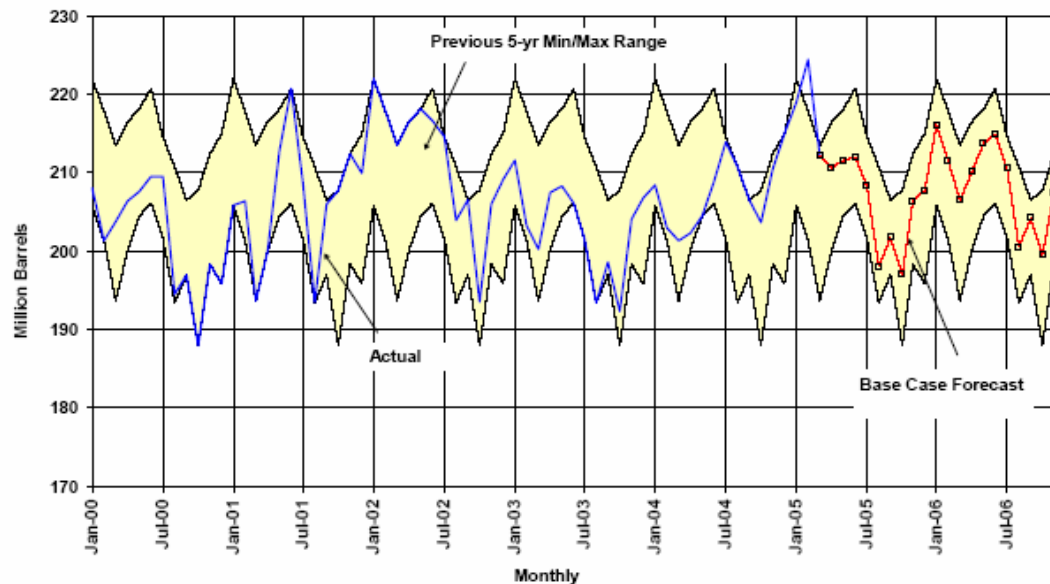


## Basis for EIA's \$ 55 per Barrel Price Forecast

- Gasoline inventories show similar pattern
  - Basis for recent EIA forecast of average WTI price for next 2 years

### EIA's Most Recent Forecast of Gasoline Stocks

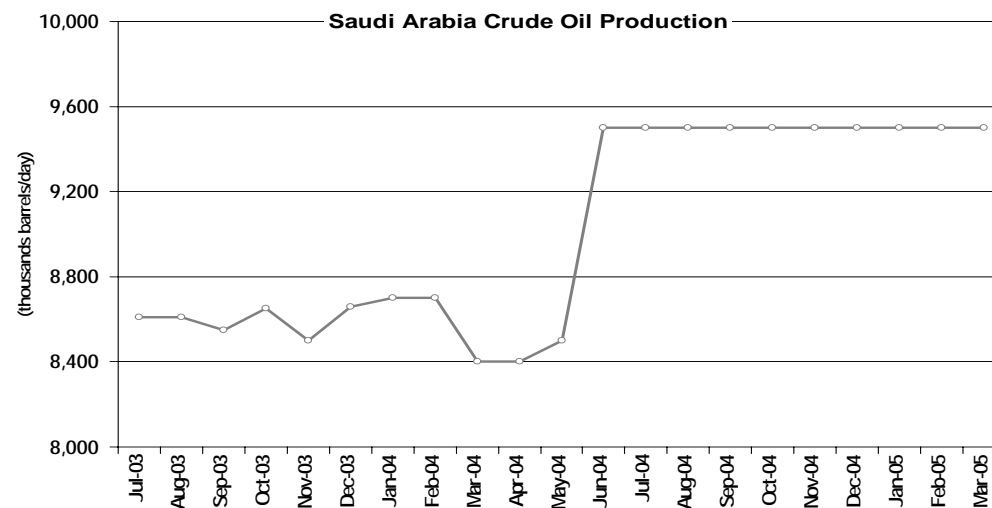
**Figure 8. U.S. Gasoline Inventories**



## Requires Major Immediate Increase in OPEC Production

- Even to maintain these inventory levels, will require:
  - Immediate increase in production of additional 500,000 barrels per day
  - Total increase of 1.1 million barrels per day by this fall
- Saudi response to date not encouraging
  - Finding excuses not to implement for over a year:

EIA Estimate of Saudi Oil Production



## Consequences of Failure Bleak

- If OPEC is unable or unwilling to increase production, all bets are off
  - EIA \$ 55 per barrel average price forecast for remainder of 2005 and for 2006 expressly predicated on assumption that production will increase
- Market will not allow inventories to fall substantially below levels indicated in previous slides
- If production increase is < 1.1 million barrels, steep price increases likely to be required to prevent inventories from rapidly falling
  - More than 25 years since market has had to rely on price increases to curb demand on a comparable scale
- No one knows how high a price increase might be required to obtain a sufficient reduction in demand
  - \$ 105 per barrel not out of question *for this year* (vs. earlier Goldman Sachs' forecast of upper end of range for 2007)
  - Equates to average price for gasoline of just \$ 3.30 per gallon
- Suggests potential for natural gas prices to reach as high as \$ 15.00/MMBTU by this fall



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Inventory Myths – Part II  
Natural Gas



## Conventional Wisdom Far off the Mark

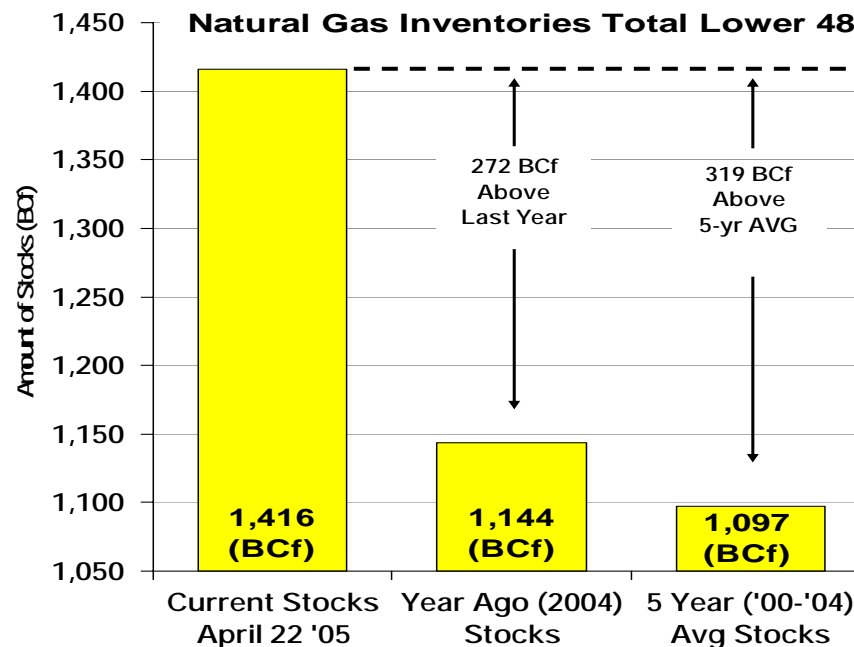
- Story similar
- Four key issues:
  1. How large is year-over-year surplus?
  2. How did it come about?
  3. What does the existence of this surplus tell us about the supply/demand balance in the current market?
  4. Is it adequate to prevent price spikes during the remainder of the year?
- Answers to all four questions may surprise you
- Key conclusions:
  - If weather-driven demand close to historical norms, even at record-high prices, current market is chronically undersupplied
  - Over next 90 -120 days, steep run-up in natural gas prices **or** storage overflow/price collapse scenario are **both still plausible**
  - Natural gas prices more likely to rise steeply, however, than to collapse



## Size of Current Surplus

- As of last week's Storage Report, amount of working gas in storage reported at 272 BCf above year-ago levels:

### Comparison to Year-Ago Inventory Levels



## Sharp Swings

- Year-over-year variance has swung sharply in recent months
  - 12/31 – 133 BCf
  - 1/31 – 193 BCf
  - 2/28 – 408 BCf
  - 3/31 – 186 BCf (est.)
  - 4/22 – 272 BCf (EIA published figure)
- Highlights potential for year-over-year surplus to increase suddenly or rapidly disappear in future months
- Figures reported by EIA may be overstated by 20 to 25 BCf
  - 2004 monthly finals indicate weekly estimates consistently too low early last year
- Colder weather in late April and early May may also shave difference
- Still clearly at least 175 BCf year-over-year

## Reclassification of Base Gas

- Almost ½ of the apparent year-over-year increase due to reclassification of “base gas” as “working gas”
  - Same gas already sitting in storage for many years
- Reclassification simultaneously expands total storage capacity and increases amount of “working gas in storage” reported by EIA
  - At least initially, gas doesn’t move physically
- Approximately another 20 BCf of the year-over-year increase due to addition of new storage facilities
- Assuming reclassifications *bona fide*, these increases in amount of working gas in storage are real
  - Provide at least some additional protection against price spikes, particularly in winter months
- But – since total “working gas” storage capacity and the amount of working gas in storage are increasing in tandem, amount of gas required to be injected during the Refill Season to fill existing storage facilities back up to year-ago levels remains largely unchanged
  - By end of next week, net difference likely to be no more than 75 to 100 BCf
  - Reduces storage refill requirement by no more than 0.6 to 0.7 BCf/day
  - Just as significantly, as experience in March illustrates, could disappear almost overnight

## Specifics on Reclassification

### Recent Changes in Storage

Date	Total Underground Storage Capacity	Base Gas	Implied Working Gas Storage Capacity
12/31/02	8,431.0 BCf	4,340.2 BCf	4,090.8 BCf
12/31/03	8,208.5 BCf	4,304.7 BCf	3,903.8 BCf
3/31/04	8,219.1 BCf	4,283.5 BCf	3,935.6 BCf
12/31/04	8,215.7 BCf	4,201.1 BCf	4,014.6 BCf
2/28/05	8,236.7 BCf	4,204.5 BCf	4,032.2 BCf

Source: EIA, Natural Gas Monthly Reports, Table 14.



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## Chronically Undersupplied Market



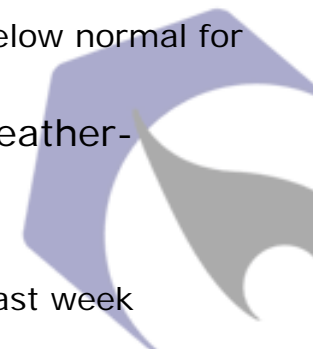
## Crisis Waiting to Explode

- Winter of 2002-2003 gave early indication of severity of current shortfall in “normal weather” scenario
  - Started winter with above-average amounts of natural gas in storage
  - Number of gas-weighted Heating Degree Days only 0.7 % > normal
  - Still just barely avoided crisis
  - Since that time, demand has grown significantly and supplies have fallen
- On a weather normalized basis, even at current record price levels, U.S. market chronically under-supplied
  - Energy Ventures Group estimate: by at least 500 to 750 BCf
- During past year, only an extraordinary streak of back-to-back mild weather events has masked severity of shortfall
- As soon as weather reverts to historical norms, natural gas prices will soar
  - Even if oil prices moderate (which is not likely to occur)



## Extraordinary String of Back-to-Back Events

- Over past 12 months, not just one episode of milder-than-normal weather, but an unbroken string of one after another followed by another
  - Temperatures generally **warmer**-than-normal (in winter, spring and fall), significantly reducing space heating demand
  - But summer then far **cooler**-than-normal (reducing use of power sector demand for natural gas to run air conditioners by at least 300 BCf last summer)
- Includes:
  - 3<sup>rd</sup> mildest spring in past 110 years in spring of 2004
  - Followed by 2<sup>nd</sup> coolest summer in 30 years
  - Followed by exceptionally mild fall
  - Followed by exceptionally mild winter, with Heating Degree Days far below normal for 4 months in a row (i.e., November through February)
- March was the first month in a year with slightly above normal weather-related demand
- But -- April once again been exceptionally mild
  - 50 HDD's below normal (13.1 % < normal), even after 25 HDD gain past week

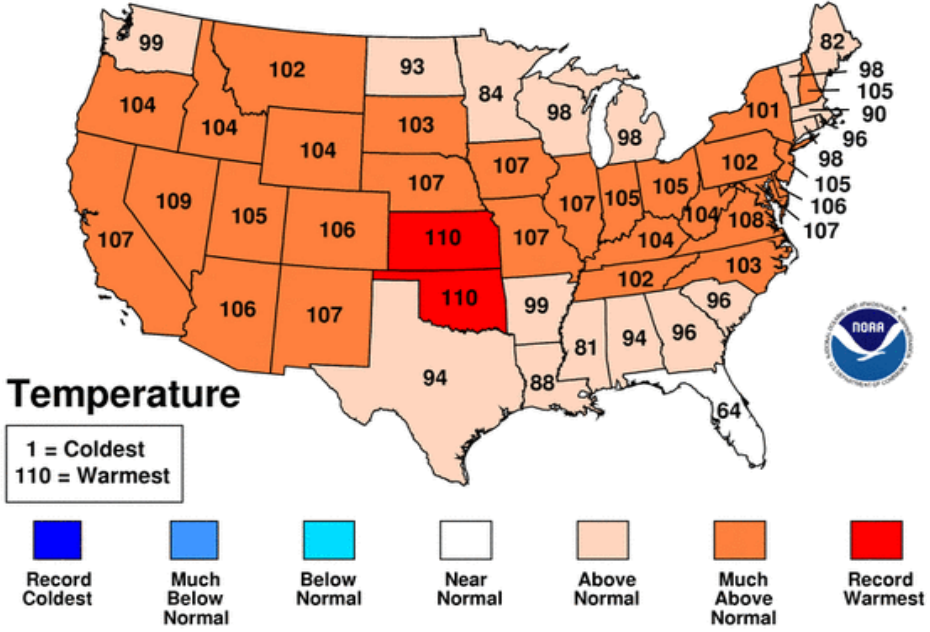


# Extremely Mild Spring Last Year

- 3<sup>rd</sup> mildest spring in 110 years

## March-May 2004 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA



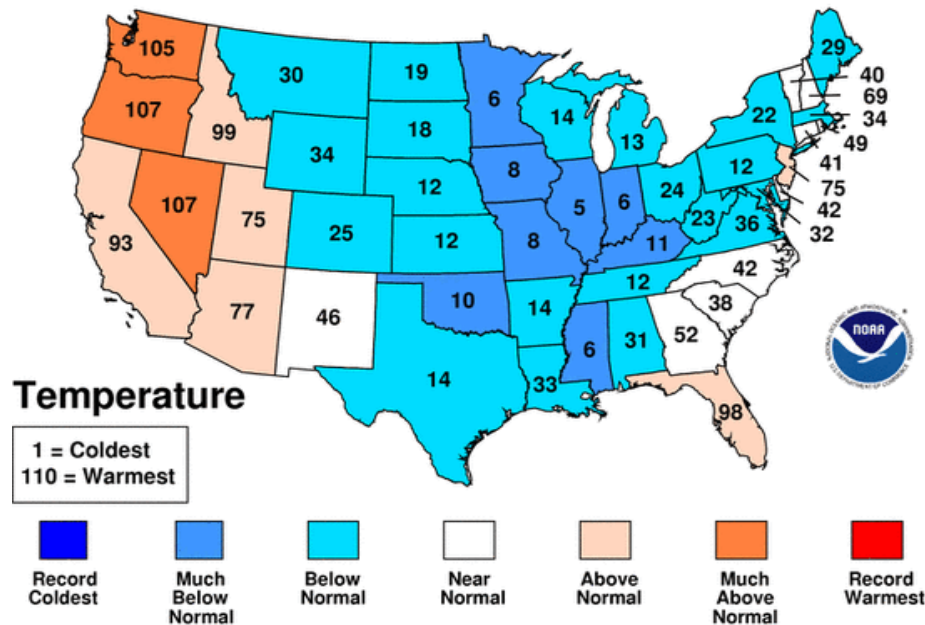


## Like Flicking a Switch on First Day of Summer

- Followed immediately by exceptionally mild summer
  - Huge impact on power sector consumption of natural gas

### June-August 2004 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA

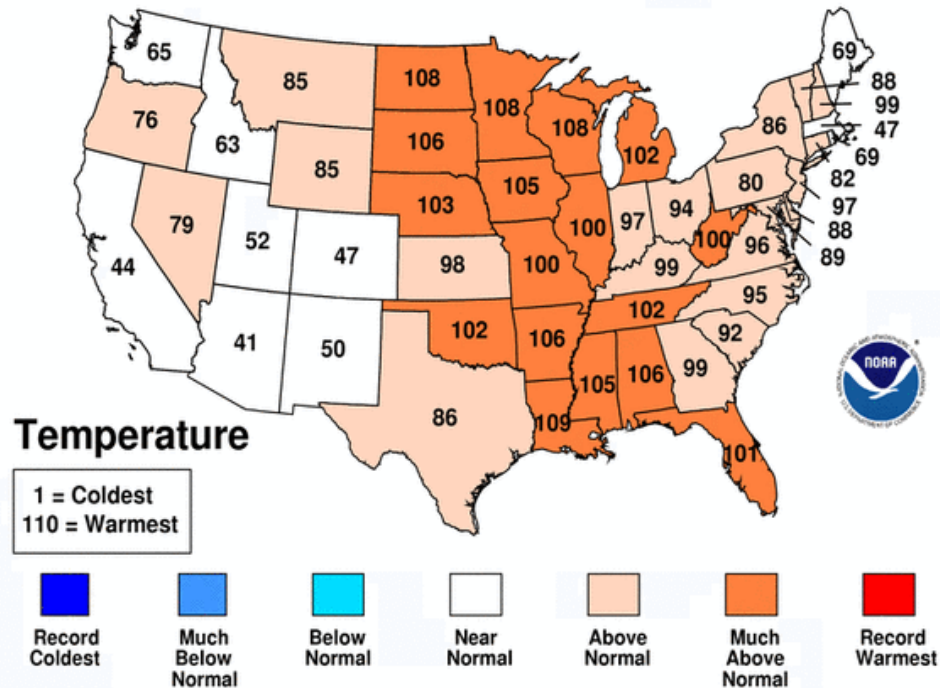


Switch Back

- Then switched back last fall:

## September-November 2004 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA

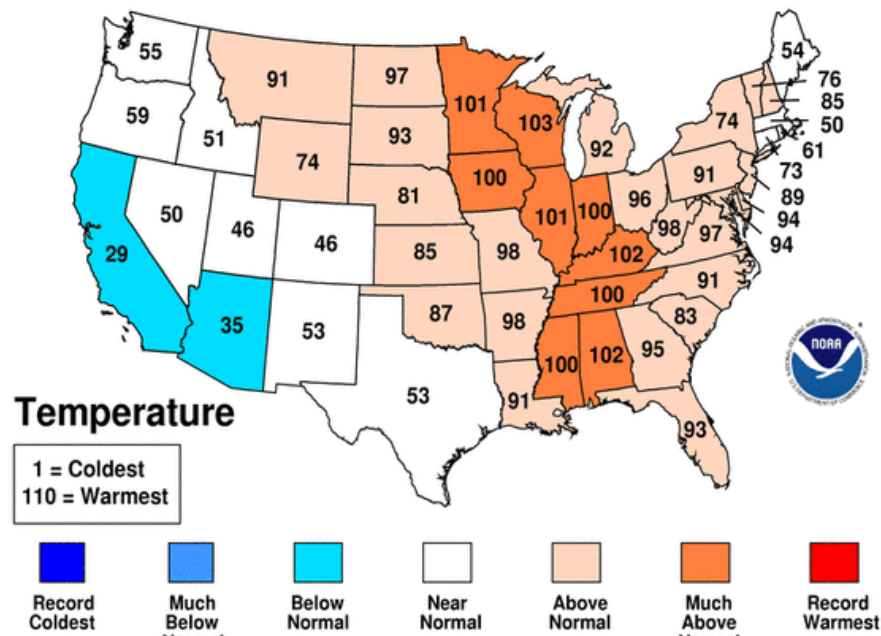


## Exceptionally Mild November

- Last November was particularly mild, allowing a significant further build-up in storage

### November 2004 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA

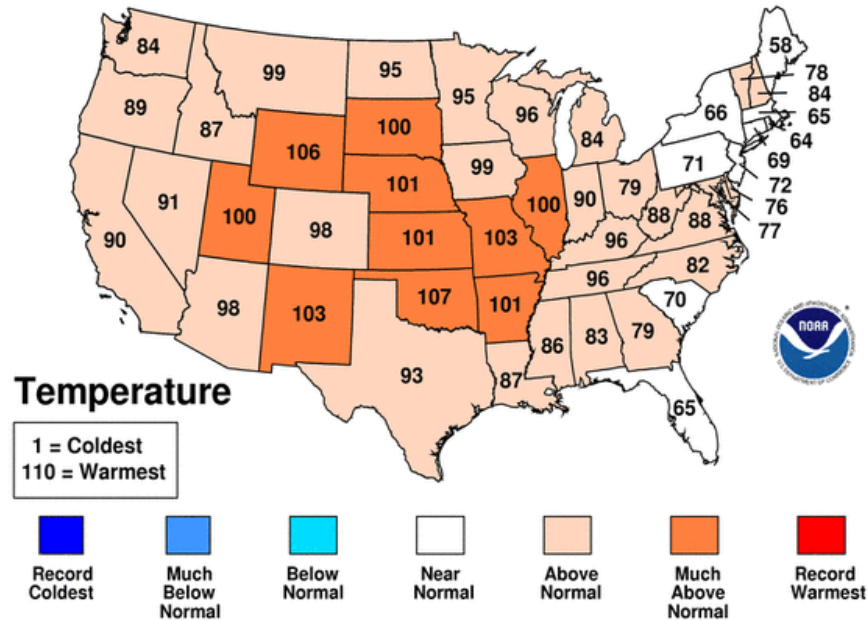


## Exceptionally Mild Winter

- Then capped off by exceptionally mild temperatures in core winter months from December through February – particularly in Midwest
  - Greatest impact on consumption of natural gas

### Dec 2004-Feb 2005 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA



## Evidence of Chronic Undersupply

- Should have resulted in either massive year-over-year increase in amount of natural gas in storage or plummeting natural gas prices or both

### Impact of Mild Weather on Consumption

Period	Impact
April – May '04	- 200 – 250 BCf
June – Aug '04	- 275 – 325 BCf
Sept – Nov '04	- 125 – 150 BCf
Dec '04 – Feb '05	- 250 – 275 BCf
March '05	+ 50 – + 75 BCf
<b>Cumulative Impact</b>	<b>- 800 – 875 BCf</b>

- Net of production lost due to Hurricane Ivan, should have been a glut on the market of as much as 625 to 700 BCf



## Missing Natural Gas

- Net gain in amount of natural gas in storage, after adjustments for reclassifications, from April 1, 2004 through March 31<sup>st</sup> 2005 = only about 90 BCf (i.e., < 15 % of this amount)
  - Year over year increase in storage = 1,244 BCf (3/31/05) vs. 1,058 BCf (3/31/04) = 186 BCf
  - But -- reclassification of base gas to working gas accounts for approximately 95 BCf of this total
  - Net gain = 91 BCf
- Spot market price 3/31/05 32.6 % > than 1 year earlier:
  - \$ 7.4662/MMBTU vs. \$ 5.6291 on 3/31/04
- By any measure, therefore, if weather-related demand for natural gas during period between 4/1/04 and 3/31/05 had been in normal range, market would have been severely undersupplied
  - Even with relatively high prices during most of this period



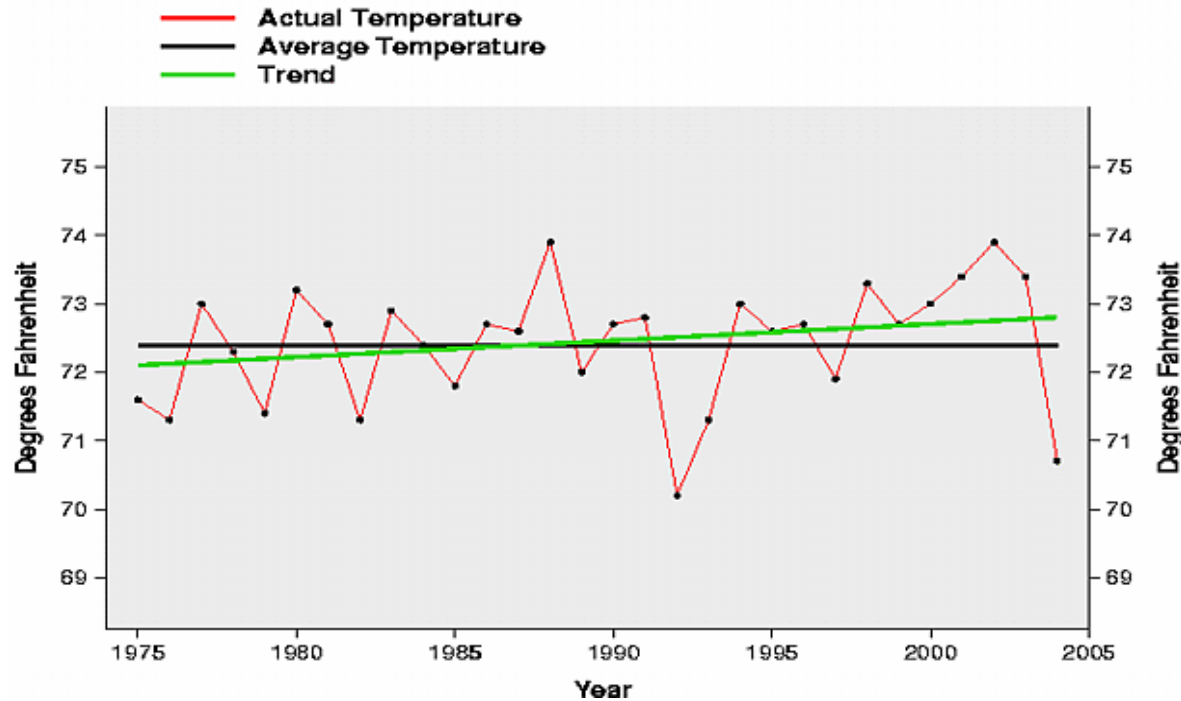


## Weather Deviations Extreme

- Last summer = 2<sup>nd</sup> mildest summer in past 30 years

NOAA – U.S. Mean Average Summer Temperature

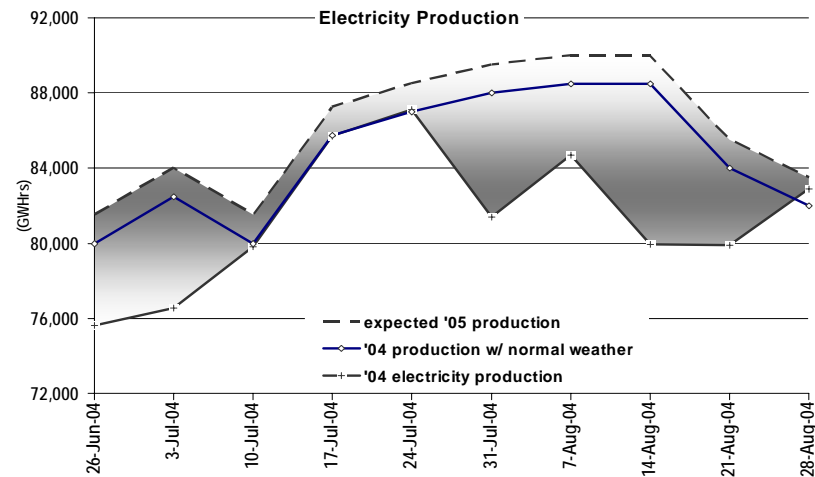
June through August – Past 30 Years



## Potential Price Spikes This Summer

- Sets up potential for severe price spikes this summer
- On a weather-adjusted basis, power sector consumption of natural gas running far above year-ago levels since at least May of last year
- If temperatures this summer in normal range, electric generation likely to be far above last year's levels:

Projected Electricity Production  
 For Weeks Ended 6/26/05 through 8/28/05



## Impact on Natural Gas & Electricity Markets

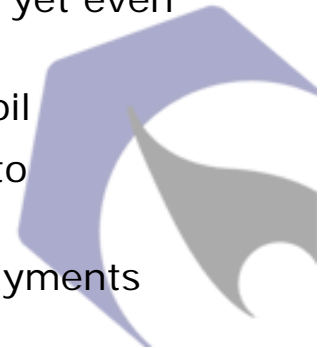
- In summer months, 95 % or more of incremental megawatt hours likely to be generated by gas-fired plants
- If temperatures nationally in normal range, between mid-May and mid-September, year-over-year increase in power sector consumption of natural gas likely to be at least 450 to 500 Bcf
  - Greater if temperatures hotter than normal, nuclear performance below last year's levels or coal transportation constraints limit ability to adequately supply coal-fired plants
- Could coincide with further increases in oil prices
- Creates potential for far steeper natural gas and wholesale market electricity price increases than most energy companies, end users or regulators currently are anticipating
  - Potential replay of last few months of 2000 in California and western markets, but on a national scale
- Even if temperatures this summer more moderate, just beginning of longer term trend
- On weather-adjusted basis, power sector demand for natural gas likely to increase 400 to 450 Bcf every year until at least 2010 or 2012
  - Projections in EIA's Annual Energy Outlook 2005 severely understate

## Role of LNG

- These circumstances create an urgent national need to obtain new sources of energy supply for the U.S. market
- Increased imports of LNG should ***and almost certainly*** will play an important role in filling at least a portion of this need
  - Concerns regarding transportation safety appear to be exaggerated
- Increased imports of LNG appropriate when:
  - Obtained from reliable suppliers
  - Pursuant to firm, long-term commitments made directly to end-users of natural gas, Local Distribution Companies or generators
  - With guaranteed, commercially binding start-dates for deliveries enforceable through meaningful penalties
  - At reasonable prices ***not indexed to the price of oil***
  - Pursuant to contracts that guarantee replacement supplies if shipments from the expected source of supply are curtailed
- Even then, however, dependence upon LNG has a ***huge potential cost*** in terms of job loss and adverse balance of payments impact

## Need for Careful Evaluation of Alternatives

- To date, no careful effort has been made at either Federal or State level to evaluate potential alternatives to a policy of massively increasing imports of LNG
- In many respects surprising
- Just 36 months ago, EIA did not expect increased imports of LNG to play an significant role in meeting future U.S. energy needs
  - U.S. now expecting to rely upon increased imports of LNG for up to 87 % of its incremental supplies of natural gas
  - Must be obtained almost entirely from projects that have not yet even broken ground
  - Pricing terms uncertain – but likely to be closely linked with oil
  - By 2020, in BTU equivalent terms, imports of LNG expected to significantly exceed current oil imports from Middle East
  - Could seriously exacerbate already severe U.S. balance of payments deficit and further weaken value of U.S. dollar



## Unanswered Questions

- Unanswered questions include:
  1. How many new projects actually will be built
  2. When they will be completed
  3. How U.S. can protect itself against potential for extended delays in completion of projects not under its control
  4. Extent of the worldwide competition for the output of these projects (including competition from China, India, Japan, Korea, many European countries and Mexico)
  5. Likely price terms/extent to which pricing will be tied to oil
  6. Potential for shipping to be disrupted or for shipments to be diverted to other countries
  7. Potential pricing power of suppliers (who have the ability to sell spot market cargoes to the highest bidder anywhere in the world)
  8. Whether there is any way to mitigate the job loss or the severe potential adverse impact on the U.S. balance of payments deficit from relying on a new source of imported fuel rather than domestic sources of supply

## Potential Alternatives

- Potential alternatives include:
  - More intensive efforts to facilitate development of domestic supplies of natural gas
  - An urgent effort to rapidly deploy coal gasification on a major scale nationally, both to provide a source of fuel for existing gas-fired combined cycle units and existing industrial facilities and as a source of fuel for new facilities
  - Relief of major electric transmission bottlenecks that prevent full utilization of existing coal-fired plants
  - Replacement of older, steam-fired gas plants in load pockets with new, more efficient combined cycle units
  - Accelerated construction of new coal and nuclear plants
  - Further efforts to promote renewable energy
  - Accelerated energy conservation, especially in commercial office buildings and retail shopping malls (where the greatest waste currently occurs)



## Issues Requiring Evaluation

- To date, there has not been any rigorous analysis – or, indeed, any analysis at all – of the potential risks and benefits of these alternatives vs. a heavily-LNG dependent strategy in terms of:
  - Reliability of U.S. energy supply
  - The potential for severe price shocks and heightened price volatility in the U.S. natural gas and electricity markets
  - Job loss or job creation in the U.S. economy
  - The continued ability of U.S. industry and U.S. farmers (who depend upon the availability of competitively-priced fertilizer) to compete in world markets
  - The U.S. balance of payments deficit
  - The future growth of the U.S. economy



## Lack of Any Fall-back Strategy

- Nor has any apparent effort been made to develop a possible U.S. “fall-back” strategy if:
  - The global LNG market does not develop as rapidly as EIA’s most recent forecasts assume;
  - Other countries outbid the U.S. for the limited new supplies expected to become available on the world market over the next 7 to 10 years; or
  - Supplies from one or more suppliers are interrupted at any point in time due to political unrest, labor strikes, terrorist incidents, wars or any of the other factors that frequently interrupt international shipments of oil
- Instead, to date, one of the most important energy policy choices ever facing the U.S. has been made almost entirely by default, with little or no apparent thought given to the potential risks of a heavily LNG-dependent strategy
- It’s as if we learned nothing from the gas-fired plant fiasco of the first ½ of this decade – which already has resulted in \$ 100 billion or more in unanticipated costs and could results in many times this amount over the next 10 to 15 years

## How to Contact Andy for Questions

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Andy Weisman's

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## Additional Background Slides





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Collision of Tectonic Plates Likely to Cause  
Steep Further Increases in  
Price of Natural Gas & Electricity

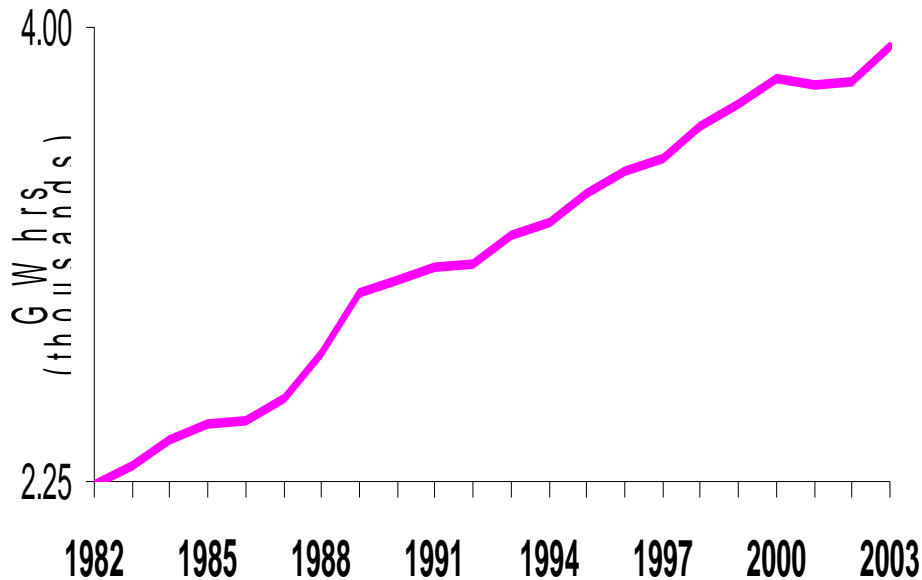




## Continued Economic Growth Requires Expanded Supplies of Electricity

- Demand for electricity generally increases every year
  - Current ratio = 0.72% increase for each 1% growth in GDP

### Electricity Consumption Grows Every Year



## Engine of Economic Growth

- Since 1980, U.S. electricity consumption has grown by more than 75%
- Lifeblood of economy
- If electricity supplies can't be expanded, growth of U.S. economy likely to come to abrupt halt
- Would require many years to changeover infrastructure of U.S. economy sufficiently to fundamentally alter relationship between electricity consumption and economic growth
- Even with increased energy efficiency, U.S. electricity production projected to increase 30% over next 15 years
- On a weather-adjusted basis, growth in electricity demand has accelerated over past 18 months
  - Huge potential implications for U.S. demand for natural gas

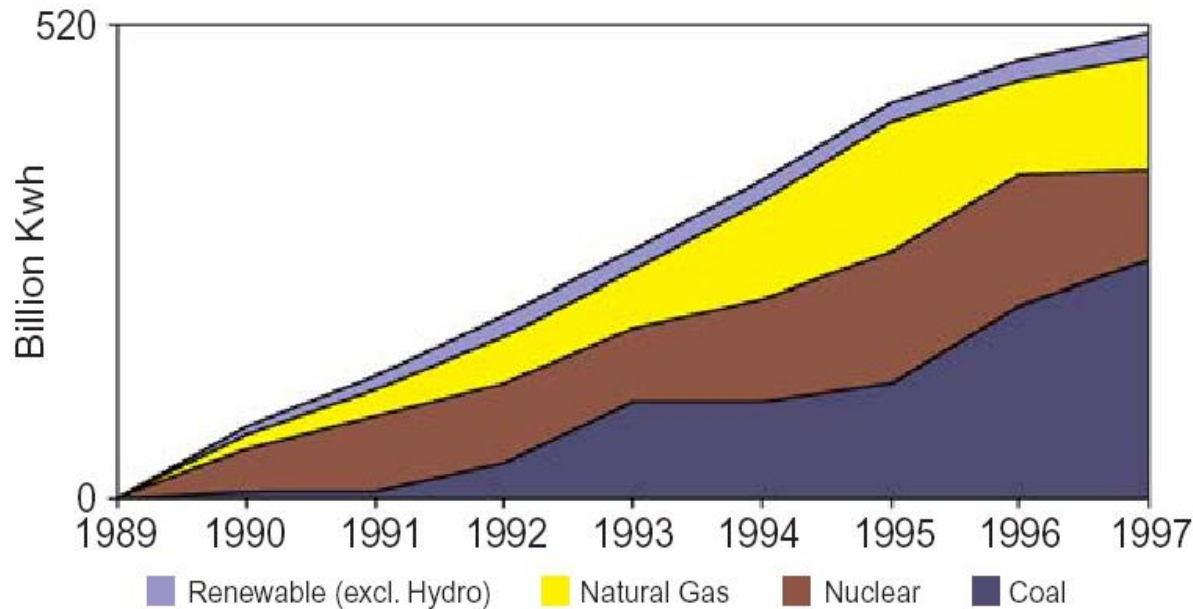




## Major Shift in Incremental Source of Supply

- Prior to late '90's, possible to meet high % of incremental electricity needs of U.S. economy thru increased utilization of existing coal and nuclear units:

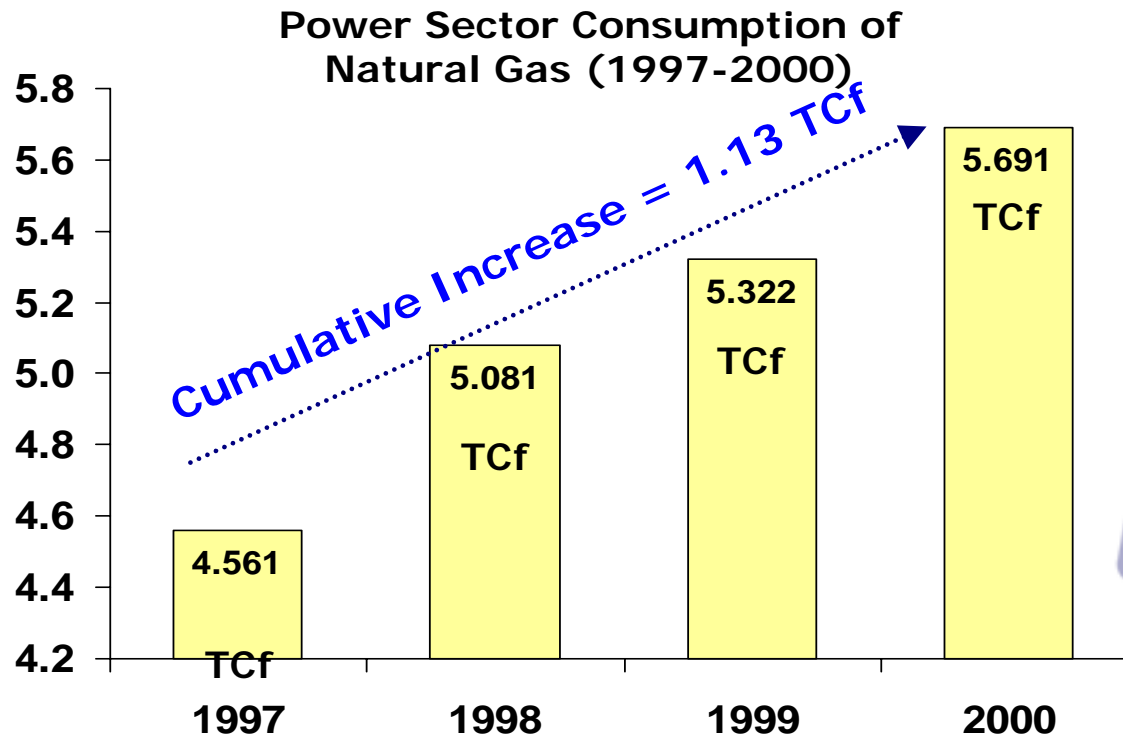
### Source of Electric Generation to Meet Incremental Demand (1989-97)





## Sharp Increase in Natural Gas Consumption

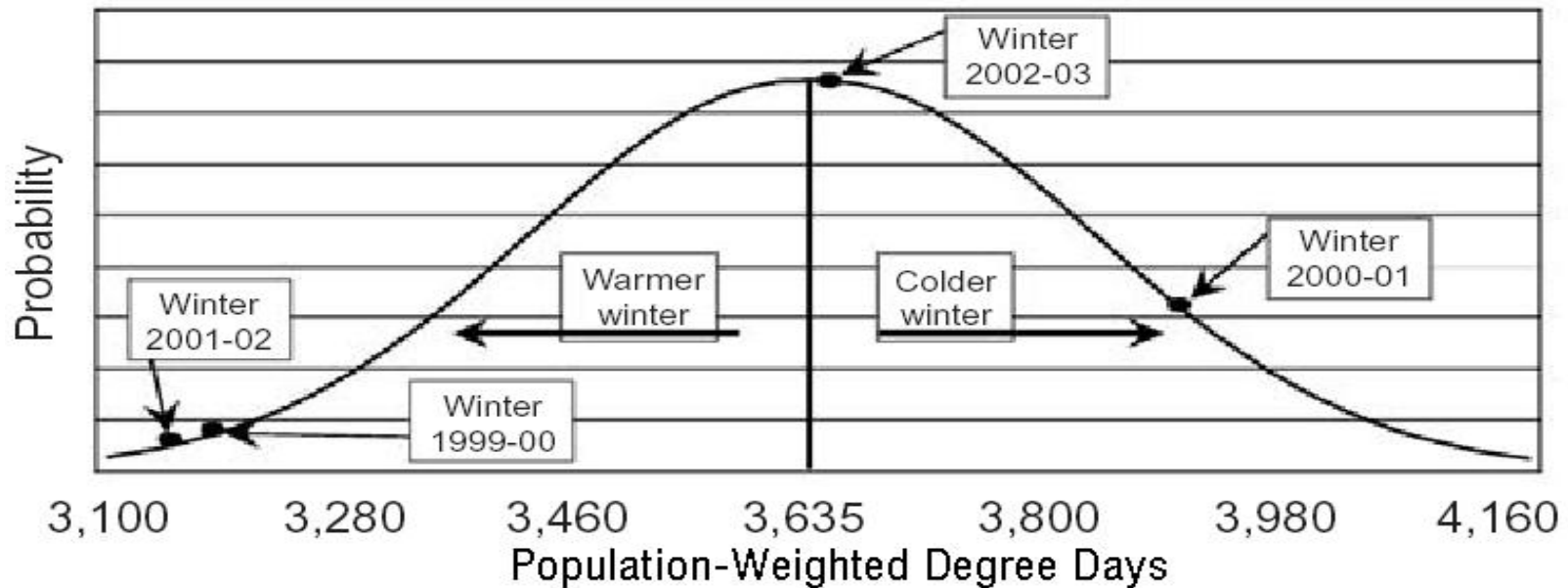
- Beginning in 1998, however, as coal and nuclear fleet increasingly utilized at maximum capacity, power sector consumption of natural gas began to rapidly increase:



## Mild Winters Temporarily Masked Increase

- Warmer-than-normal winters initially masked magnitude of increase
  - Far more extreme than winter of '02/'03 or even winter of '00/'01
  - Resulting in offsetting reductions in use of natural gas for space heating

### Probability Distribution of Cumulative U.S. Winter Heating Degree Days (1950-2003)

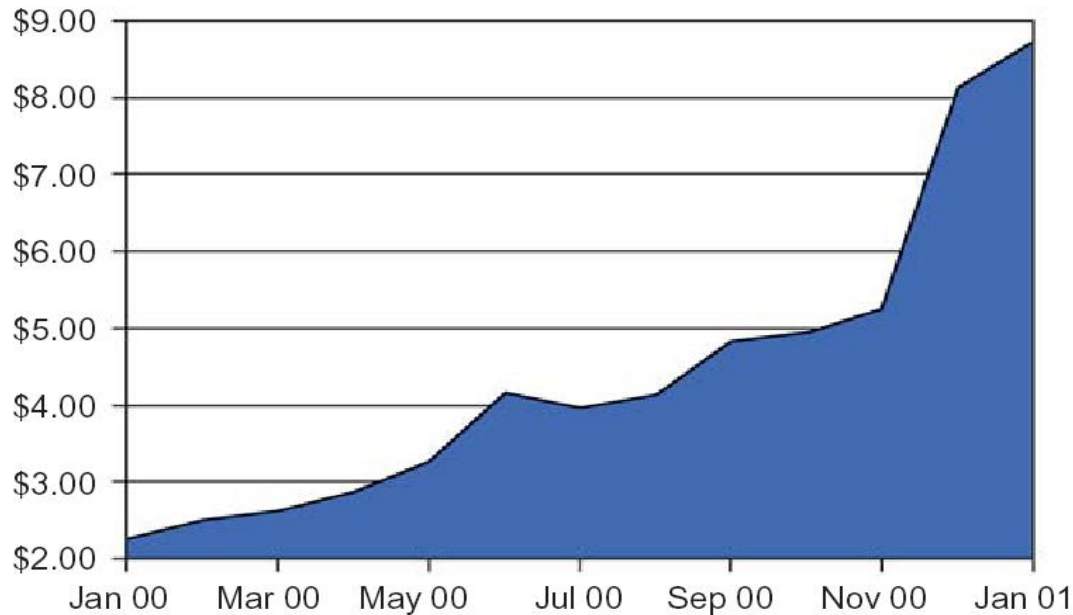




## Prices Quadrupled

- In 2000, mild winter weather no longer masked increase in power sector demand
- Led to 4X increase in natural gas prices nationally not predicted in advance by anyone in industry

**2000-01 Wellhead Gas Prices (\$/MMBtu)**



Abrupt Shift in Strategy for  
Meeting U.S. Electricity Needs  
Without Careful Evaluation by Any  
Federal or State Agency



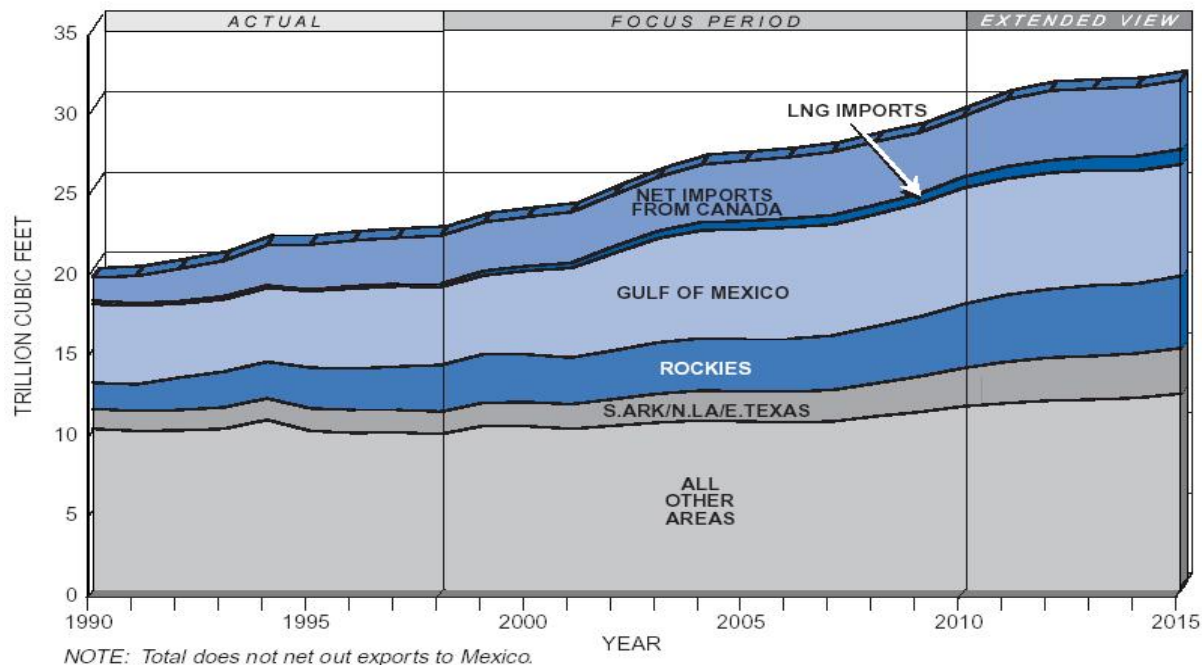
## Need for New Capacity

- By late 1990's, as load continued to grow, new electric generating capacity needed in every region of U.S. for first time in almost 30 years
- At this key choice point, utility industry in midst of far-reaching change
  - FERC de-regulation of wholesale markets + state PUC restructuring
  - Explosive growth of Independent Power Producer industry & power marketers
- Power plant developers strongly favored gas-fired capacity over coal
  - Shorter lead time and much lower (apparent) capital cost
  - Lower perceived permitting risk/seen as “pro-environment”
- Near universal belief natural gas supplies would remain plentiful and prices would remain low, based in part upon 1999 National Petroleum Council Study
  - Parallels in some respects impact of 2003 NPC Study urging strategy of massively increasing dependence upon imports of LNG

## Natural Gas Supplies Expected to Be Adequate

- 1999 NPC Study forecast North American natural gas production rising to 33.5 Tcf by 2015 without significant price increases
  - Increased production expected to come principally from U.S. sources

U.S. Natural Gas Supply by Source



## Key Juncture

- Timing of 1999 NPC study critical
- Key choice point regarding long-term strategy for meeting incremental electricity requirements of U.S. economy
- Potential long-term implications for U.S. economy of decisions required to be made during this period not well understood at the time
- With benefit of hindsight, one of the most significant failures of public policy formulation of past decade
  - Lack of adequate analysis and review at both federal and state level nationwide
- Arguably already has resulted in \$ 100 billion + in potentially-avoidable energy costs
  - Negated all or most of the benefits of industry restructuring
- Potential long-term costs could be many times greater
- Will 2003 NPC Study urging increased dependence upon LNG, with benefit of hindsight, ultimately prove to be equally misguided?



## Choices Necessary

- Result of choices made = abrupt shift in U.S. energy policy (never publicly debated at time)
  - \$ 100 billion investment in new gas-fired plants
  - Enough generation to meet *total* current electricity demand in Great Britain, Germany and France *combined*

### Gas-Fired Generating Capacity Added Since 1999

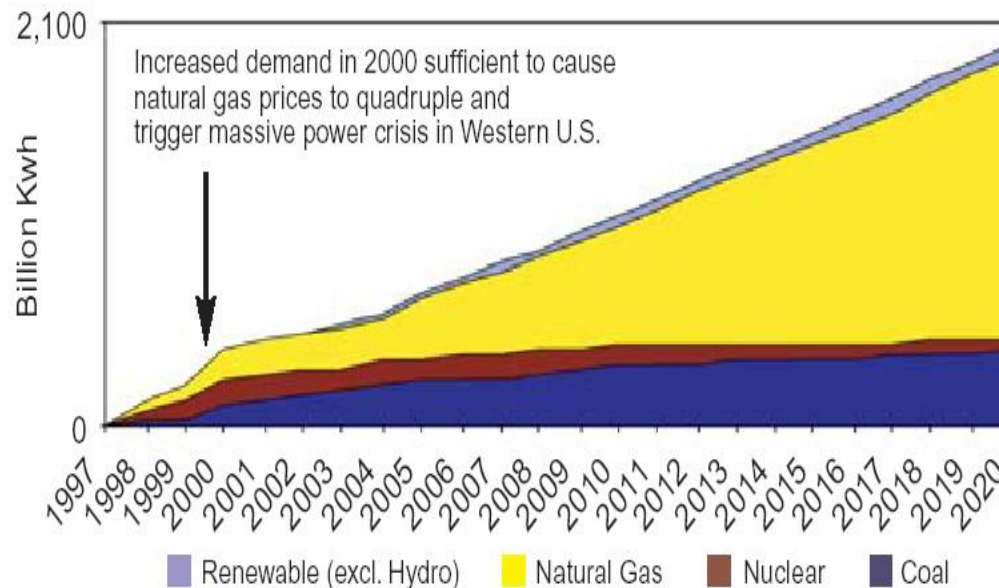
Year	Additions	Total Gas-Fired Generation	% of Total US Capacity
1999	22,641 MW	201,979 MW	25.4%
2000	25,527 MW	227,506 MW	27.7%
2001	41,372 MW	268,892 MW	31.0%
2002	54,701 MW	323,593 MW	34.7%
2003*	60,488 MW	384,081 MW	39.0%
2004*	10,404 MW	394,485 MW	40.0%
Total Additions		215,133 MW	

\* Includes plants currently under construction but excludes all planned additions that have not yet broken ground

## One of Two Major Causes of California Energy Crisis in 2000

- U.S. now dependent upon gas-fired units to meet virtually all of its incremental electricity needs for at least the rest of this decade

### Expected Sources of Incremental Generation (1997-2020)





Andy Weisman's

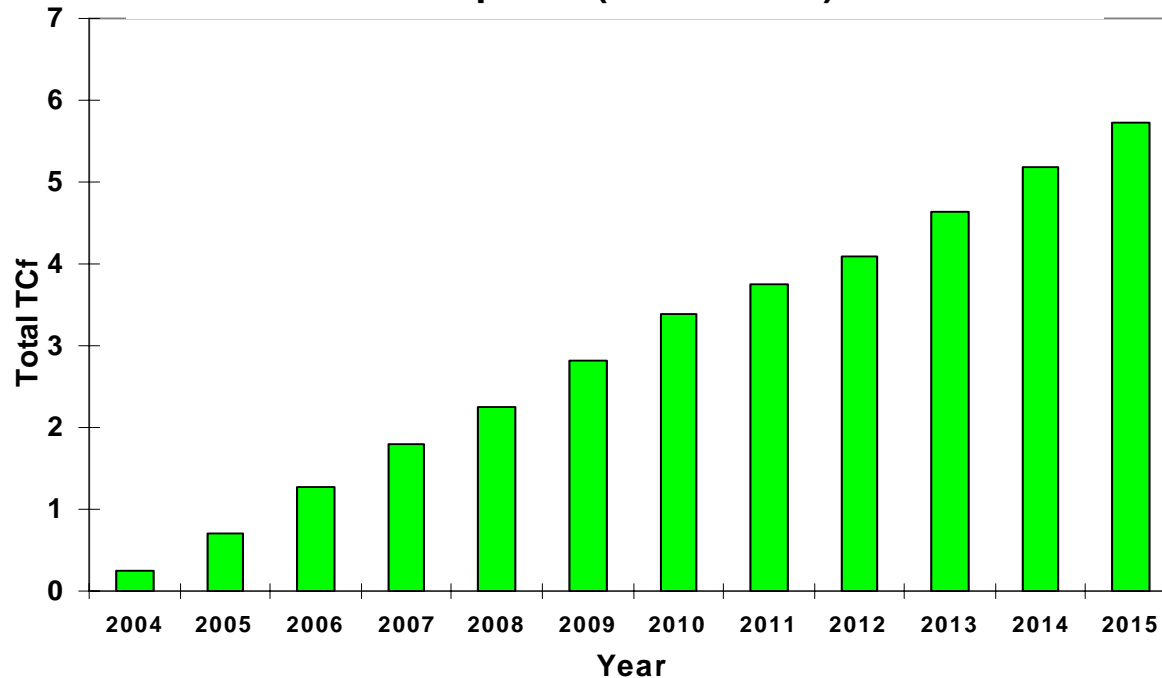
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## Primary Driver of Increased Consumption

- After brief pause early in decade, power sector consumption of natural gas likely to increase significantly *every* year:

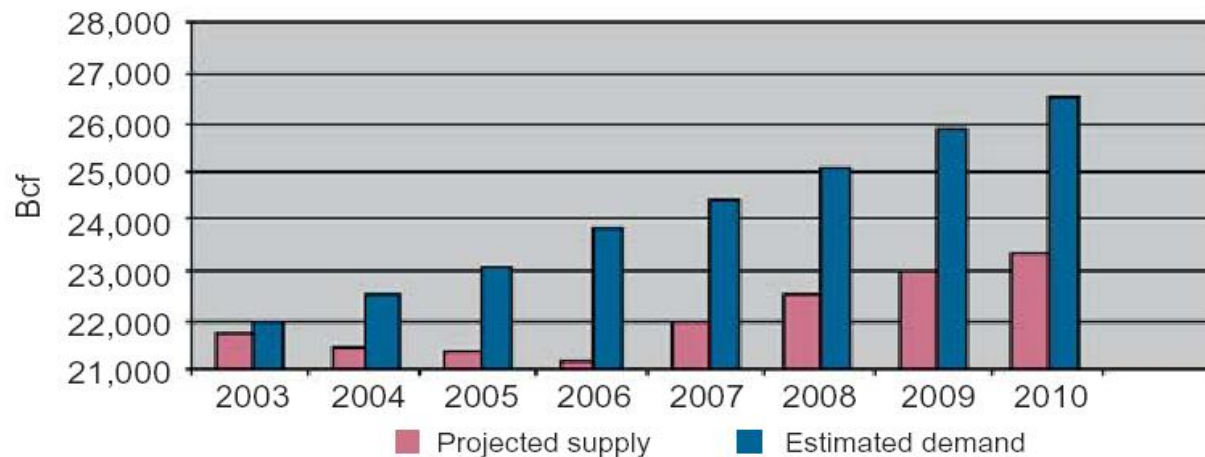
**Cumulative Increase in Power Industry Natural Gas Consumption (2004-2015) vs. 2003**



## Creates Massive Hole in Expected U.S. Energy Supply

- 2003 NPC Study reduces 1999 estimate of total natural gas production from “traditional” North American sources of supply by an almost unfathomable **50 Tcf +** between now and 2015
- Creates >21 Tcf gap between projected needs and available supplies and between now and 2010

**New U.S. Supplies versus Estimated Demand  
 (with prices at or near \$5/MMBtu)**

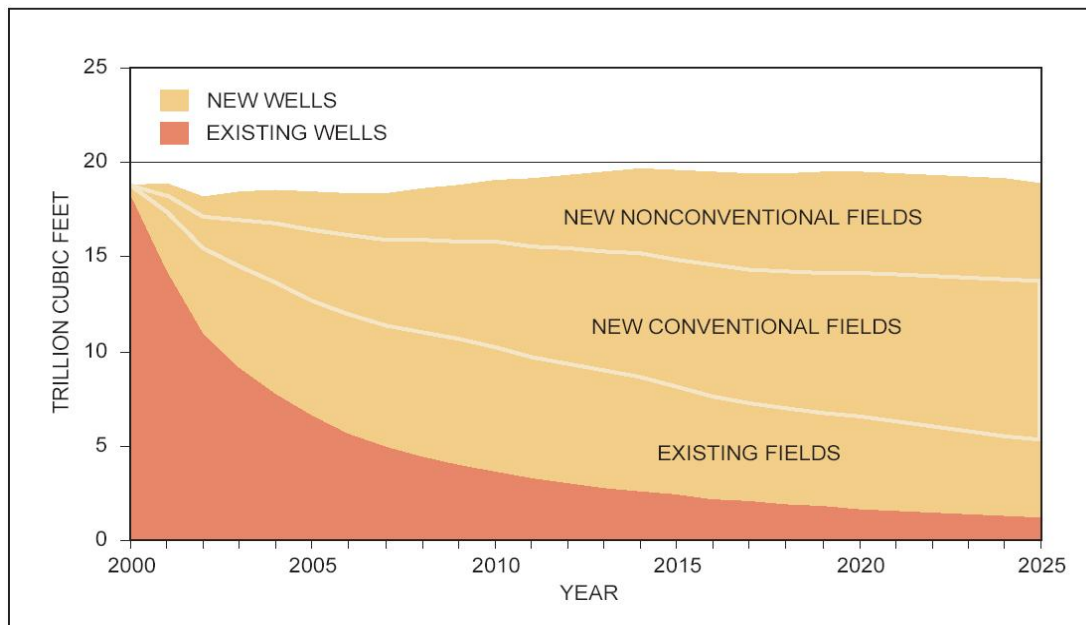




## Creates Huge Void

- North American supply certain to fall **far** short of current estimates of U.S. demand
- NPC U.S. production estimate for 2010 reduced by a staggering 16 Bcf/day vs. 1999 forecast (i.e., just under 6.0 Tcf/year)

2003 NPC Forecast of U.S. Production



*Lower-48 Production, Existing and Future Wells*

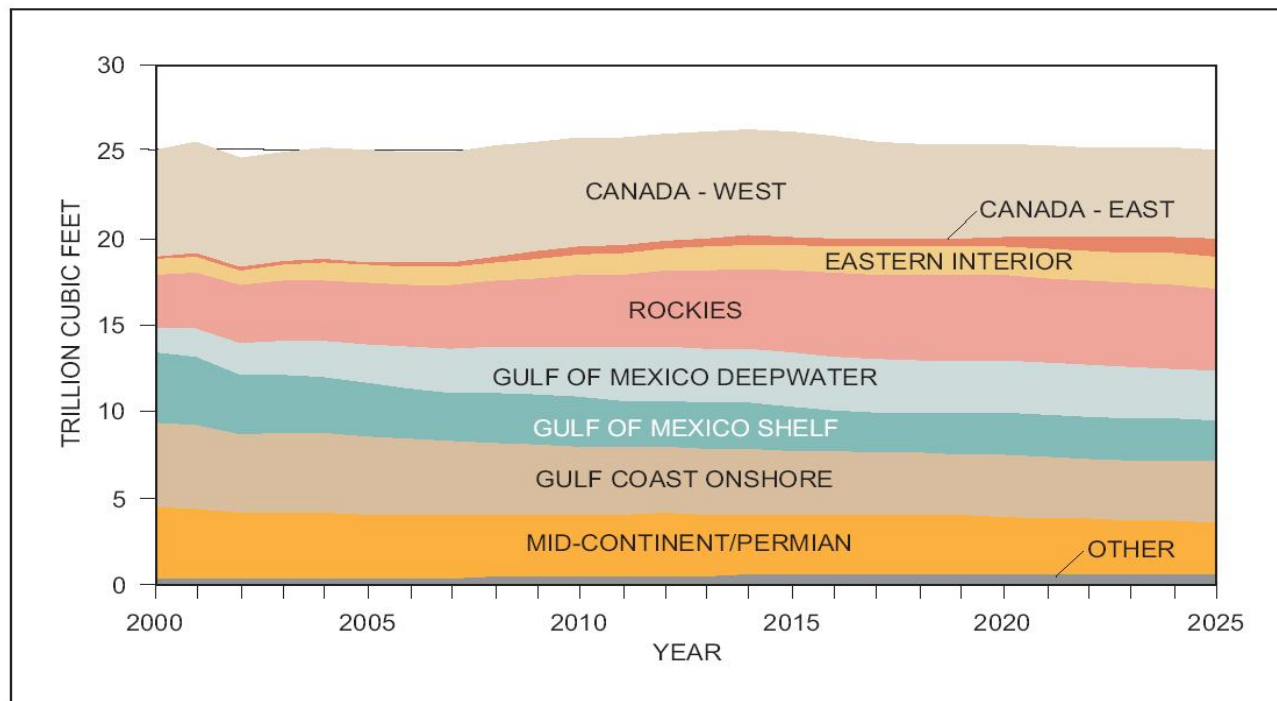




## Production Has Hit Plateau

- **At best**, production increases in Rockies and Deepwater projects in Gulf of Mexico expected to just barely offset declines in other basins

2003 NPC Forecast of North American Production



U.S. Lower-48 and Non-Arctic Canadian Gas Production by Region

## May Overestimate Production Actually Achieved

- NPC estimates more of a “best case” than a “most likely” scenario
- Many assumptions – while plausible – may not be achieved
  - No contingency for further declines
- Assumes that:
  - Decline rates, which have been increasing significantly, will soon level off
  - Well size, which has been falling rapidly, will soon begin to stabilize, with only modest further decreases in future years
- Also assumes that high degree of success in finding new targets in existing fields and new fields in unexplored regions even though:
  - Expenditures on exploratory drilling have slowed markedly (as companies prefer to buy proven reserves than to explore)
  - Many E&P companies are said to have largely exhausted their inventory of attractive prospects during 2000/2001

## Bottom Line

- U.S. faces unprecedented natural gas supply shortfall
- Already has caused serious harm to the economy
  - Severe, unanticipated price spikes 3 out of past 5 winters
  - One of two major precipitating causes of California crisis in 2000
  - May have helped to precipitate recession in 2001 (worst manufacturing recession in 22 years)
- No precedent for being able to sustain growth of U.S. economy without being able to expand supplies of electricity
- Yet, no urgent effort is being made at national level to:
  - Dramatically improve efficiency of energy utilization beyond current levels
  - Increase our ability to supply electricity from alternative sources (e.g., coal, nuclear and renewable energy)
- Could have serious repercussions for U.S. economy – quite possibly this year