



# Power, Natural Gas and Coal Market Trends and Industry Issues

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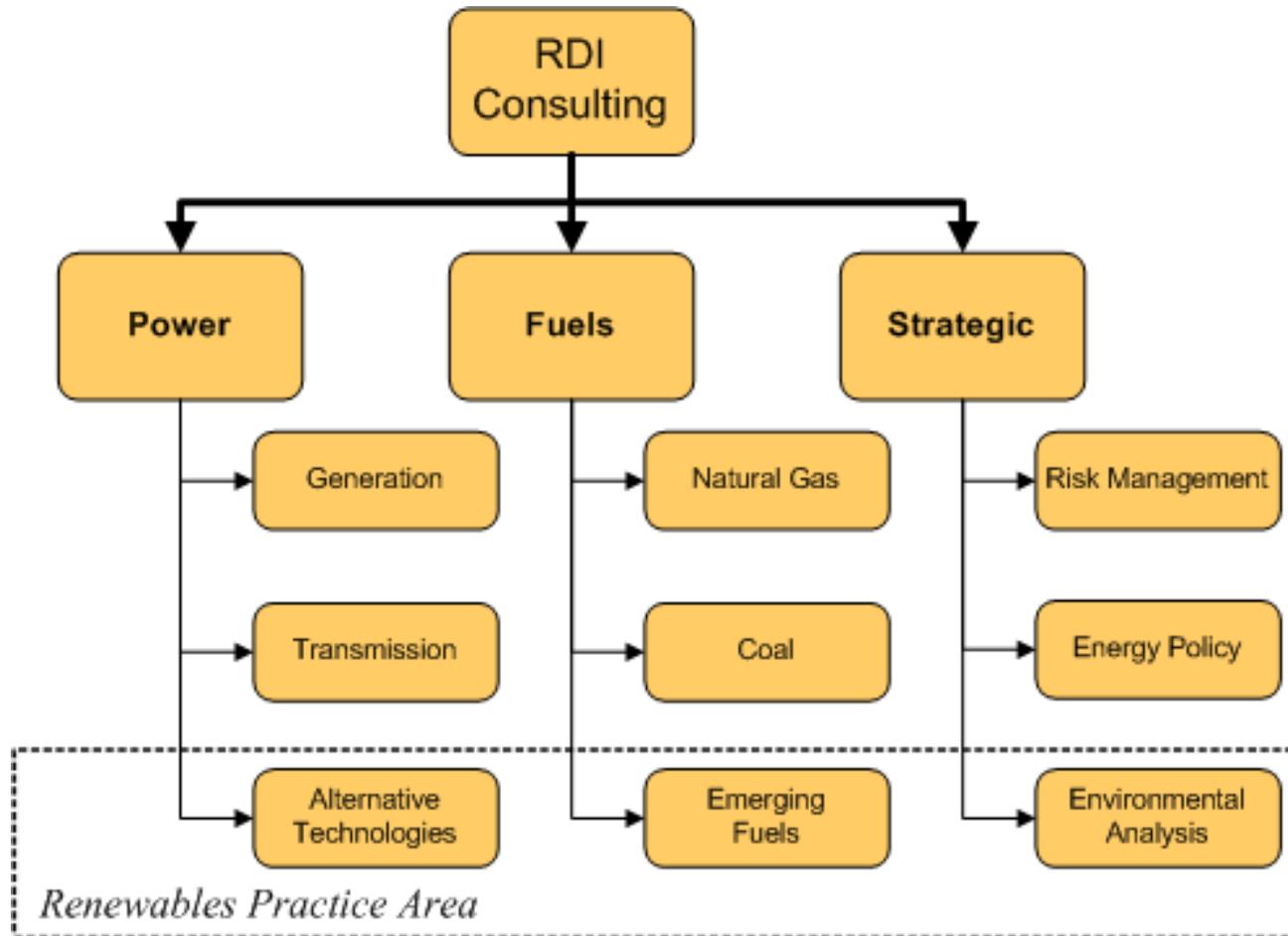
Workshop on Systems Analysis Approach to Program Planning and Management,  
Maritime Institute, Baltimore, MD

The  
**McGraw-Hill**  
Companies

# Discussion Agenda

- ➔ RDI Consulting Overview
- ➔ Power: Generation and Transmission
- ➔ Fuels: Natural Gas and Coal
- ➔ Key Uncertainties
- ➔ Renewable Energy Drivers

# RDI Consulting Practice Areas



# RDI Consulting Services



## Planning & Implementation

- Strategic Planning
- Feasibility Studies
- Innovative & Insightful Problem Solving
- Regulatory Policy Analysis & Guidance
- R&D planning and evaluation



## Unbiased Third Party Services

- Litigation Support
- Expert Valuations
- Due Diligence
- Persuasive Argument Framing
- Expert Testimony



## Market Trend Analysis

- Targeted Analysis
- Fuel Price, Supply & Transportation Capacity Forecasting
- Valuation Services
- Financing Support



## Operational Management

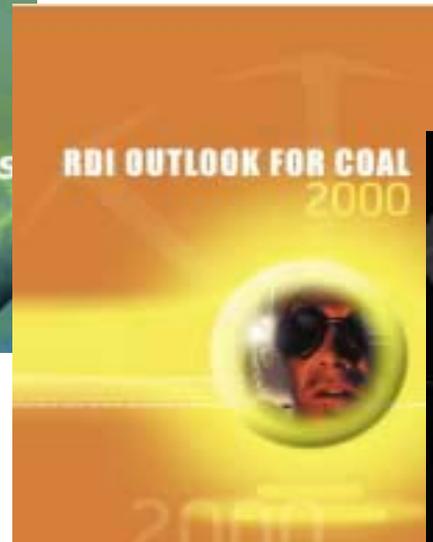
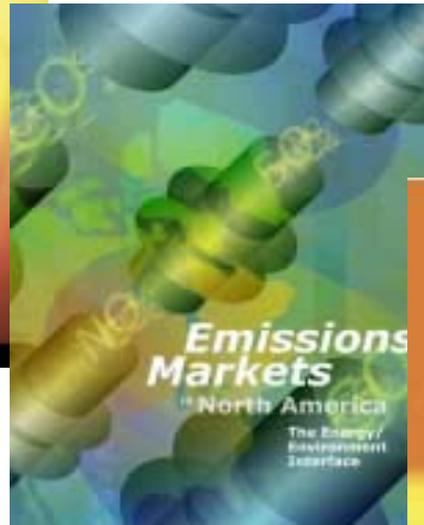
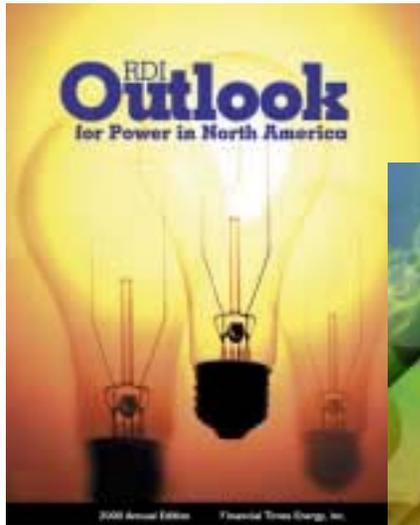
- Project Viability Analysis
- Merger & Acquisition Support
- Benchmarking Studies
- Sale/Purchase Contract Development & Negotiations
- Operational Streamlining

# RDI Consulting

## Core Competencies



# RDI Consulting Studies

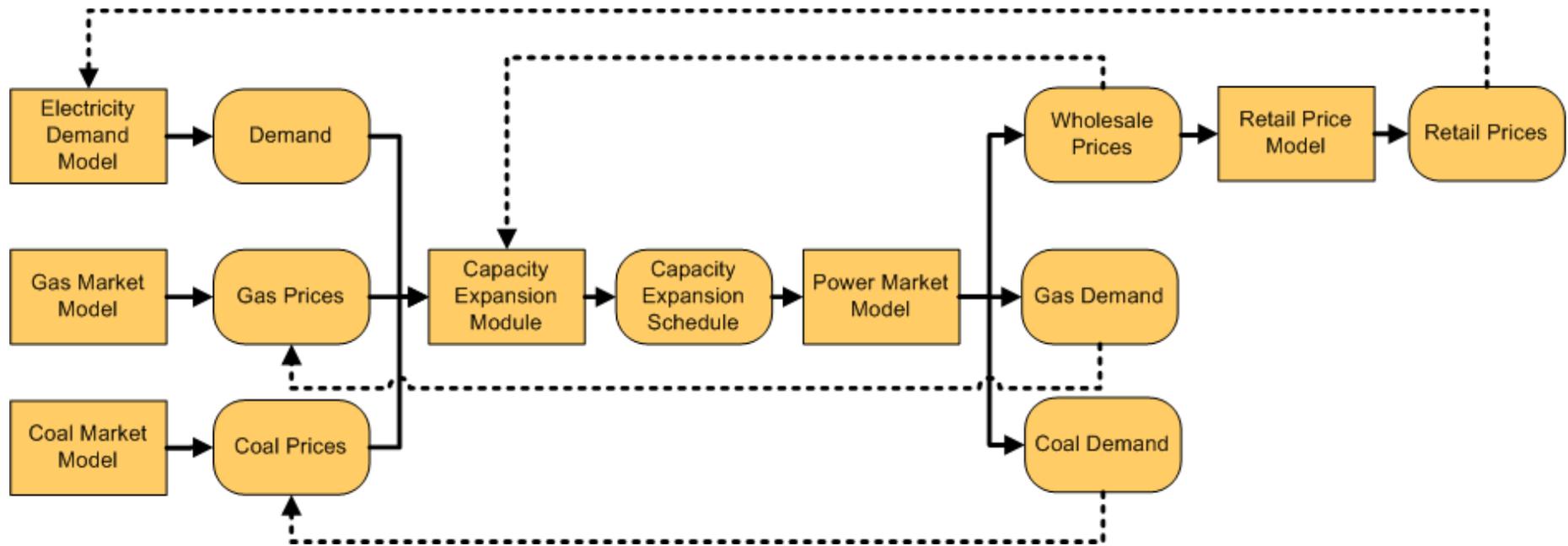


# RDI Consulting Data Products



# RDI Consulting

## Energy Modeling



### ➔ Fundamentals-based modeling:

- Part of an integrated energy market modeling process.
- Medium to long-term analysis, primarily geared toward price determination.

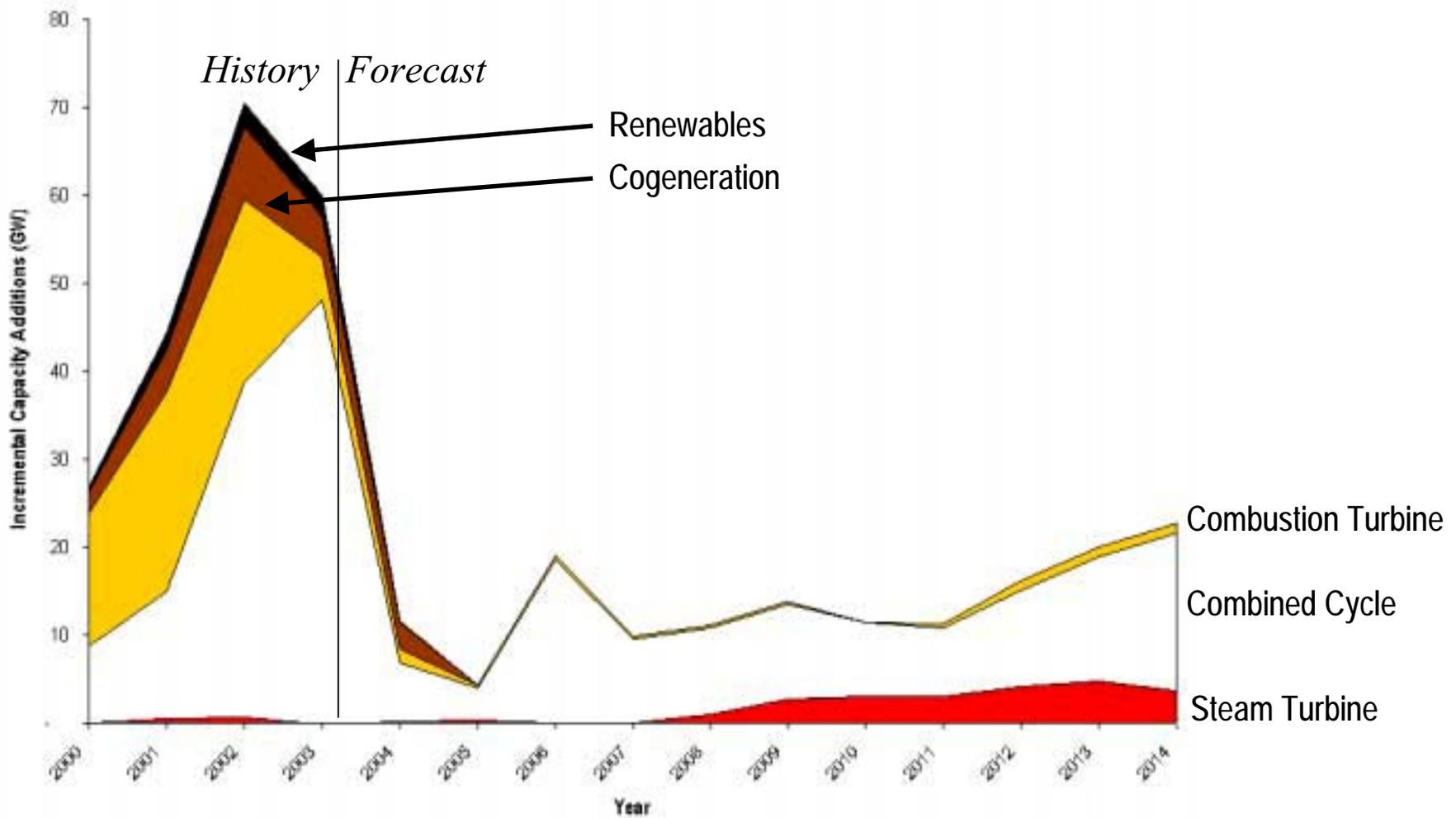
# Power Markets

## Market in Turmoil

- ➔ Utilities are suffering from: [1] high debt loads piled on in the late 1990s in preparation for deregulation, and [2] low power prices caused by capacity overbuild and the ongoing economic slowdown.
- ➔ Credit downgrades have lowered share prices and limited access to capital at a critical time; \$50 billion in debt must be restructured in the next 6 months at potentially unfavorable terms.
- ➔ The collapse of Enron, fall-out from the California energy crisis, and market manipulation schemes have eroded confidence and worsened the situation.

# Power Markets

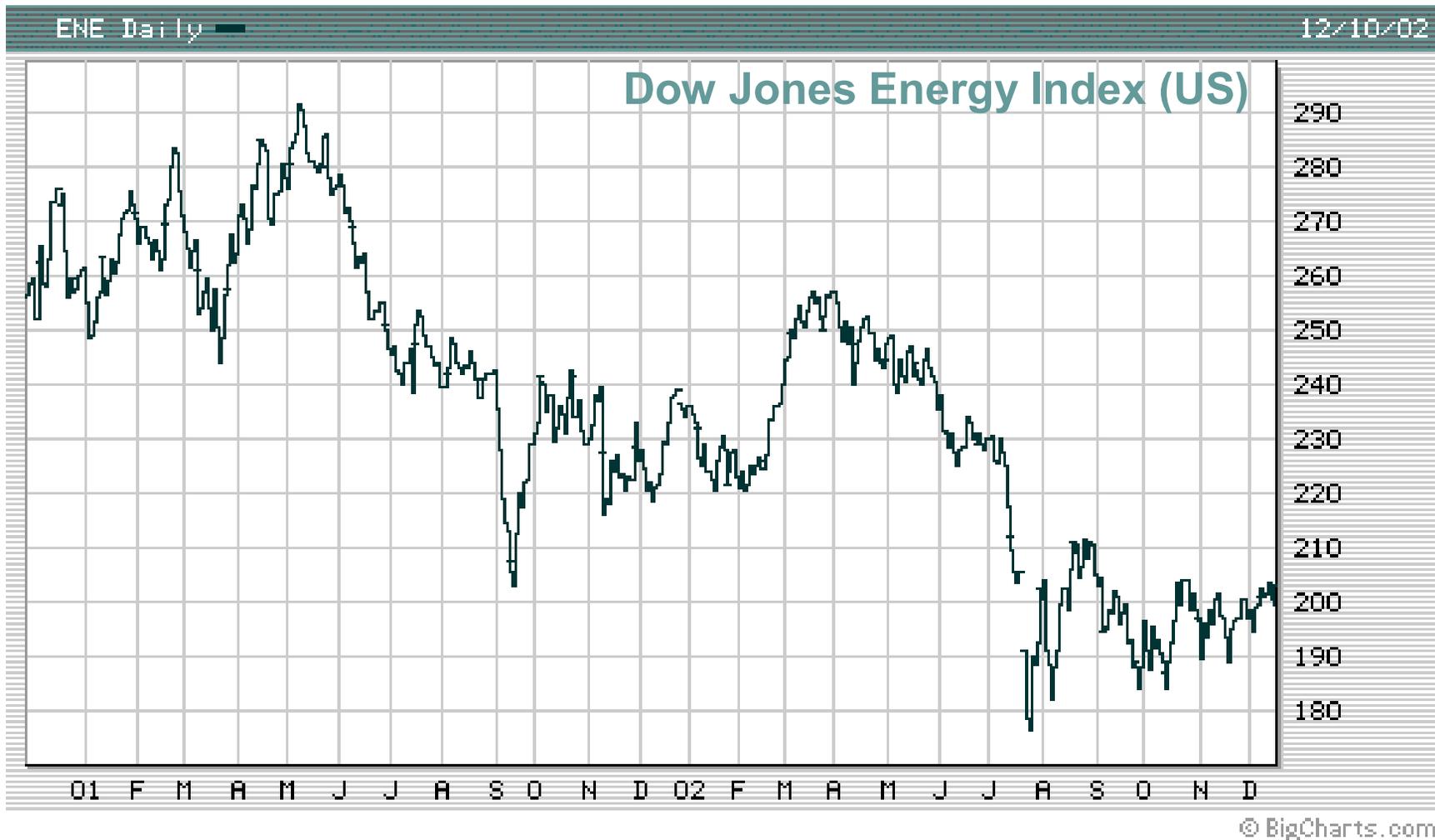
## Incremental Capacity Additions



Source: Platts Research & Consulting/RDI Consulting

# Power Markets

## Stock Prices



Source: Wall Street Journal, Interactive Edition, Markets Data Center (12/10/02)

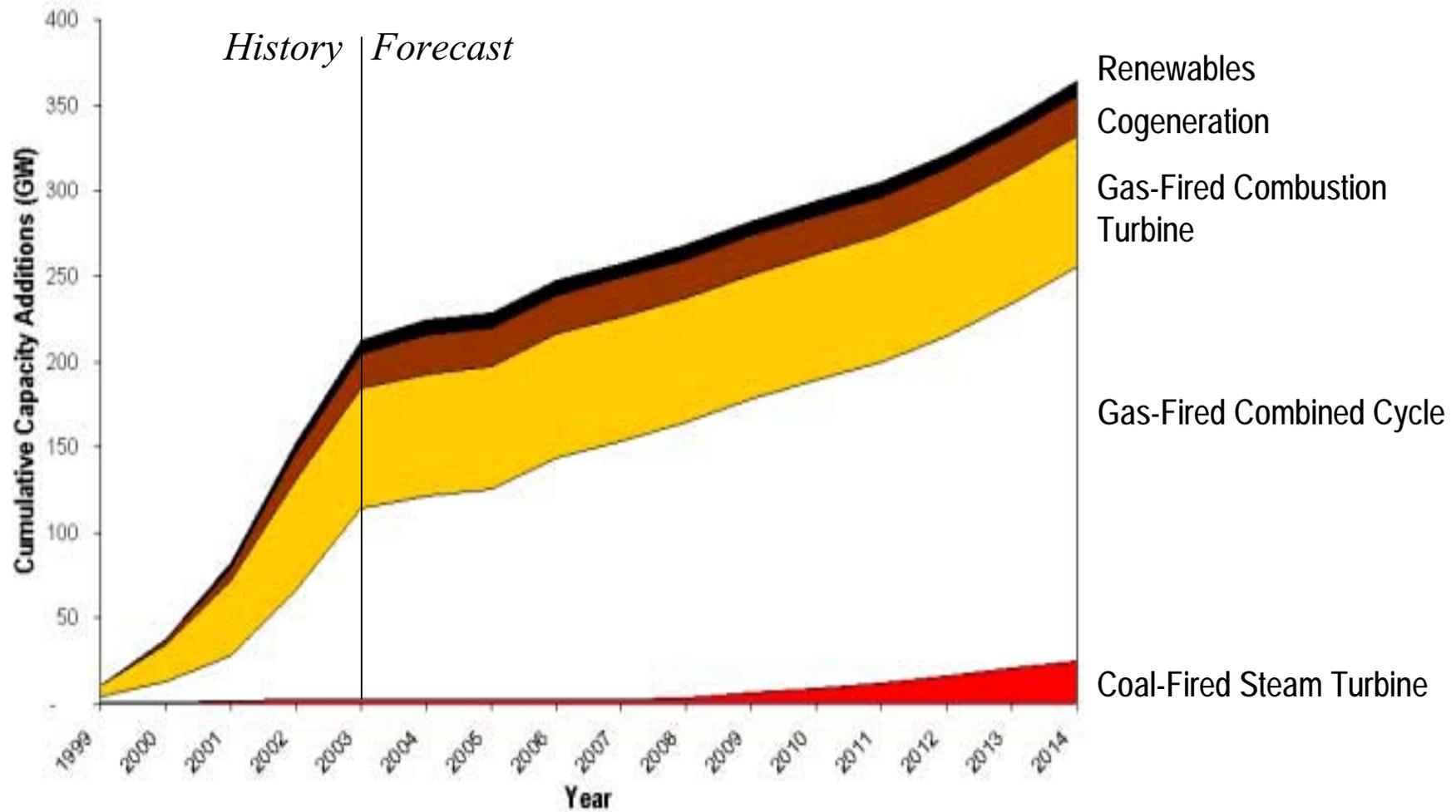
# Power Markets

## Capacity

- ➔ RDI's baseline forecast calls for nearly 282 GW of new generating capacity between 2002 and 2014.
- ➔ Over half (145 GW) is expected to come on-line between 2002 and 2005.
- ➔ Of this half, 94% is already operating or under construction.
- ➔ Expected new generation mix is 70% gas-fired combined cycle, 21% gas-fired combustion turbine, 7% coal, 2% renewables.

# Power Markets

## Cumulative Capacity Additions



Source: Platts Research & Consulting/RDI Consulting

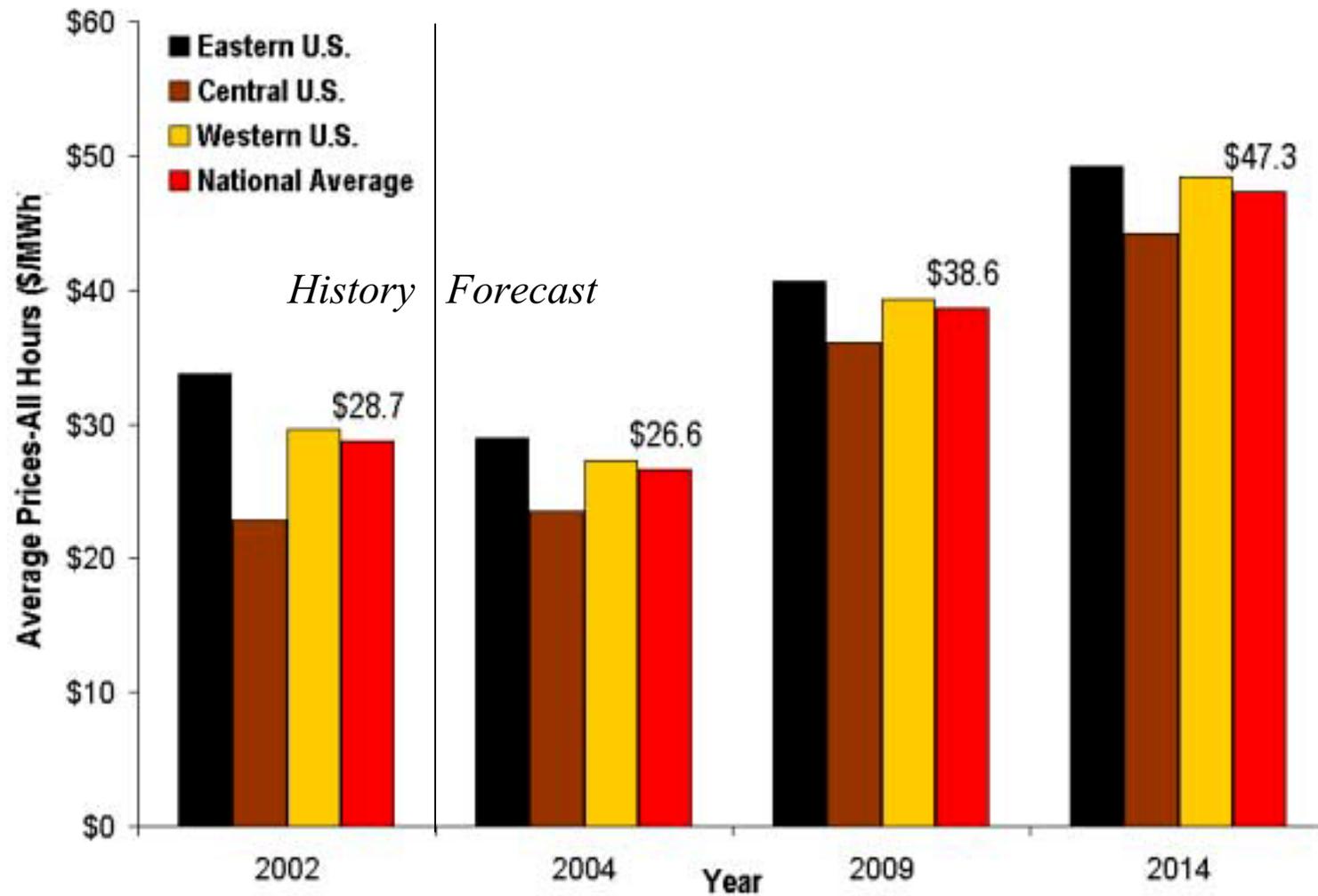
# Power Markets

## Prices

- ➔ Wholesale power prices collapsed across the country this year. We do not expect average prices to break \$30/MWh until the latter half of the decade.
- ➔ Power prices are being held down by the sluggish economy, high levels of new generation, moderate gas prices and a return to normal hydro levels in the Western U.S.
- ➔ Except for brief periods in PJM, Ontario, and NEPOOL, wholesale prices did not break \$100/MWh for a sustained period this year.

# Power Markets

## Average Prices All-Hours



Source: Platts Research & Consulting/RDI Consulting

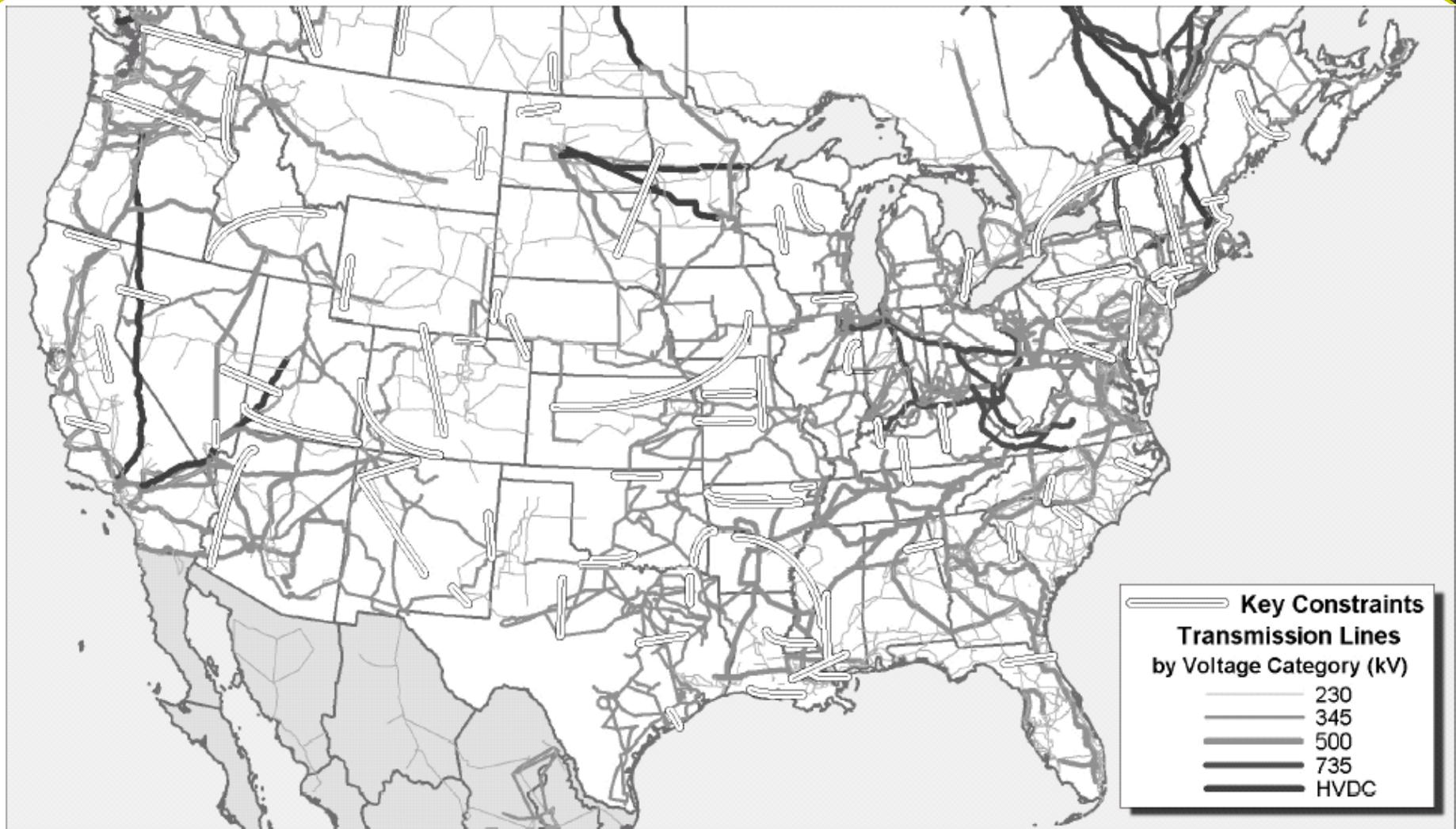
# Power Markets

## Transmission Constraints

- ➔ Numerous transmission constraints restrict access to electric power markets and indicate system reliability problems across North America. Except for local reinforcements and new generation interconnections, few new projects are moving forward.
- ➔ Regulators continue to struggle incentives to promote the “right” amount of investment to address economic and reliability problems caused by these constraints.
- ➔ The difficulty is addressing how the benefits of expansion can be delineated, and how the cost for such expansion can be allocated to the beneficiaries in an equitable manner.

# Power Markets

## Transmission Constraints



# Power Markets

## Transmission Constraints

- ➔ The FERC SMD NOPR proposes two sources of funding for transmission upgrades: [1] funding through access fees with the cost of upgrades rolled into the access fees, and [2] “participant funding,” which generally means voluntary funding from investors.
- ➔ The idea is to have the cost of projects that address reliability problems funded through access fees, but have the cost of projects that address economic issues funded by voluntary investors who benefit.
- ➔ In reality, determining the exact economic and reliability benefit of any transmission expansion project is extremely difficult.

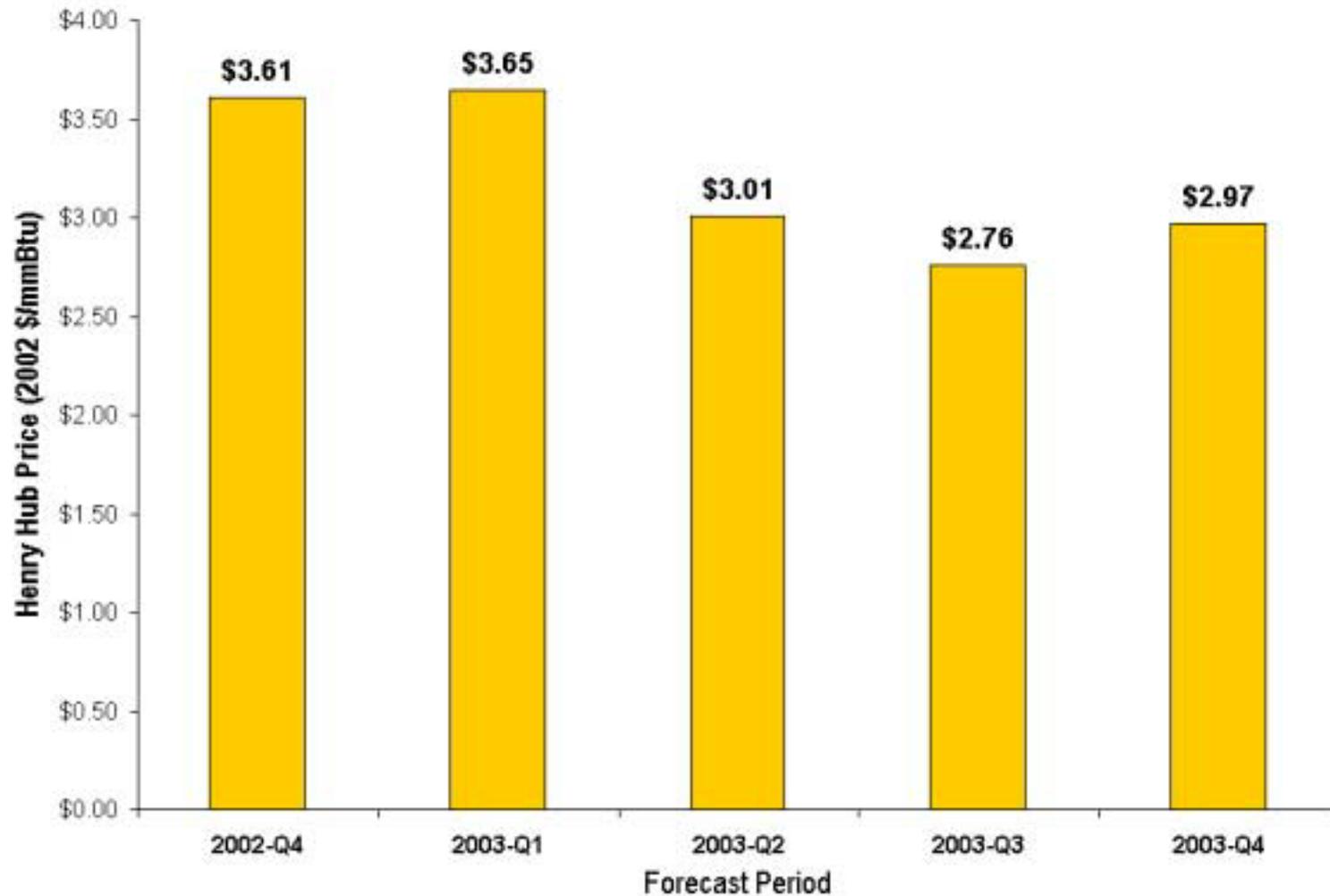
## Fuels

### Natural Gas Near-Term Outlook

- ➔ The near-term outlook for the natural gas market is vague due to supply and demand uncertainties. Going forward, we expect prices to reach \$3.65/mmBtu in 2003 Q1, falling to \$3.01/mmBtu by 2003 Q2.
- ➔ In the next several years, an economic recovery and aggressive build-up of gas-fired generation will create modest growth in natural gas demand.
- ➔ U.S. production, which has been in slow decline for the last several quarters, needs to remain flat, while LNG imports offset Canadian import declines. In 2003, LNG imports combined with larger than usual storage withdrawals will balance the market.

# Fuels

## Natural Gas Near-Term Price Forecast



Source: Platts Research & Consulting/RDI Consulting

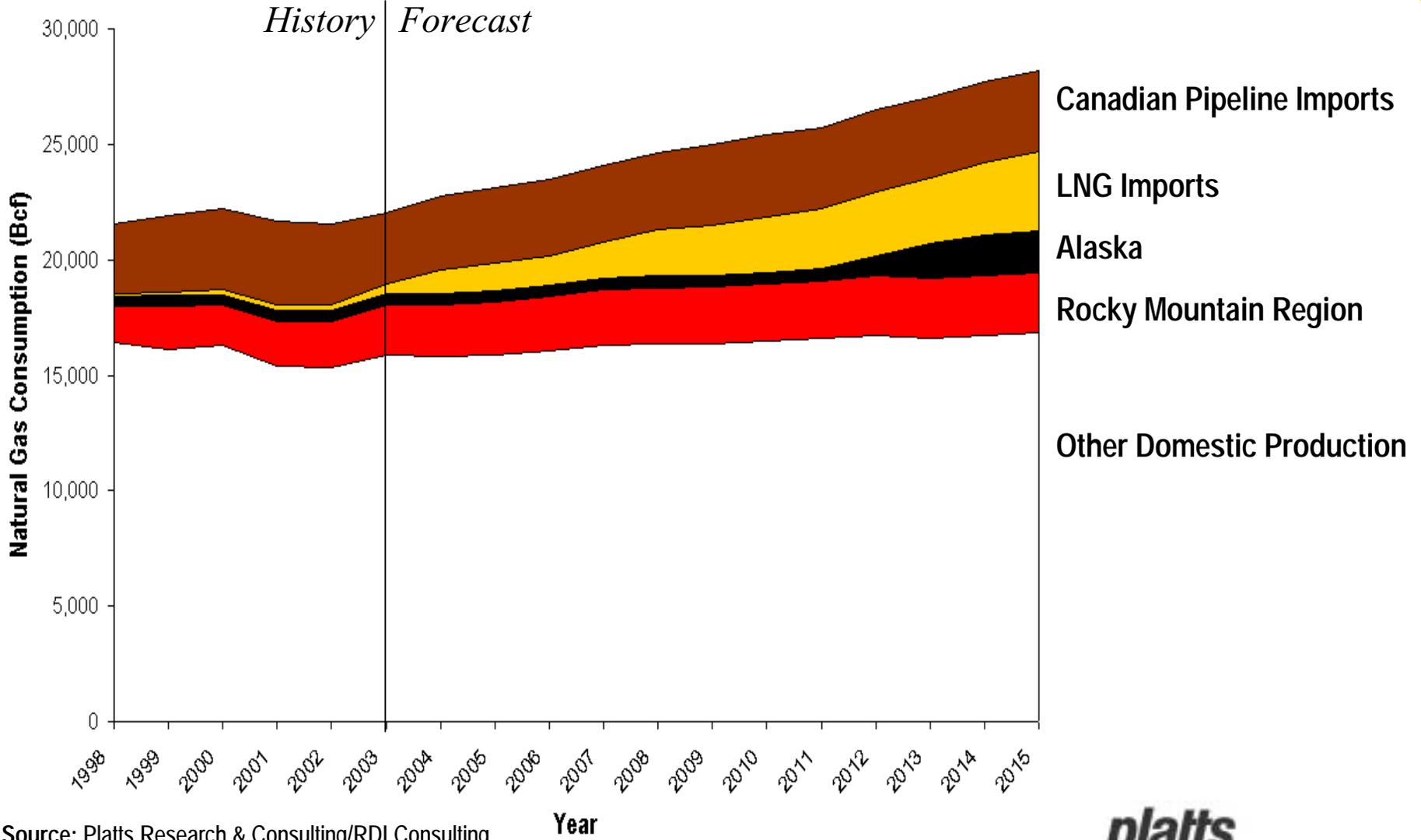
## Fuels

### Natural Gas Long-Term Outlook

- ➔ In the long-term, we expect gas consumption to reach 28.1 Tcf in 2015 (EIA project's 29.2 Tcf). Incremental increases will be driven primarily by new electric sector natural-gas fired generation.
- ➔ Domestic gas supplies must increase in the Rocky Mountain and Alaska regions at a rate of 2.6% and 9.6% respectively, to achieve this level of consumption. We assume that the Alaskan Natural Gas transportation System is built in 2011.
- ➔ By 2015, Canadian and LNG imports are expected to account for roughly 25% of U.S. supply needs. LNG imports are expected to grow at an average annual rate of 20%, increasing from 244 Bcf in 2002 to 3,441 Bcf in 2015.

# Fuels

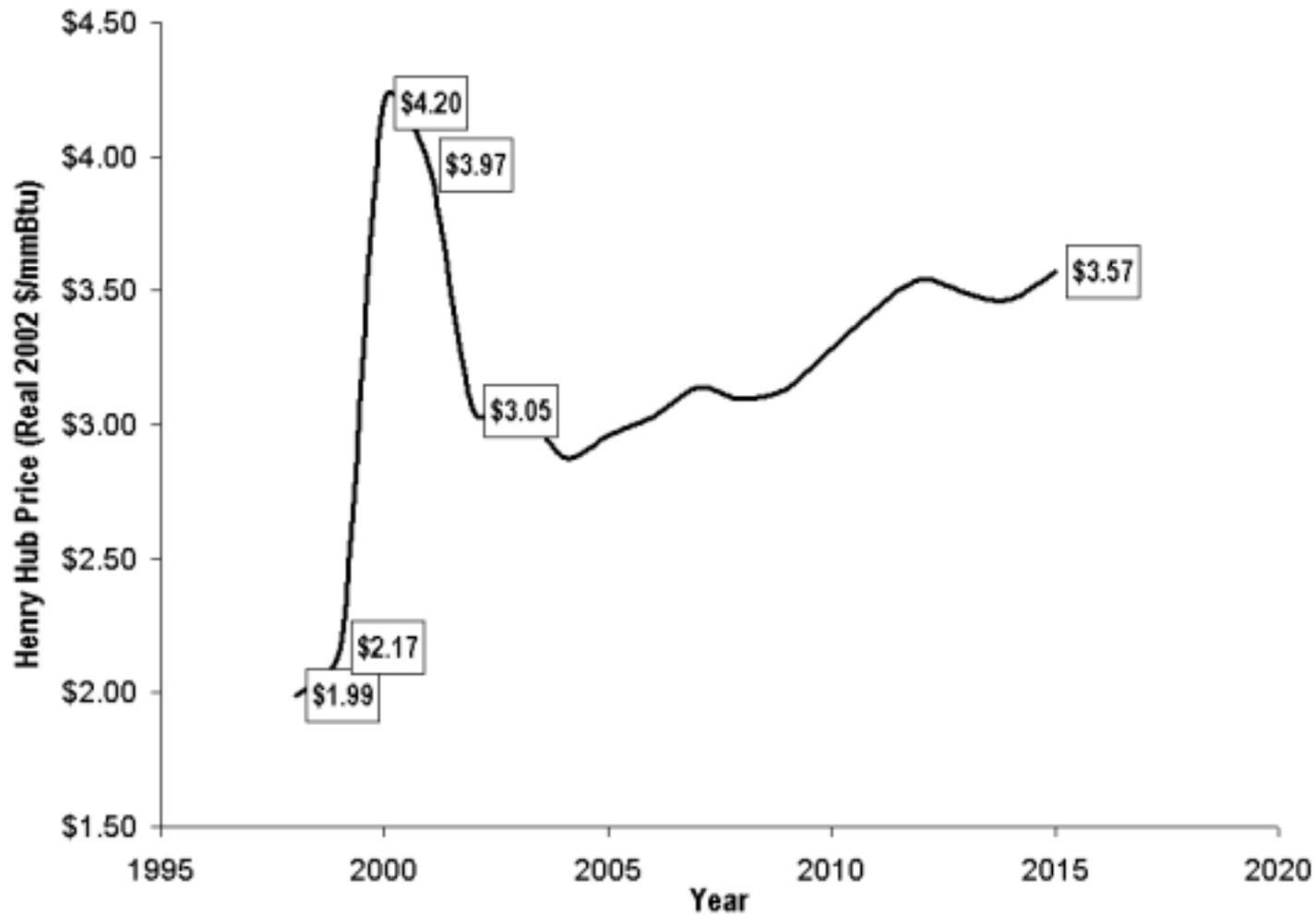
## Natural Gas Consumption Forecast



Source: Platts Research & Consulting/RDI Consulting

# Fuels

## Natural Gas Price Forecast



Source: Platts Research & Consulting/RDI Consulting

## Fuels

### Coal Outlook

- ➔ The compelling economics for coal-fired generation ensure continued use of coal for the foreseeable future. The average delivered price of coal in the U.S. is \$1.25/mmBtu. This price is expected to decline over the next decade.
- ➔ Volatility in coal prices is much lower for coal than for natural gas. After a coal price surge in 2001, coal has returned to a steady price close to the pre-surge level.
- ➔ There are significant domestic reserves of coal. Most estimates predict enough reserve for at least 200 years at current consumption rates.

## Fuels

### Coal Outlook

- ➔ Uncertainty surrounding environmental regulations stalled coal-fired development during the capacity boom and will continue to hinder new development moving forward.
- ➔ Mercury regulation represents the greatest near-term uncertainty, with EPA slated to issue control standards by late 2004. Because mercury content is not uniform within a coal seam or region, mercury regulations will emphasize technological control over coal-switching, which will drive up the costs of coal-fired generation.
- ➔ Carbon regulation represents another uncertainty. Any regulation of carbon dioxide will force reductions in coal-fired generation.

## Key Uncertainties

### Impact of the Merchant Shakeout

- ➔ As power plant developers and traders struggle to stabilize their declining financial conditions, many projects are in jeopardy. Over the next year, positions under development are likely to change hands and an unprecedented number of projects may be tabled.
- ➔ These changes appear likely to consolidate ownership of capacity into a few companies with strong balance sheets and liquidity.
- ➔ The merchant project development model, in which power is sold on the spot market, appears to be at risk. Movement toward the traditional project development approach will favor renewables, and other generators with large up-front investment costs.

# Key Uncertainties

## Capacity Retirements

- ➔ RDI assumes 90 GW of retirements over the next decade. However, the level of retirements is extremely difficult to estimate because the retirement decision is ultimately driven by the plant owner's market and regulatory expectations.
- ➔ If RDI has overestimated the level of retirements, oversupply conditions will persist longer than forecast. If RDI has under estimated the level of retirements, prices will recovery more quickly than expected.
- ➔ Recent decision by AEP/CSW and Texas Generation to mothball generation in ERCOT serves as an indication that when competitive markets are in place rapid shut-in can occur quickly in response to oversupply.

## Key Uncertainties

### Progress of Deregulation

- ➔ FERC's SMD NOPR indicates that it is committed to advancing broad competitive wholesale markets. However, state regulatory agencies and utility interests, appalled by deregulation failures, have opposed FERC.
- ➔ Supply uncertainty and evidence of dishonest conduct by some power merchants has slowed down the deregulation bandwagon.
- ➔ Until consumers are both informed about the choices associated with competition, and protected from the market's worst excesses, deregulation appears likely to move forward more slowly.

## Key Uncertainties

### Environmental Policy

- ➔ A consensus is building in favor of stricter limits on air emissions of sulfur dioxides, nitrogen oxides, and mercury.
- ➔ The EPA has developed “multi-pollutant” standards and competing bills for multi-pollutant limitations have been proposed in Congress. Several include limitations on carbon emissions.
- ➔ Some states have enacted some form of greenhouse gas regulation, and concern about anthropogenic global climate change has increased.
- ➔ While the potential combination of new environmental restrictions is highly varied, the impact on generating asset values, particularly for coal-fired power plants, could be enormous.

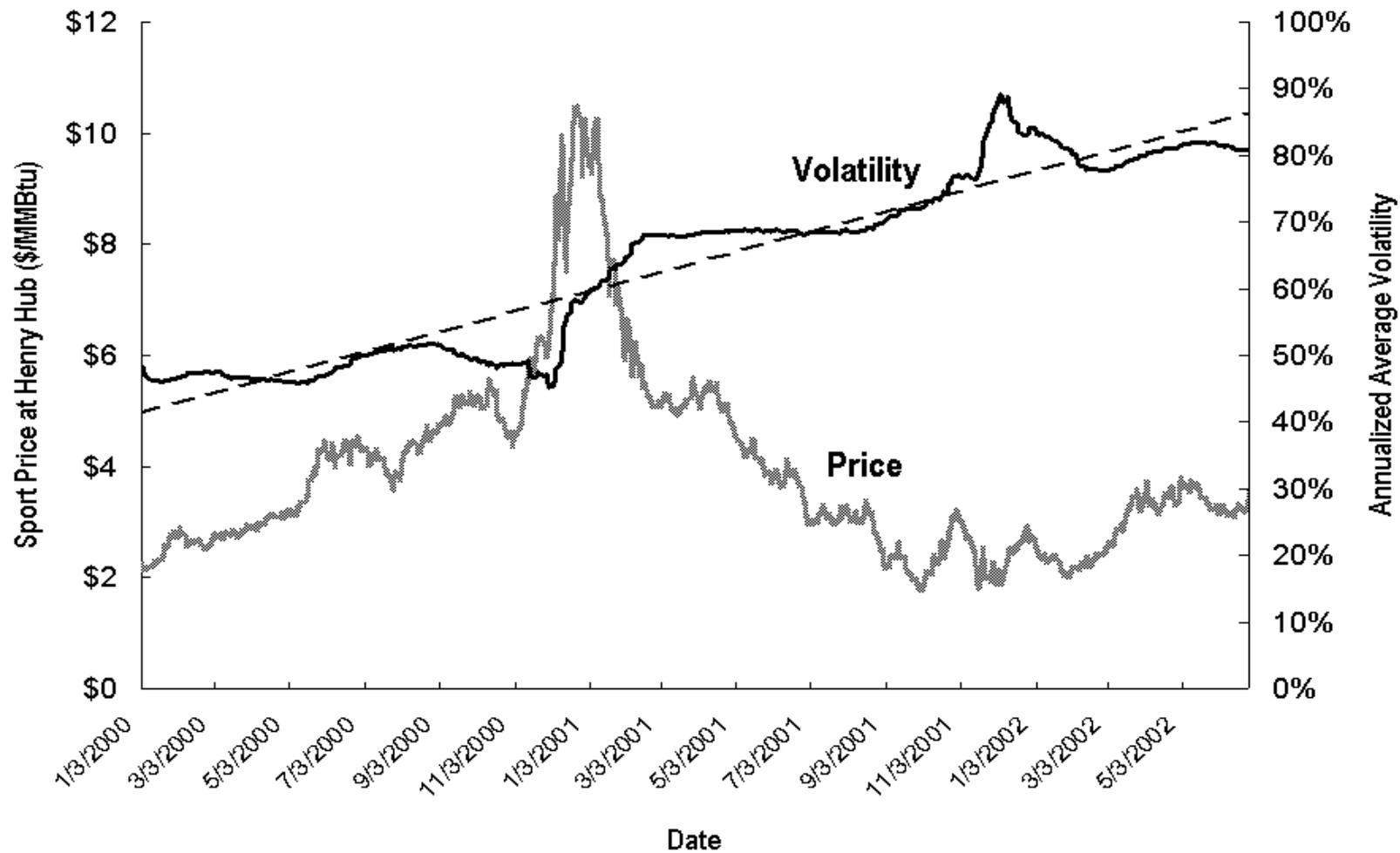
## Key Uncertainties

### Natural Gas Supply & Pricing

- ➔ U.S. gas production has been in slow decline over the last several years. Canadian gas production fell by 3.5% in 2001.
- ➔ In order to meet growing demand, domestic production must stabilize. If this does not occur, natural gas prices could increase substantially, rising the cost of gas-fired generation.
- ➔ Increased gas price volatility is being driven by a shift toward users with inelastic demand, increased price responsiveness of producers, smaller gas pools and better production technologies, a greater reliance on storage, and less storage relative to demand.
- ➔ If gas price volatility increases substantially, the tide may turn against gas-fired generators and toward technologies that provide price stability.

# Key Uncertainties

## Historic Natural Gas Price & Volatility



## Renewable Energy Drivers

- + State and Federal Policies:** The recent enactment of RPS mandates in the renewable-resource rich states of Nevada and California may signal a nationwide trend toward state-level mandates. Federal tax policies - such as a PTC expansion – will improve the market competitiveness of renewable energy technologies.
- + Natural Gas Price Volatility:** Increased natural gas price volatility may prove to be too financially onerous and may stimulate the development of renewables as a hedge against this volatility.
- Energy Market Conditions:** On-going over-supply and low power prices may hinder efforts to expand the supply of higher cost renewable energy technologies.

# Renewable Energy Drivers

- + “Green” Power Demand:** Competitive retail markets may level the playing field for generators stimulating greater demand for renewables. Continued electric sector weakness may slow the growth of green power programs.
- + Transmission Investments:** Properly functioning competitive wholesale markets will stimulate investments that provide access to remote renewable energy sites with favorable resources. Continued regulatory uncertainty and lack of local reinforcements may create opportunities for distributed technologies.
- + Research, development & deployment:** Continued public and private sector R&D is required to move technology costs toward market competitiveness.