

OVERVIEW OF NATURAL GAS ECONOMICS, MARKET STRUCTURE AND REGULATION

The National Regulatory Research Institute

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before

**The Public Utilities Regulatory Commission, the
Energy Commission, and the Ministry of Energy of
Ghana**

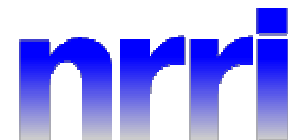
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Topics

- Structure of the natural gas industry in the U.S. and other countries
- The functions of a local gas distribution company (LDC)
- Federal Energy Regulatory Commission (FERC)
- State public utility regulation
- Historical and recent developments in the natural gas industry
- Current issues

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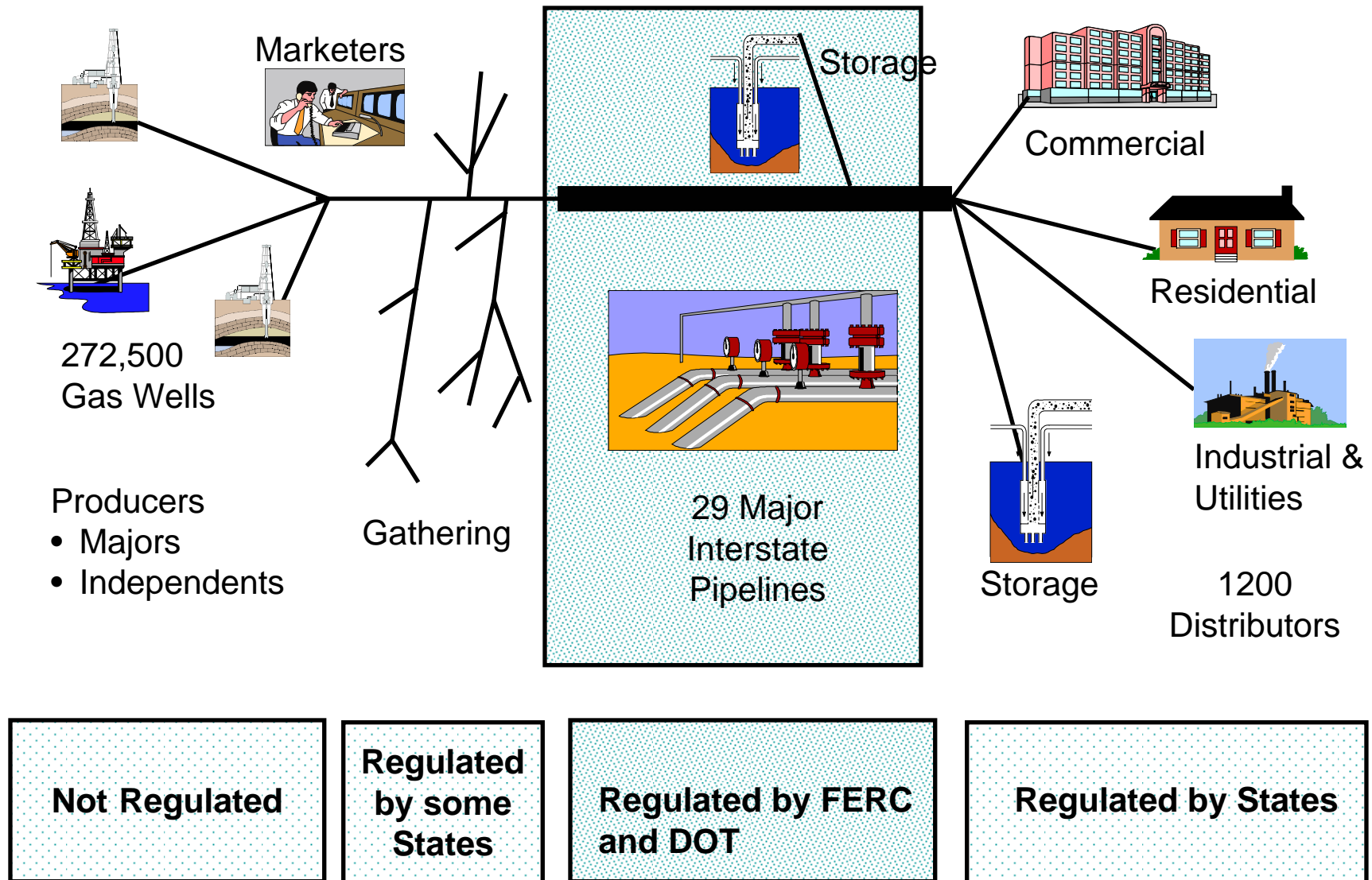
Industry Segments

- *Production* (unregulated)
- *Interstate transmission* (regulated by FERC)
- *Intrastate transmission* (regulated by state PUCs)
- *Gathering and processing* (regulated by some states)
- *Local distribution* (regulated by state PUCs)
- *Consumers* (vary in size and how gas is used)

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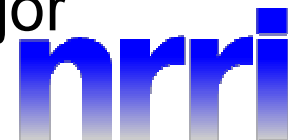
Structure of the U.S. Natural Gas Sector



Basic Technical and Economic Features of U.S. Natural Gas Industry

- Competitive production sector – over 7,000 producers, with 21 major companies (top 10 companies produce about 45% of total U.S. production)
- Imports make up about 15% of our gas, mostly from Canada and increasingly from other countries in the form of LNG
- Interstate pipelines carrying gas long distances from gas fields to market areas (about 90 pipelines, with more than 250,000 miles of pipes)
- Market centers and hubs (over 40) – allows trading of gas supply away from production areas/wellhead and toward pipeline interconnections and storage areas and major market areas

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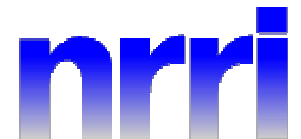


Basic Technical and Economic Features of U.S. Natural Gas Industry

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- Storage facilities (mostly owned by pipelines and LDCs, and increasingly by marketers and other independent entities) serve important functions
 - Reducing the magnitude of short-run market price fluctuations
 - Helping marketers, pipelines and LDCs to manage the price and availability of gas year-round
 - More recently, marketers use storage as a financial tool, relying on price fluctuations in the spot and futures markets to create arbitrage opportunities
 - With storage, the market-clearing price is determined not only by current production and consumption, but also by changes in the storage level

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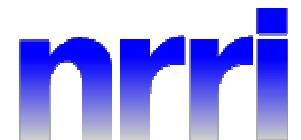


Basic Technical and Economic Features of U.S. Natural Gas Industry

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- Over 250 independent and affiliated marketers and brokers providing both wholesale and retail services
- Individual pipeline operation of their facilities
- LDCs provide both bundled sales service and transportation
- Scale economies for delivery services, which require some form of price regulation

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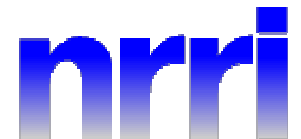


Basic Technical and Economic Features of U.S. Natural Gas Industry

-- continued

- Open access to interstate pipelines (contract carriers)
- Open access to distribution systems for large customers and many small customers (“customer choice” programs)
- Well-developed spot and futures markets (NYMEX futures market since 1990, options on futures contracts since 1992)
- Bypass of local distribution systems by large customers (industrials, electric generators)
- Most large customers buy only transportation service from the local gas utility

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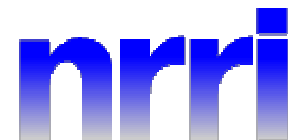


Basic Technical and Economic Features of U.S. Natural Gas Industry

-- continued

- Small customers in 19 states and the District of Columbia have been able to purchase gas from third parties, with only one exception where the local utility is not the provider of last resort or the default supplier
- Industrials are the largest user of gas (over 40% of total), but gas use for electric generation has grown rapidly and will continue to do so
- Primary markets for gas use: (1) direct energy source (primarily heat), (2) feedstock (industrial), and (3) fuel for electric generation
- Pipeline and LDC marketing affiliates are important players

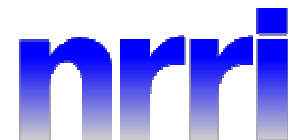
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General Gas Market Models around the World

- **Vertically integrated monopoly** (single entity controls production and transportation)
- **Wholesale competition** (transport entity buys gas from competing wholesale suppliers)
- **Customer choice** (final customers obtain gas from competing retail suppliers)

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Major Gas Consuming Regions

(source: IGU workshop)

Country/Attribute	Import Dependency	Level of Government Intervention
Asia	High	High
Europe	Medium, Increasing	Medium
U.S.	Low, Increasing	Low

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Examples of the Natural Gas Sector in Different Countries

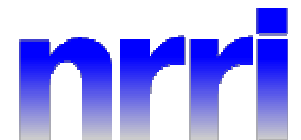
- Argentina
- Asia Pacific countries (APEC)
- Bolivia
- European Union countries
- Mexico
- South Africa
- Turkey

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Conditions for Effective Economic Performance

- Services exhibiting natural-monopoly characteristics, such as long-distance pipeline transportation and local distribution, are regulated with regard to price and quality of service
- Regulated providers are given a reasonable opportunity to recover their costs, including a return on investments that covers their cost of capital
- Control of the major functions -- namely, production, pipeline transportation and distribution -- commonly lies with different entities

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Lessons Learned from Different Countries

- Open and non-discriminatory access to pipeline facilities is necessary for effective competition to develop in the upstream segment of the industry.
- Regulatory predictability and stability are important in attracting new capital funds for the development of the network infrastructure.
- “One shoe does not fit all feet,” which infers that one must be cautious in extrapolating the experiences of one country to another – for example, what may work in Bolivia or Argentina may not be so in Ghana.
- Regulatory institutions must have sufficient authority and resources to effectively control gas transportation providers – namely, pipelines and distributors – from exercising monopoly power.

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Lessons Learned from Different Countries -- *continued*

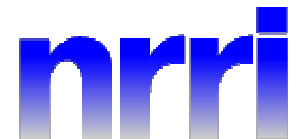
- The abolition of cross-subsidies, for political reasons if nothing else, should be transitioned over a period of years
- The primary goals of regulatory actions should include; (1) attracting private capital for infrastructure development, (2) setting of cost-based pricing for regulated services, (3) providing reasonable opportunities for financial viability of regulated entities, and (4) creating an environment for high industry productivity
- Regulatory agency independence, credibility and accountability are essential for effective oversight of sector activities

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Features of Good Regulation

- Establishment of up-front rules and guiding principles
- Responsive to the general public and consumers of utility service in particular
- Avoidance of short-term politically expedient decisions
- Transparent decision-making
- Accountability
- Independence

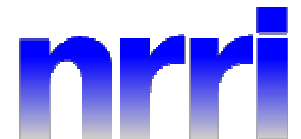
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CNG Vehicles

- Status in different countries
 - Countries with the most CNG vehicles: Argentina, Italy, Russia (In Argentina the price of CNG is about 30% of the cost of gasoline; this relative low cost of CNG has over 20 years built up the largest NGV fleet in the world, of almost 1.5 million vehicles)
 - Less interest in the U.S. in recent years because of the development of hybrid cars
 - Economics of CNG importantly depends on the price of CNG relative to gasoline and diesel fuel (Experience over the last 20 years suggests that the retail price of CNG into the vehicle should ideally be no more than 50% of the price of gasoline or 70% of the price of diesel.)

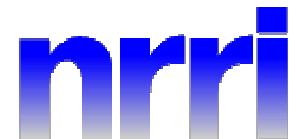
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CNG Vehicles -- *continued*

- **Benefits**
 - Cleaner environment
 - Less dependency on foreign oil
 - Economical in terms of lower fuel costs
- **Disadvantages of CNG vehicles**
 - Higher vehicle cost (especially at low levels of CNG-vehicle production)
 - Shorter driving range
 - Limited refueling infrastructure
 - Much heavier fuel tank
 - Potential performance and operational problems
 - Much more distribution and storage required

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CNG Vehicles -- *continued*

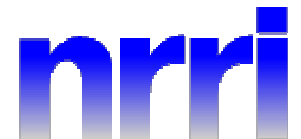
- Government/regulatory issues
 - Financial incentives/subsidies
 - Support for infrastructure development – e.g., refueling stations, distribution and storage facilities (“chicken and egg” problem)
 - Pricing of natural gas and status of refueling stations (public utilities?)
 - Availability of natural gas to CNG vehicles (how secured or reliable?)

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Local Gas Distribution Companies (LDCs)

- Own and operate city gate to burner tip distribution facilities (the city gate is the interconnection between the interstate pipeline system and the local distribution system)
- Network includes low pressure distribution lines, measurement and pressure regulators
- Major buyers of gas supply and interstate transportation and storage services
- Regulated by state public utility commissions

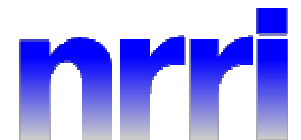
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Major Activities Of LDCs

- Long- and short-term planning
- Demand forecasting for gas
- Gather/maintain information on customer groups/service area
- Determine long-term and short-term needs for resources/assets/facilities (e.g., the “design day”)
- System construction and operation
- Metering and customer service

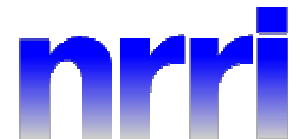
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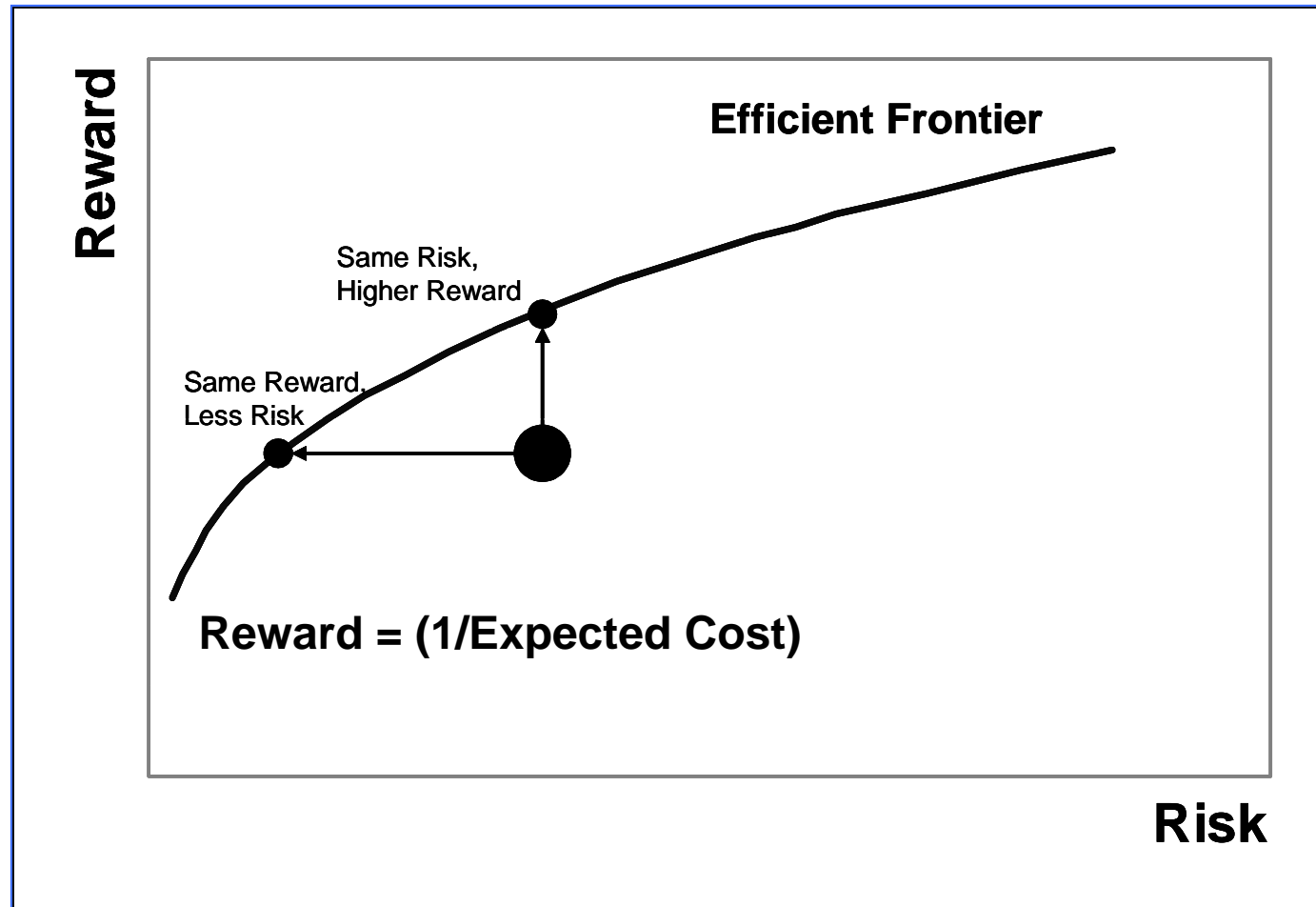
LDC Activities — *continued*

- Gas acquisition/procurement/risk management (portfolio strategy and tactics)
 - Manufacturing facilities
 - Local gas production
 - Producers
 - Marketers and brokers
 - Short-term contracts
 - Long-term contracts
 - Spot market
 - Financial derivatives (e.g., futures contracts)
 - Outsourcing

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Portfolio Analysis: Tradeoff between Risk and Expected Cost



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Recent Trends in Gas Procurement

- Application of the principles of portfolio theory to the procurement and pricing of gas supplies and transportation
- Price stability and predictability as an explicit objective
- Increased use of financial instruments for hedging
- Use of storage for additional functions (e.g., parking, balancing, arbitrage opportunities)
- Shorter-term pipeline service transactions

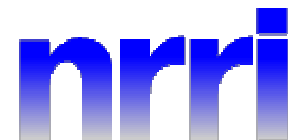
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Recent Trends in Gas Procurement -- *continued*

- Movement away from multi-year commodity gas transactions
- Competitive bidding process for procuring gas supplies
- Submittal of annual gas supply plans for regulatory review, with the result of better documented information provided upfront to regulators

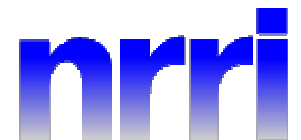
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LDC Activities — *continued*

- Purchases capacity and services from pipelines
 - Long-term firm contracts
 - Short-term firm contracts
 - Interruptible capacity
- Purchases/builds storage
 - Market area storage (e.g., pipeline)
 - Local storage

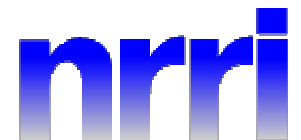
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LDC Activities — *continued*

- Sells services
 - Bundled gas sales service
 - Transportation
 - Other unbundled services (e.g., surplus pipeline capacity)
- Customer categories – () = % of total U.S. gas sales
 - Residential (22%)
 - Small commercial (14%)
 - Large commercial and industrial (43%)
 - Electric generators (18%)
 - Transportation (3%)

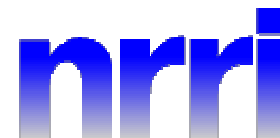
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Federal Regulation of Natural Gas

- The Federal Energy Regulatory Commission (FERC) – mandate: ensure “adequate supply of natural gas at reasonable prices”
 - Regulates pipeline, storage, and liquefied natural gas facility construction
 - Regulates natural gas transportation, including setting rates, in interstate commerce
 - Issues certificates of public convenience and necessity for interstate pipelines and storage facilities
 - Sets rates for interstate and wholesale storage services
 - One current major concern of FERC is the possibility of inadequate infrastructure development, especially regarding LNG terminals and storage facilities and to a lesser extent pipelines

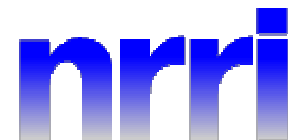
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Guiding Principles of FERC Policies

- Commodity and other competitive goods and services are best left unregulated
- Interstate gas pipelines have monopoly characteristics and must continue to be regulated
- Pipeline transportation must be operated without undue discrimination or preference
- New gas supply sources and infrastructure development must be encouraged
- Regulation should be a balancing act, with stakeholders including other government agencies, competitors of pipelines, shippers, landowners and pipelines

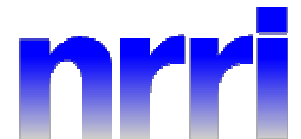
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Ratemaking at FERC

- **Discounted Cash Flow (DCF) analysis in determining the cost of equity**
 - Based on the notion that equity investors have two sources of return, dividend yield and growth in value
 - Estimating growth is the difficult task subject to uncertainty
- **Straight fixed variable rates (SFV)**
 - All fixed costs are recovered through a reservation charge (i.e., fixed rate based on peak-day demand)
 - All variable costs are recovered through a usage charge (i.e., volumetric rate)
 - Rationale: (1) should maximize pipeline throughput over time, (2) allows gas to compete with alternative fuels on a timely basis

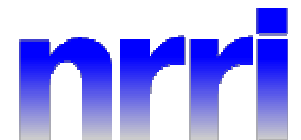
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Major Federal Actions Over the Past 25 Years

- Natural Gas Policy Act of 1978
- FERC Order 380 (1984)
- FERC Order 436/500 (1985-87)
- Natural Gas Wellhead Decontrol Act of 1989
- FERC Order 636 (1992)
- FERC Order 637 (2000)

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Federal Regulation of Natural Gas -- *continued*

- Pre-1979
 - Beginning of federal regulation — Natural Gas Act (NGA) of 1938
 - Established regulatory authority of the Federal Power Commission (FPC) over interstate sale and transportation of natural gas
 - Phillips decision in 1954
 - Extended federal authority to regulate wellhead gas

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Federal Regulation of Natural Gas -- *continued*

- Pre-1979 -- continued
 - Induced by wellhead price ceilings, gas shortages and curtailments starting in the 1970s
 - No shortages in gas-producing states
 - Wellhead price regulation was not applicable to intrastate markets
 - Natural Gas Policy Act (NGPA) of 1978
 - By 1985 complete deregulation of most wellhead gas

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Federal Regulation of Natural Gas -- *continued*

- FERC Order 380 (1984)
 - Eliminated minimum bill requirements for gas utilities
 - Gave gas utilities economic opportunities to shift to lower-priced pipelines
- FERC Orders 436 (1985) and 500 (1987)
 - “Voluntary” open pipeline access transportation
 - Contract Demand (CD) conversion/reduction
 - Within 2 years, 75% of pipeline-transported gas owned by third parties

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Federal Regulation of Natural Gas -- *continued*

- FERC Order 636 (1992)
 - Mandatory unbundling of pipeline services
 - Well-defined rights to third-party transporters (“true open access”)
 - Pipeline’s main-line capacity and storage facilities
 - Upstream pipelines
 - “No notice” transportation service

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Federal Regulation of Natural Gas -- *continued*

- FERC Order 636 (1992) – *continued*
 - Resale of pipeline gas on an unbundled basis at market-based prices
 - Pre-granted abandonment under the right-of-first-refusal rule
 - 100% recovery by pipelines of transition costs (roughly \$4.5 billion)
 - Capacity releasing and electronic bulletin boards

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Federal Regulation of Natural Gas -- *continued*

- FERC Order 636 (1992) – *continued*
 - Shifting of responsibility to LDC for gas procurement, storage, risk management, balancing, reliability, coordination, and aggregation
 - Straight fixed variable (SFV) rate design for pipeline service

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Federal Regulation of Natural Gas -- *continued*

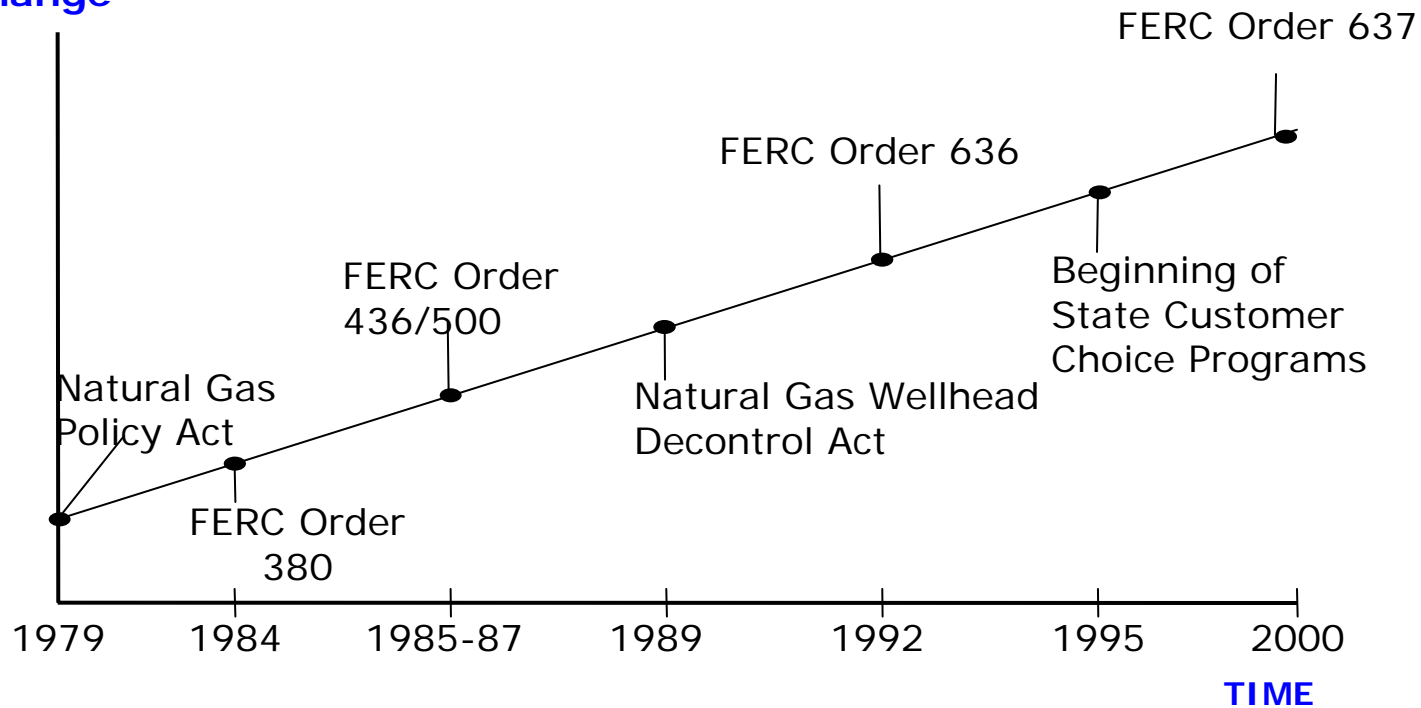
- FERC Order 637 (2000)
 - Price ceilings removed for short-term secondary market capacity release until September 30, 2002
 - Pipelines allowed to propose peak/off-peak and term-differentiated rates (i.e., lower rates for longer-term contracts)
 - Need for more transparent information and monitoring of gas markets
 - Further study of negotiated rates, capacity auctions and market-based rates
 - Enhancement of firm capacity rights

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Chronological Order of Events

Evolution of
Change



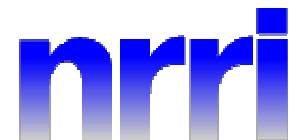
Major Federal Regulatory Changes (source: FERC)

	Market/Regulatory Feature	Problem	Remedy	Mechanism
Pre- 1938	No regulation of pipelines	Market power by pipeline companies who sold and transported gas	Regulation	NGA
Pre- 1954	No regulation of producers	None	Wellhead price controls and regulation	Phillips Petroleum v. FPC (S.Ct)
1954-89	Wellhead price controls and regulation	Supply shortage	Wellhead deregulation	NPGA (1978) Decontrol Act (1989)
1978-86	Bundled sales	Limited access to low-cost gas	Open-access	Order No. 436
1986-92	Sales and transportation	Transport inequality, take-or-pay	Unbundling	Order No. 636
1992-present	Unbundled transport	Short-term focus, need for long-term investment support	Enhance project support	Hackberry (LNG), return to long term LDC contracts?

Pipeline Safety Regulation

- U.S. Department of Transportation (DOT) is responsible for enforcing regulations pertaining to pipeline safety
- Federal pipeline safety regulations have the objectives of
 - Assuring safety in design, construction, inspection, testing, operation, and maintenance of pipeline facilities and in the siting, construction, operation, and maintenance of LNG facilities
 - Setting out parameters for administering the pipeline safety program

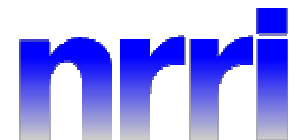
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Pipeline Safety Regulation -- *continued*

- Compliance with pipeline regulations through partnerships with state agencies
 - States responsible for intrastate pipelines (assuming their safety programs are federally certified or states entered into an agreement with DOT)
 - Federal government responsible for interstate pipelines
- The Federal/State partnership helps to assure uniform implementation of the pipeline safety program nationwide
- States must enforce at least the federal regulations, with many actually going beyond federal regulations

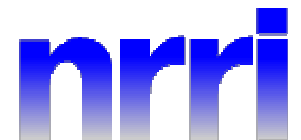
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Pipeline Safety Regulation -- *continued*

- A State must provide for sanctions substantially the same as those authorized by the pipeline safety statutes
- Federal pipeline statutes provide for exclusive Federal authority to regulate *interstate* pipelines; DOT, however, may authorize a state to act as its agent to inspect interstate pipelines, but retains for itself responsibility for enforcement of the regulations

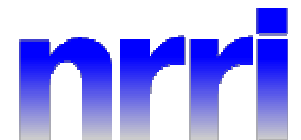
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Major Functions of a State PUC

- Approves the cost of purchased gas (e.g., via PGAs)
- Approves construction of distribution facilities (e.g., distribution pipes, storage facilities)
- Issues certificates of convenience and necessity
- Assures high quality and safe service

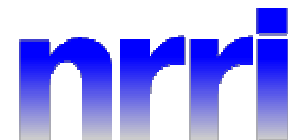
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Major Functions of State PUCs -- *continued*

- Approves rates for the sale of services
 - Sales forecasts
 - Cost-of-service analysis
 - Rate of return on undepreciated capital investments
 - Special rates for specific customer groups
 - Nontraditional or performance-based rates (e.g., price caps)

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Major Functions of State PUCs -- *continued*

- **Example**: Traditional rate method (“U.S. Model” for base rates)

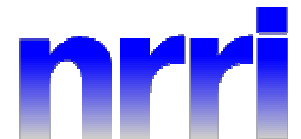
$$R = RR = OC + r \times RB$$

$$P \times Q = OC + (r \times RB)$$

$$P = \frac{OC + (r \times RB)}{Q}$$

where, **RR** = revenue requirement, **R** = revenues, **OC** = operating costs, **r** = allowable rate of return, **RB** = rate base, **P** = average price, **Q** = quantity of sales

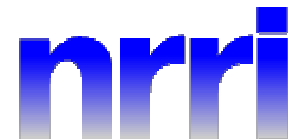
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Major Functions of State PUCs -- *continued*

- Traditional ratemaking method – 3-step approach
 - Revenue requirement
 - A utility's recovery of capital investments (depreciated over their economic lives)
 - A utility earning a return on investments
 - A utility's recovery of operating costs
 - Cost allocation (how much revenues to collect from various customer groups and services)
 - Rate design (how to collect revenues from various customer groups and services)

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Major Functions of State PUCs -- *continued*

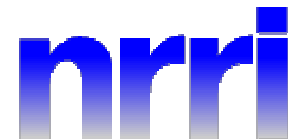
- Other components of the ratemaking function
 - Purchased gas adjustment clauses (PGAs)
 - Financing of social goals
 - Low-income assistance
 - Winter moratorium rules
 - Demand-side management and energy conservation
 - Research and development

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Major Functions of State PUCs -- *continued*

- *Regulatory functions under the “new paradigm” of retail competition for small customers (“customer choice”)*
 - Price regulation of bundled sales service (service of “last resort”)
 - Price regulation of unbundled distribution service for “switching” customers
 - Oversight of an LDC’s “operations” activities
 - Market monitoring and evaluation
 - Design and enforcement of affiliate rules (“codes of conduct”)
 - Design and enforcement of consumer protection, as well as service unbundling, rules

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Evolution Of State PUC Regulation Of Natural Gas

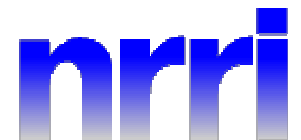
- Pre-1970
 - Traditional price regulation with no PGA clauses
 - Ample gas supplies
 - Low prices
- 1970s
 - The “energy crisis”
 - Gas shortages and curtailments
 - Rapid rise in gas prices but prices still low
 - Advent of PGA clauses

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Evolution Of State PUC Regulation -- *continued*

- 1980s
 - Heightening of state PUC scrutiny of LDC operations, gas purchases and other costs
 - Introduction of demand-side management (DSM), energy conservation, and integrated resource planning (IRP)
 - Strong push by marketers and industrial customers for open access at both wholesale and retail levels
 - Initiation of service unbundling (“customer choice”) for large customers

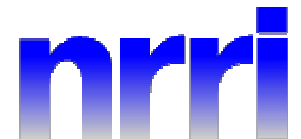
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Evolution Of State PUC Regulation -- *continued*

- 1990s (period of low gas prices)
 - Proliferation of service unbundling for large customers
 - Introduction of pilot/permanent choice programs for small customers (including residential)
- 2000-today
 - Concern over high and volatile gas prices
 - Interest in hedging with financial derivatives
 - Interest also in other actions to mitigate the effects of high natural gas prices (e.g., energy efficiency, budget billing, restructuring of PGAs)
 - Dramatic increase in natural gas usage for electric generation

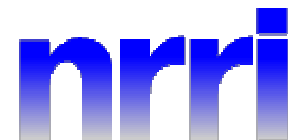
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Transformation of the Natural Gas Industry Since the Early 1980s

- Erosion of pipeline monopoly power
- More flexible, volatile and market-driven prices
- Increase in LDC opportunities and responsibilities for acquiring and managing gas procurement and pipeline services
- Retail competition in some states

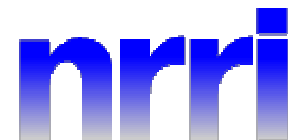
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Transformation of the Natural Gas Industry -- *continued*

- Development of spot and financial-derivative markets
- Proliferation of market centers and offering of ancillary pipeline services (e.g., parking, loaning, storage, balancing)
- Overall, transformation of the natural gas industry toward greater competition and customer choice

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Transformation of the Natural Gas Industry -- *continued*

- Role of state PUCs in crafting policies to ensure
 - Fair competition
 - Stable and affordable retail prices
 - Safe and reliable service
 - Benefits to all gas consumers from increased competition

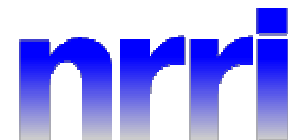
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14 Things To Know About the U.S. Natural Gas Sector

1. We are not running out of natural gas or facing a natural-gas shortage problem.
2. For at least the next few years, natural gas prices will likely remain high and, with almost complete certainty, not return close to the low prices of the 1990s.
3. Price volatility has become an inherent feature of natural gas markets.
4. Financial derivatives have increasingly become an important tool for managing price risks in natural gas markets.

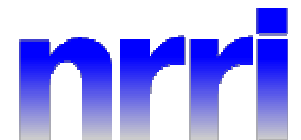
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14 Things To Know -- *continued*

5. Natural gas is highly price inelastic in the short run.
6. Starting in the 1980s, energy conservation in various forms has significantly curtailed the use of natural gas.
7. New gas-fired electric facilities have been a factor, along with tightening of domestic gas supplies, in the rise in natural gas prices over the past few years.
8. Natural gas will increasingly be transacted in a world market.

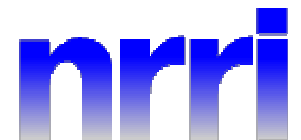
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14 Things To Know -- *continued*

9. Higher consumption of natural gas can have a favorable environmental effect to the extent it displaces oil and coal for industrial and electric generation use.
10. A national debate on the need to expand new sources of natural gas supplies as well as energy-conservation activities is taking place.
11. Retail access for small customers has met with greater success for natural gas than for electricity and local exchange telephone service, but it has encountered some problems.

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14 Things To Know -- *continued*

12. For various reasons, it has been easier to restructure the natural gas sector than the electric sector.
13. “High” natural gas prices have only a minimal effect on the general economy (unlike oil prices), but they can have a significant effect on gas-intensive industries and low-income households.
14. State commissions, along with gas utilities, have taken various initiatives to mitigate the effect of high and volatile natural gas prices on small consumers.

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Major Natural Gas Issues in the U.S.

- **High natural gas prices** (this will be the fifth straight year of high gas prices)
 - What can PUCs and LDCs do, if anything?
 - Effect on different gas consumers
- **LDC price-risk management (or hedging)**
 - Use of futures contracts and other financial derivatives by utilities, in addition to traditional hedges such as storage and physical contracts

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Major Issues -- *continued*

- **LDC price-risk management (or hedging) - *continued***
 - How much are consumers willing to pay to have more price stability?
 - How much should a utility spend on hedging, and how much should it hedge?
 - Utility incentives to hedge
 - Prudence criteria and regulatory pre-approval commitment
 - Gas portfolio management

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Major Issues -- *continued*

- **The need for new sources of gas supplies**
 - LNG
 - Alaskan gas
 - Opening up restricted areas in the Lower-48 for drilling and exploration?
- **Gas-electricity interdependency**
 - Gas transportation constraints
 - Reliability consequences for electric power systems (e.g., security)
 - High gas prices driving up electricity prices

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Major Issues -- *continued*

- **Infrastructure Development** (LNG terminals, storage facilities, pipelines)
- **Fuel diversity for electric generation** – particularly, shifting from gas-fired electricity generation to non-gas technologies, such as nuclear, renewable energy and clean coal
- **Energy efficiency** (for example, the promotion of utility-funded energy conservation initiatives)

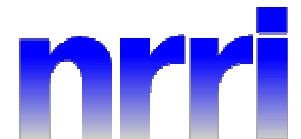
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Summary Of Recent Market Developments for Wholesale Gas

- Tight market conditions since 2002 – for at least the next few years, prices will remain high (for the spot market, \$7-9 per Mcf range) and vulnerable to volatility
- Much drilling activity and well completions, but the productivity of gas wells has fallen sharply over the past several years
- Need for LNG to fill the “supply gap” until the end of the decade and beyond

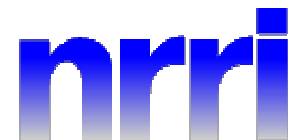
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Recent Market Developments — *continued*

- Prices won't loosen until new gas sources are forthcoming (e.g., LNG), and oil prices start to decline, which may not occur until after 2007-2008
- Even prior to Katrina/Rita, natural gas prices were on the rise this year, largely because of hot weather in late summer and high oil prices

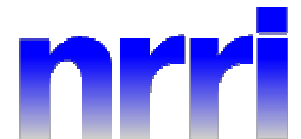
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Recent Market Developments — *continued*

- Natural gas prices in the short term are extremely sensitive to various factors, making price projections highly vulnerable to error
 - Storage levels
 - Weather
 - Gas production
 - Oil prices
 - General economic conditions
 - Regional pipeline capacity
 - Fuel switching

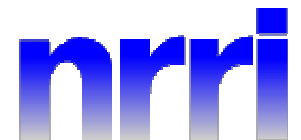
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Recent Market Developments — *continued*

- Experts disagree more on longer-term natural gas prices – specifically, over when and how much prices will start to decline this decade from the levels of the past few years
- LNG and gas supplies from other sources won't have a noticeable moderating effect on natural gas prices until at least the middle or later part of this decade

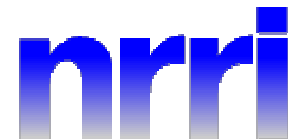
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Recent Market Developments — *continued*

- Domestic gas production will be increasingly supplemented by LNG in the years ahead
- Since the mid-1990s, domestic gas production has bumped up close to gas productive capacity (an indicator of a tight gas market)

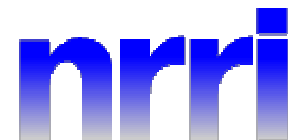
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Recent Market Developments — *continued*

- Short-to mid-term supply/demand options to alleviate the tight gas-supply situation
 - Expansion of existing LNG facilities
 - Increase in Canadian imports
 - Increase in the capacity of dual-fuel electric generating units
 - More aggressive energy-efficiency efforts
 - Increase in gas production from deeper waters in the Gulf and from the Rocky Mountains area

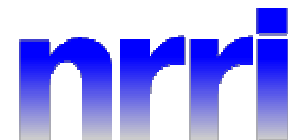
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Recent Market Developments — *continued*

- Overall, in the short term, the outlook for the gas market is anything but settling and, certainly, not optimistic
- Current conditions in the gas market in some ways are analogous to those that emerged in the oil market during the 1970s

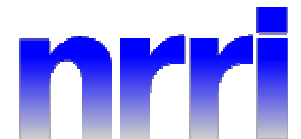
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Appendix

Statistics, Graphs, and Supplemental information

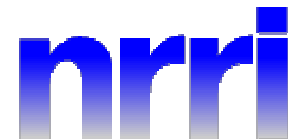
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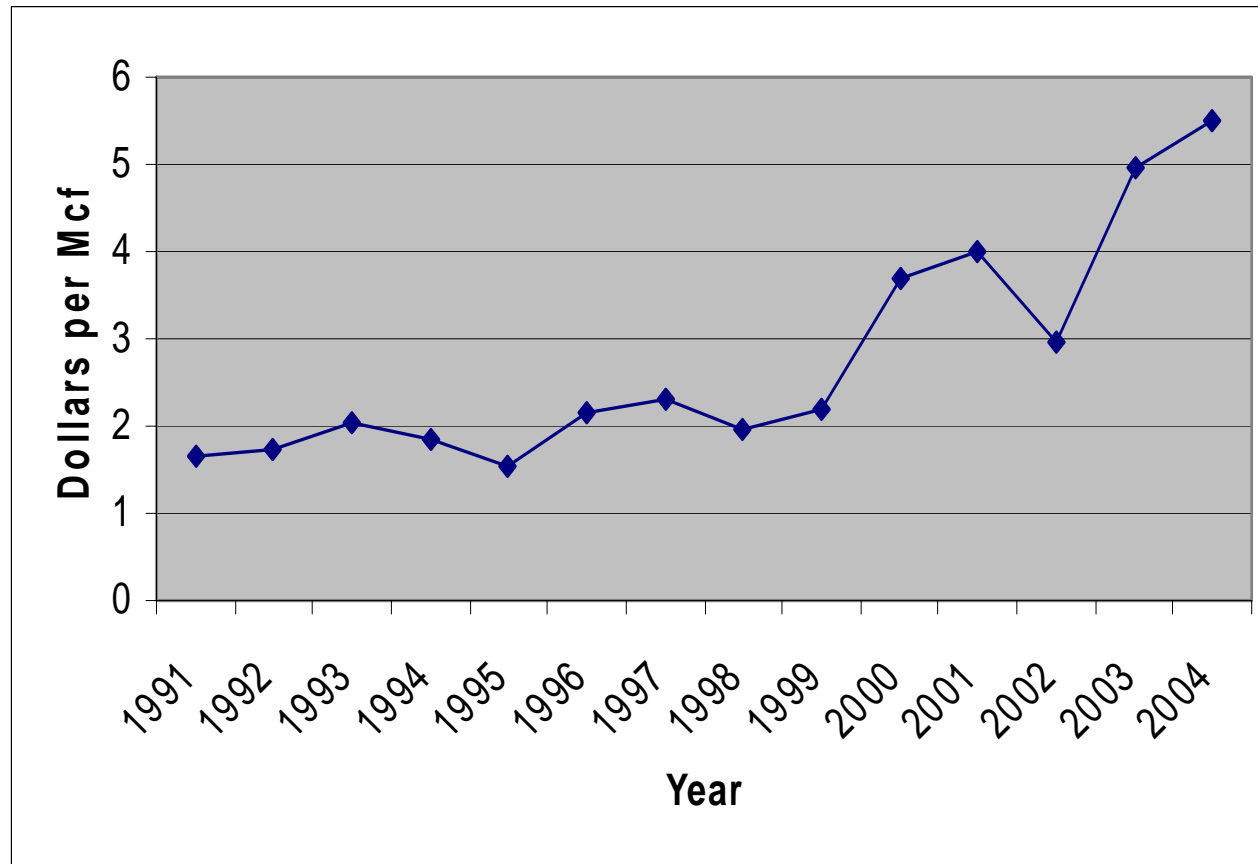
EIA's 2005 and 2006 Projections (as of November 2005)

	2004	2005	2006
LNG Imports (Bcf)	650	650	1,050
Average Wellhead Price (\$/Mcf)	\$5.50	\$7.62	\$7.86
Average Henry Hub Price (\$/Mcf)	\$6.06	\$9.15	\$9.00
Residential Gas Price (\$/Mcf)	\$10.74	\$13.05	\$14.48

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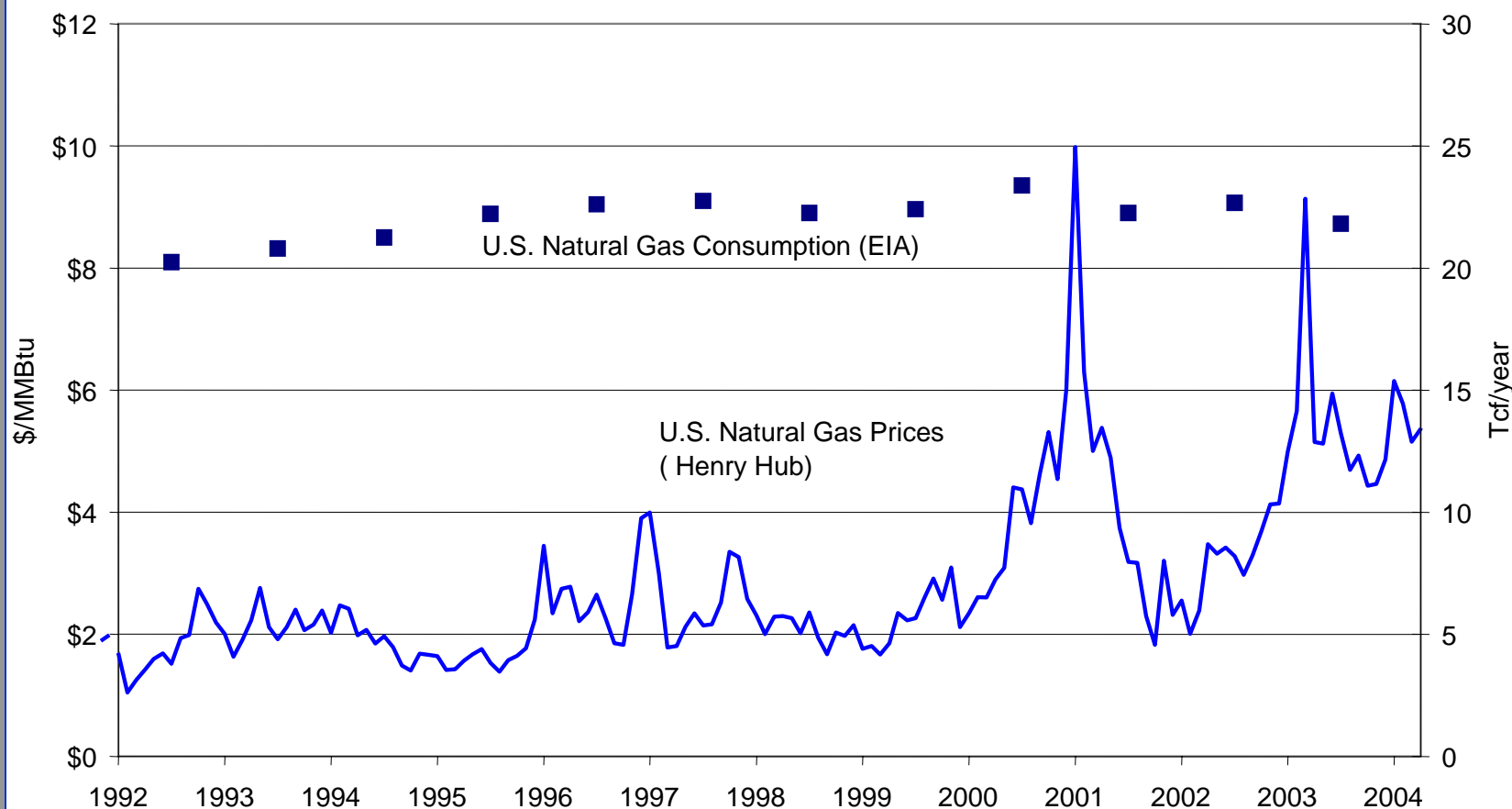


Wellhead Natural Gas Prices, 1991-2004



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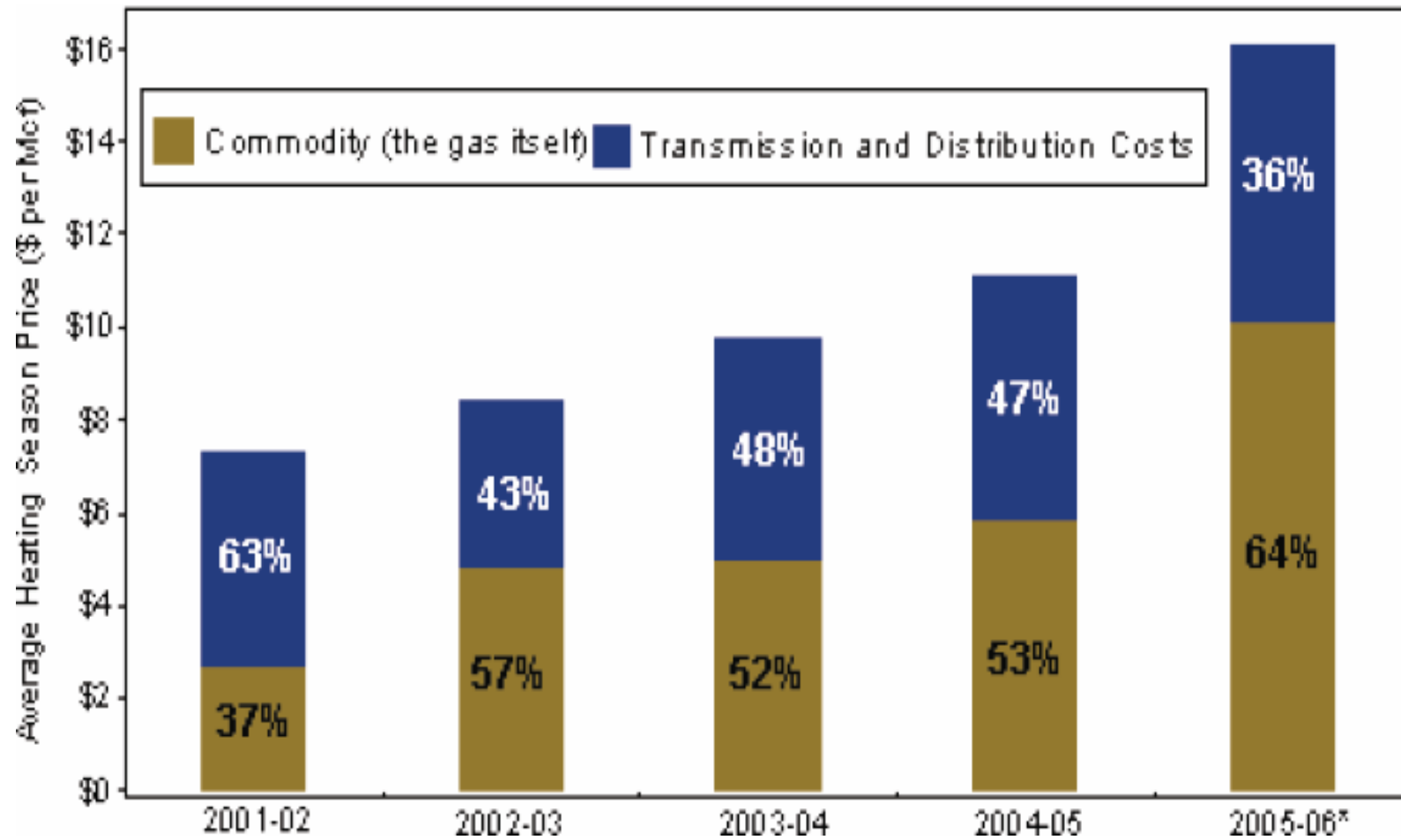
U.S. Natural Gas Demand and Prices Since 1992



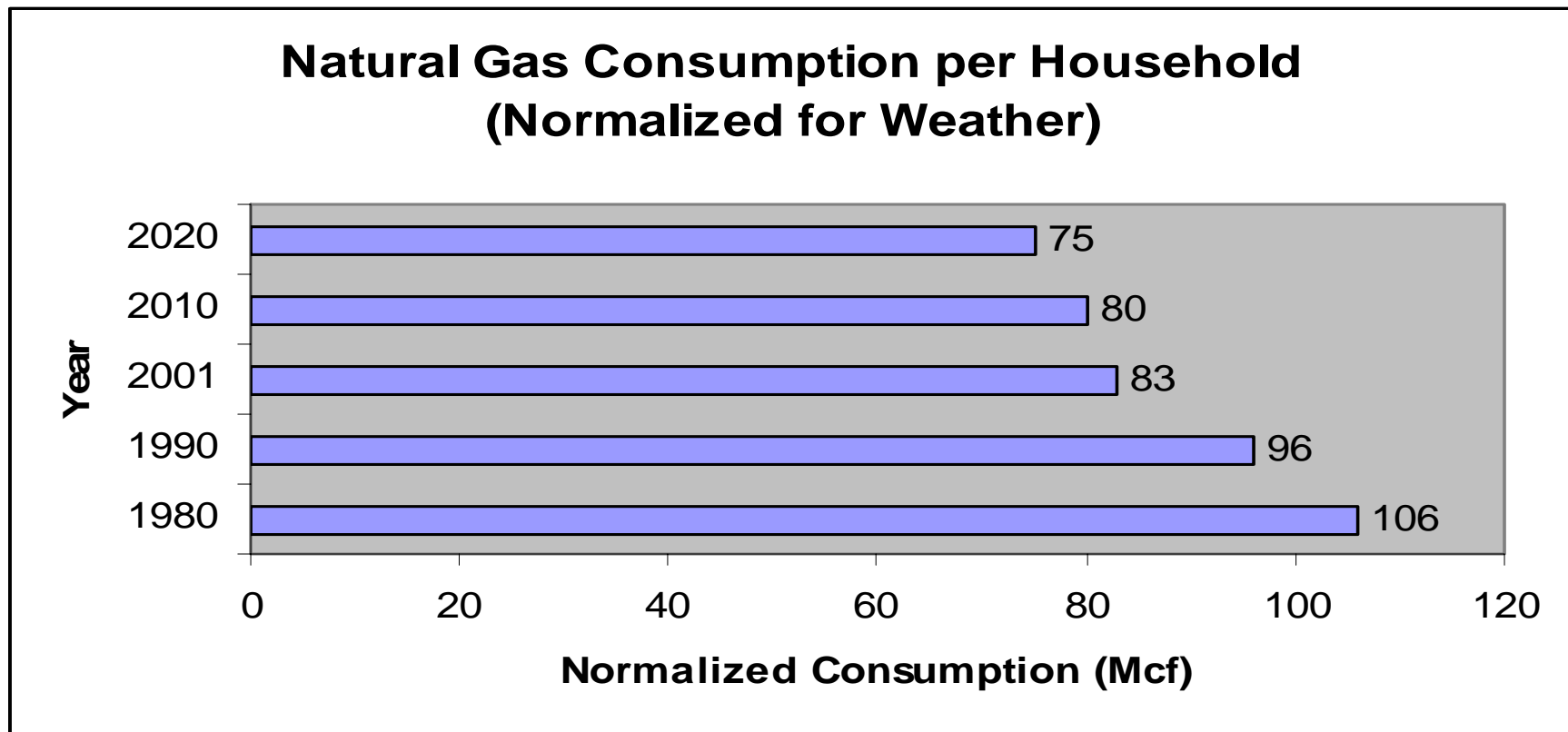
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Composition of Natural Gas Prices Paid by Residential Consumers During the Heating Season (source: EIA)

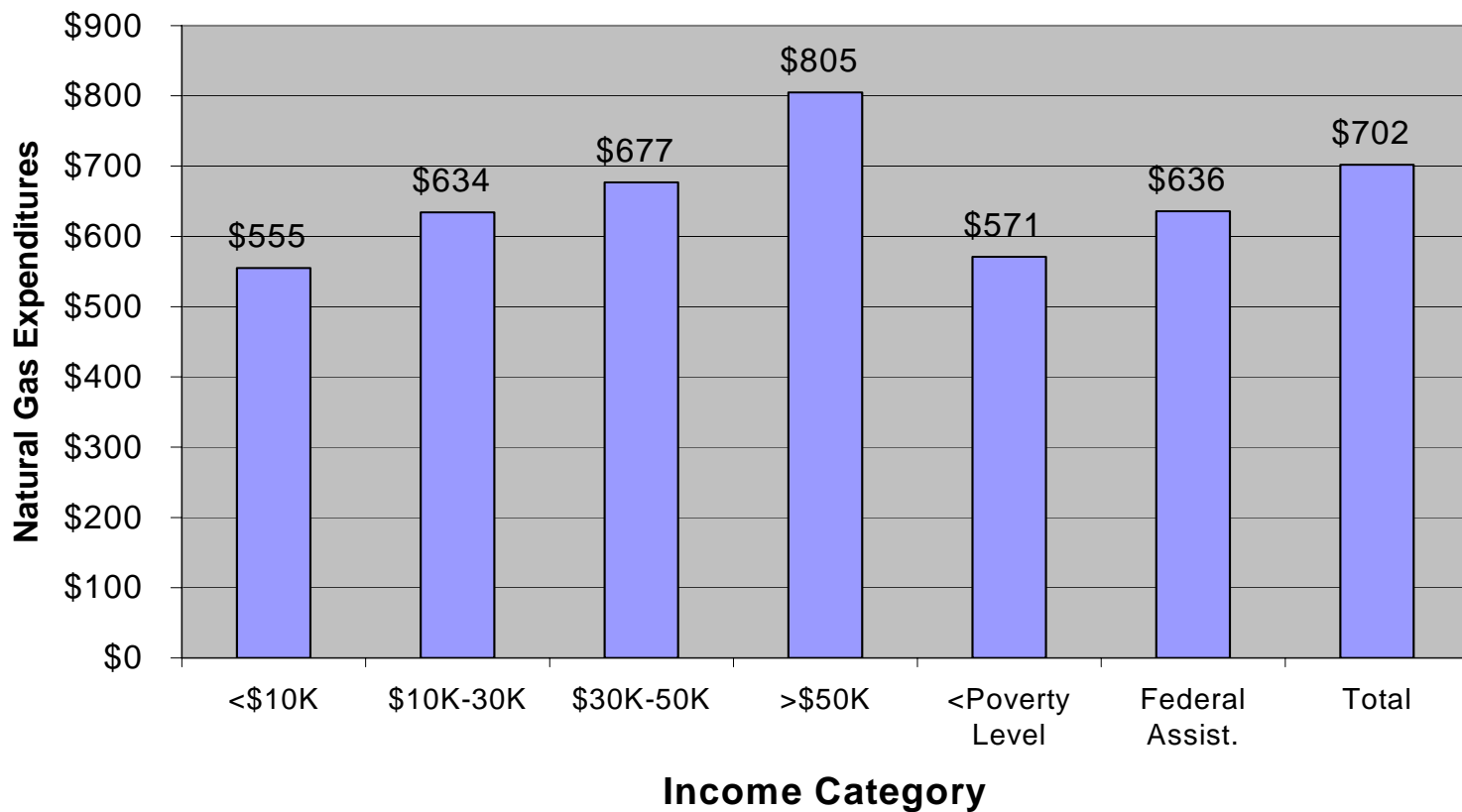


Declining Gas Consumption per Household since 1980 (source: AGA)



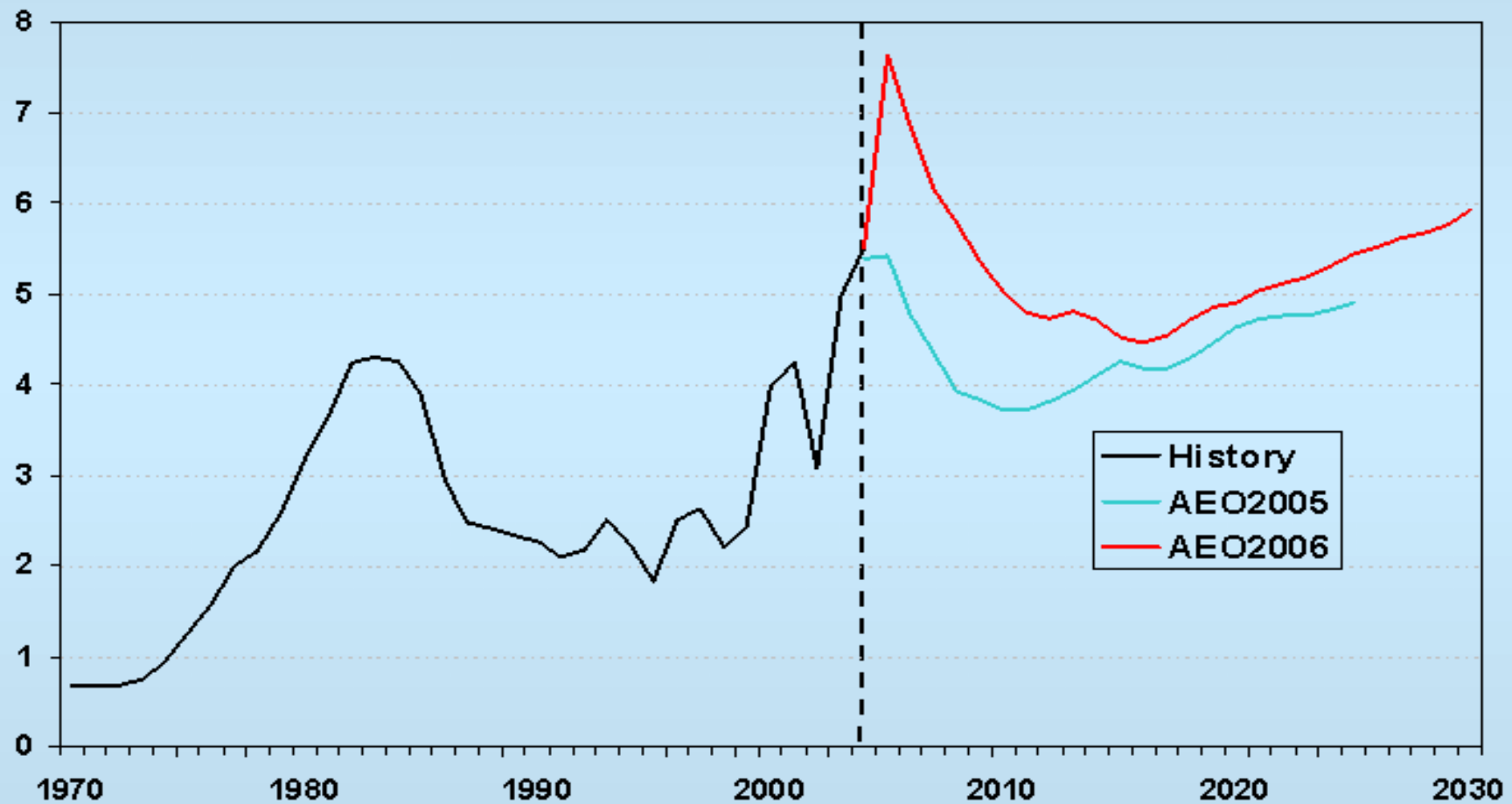
Natural Gas Expenditures by Income Category, 2001

Natural Gas Expenditures by Income Category, 2001



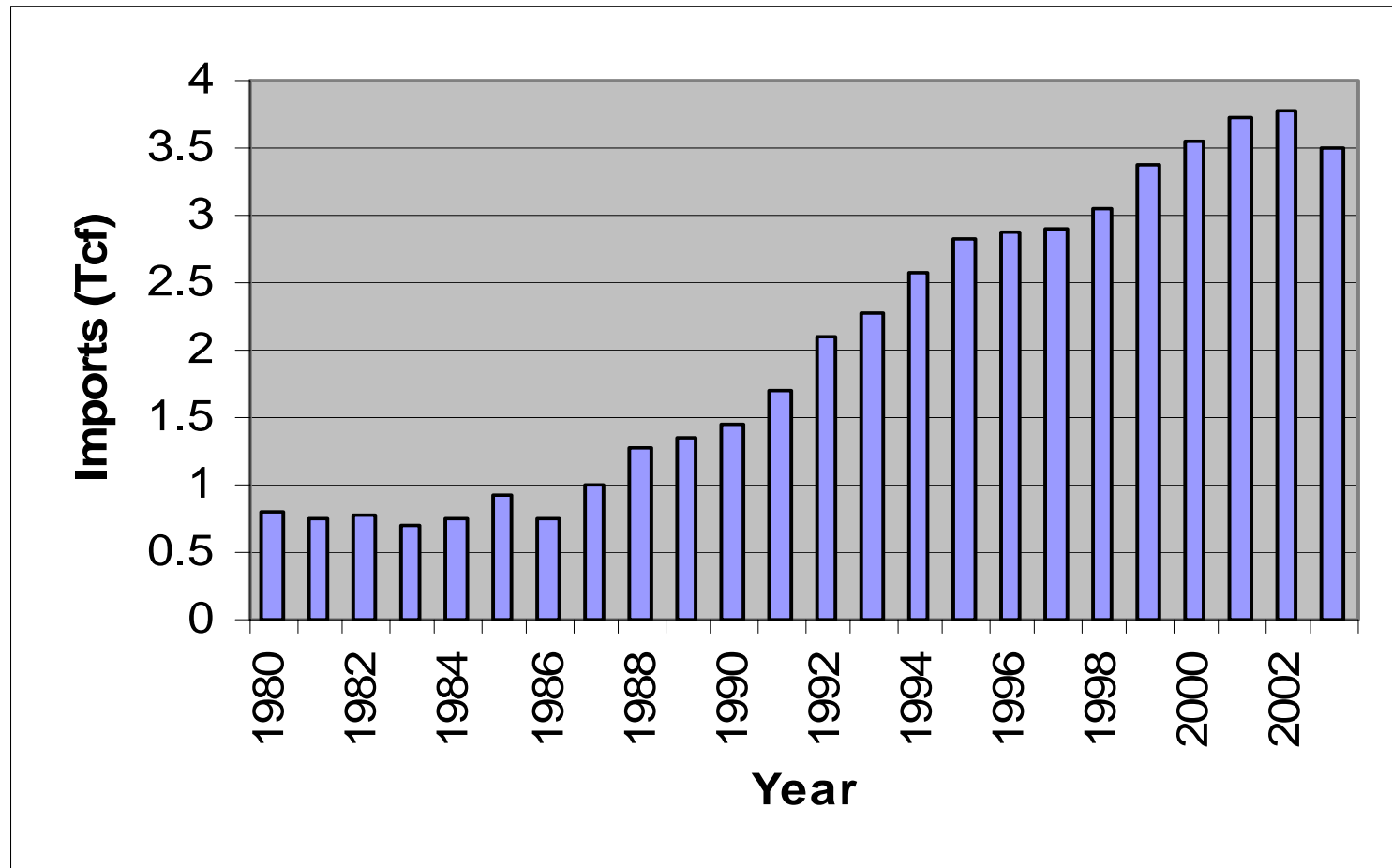
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Natural Gas Wellhead Price, 1970-2030 (2004 dollars per thousand cubic feet)



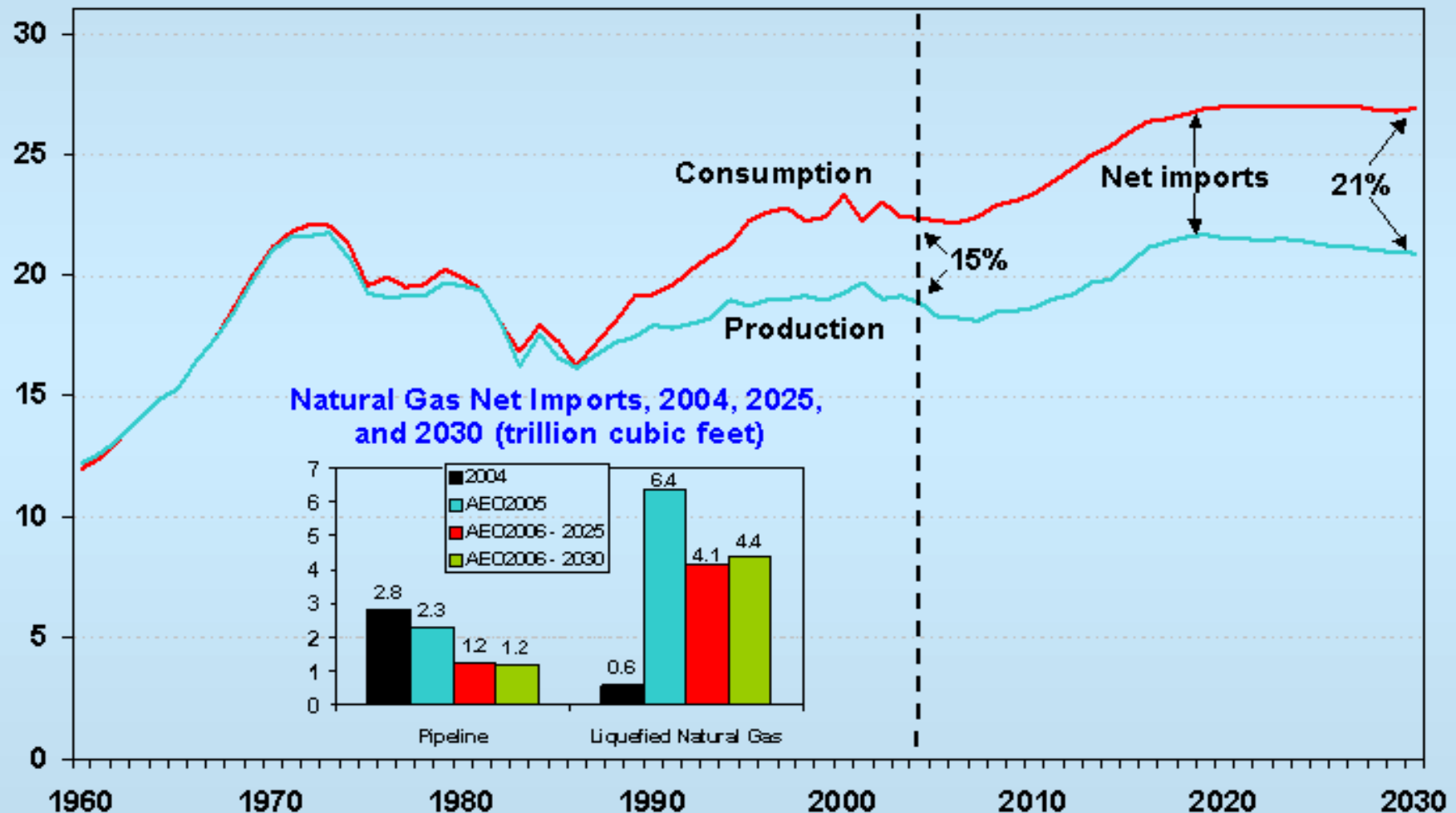
EIA, Annual Energy Outlook 2006

Canadian Natural Gas Imports, 1980-2003

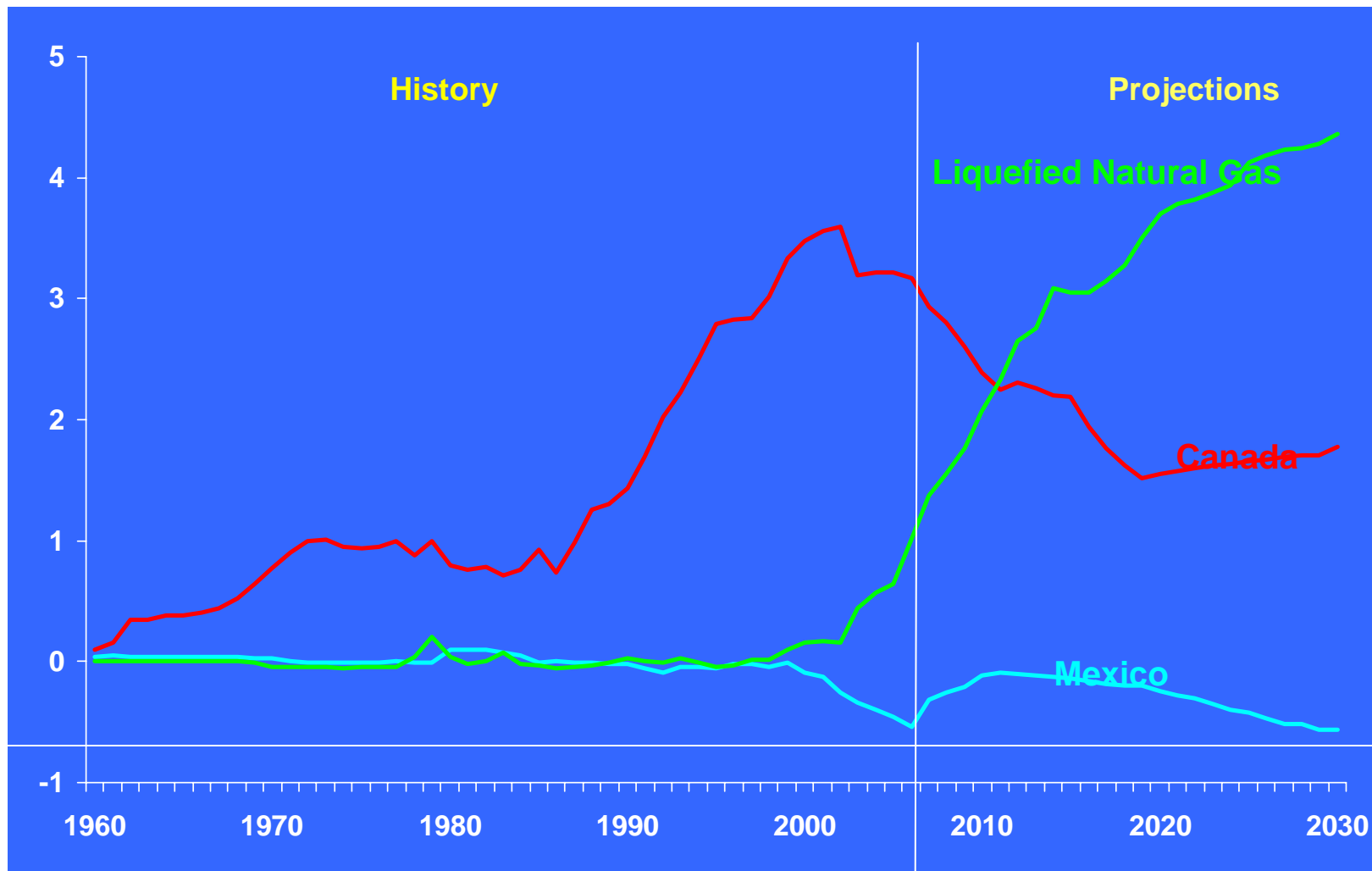


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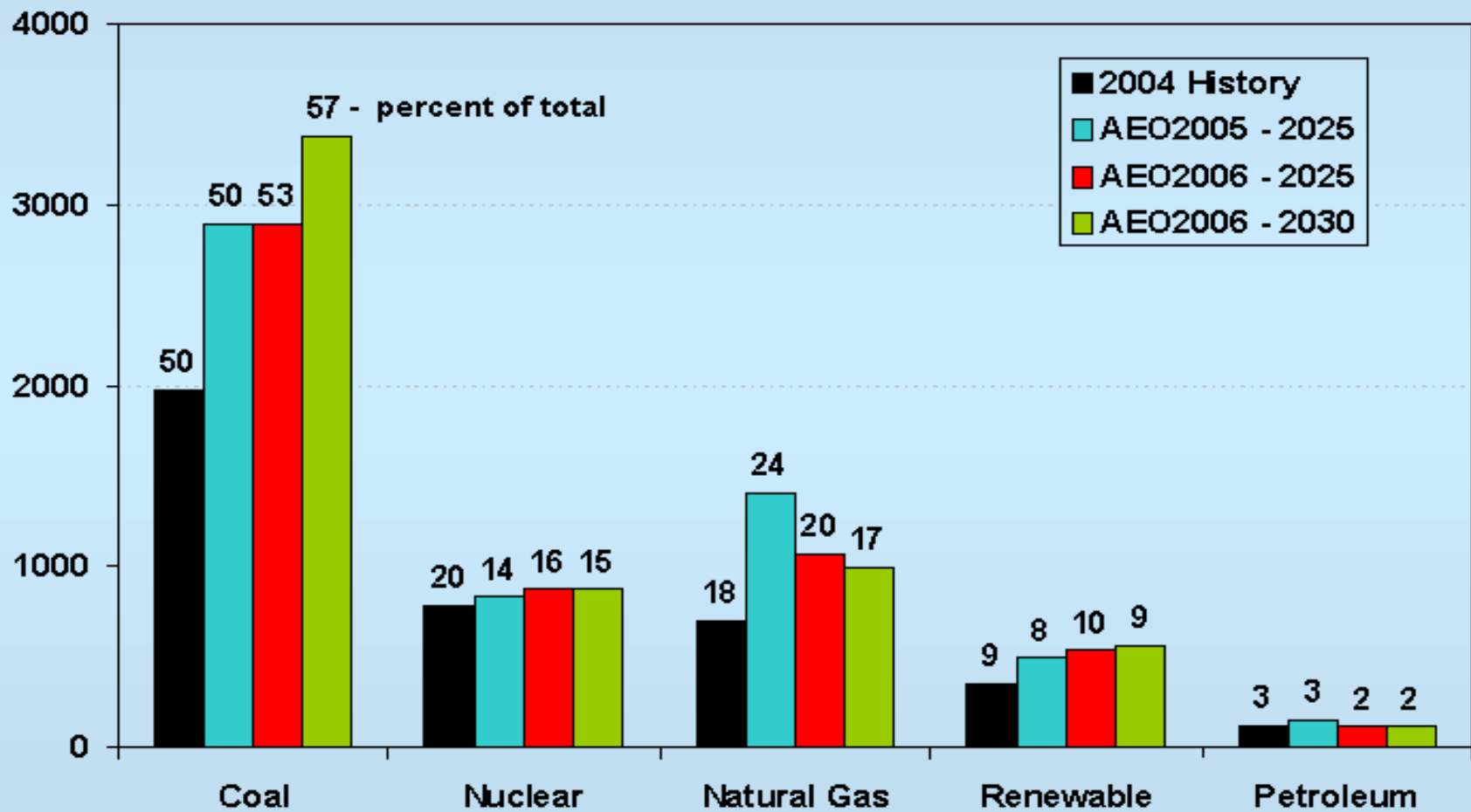
Natural Gas Production, Consumption, and Imports, 1960-2030 (trillion cubic feet)



U.S. Net Imports of Natural Gas, 1960-2030 (trillion cubic feet)



Electricity Generation by Fuel, 2004, 2025, and 2030 (billion kilowatthours)



Composition of U.S. Energy Use

- Petroleum products 39%
- Natural gas 24%
- Coal 22%
- Nuclear power 8%
- Other 7%

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