

ELECTRICITY RESTRUCTURING

TRENDS AND IMPACTS

presentation by

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at the

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Georgia Tech Campus

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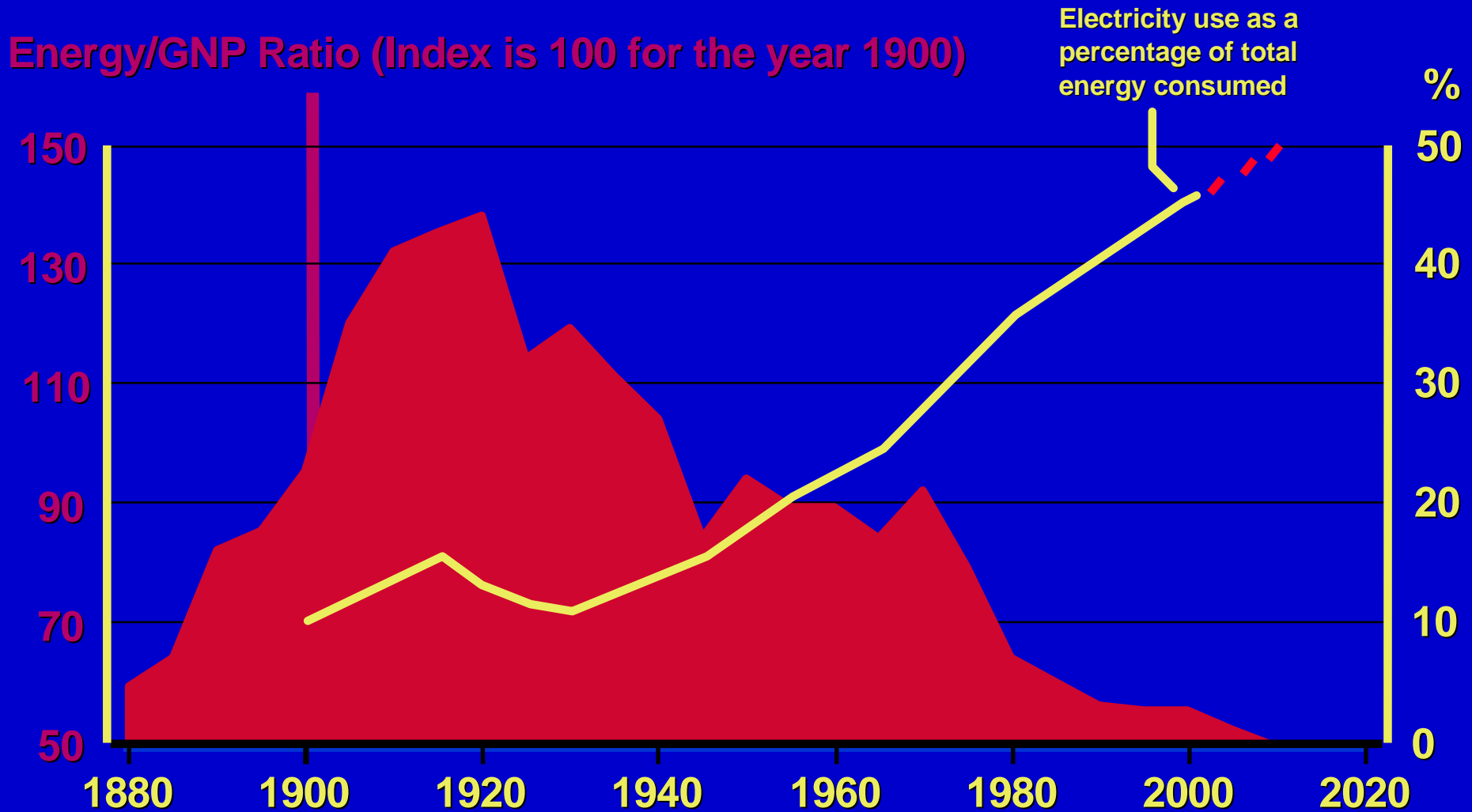
OBJECTIVES

- ❑ To provide an overview of the environment in which the discussions on sustainability are undertaken**
- ❑ To review the key developments in electricity restructuring**
- ❑ To assess the key trends in the new electricity business and their impacts**
- ❑ To identify specific challenges and research needs**

OUTLINE

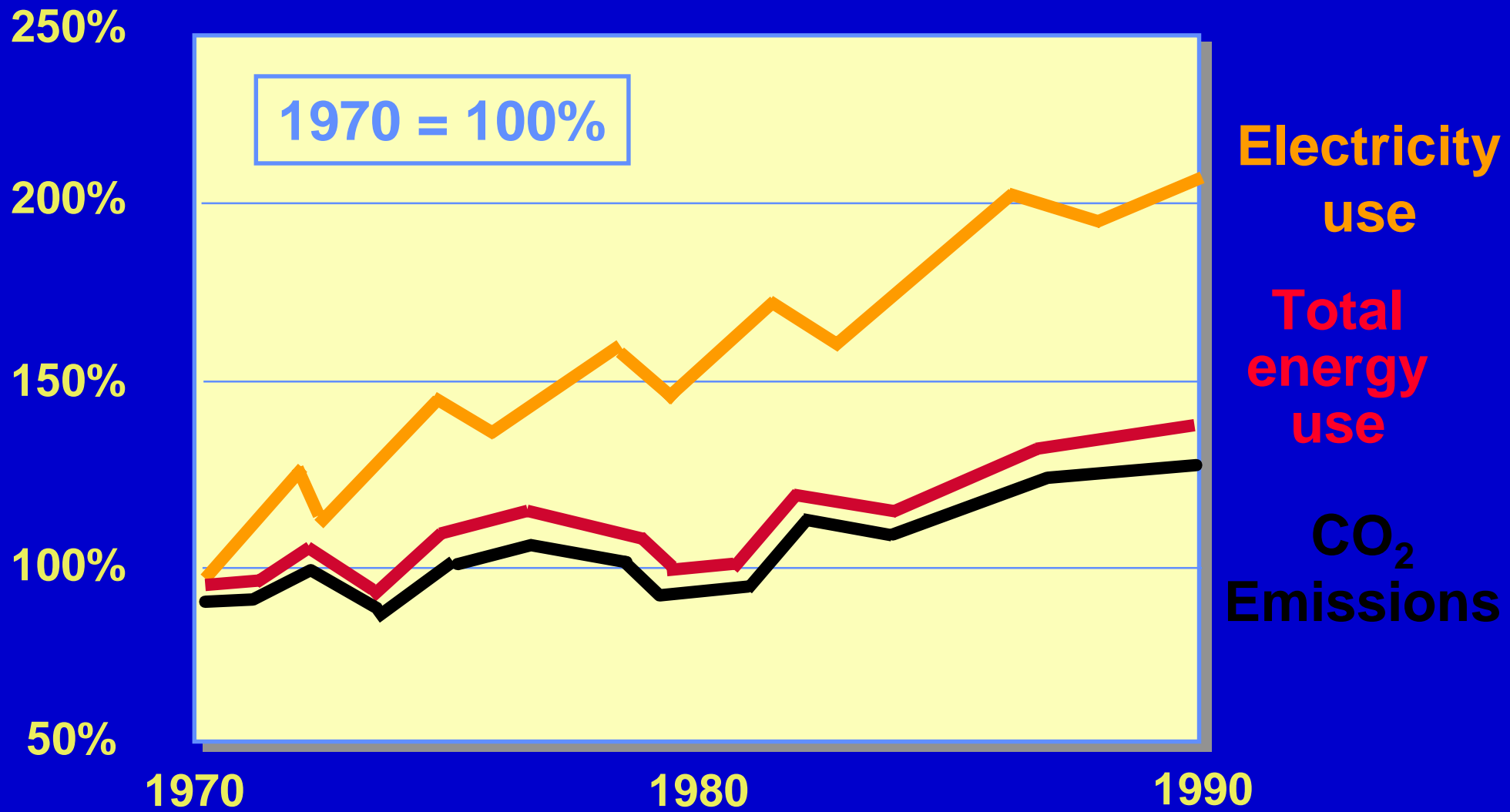
- Importance of electricity**
- Key federal legislative and regulatory developments**
- Direct access at the state level**
- Key trends and developments**
- Dispersed resources**
- Major challenges**

ENERGY CONSUMPTION AND ELECTRICITY USE



Electricity will continue to substitute for less efficient and less productive energy forms

ELECTRICITY / ENERGY DEMAND



IMPACT OF ELECTRICITY

- **The National Academy of Engineering - the nation's most prestigious collection of outstanding engineers - named **electrification** - the development of the vast networks of electricity that power the world - as the most important of the twenty engineering achievements that have had the greatest impact on the quality of life in the 20th century**

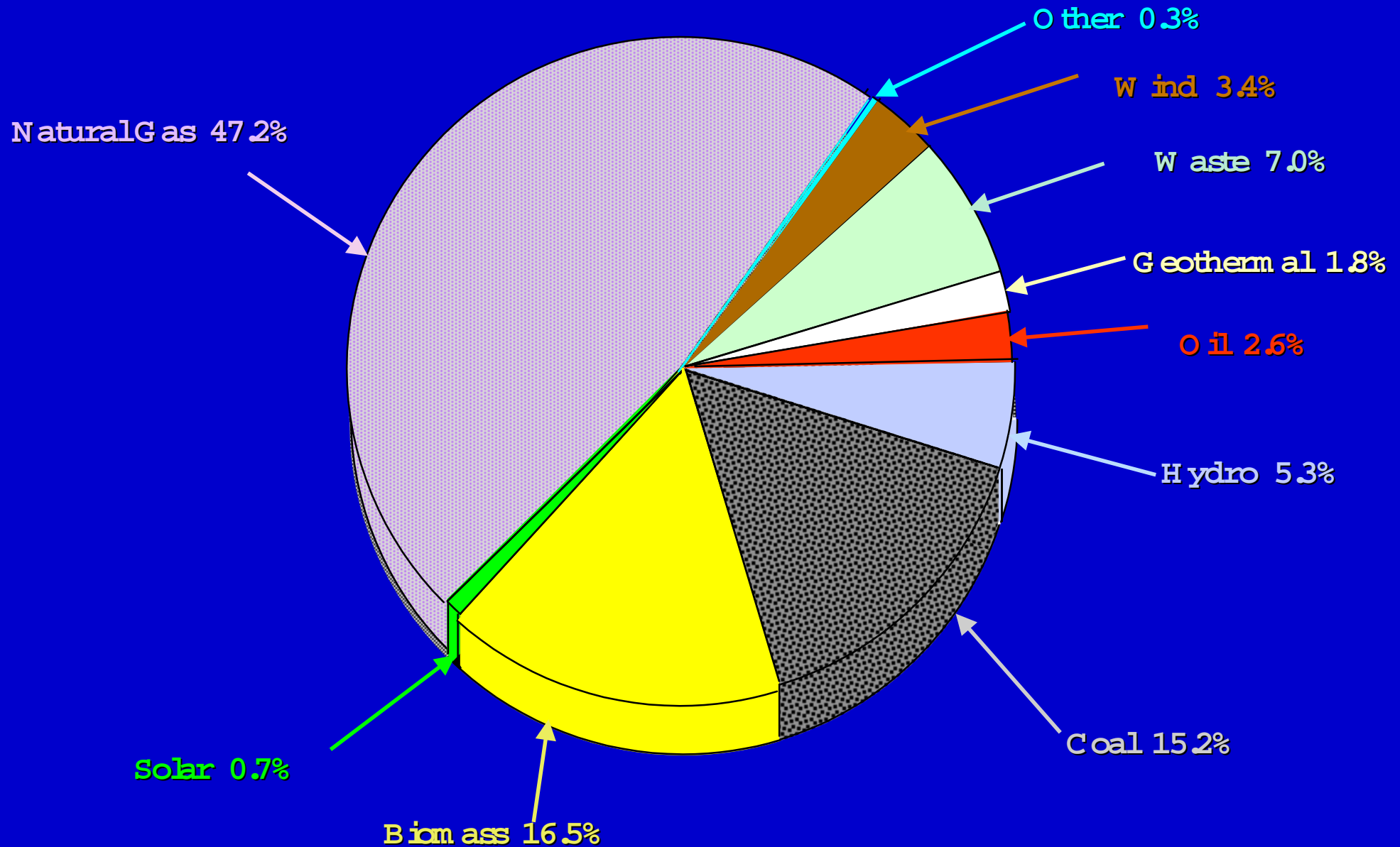
IMPACT OF ELECTRICITY

- ❑ Electricity ranked ahead of the automobile, airplane, safe and abundant water, electronics, computers and space exploration**
- ❑ The widespread electrification implemented in the 20th century gave us power for our cities, factories, farms and homes, forever changing the lives of people**

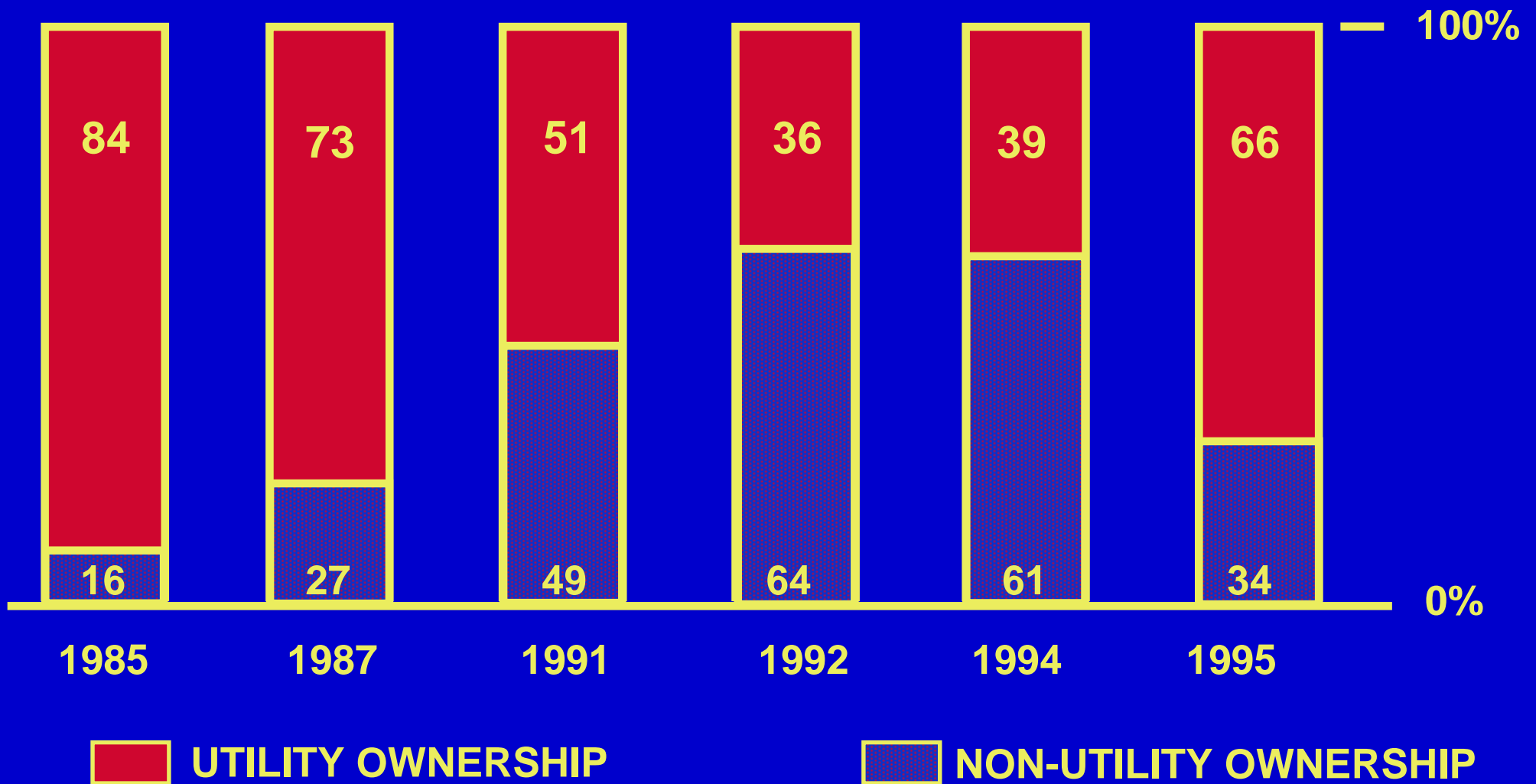
COMPETITION IN THE GENERATION MARKET

- ❑ The 1978 Public Utility Regulatory Policies Act (PURPA) unleashes competition through the introduction of qualifying facilities (QF's)
- ❑ PURPA mandates each investor-owned utility to purchase power at **avoided cost** from QF's located in its service territory
- ❑ Implementation of PURPA was left to individual states resulting in nonuniform definitions of avoided cost
- ❑ The once fledgling private power enterprises constitute today a multi-billion dollar industry and play a critically important role in the electricity business

ENERGY SOURCES OF NUG CAPACITY



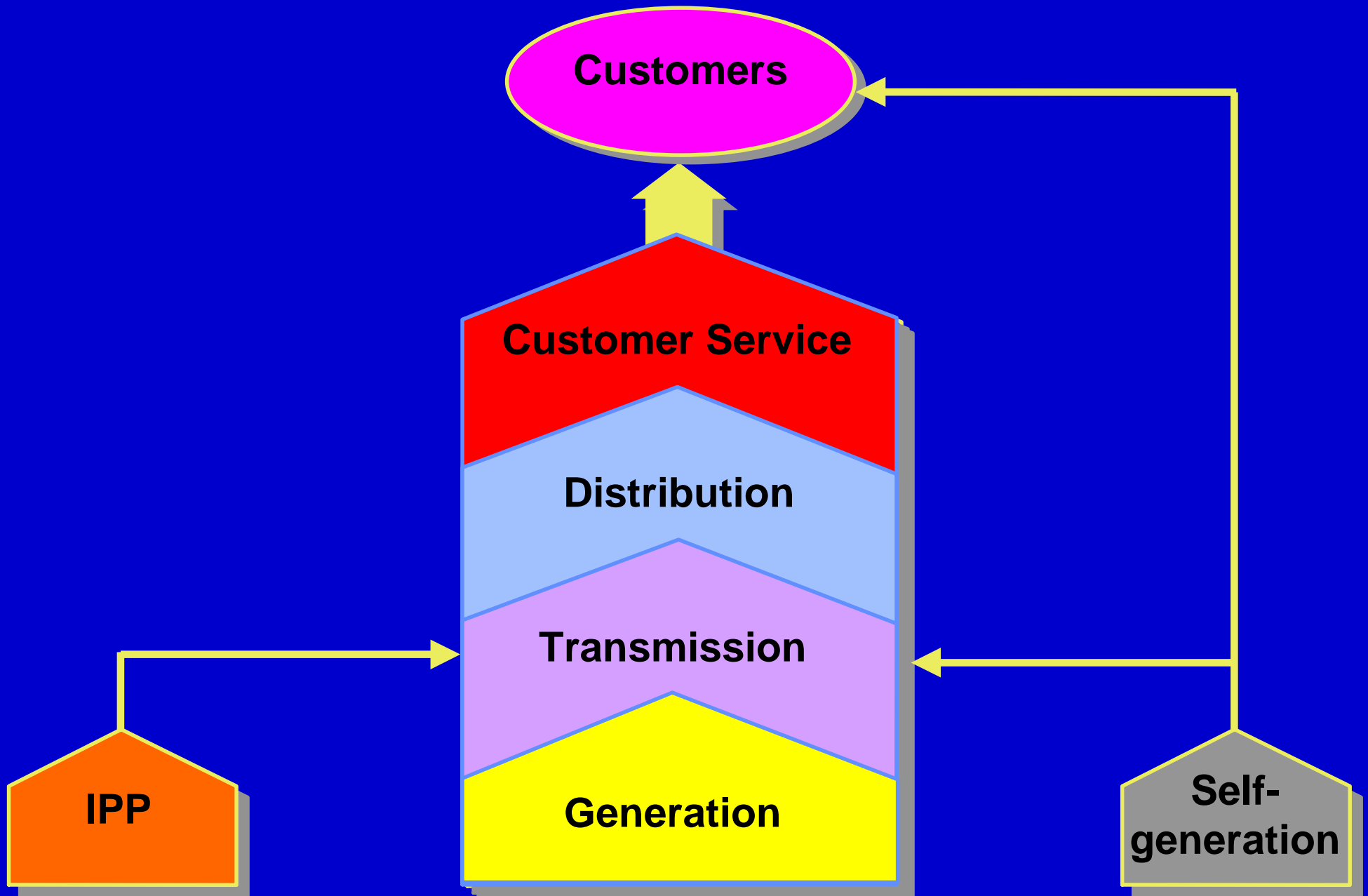
OWNERSHIP OF NEW GENERATING CAPACITY ADDITIONS



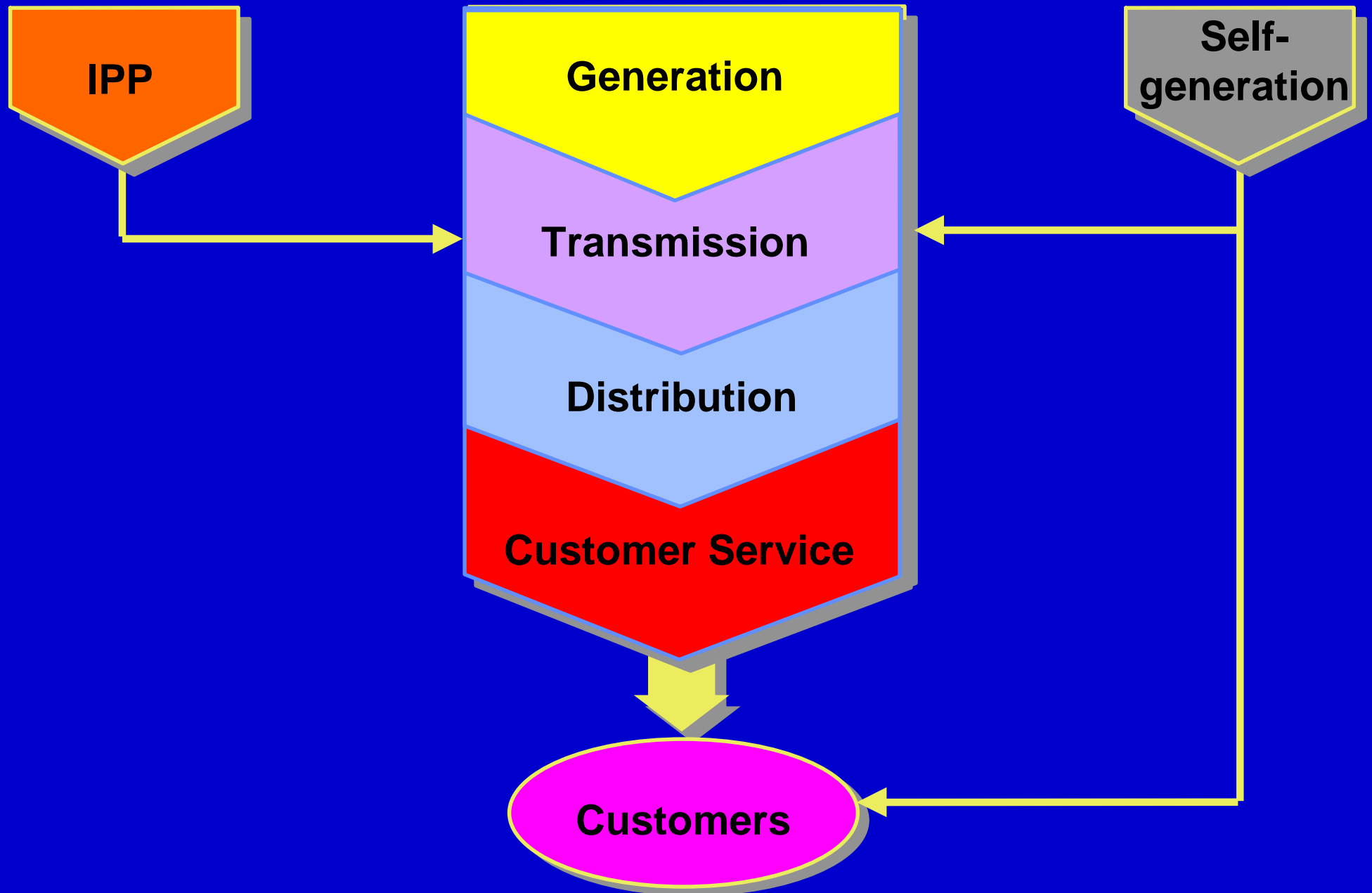
1992 NATIONAL ENERGY POLICY ACT

- ❑ **Addresses all major elements of national energy supply and use**
- ❑ **Marks the end of a highly regulated and structured period for utilities**
- ❑ **Pushes aggressively wholesale competition by changing federal policies governing electric power in the wholesale marketplace**
 - **revision of PUHCA of 1935**
 - **establishment of the new class of exempt wholesale generators (EWGs)**
 - **reform of the FPA broadening the powers of FERC to mandate wheeling**

THE EXISTING ELECTRIC INDUSTRY STRUCTURE



THE EXISTING ELECTRIC INDUSTRY STRUCTURE



RESTRUCTURING IN OTHER INDUSTRIES

- The recent past has witnessed major changes in virtually every other regulated industry:
 - airlines
 - telecommunications
 - railroads
 - trucking
 - natural gas
- Electric utility industry was the **last major regulated monopoly** to undergo this “been there, done that” phenomenon

SOME LESSONS LEARNED FROM RESTRUCTURING IN OTHER DOMAINS

- ❑ Basic driver was the market -- emergence of real economic opportunities**
- ❑ Breakup of strong vertically integrated industries can be done rapidly**
- ❑ Prices decrease rapidly as products become more like commodities**
- ❑ Decreasing prices encourage product differentiation and innovation**

SOME LESSONS LEARNED FROM RESTRUCTURING IN OTHER DOMAINS

- ❑ Far more customer segments emerged than anyone ever imagined or believed possible**
- ❑ Pace of change has continuously accelerated**
- ❑ The winners are the innovators who understand customer needs and effectively apply technology - - they create new opportunities rather than just compete more aggressively for the existing ones**

ELECTRICITY VS. OTHER SERVICES



telephone

busy signal

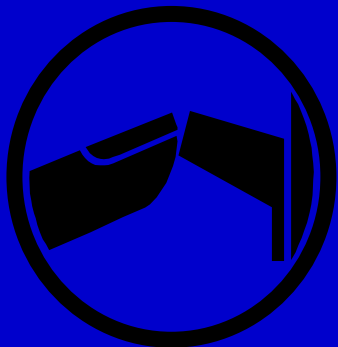


airline reservations

bumping



next available flight

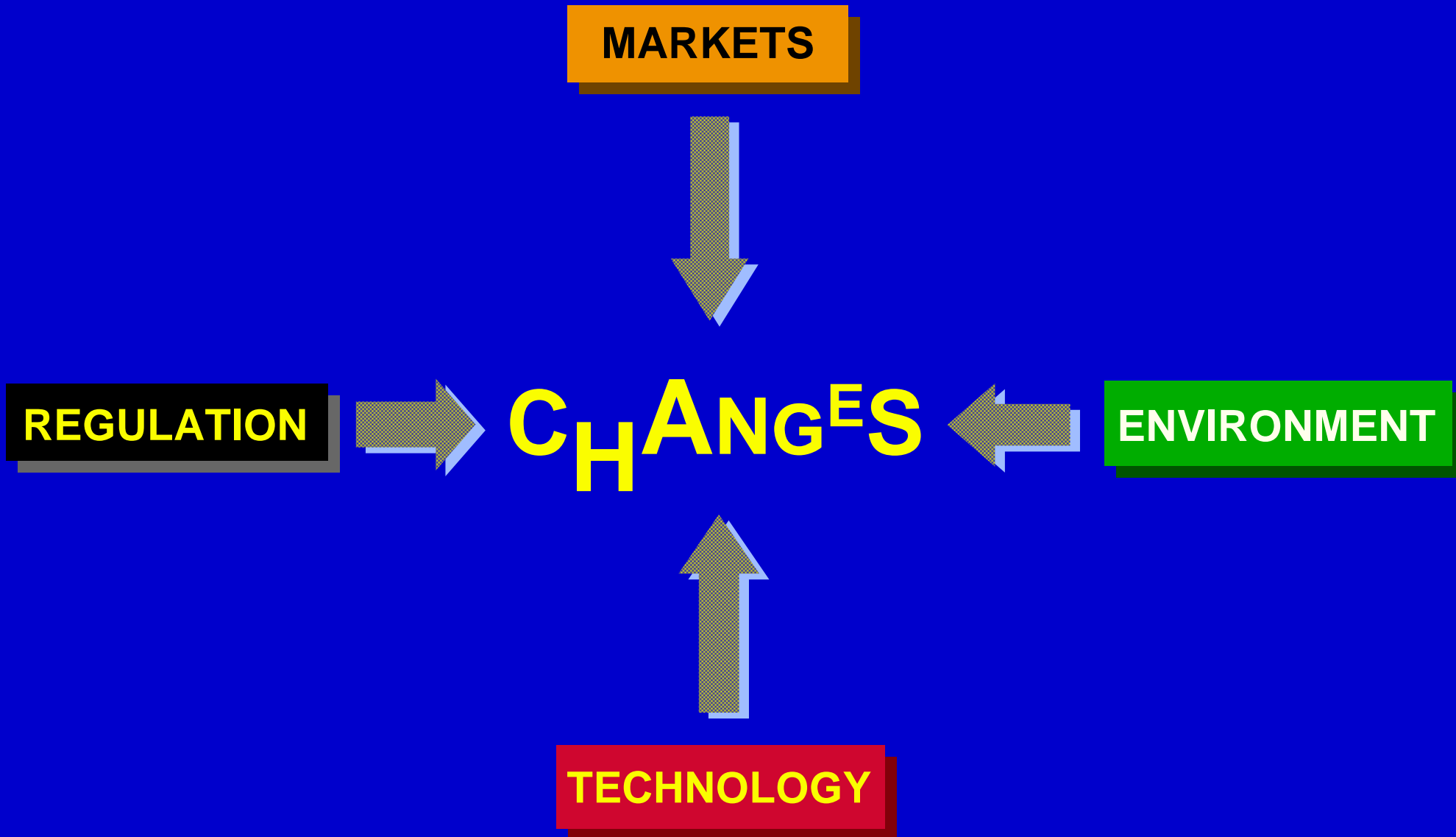


electricity

obligation to serve



DRIVING FORCES OF CHANGE



FERC ORDERS 888 AND 889

- ❑ On April 24, 1996, FERC released
 - Order No. 888 - Open Access Transmission and Stranded Cost Recovery
 - Order No. 889 - Open Access Same-Time Information System (OASIS)
- ❑ The orders constitute a *generic* remedy for the undue discrimination in the industry's past practices in providing transmission services

KEY OBJECTIVES

- To promote aggressively robust competition in wholesale markets**
- To remedy undue discrimination in transmission**
- To establish standards for recovering stranded costs**

MAJOR THRUSTS

- ❑ Utilities must provide non-discriminatory open access through tariffs of general applicability**
- ❑ Utilities must functionally unbundle transmission and generation services**
- ❑ Transmission providers must set up electronic bulletin boards**

MAJOR THRUSTS

- Utilities must abide by the *standards of conduct***
- Standards and procedures provide the recovery of stranded costs resulting from increased competition under the new FERC rules**
- Limited reciprocity must be provided by nonjurisdictional entities requesting transmission services**

UNBUNDLING EXAMPLE



Baggage Service

Takeoffs

Landings

In-Air Pillow/Blanket Service

Oxygen

Bath rooms

Backup Service

**FLY THE FRIENDLY SKIES
WITH
UNBUNDLING 'R' US**

* Bundled service available upon customer request

SAME INFORMATION AVAILABILITY

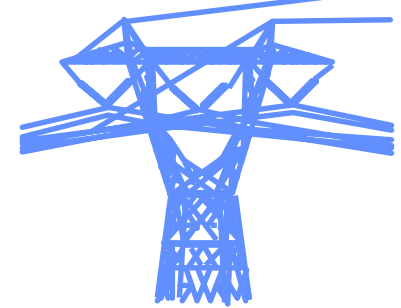
Transmission
Customer



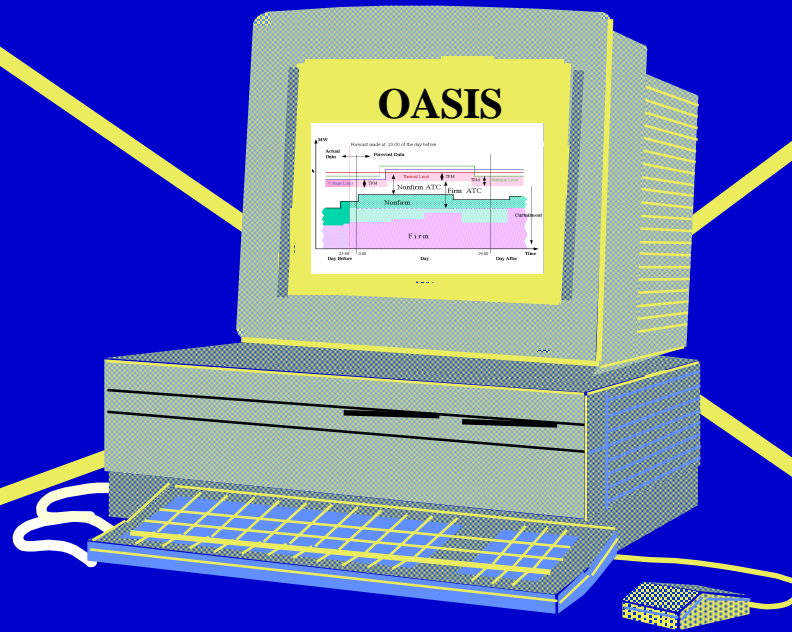
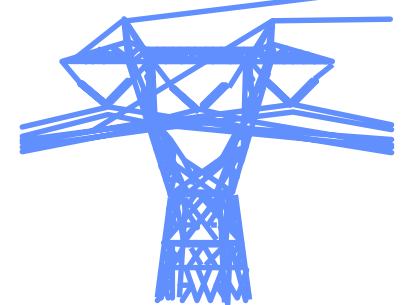
Transmission
Customer



Transmission
Provider



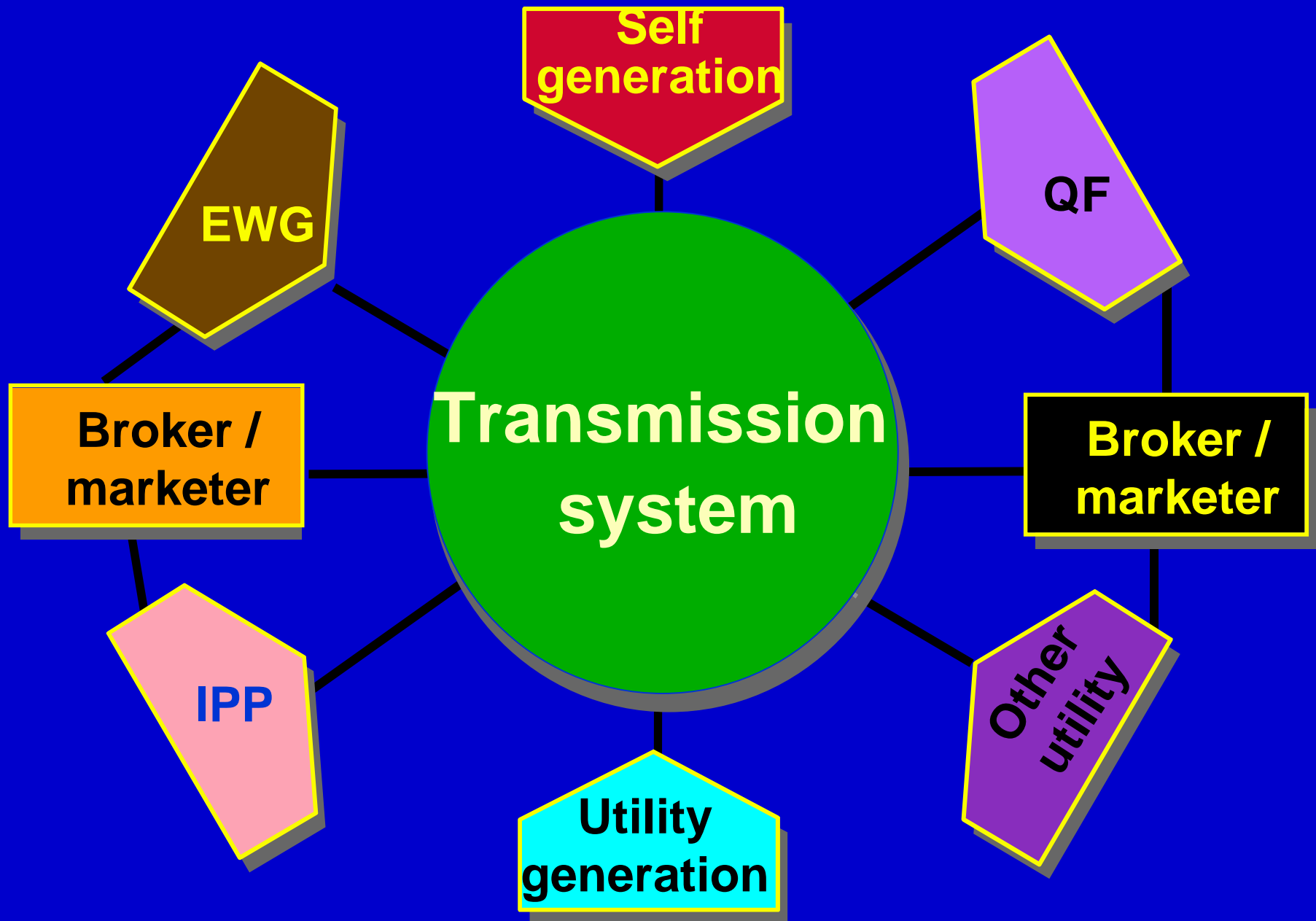
Transmission
Provider



THE FERC ORDERS NO. 888 AND 889

- ❑ Signal FERC's intention to establish *universal open access*
- ❑ Aim to aggressively promote the development of a competitive wholesale electricity market by mandating non-discriminatory open transmission access
- ❑ Provide a generic definition of a utility's comparable transmission service obligations
- ❑ Address transition costs associated with industry restructuring
- ❑ Use the OASIS to provide functional unbundling of transmission and generation services

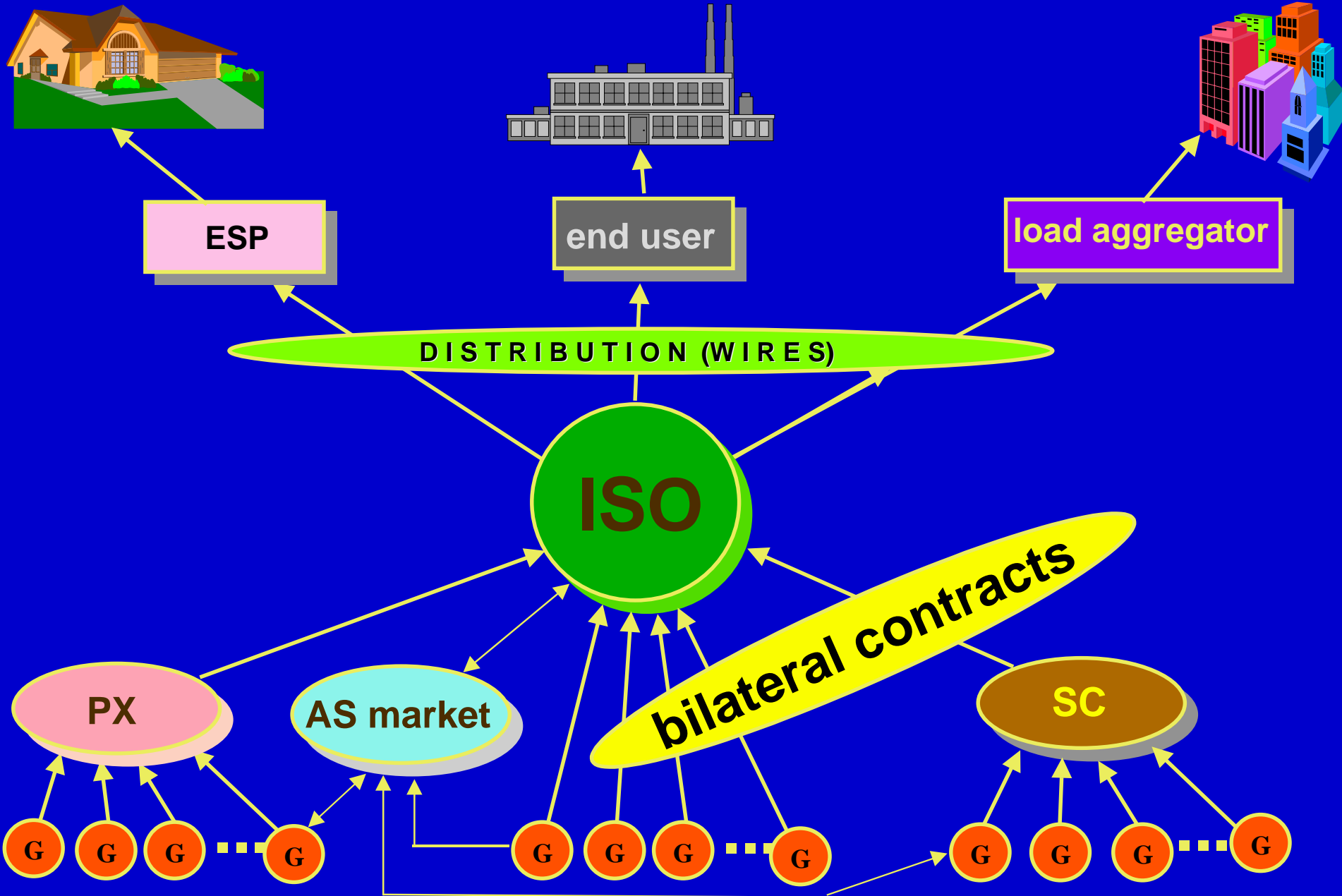
“COMMON CARRIER” TRANSMISSION SERVICE



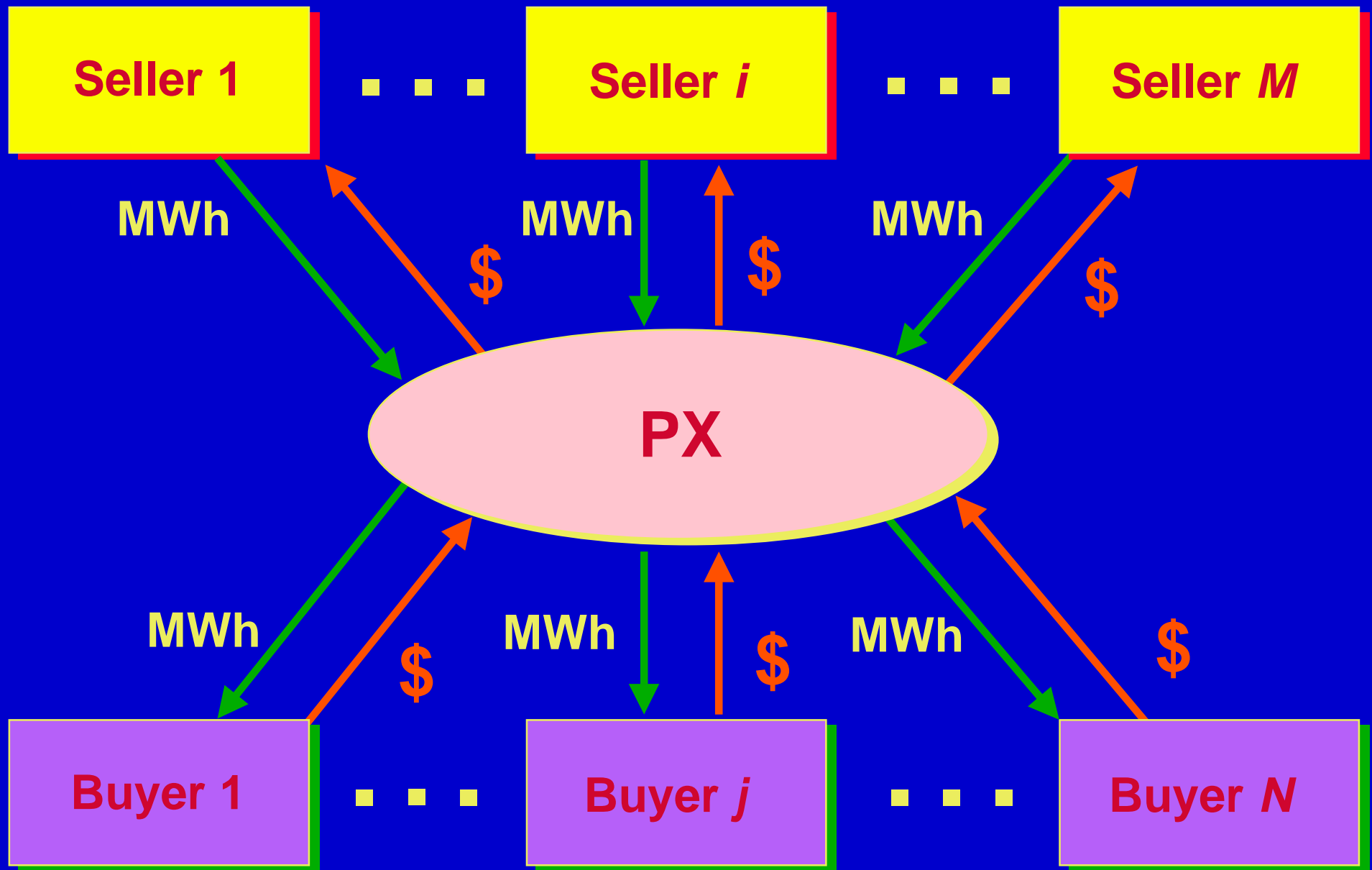
SALIENT CHARACTERISTICS OF CALIFORNIA RESTRUCTURING

- ❑ **Basic principles embodied are**
 - **customer choice**
 - **competition in generation**
 - **open access transmission**
- ❑ **Physical direct access: flow based bilateral transactions coexist with the PX spot market**
- ❑ **Independence of the ISO and PX: separation of security and economics functions**
- ❑ **ISO has primary responsibility to facilitate transactions while maintaining system reliability/security**

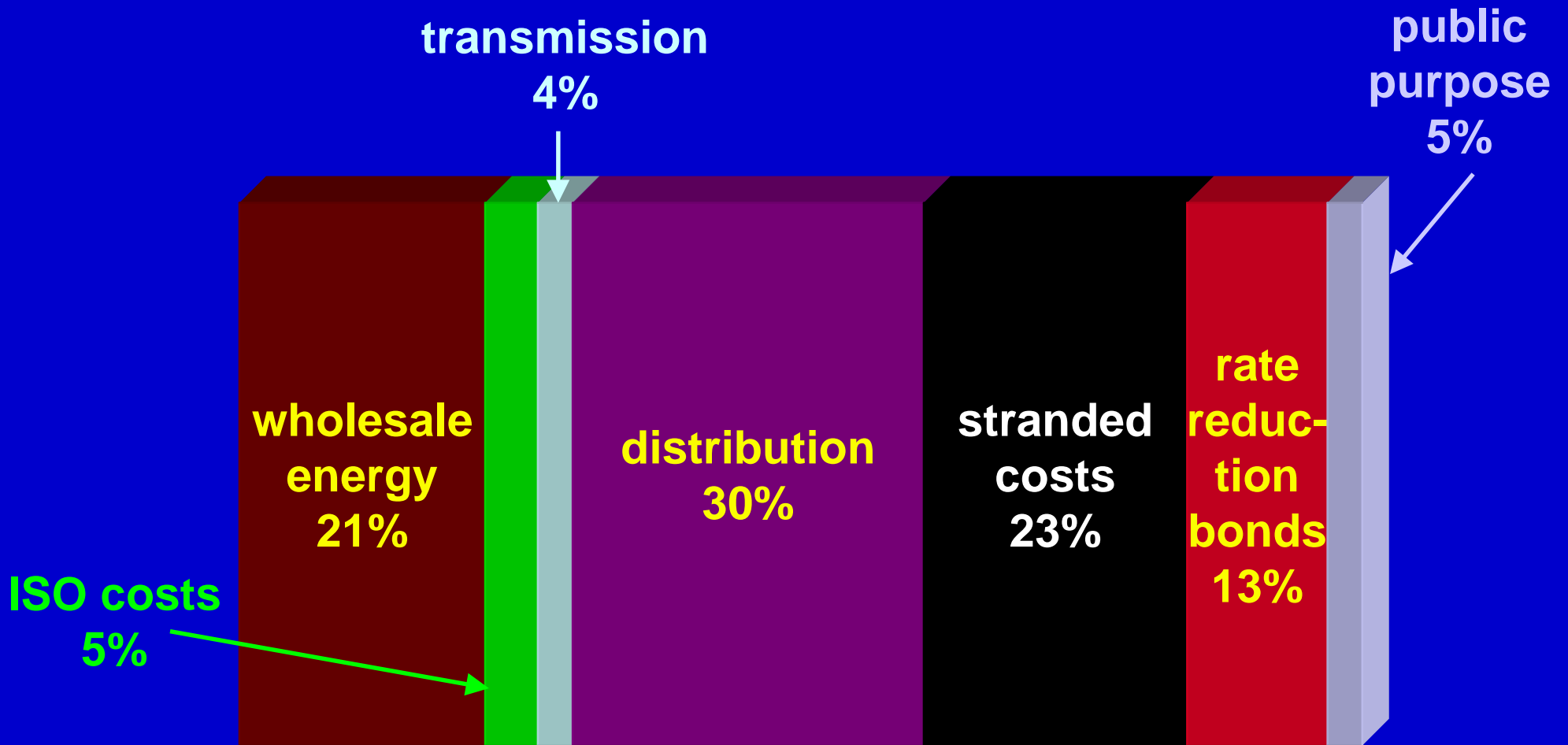
THE CALIFORNIA SYSTEM



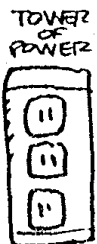
THE POWER EXCHANGE



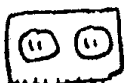
RETAIL ENERGY COSTS 4/1/98 - 3/31/99



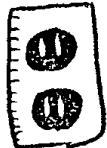
total costs = \$ 28 billion



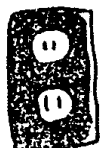
GREEN POWER
CHRIS COOP



E1
ENERGY ENRON
ONE



SURFER DUDE
ELECTRIC



INDUSTRIAL
LIGHTS & GAS



ACME
POWER



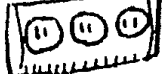
CAPTAIN
JACK



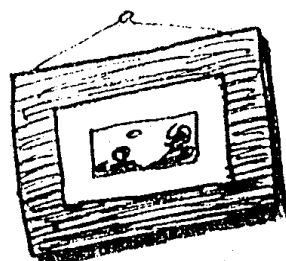
FLOWER
POWER



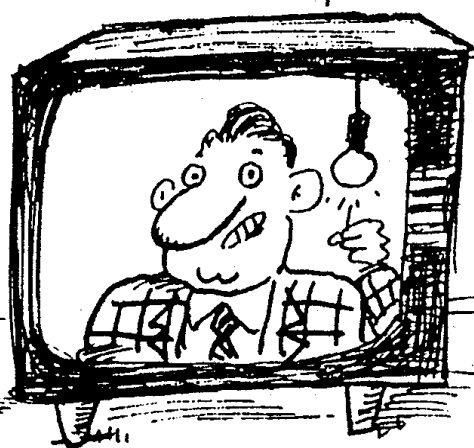
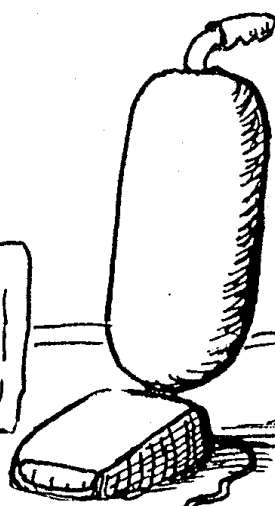
REDDY
GIGAWATT



ZAPPO
LOEP



HI!
CRAZY PETE
HERE WITH
A FRIENDLY
PLUG
FOR PETE'S
POWER
"LOWEST PRICE
PER KILOWATT
HOUR"-WE
SHOCK THE
COMPETITION!...

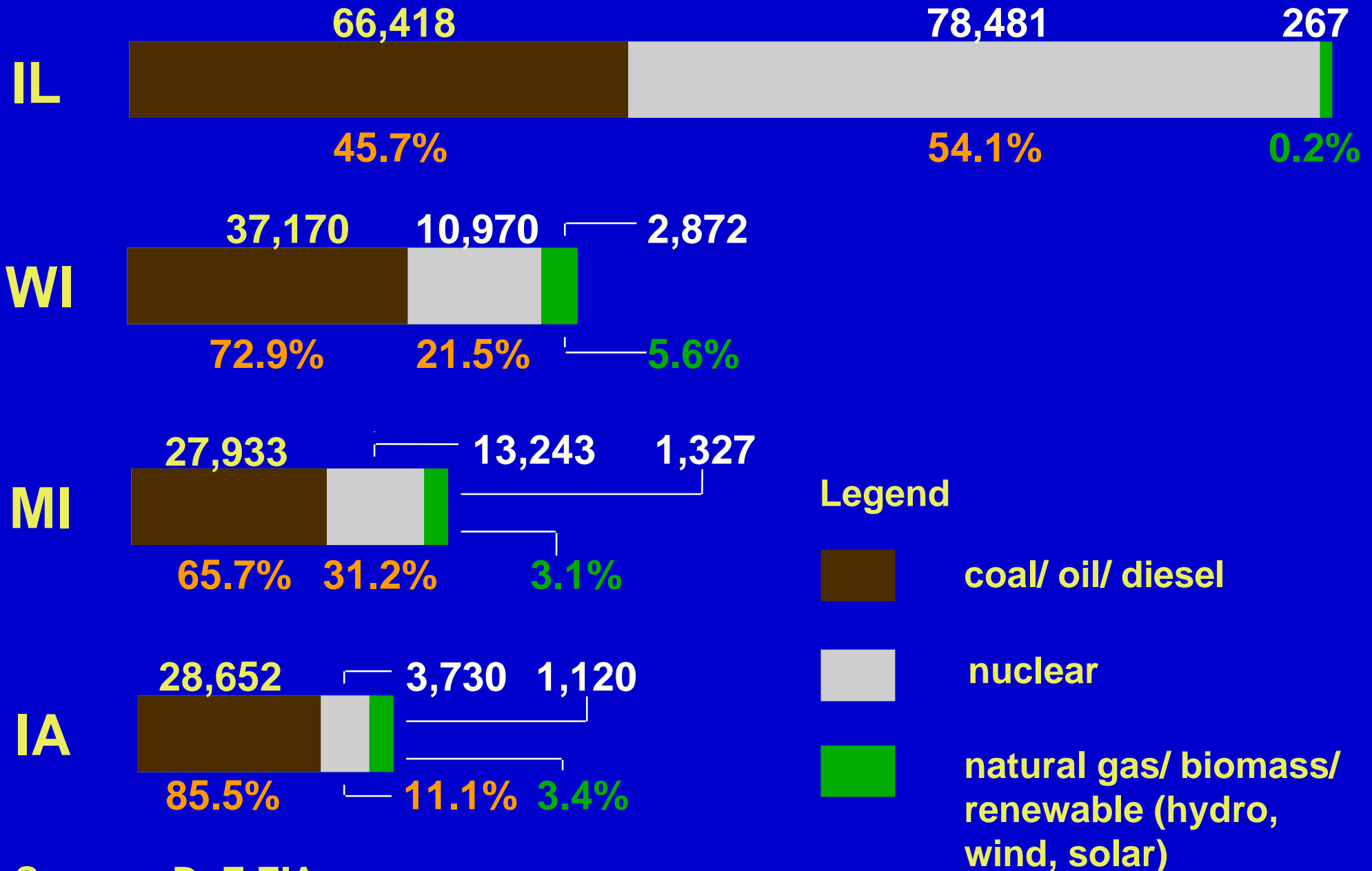


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MERCURY NEWS

ELECTRICITY RESTRUCTURING IN ILLINOIS

- ❑ The *Electric Service Customer Choice and Rate Relief Law* was enacted and signed in 1997
- ❑ The *Law* is a 261 page document which
 - provides customer choice to all by 2002
 - lowers residential base rates
 - addresses utilities' stranded cost recovery and transition issues
 - reshapes the utility industry for the competitive environment
 - refocuses the scope of regulation in Illinois to reflect the future competition in electricity

ENERGY SOURCES FOR ELECTRICITY



Source: DoE EIA

RENEWABLE ENERGY AND ENERGY EFFICIENCY

- A Renewable Energy Resources Trust Fund (RERTF) is established with funding to equal \$100 million over 10 years**
- All customers will be assessed charges starting 1/1/98:**
 - \$0.05 on each residential electric customer**
 - \$0.05 on each residential gas customer**
 - \$0.50 (\$37.50) on each nonresidential electric customer with peak load below (above) 10 MW**
 - \$0.50 (\$37.50) on each nonresidential gas customer with annual load under (above) 4 million therms**

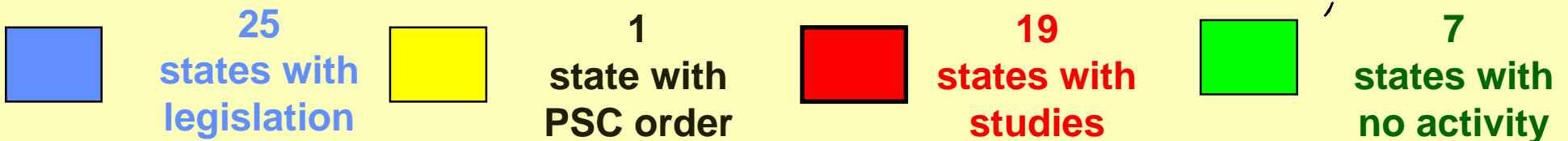
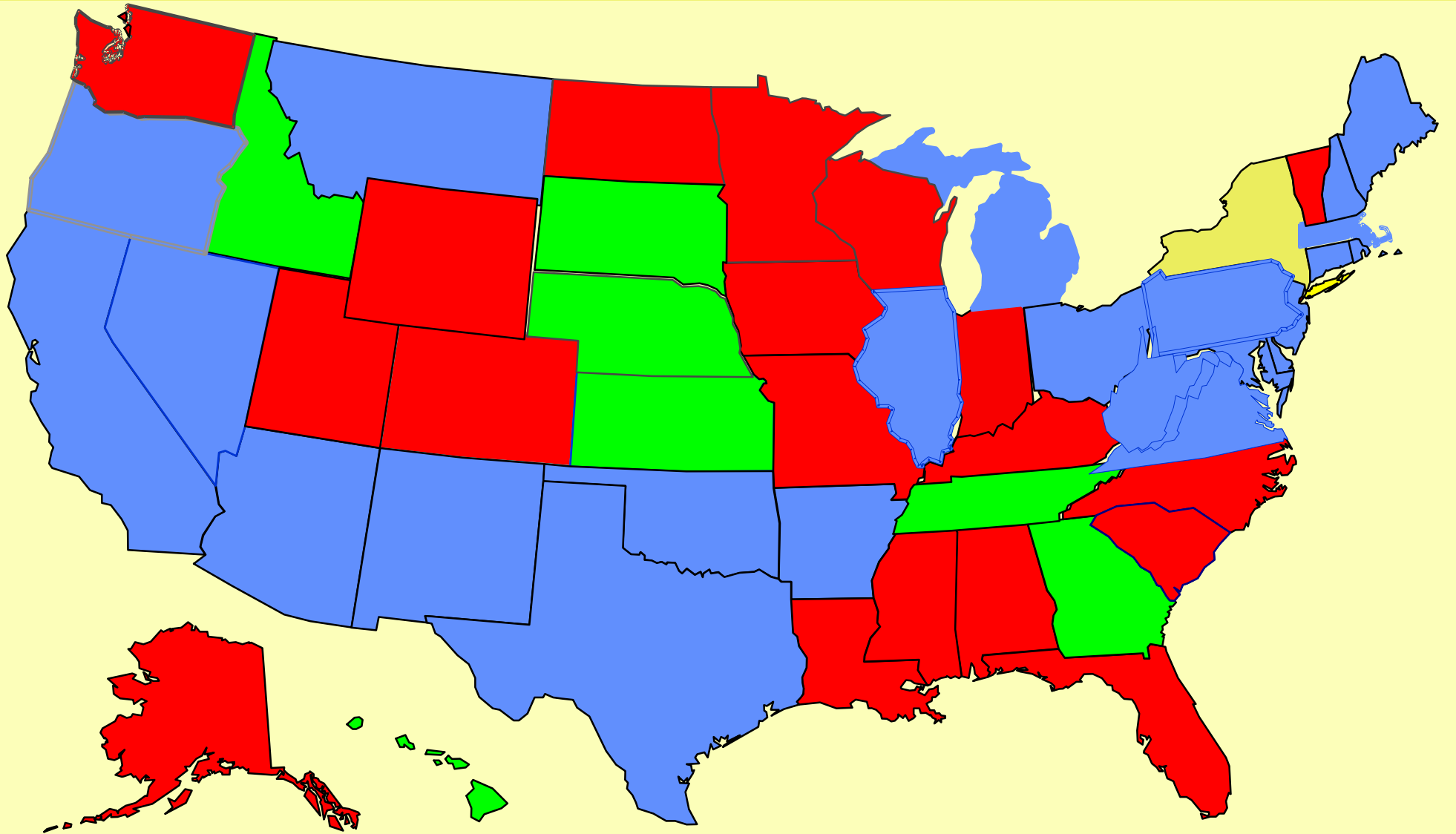
RENEWABLE ENERGY AND ENERGY EFFICIENCY

- **These amounts will be shared equally by the RERTF and the Coal Technology Development Assistance Fund**
- **The Energy Efficiency Trust Fund is established through the collection of \$3 million annually over 10 years from each electric utility and ARES**

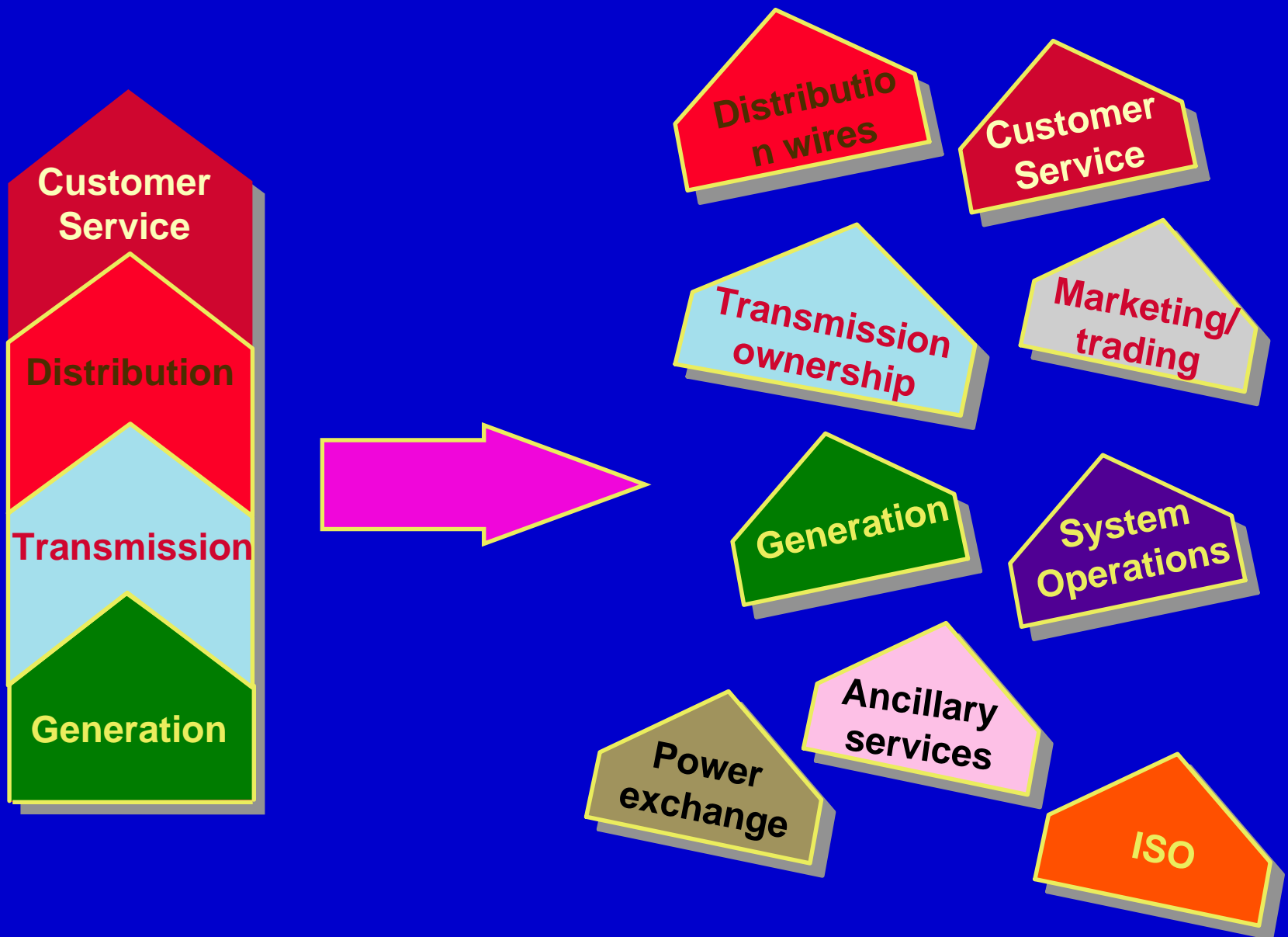
KEY TRENDS IN THE ELECTRICITY BUSINESS

- ❑ **State-by-state patchwork restructuring pattern**
- ❑ **Breakup of the vertically integrated utility**
- ❑ **Growing importance of energy trading**
- ❑ **Underperformance of electric utility stocks**
- ❑ **Horizontal aggregation**
- ❑ **Generation divestiture**
- ❑ ***Normalcy* of price volatility and price spikes**
- ❑ **Grid regionalization**
- ❑ **Increasing use of e-commerce in electricity**

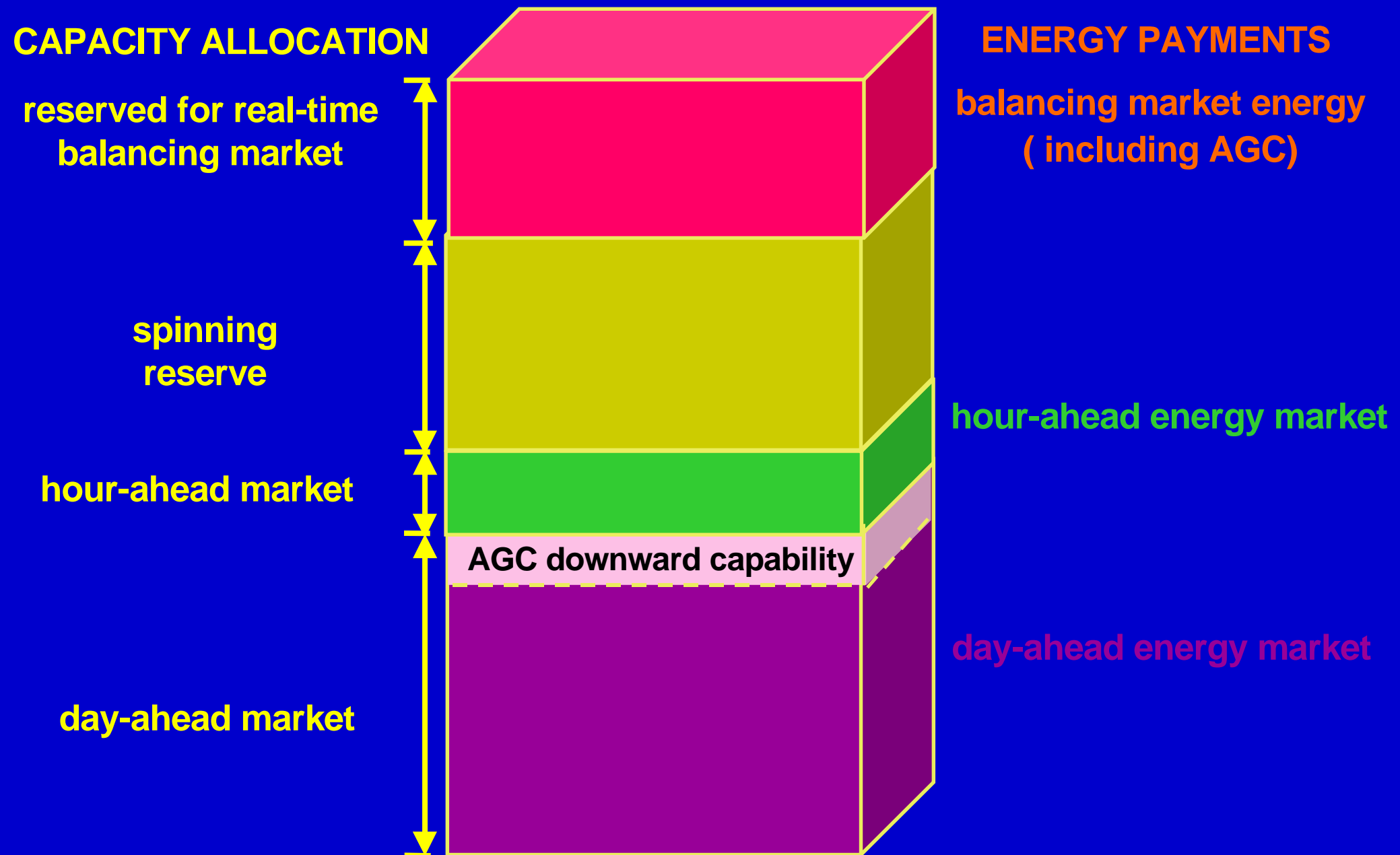
RETAIL ACCESS STATUS



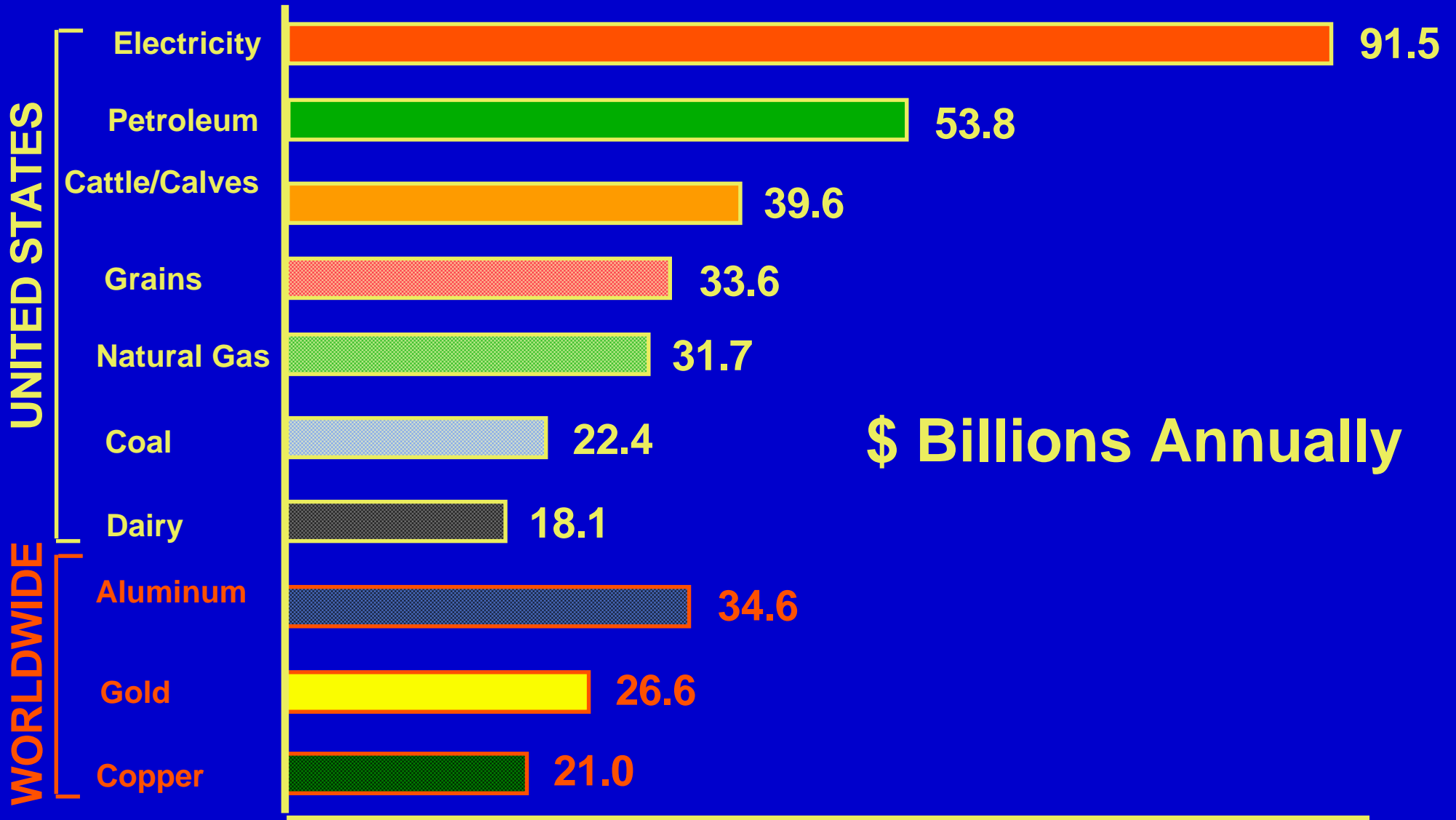
VERTICALLY INTEGRATED UTILITY STRUCTURE IS DISINTEGRATING



UNIT/PLANT SALES



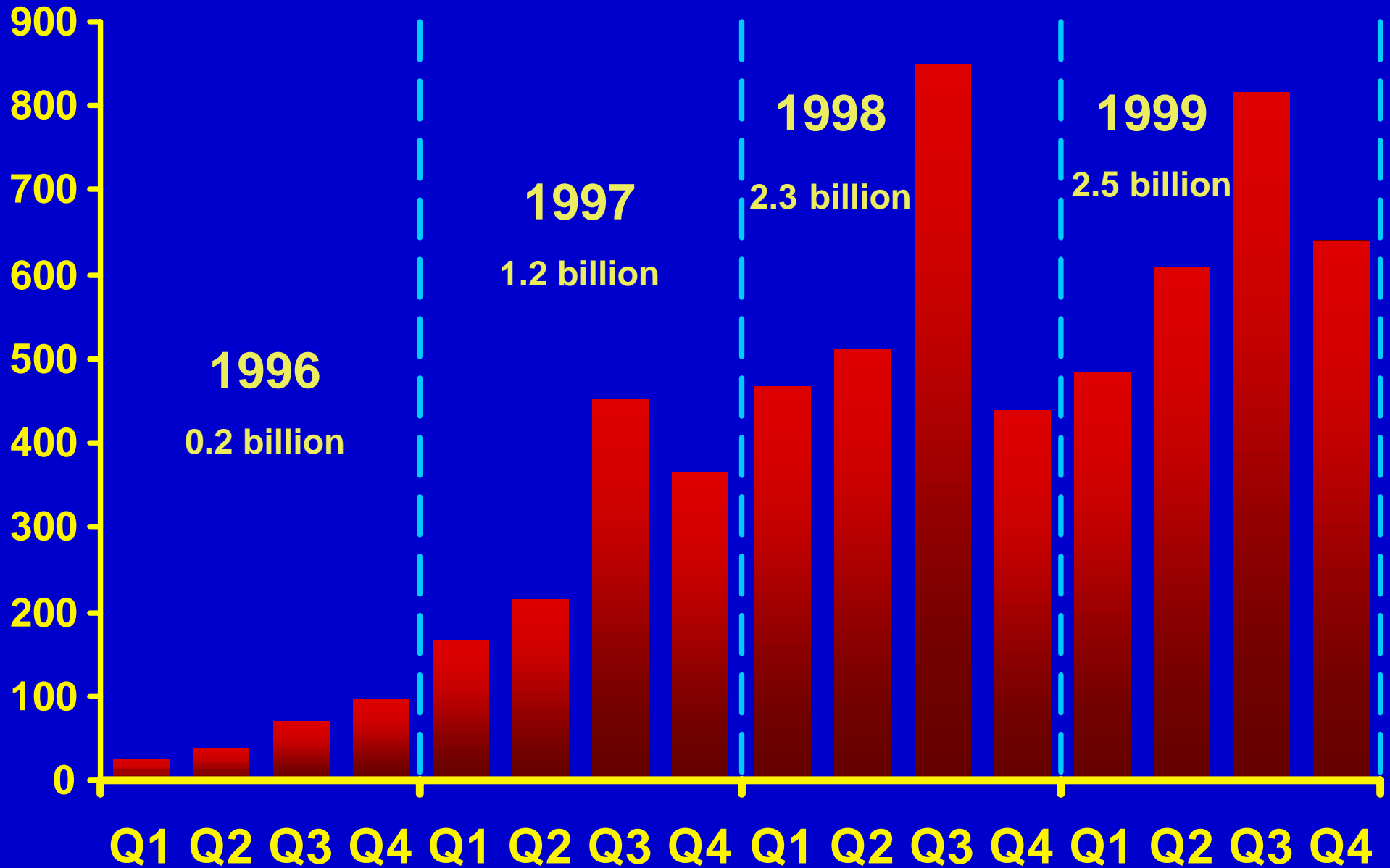
WHOLESALE COMMODITY MARKETS



THE POWER MARKETING AND ENERGY TRADING EXPLOSION

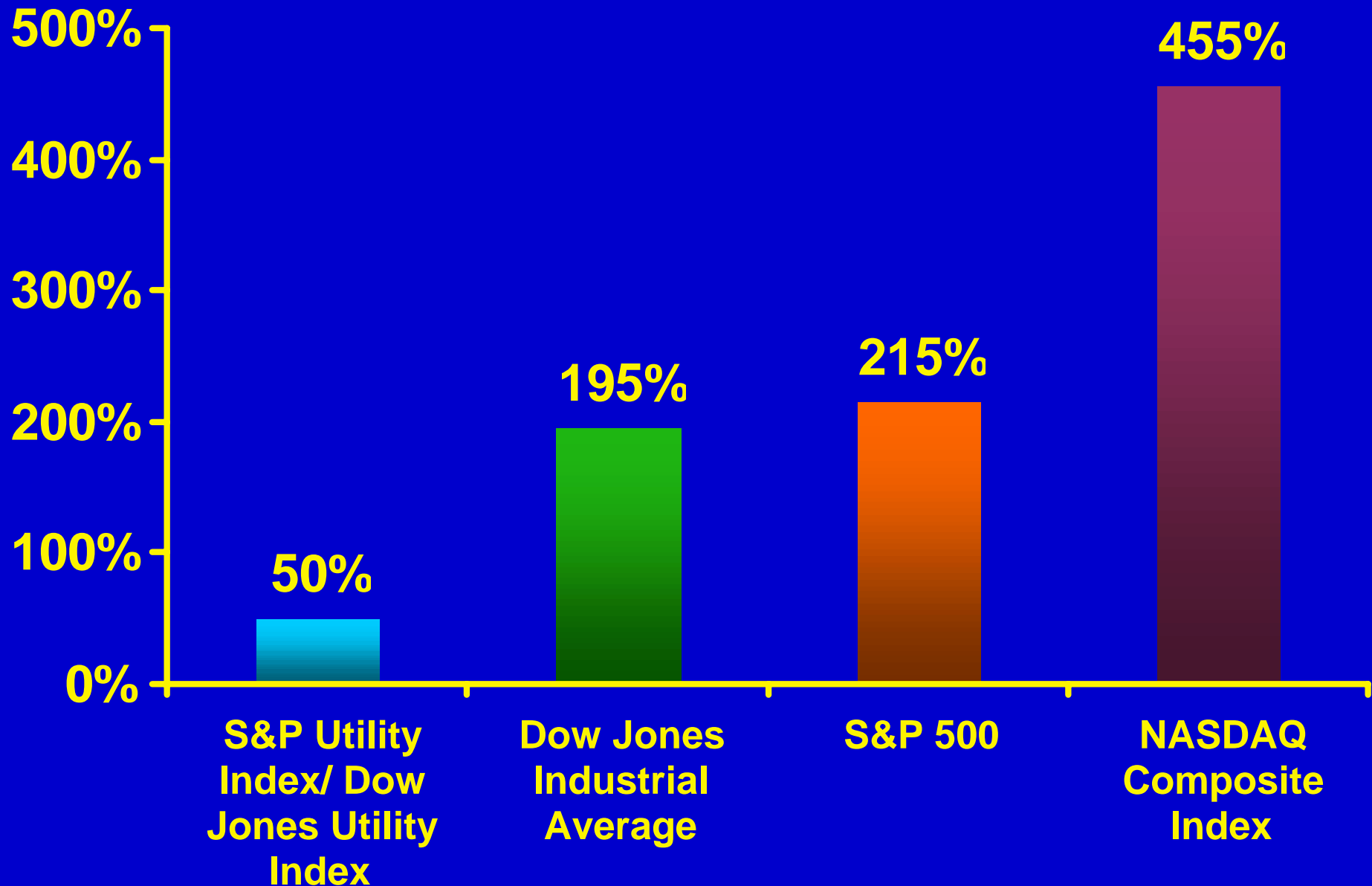
- ❑ **Utilities, financial houses, marketers, generating entities, brokers, and speculators are buying, selling and swapping power/energy on a huge scale with the total volume of trade worth multiples of the value of the underlying commodity**
- ❑ **Electric power marketing is dominated by Houston**
 - **each of the top 20 power marketers trades gas**
 - **75% of all unregulated power marketing volume is conducted from Houston with 25% of all the power marketers headquartered there**
- ❑ **Multimillion dollar bets are placed on how weather can affect demand for gas, heating, oil and electricity**

POWER MARKETERS' SALES



Source: Edison Electric Institute, Regulatory Research Services

INDEX COMPARISON



Data sources for Jan 1, 1995 - Dec 31, 1999

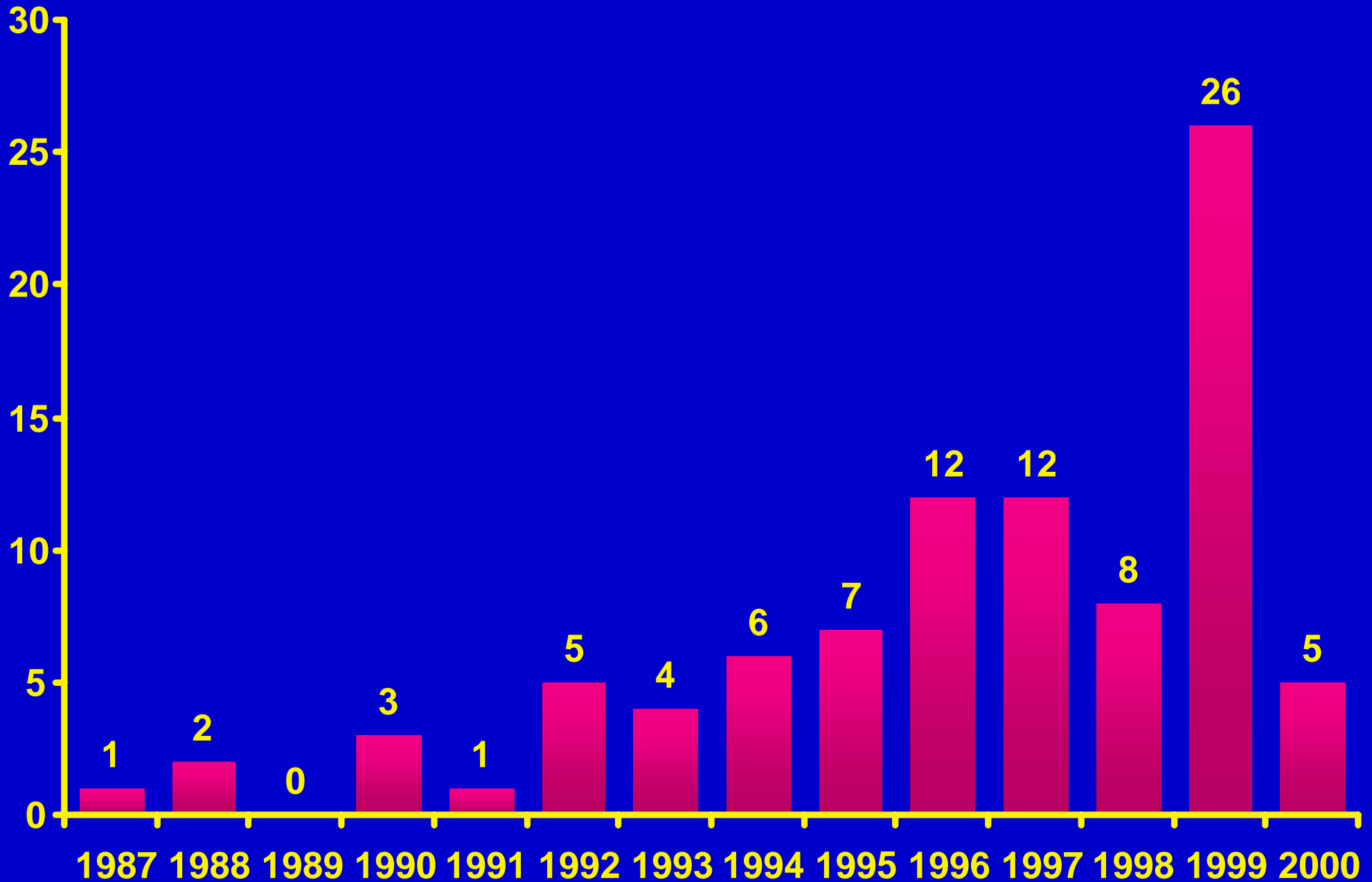
KEY IMPACTS ON THE ELECTRICITY BUSINESS

- ❑ **Underperformance of electric utility stocks push companies into adopting new strategies:**
 - **diversification, including many nontraditional businesses;**
 - **mergers**
 - **separation of high and low growth assets**
- ❑ **Divestiture of assets of electric utilities by**
 - **transfer from regulated to unregulated; or**
 - **outright sale**

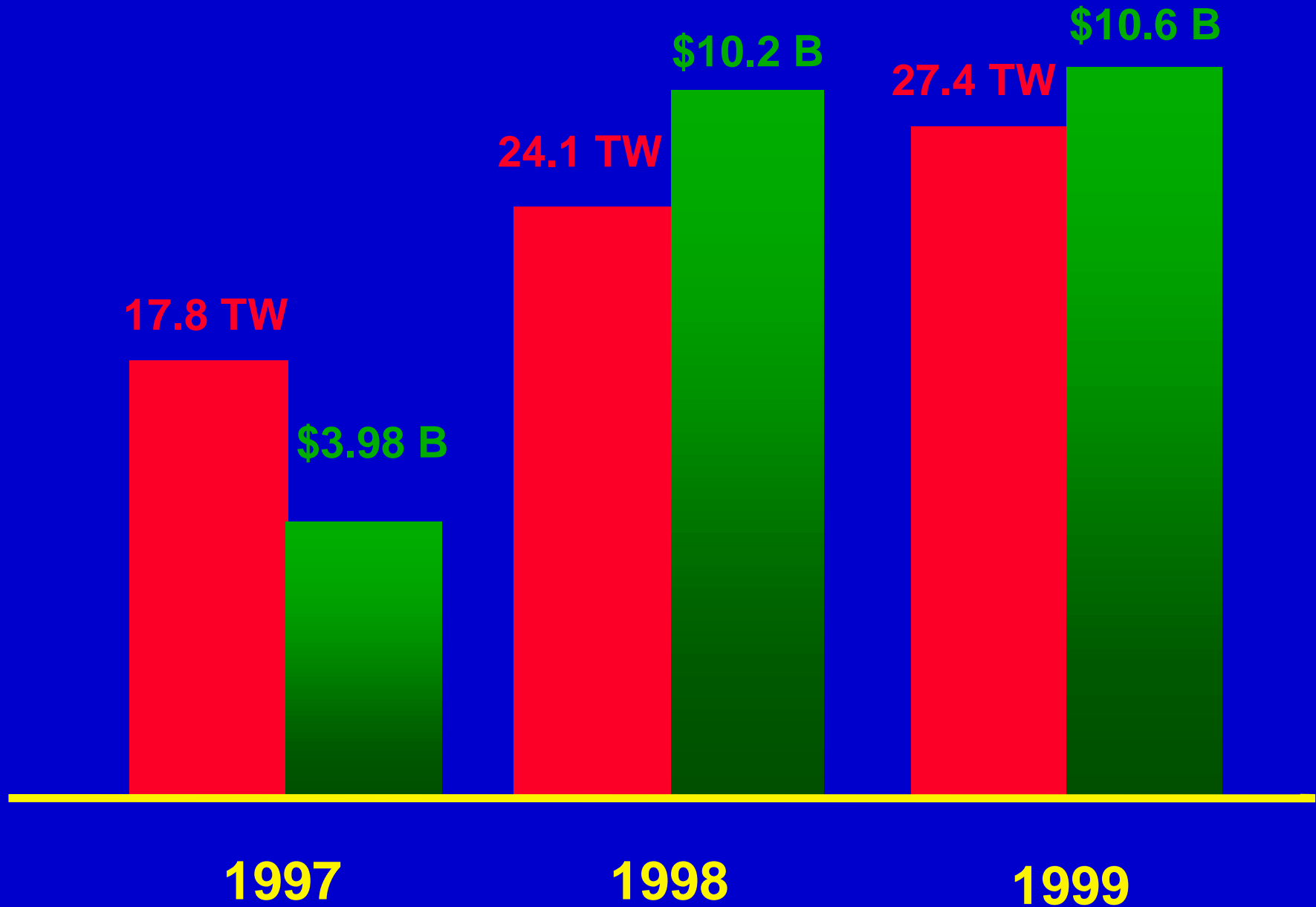
THE M&A SCENE

- Acquisitions of regulated utilities by IPP's**
- Acquisitions of U.S. entities by foreign companies**
- Mergers of vertically integrated utilities**
- Purchases of energy businesses by investor groups**
- Convergence mergers of electric and gas utilities**

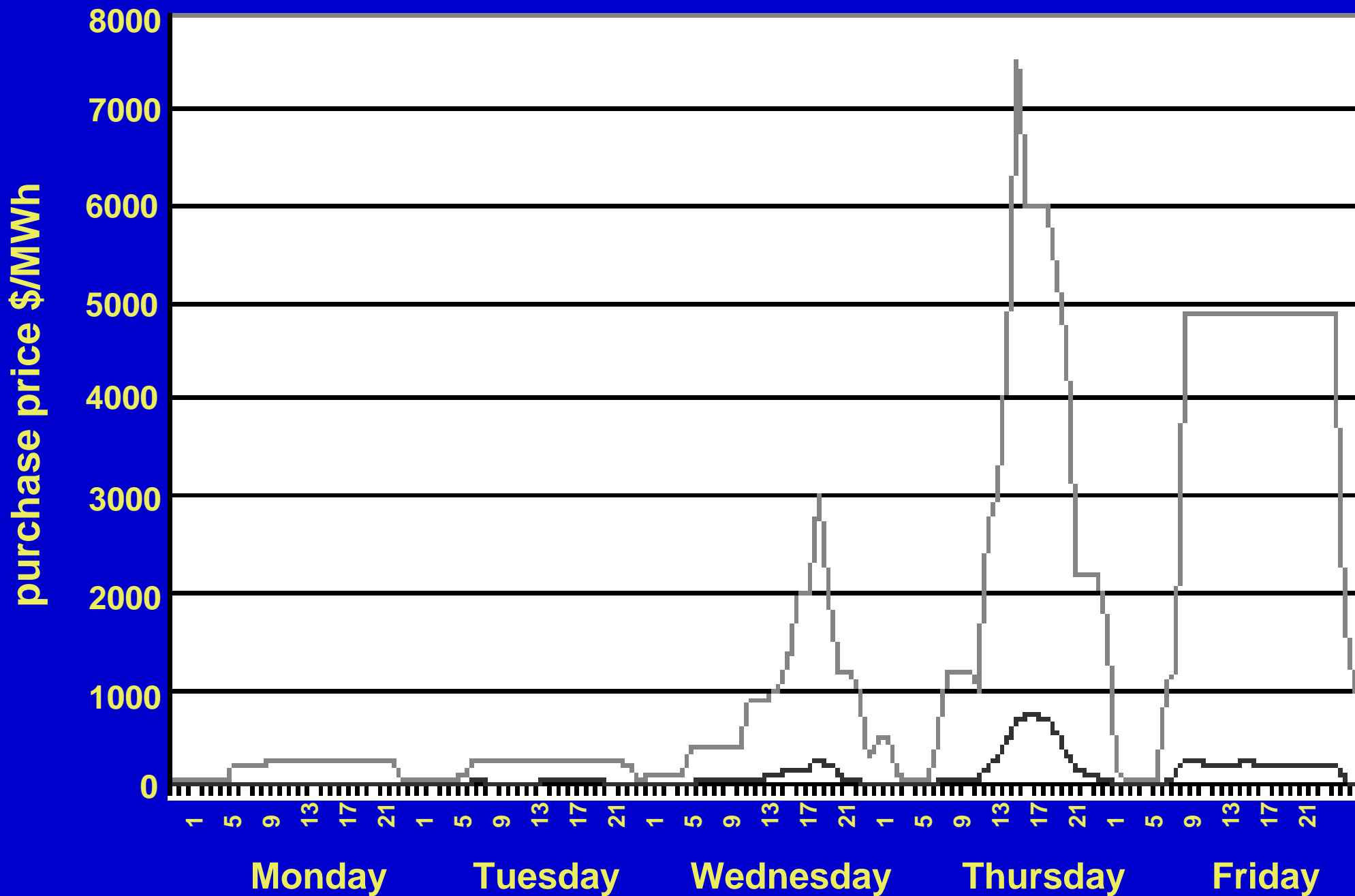
QUICKENING PACE OF M & A



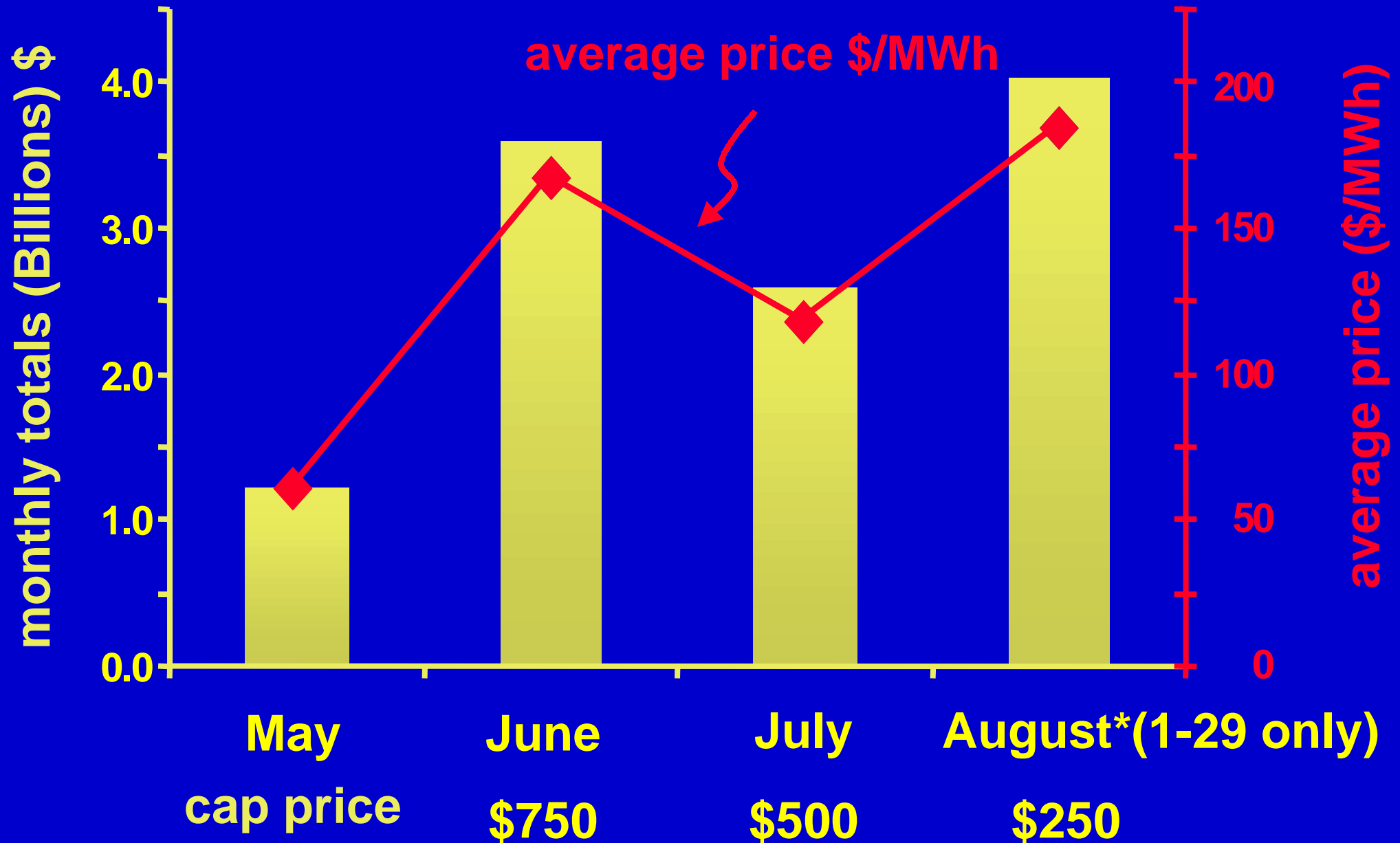
GENERATION DIVESTITURE






MAXIMUM AND AVERAGE HOURLY PRICES FOR JUNE 22 - 25, 1998

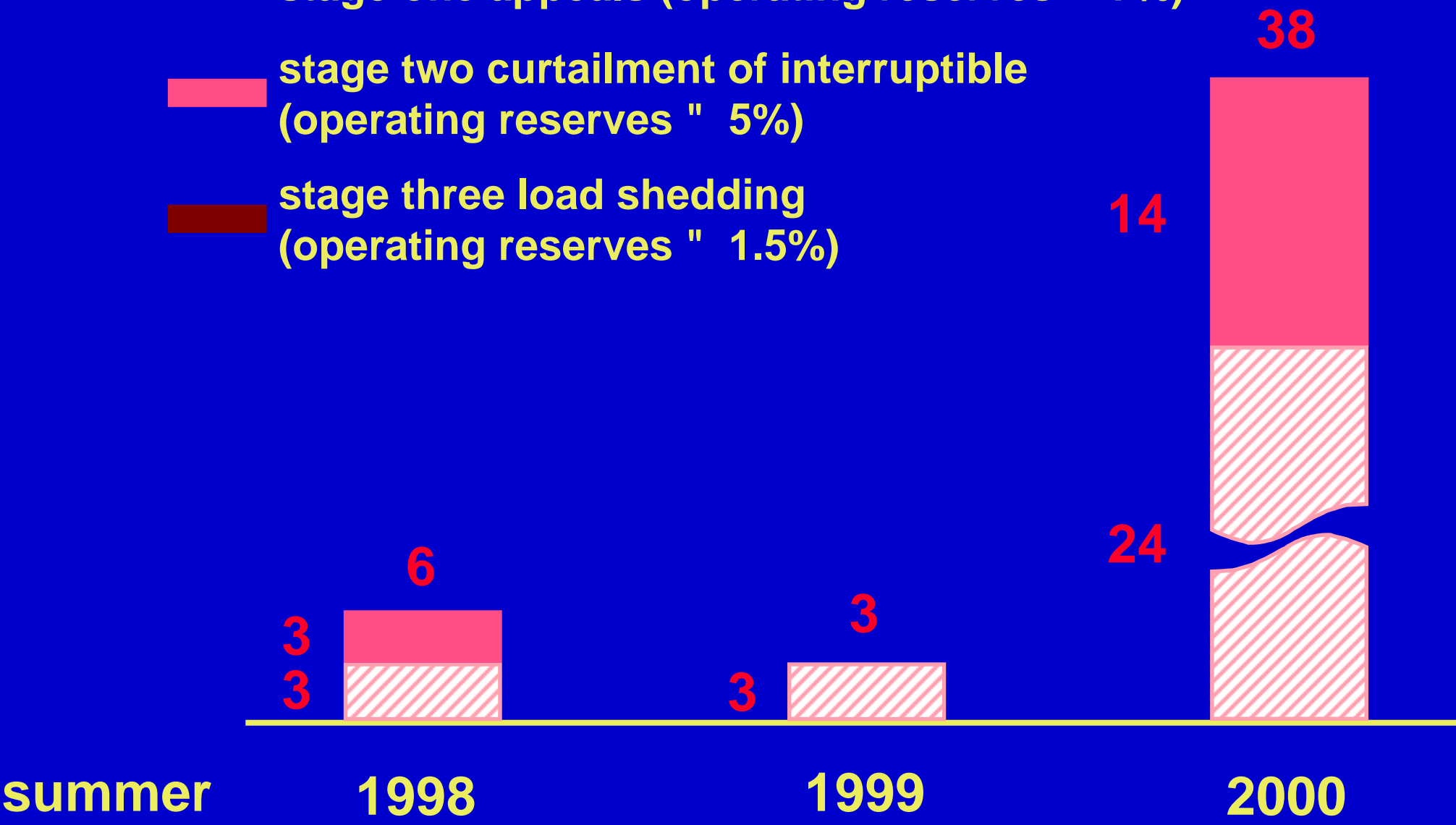


THE SUMMER 2000 MARKETS



DECLARATIONS OF EMERGENCY BY THE CA ISO

-  stage one appeals (operating reserves " 7%)
-  stage two curtailment of interruptible (operating reserves " 5%)
-  stage three load shedding (operating reserves " 1.5%)



REGIONAL TRANSMISSION ORGANIZATION (RTO)

- ❑ FERC's functional unbundling has not resulted in the desired separation of transmission and market functions
- ❑ Certain structural impediments to greater competition
 - elimination of pancaked rates
 - improved congestion management
 - curbing of market power
 - undertaking of improved regional planning proceduresare best addressed regionally
- ❑ RTO is a generic term for a new *independent* transmission management structure that will control transmission operations and planning uniformly in large regions of the US
- ❑ RTO's may come in various flavors -- ISO, TRANSCO, grid or some combination

DISPERSED RESOURCES

- ❑ **Direct access coupled with advances in fuel cell and microturbine development are leading some to forecast that DR will replace the role played by today's power plants**
- ❑ **The utilization of DR to date is, by and large, limited to specific niche applications**
- ❑ **Some DR companies have enjoyed *dot - com* success in terms of stock appreciation**

DISPERSED RESOURCES

- ❑ **Emergence of DR represents both opportunities and threats to the restructured business**
 - **new sources to help the supply - demand balance**
 - **disruptive technology to change the transmission system through generation solutions**
- ❑ **The future penetration of DG is uncertain due to factors such as**
 - **technology advances**
 - **environmental aspects**
 - **economics**
 - **“integration” into the existing system**
- ❑ **The future role of transmission is also uncertain**

ELECTRICITY AND THE *NEW ECONOMY*

- **The electricity business is on the cutting edge of the *new economy***
 - *new economy runs on electricity*
 - 400 million plus web users internationally
 - 62% growth in U.S. internet industry in 1999
 - over 80 million PC's shipped annually
- **Reliable and competitively priced electricity is a key requirement for the myriad applications and the operations of web-based e - businesses**

MAJOR CHALLENGES

- Smoother operations of the balkanized electricity markets
- Effective integration of new technology and application of advances in information technology
- Monitoring of market performance
- Implementation of demand-side responsiveness
- Green electricity
- Efficient economic signals for robust and reliable transmission system
- Market-based congestion management schemes