Energy Regulation: Overview of Power and Gas Regulation

Environmental Sciences: Energy Law and Regulation

David E. Dismukes
Center for Energy Studies
Louisiana State University

Topics

- Overview of Power and Gas Regulation
- Structure of the Electric Power Industry
- Structure of the Natural Gas Industry
- The Theory and Mechanics of Power and Gas Regulation
  - Federal Regulatory Process
  - State Regulatory Process
- Ratemaking 101
- Resource Planning in Power and Gas
- Emerging Issues in Alternative Energy and Efficiency
- Conclusions

Overview of Power and Gas Regulation

Why Do We Regulate Energy Companies and Utilities?

Market Failure Issues:

- Natural Monopoly Conditions Exist
- Public Good (Externality)
- Asymmetric Information (Externality)

Rent-Seeking:

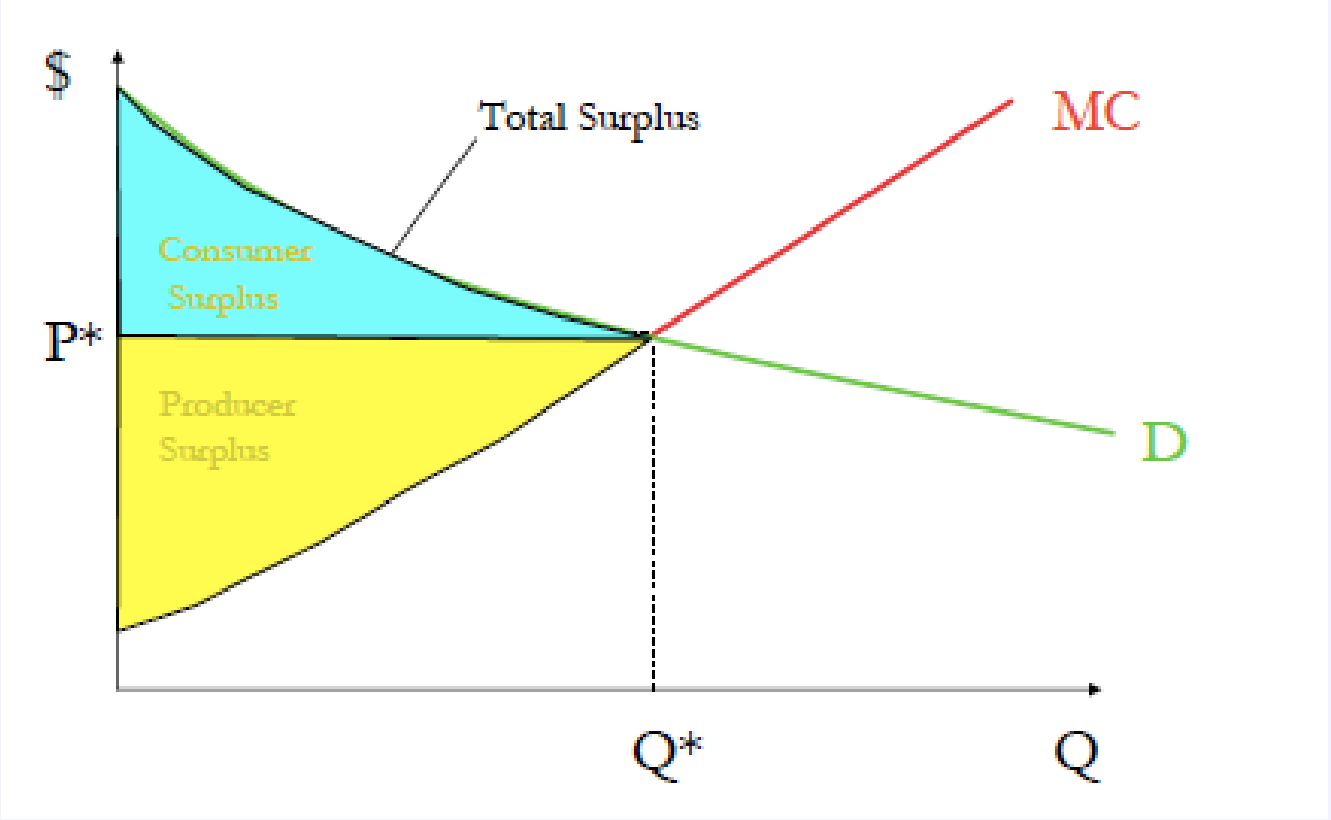
- "Chicago School" Theory (barriers to generate profit)
- "Public Interest" School of Thought

Generally: It is a combination of both – We regulate utilities because they exhibit natural monopoly characteristics and are imbued with the public interest.

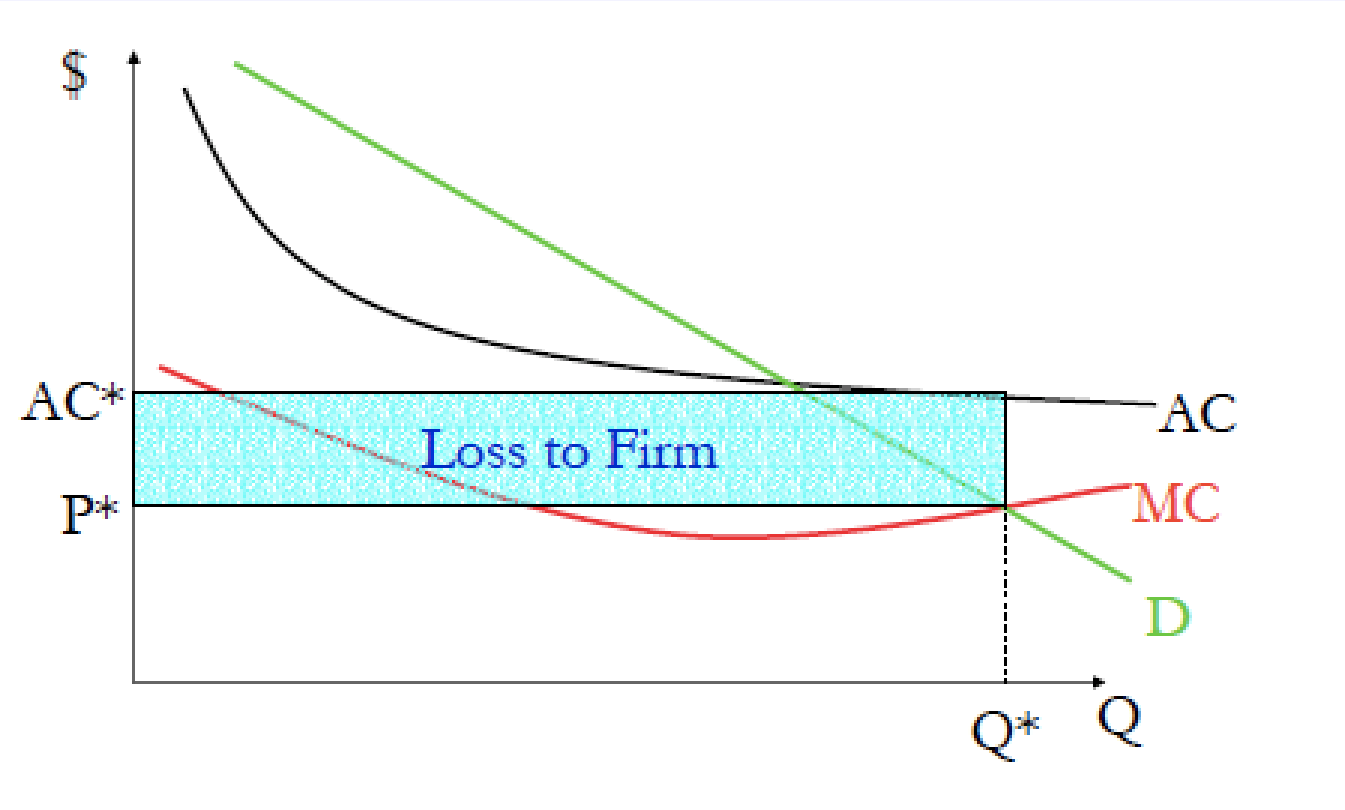
Various Forms of Energy Regulation

- Price Regulation/Rate of Return ("ROR") Regulation
- Siting/Location Requirements (Entry and Exit of Supplier)
  - Legal monopolies
  - Extensive permitting requirements
- Service Quality, Safety, and Reliability
- Standards or "Command and Control" (Operating or performance efficiency, emissions and/or discharges requirements)

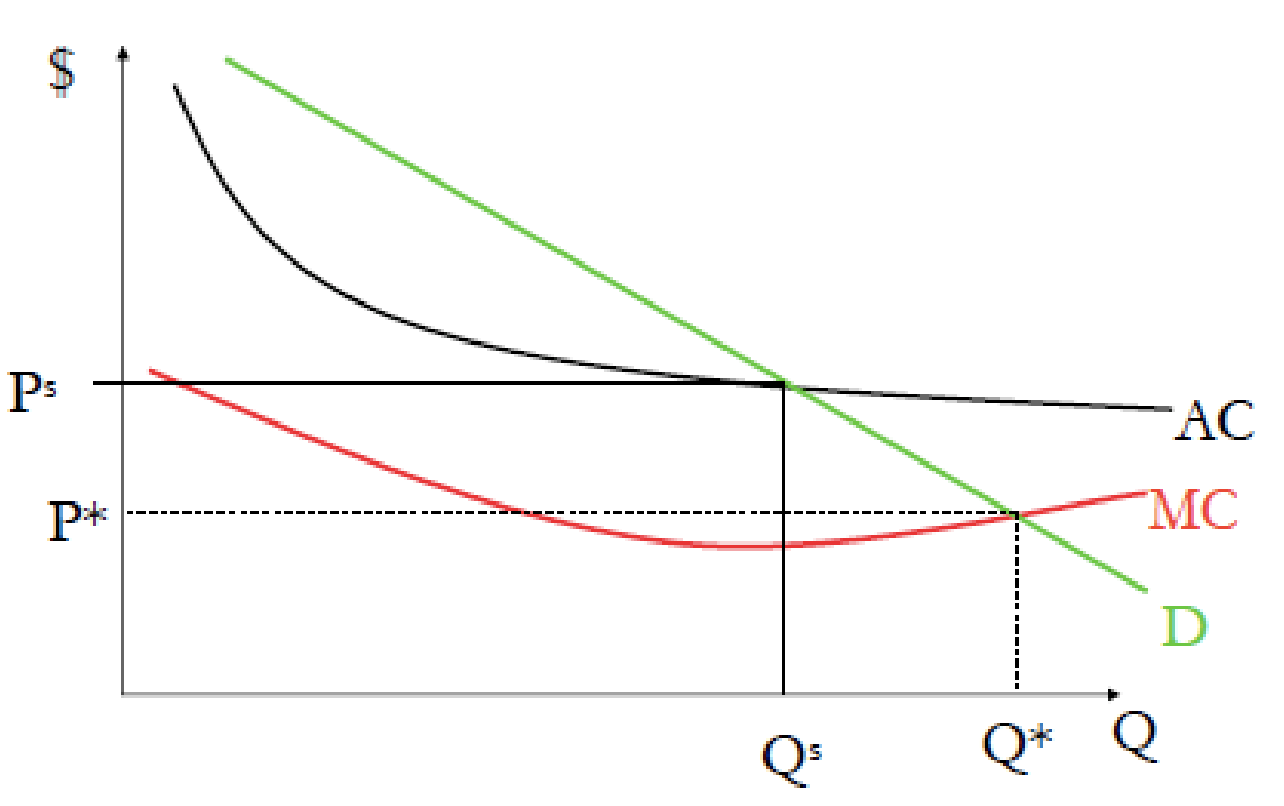
How are Prices and Output Determined in Perfectly Competitive Markets



The Natural Monopoly Problem

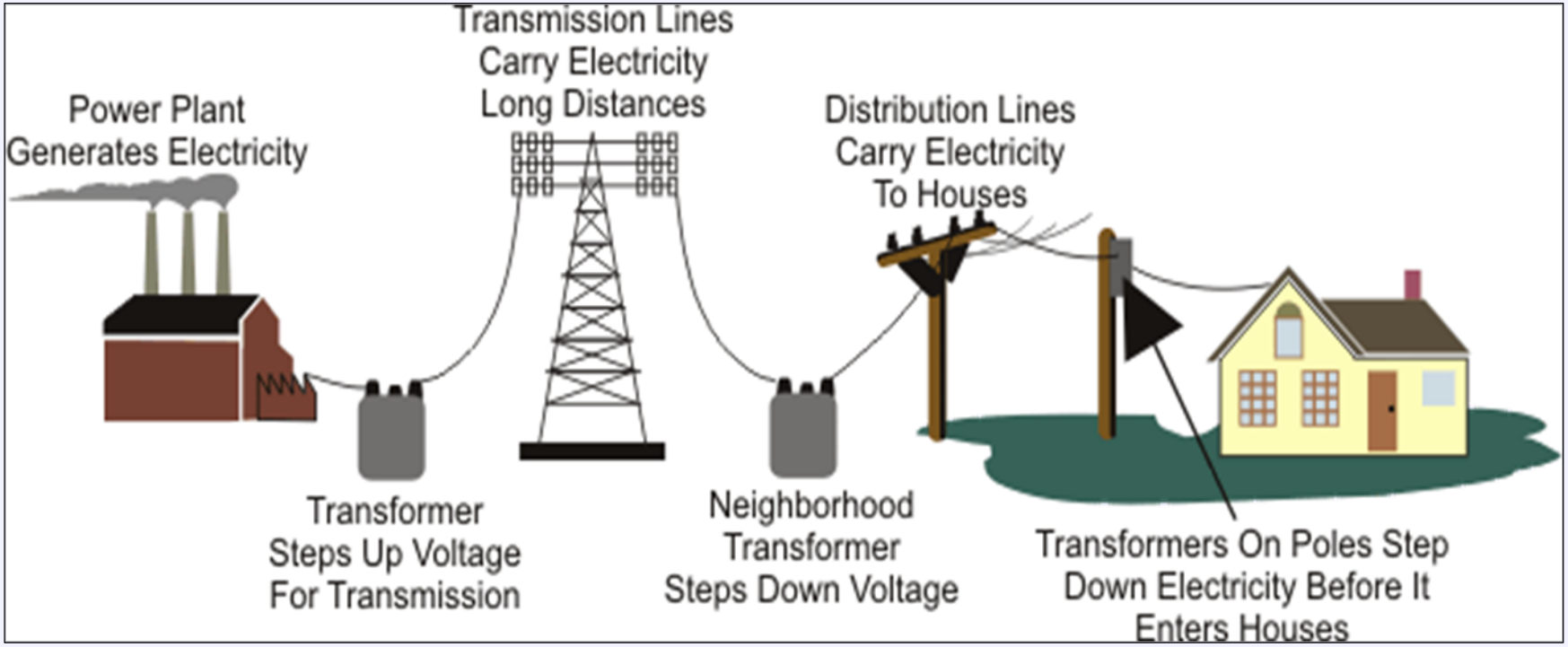


Regulatory “Second Best” Solutions

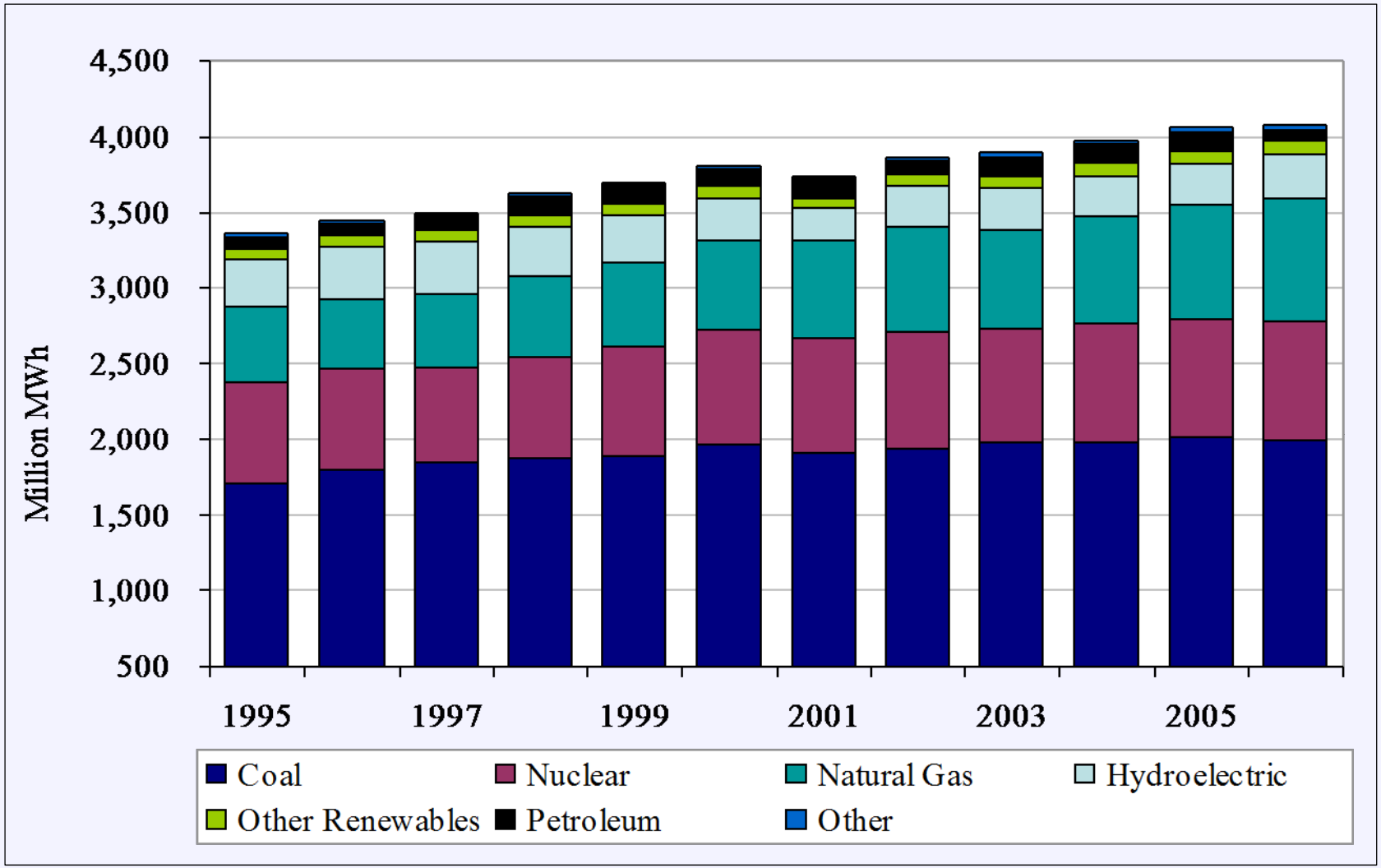


Structure of the Electric Power Industry

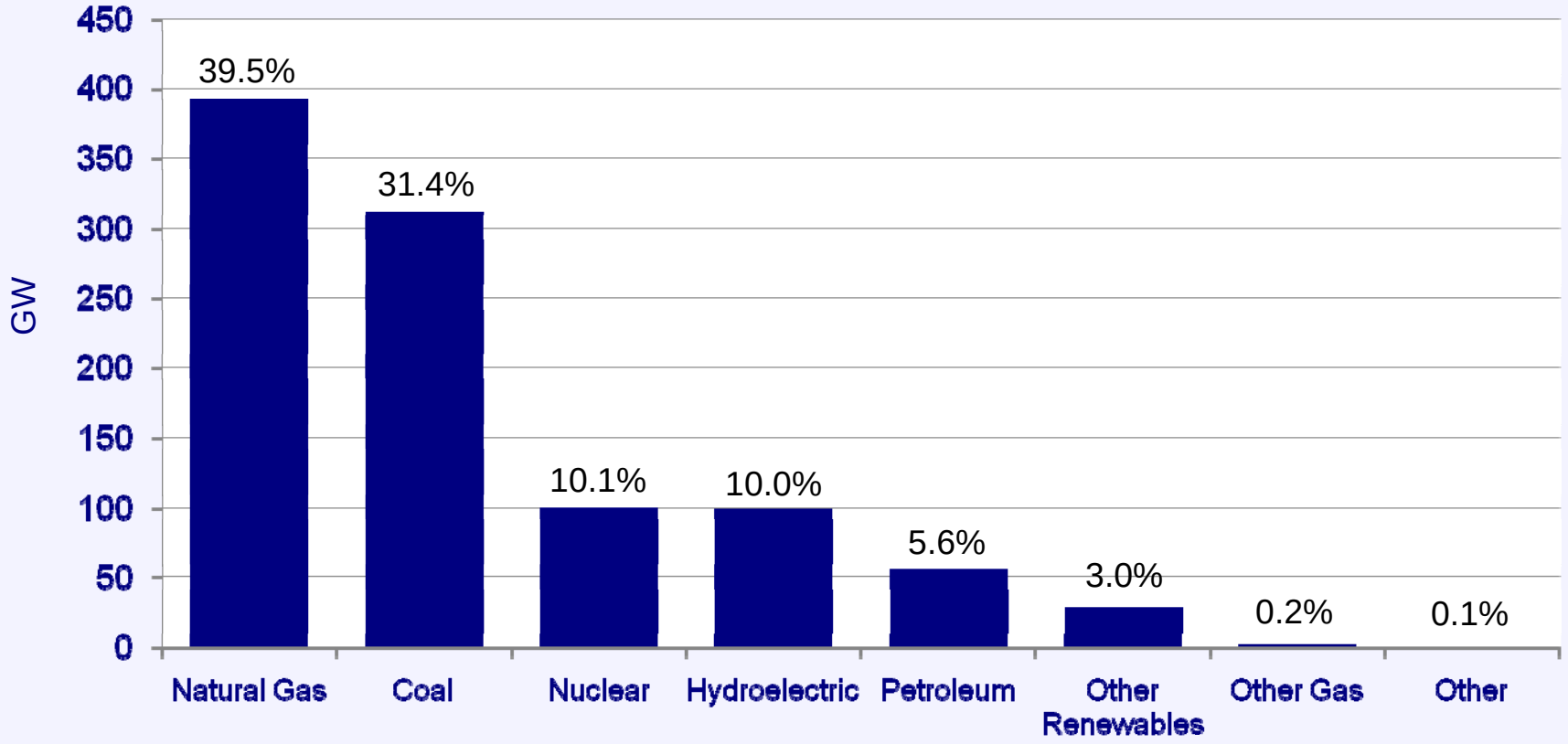
Power Industry Structure



U.S. Net Generation by Fuel Type (1995-2006)

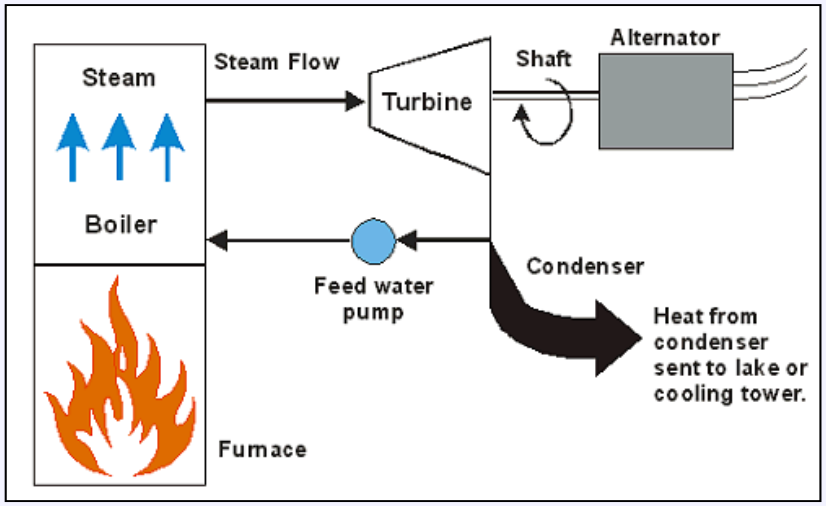


Generation Capacity by Fuel Type (2007)

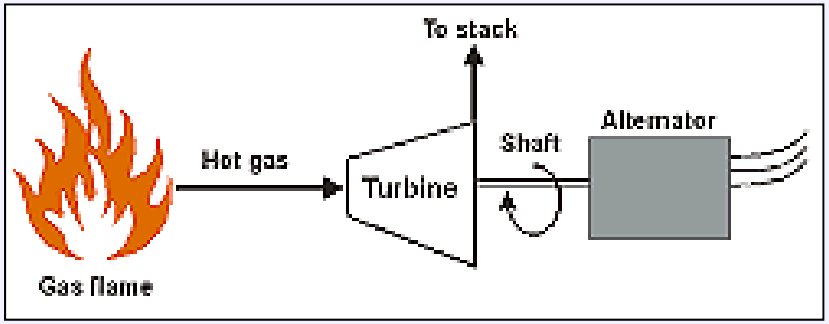


Title

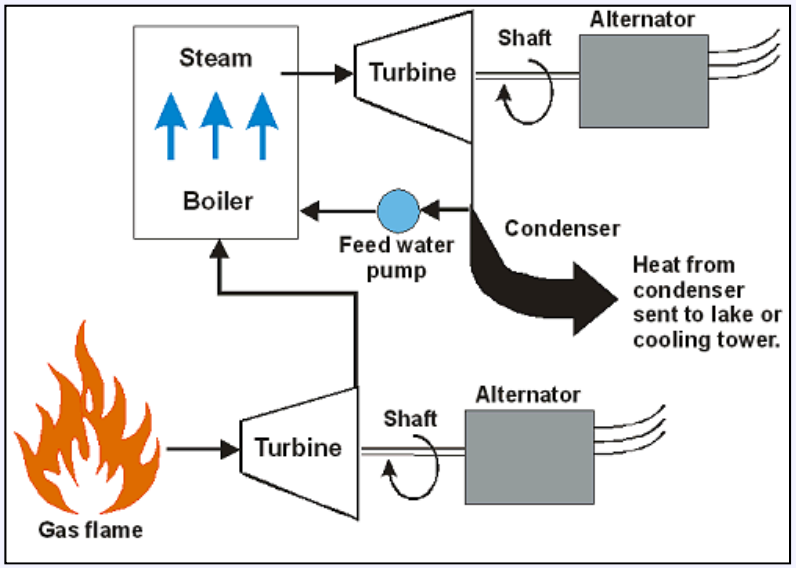
Simple Steam Generator



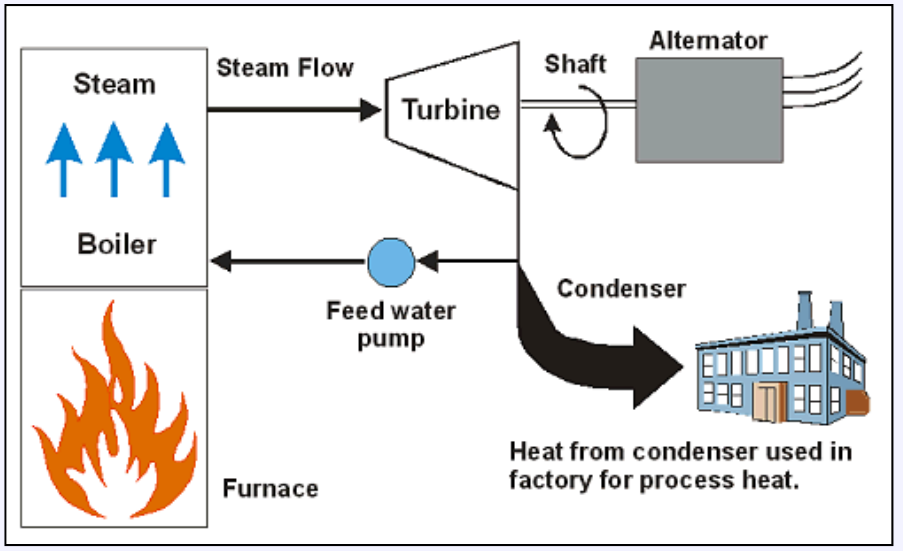
Simple Turbine Generator



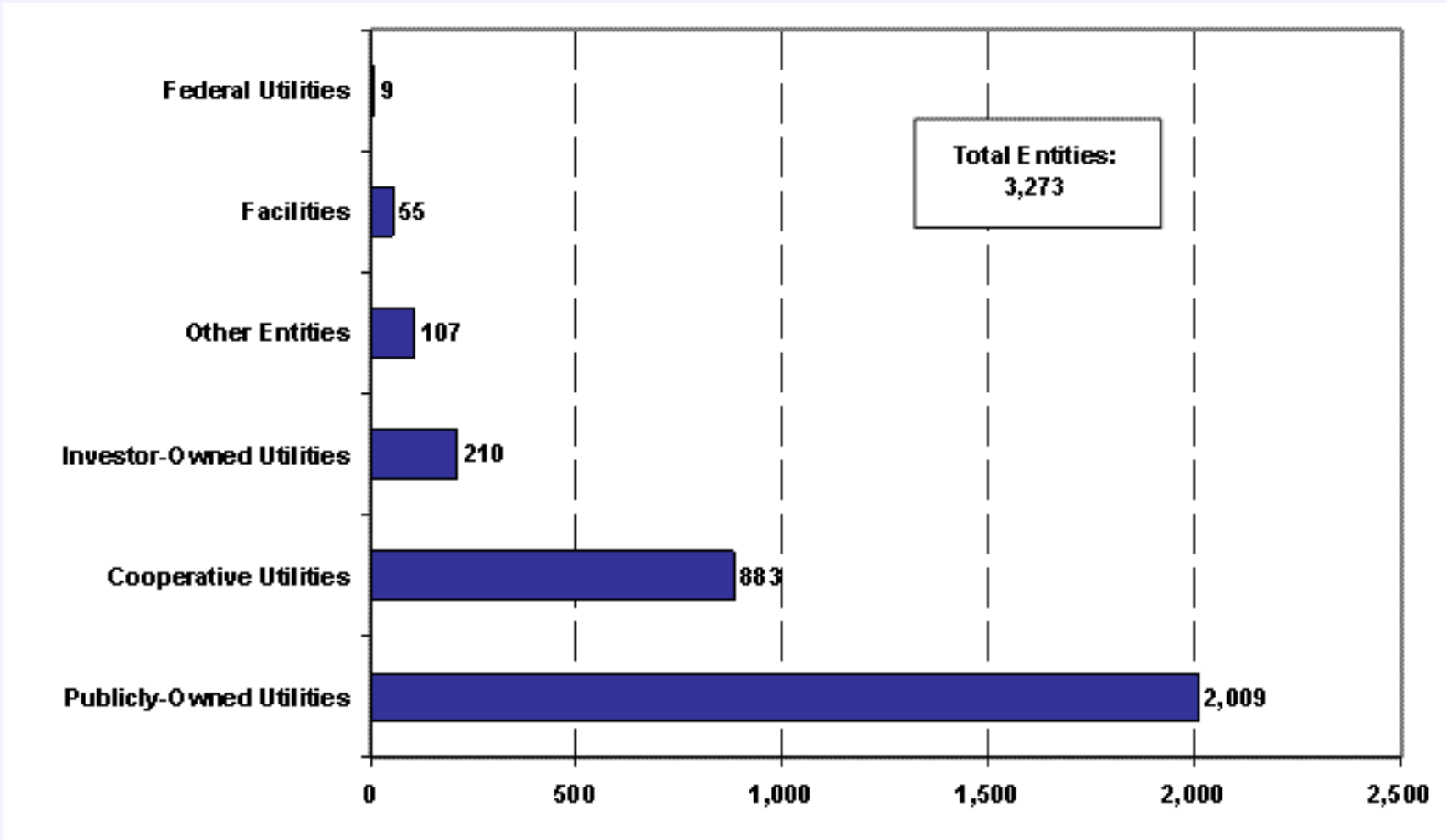
Combined Cycle Generator



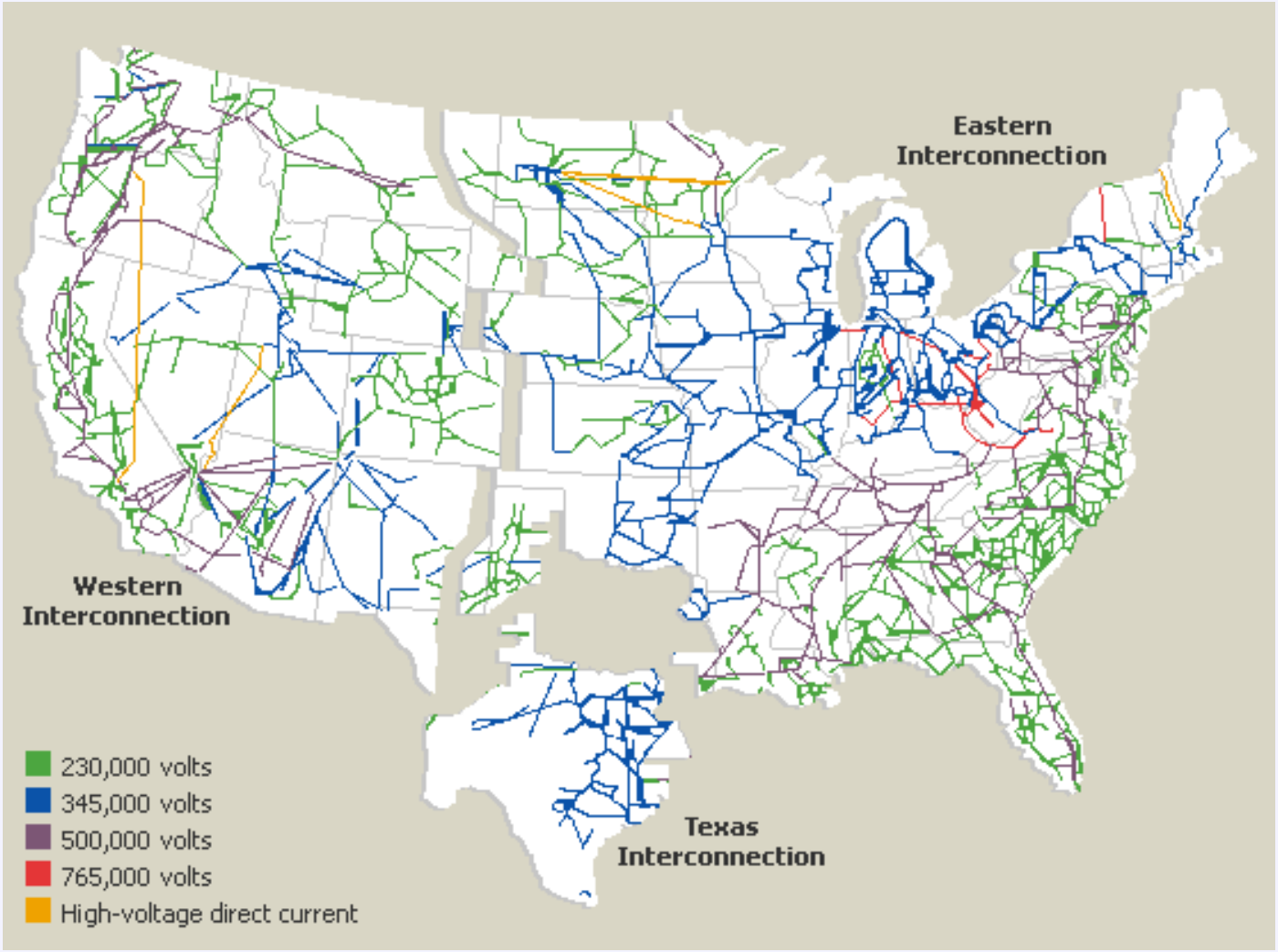
Cogeneration



Generation Ownership Type (2007)

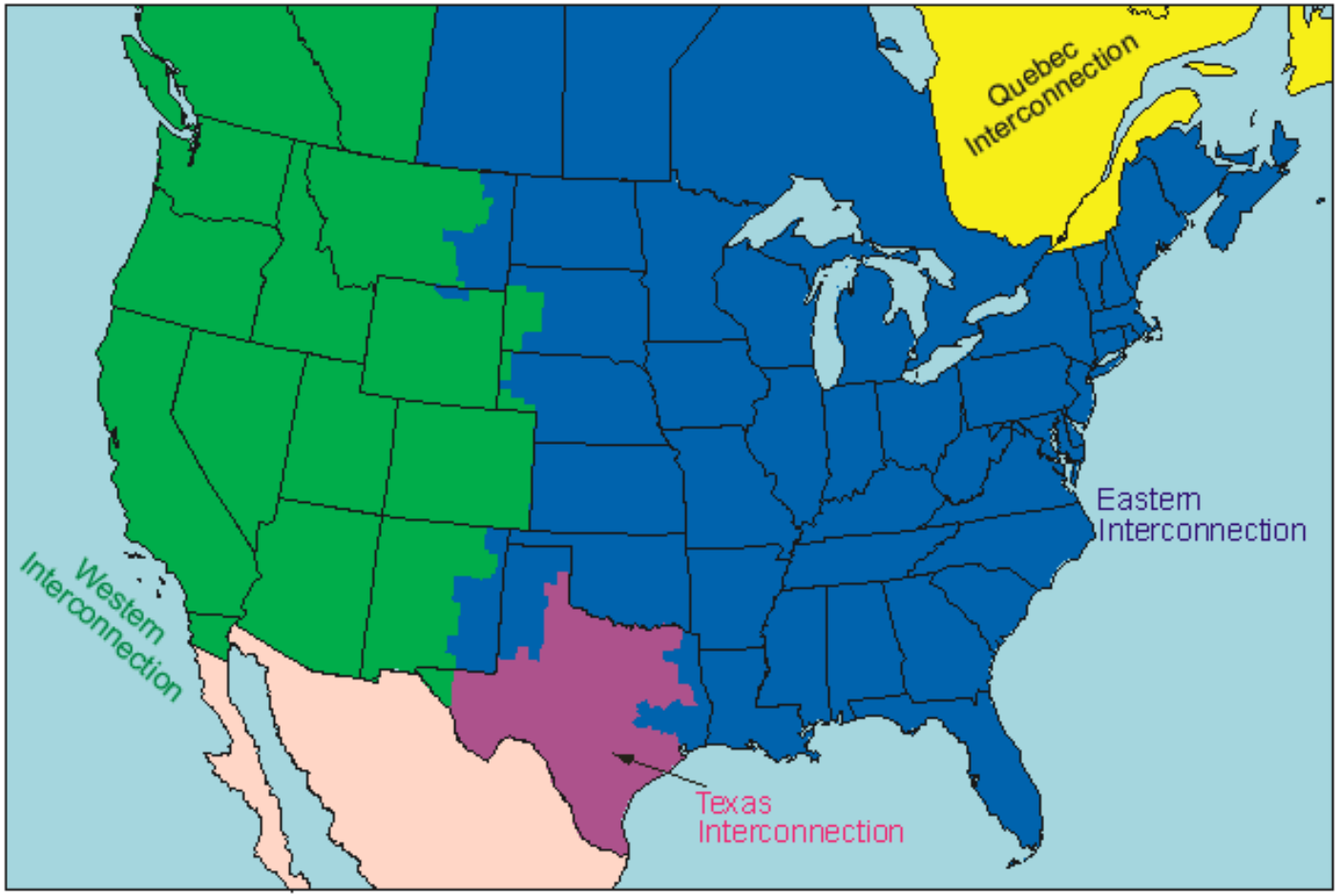


North American Transmission Grid

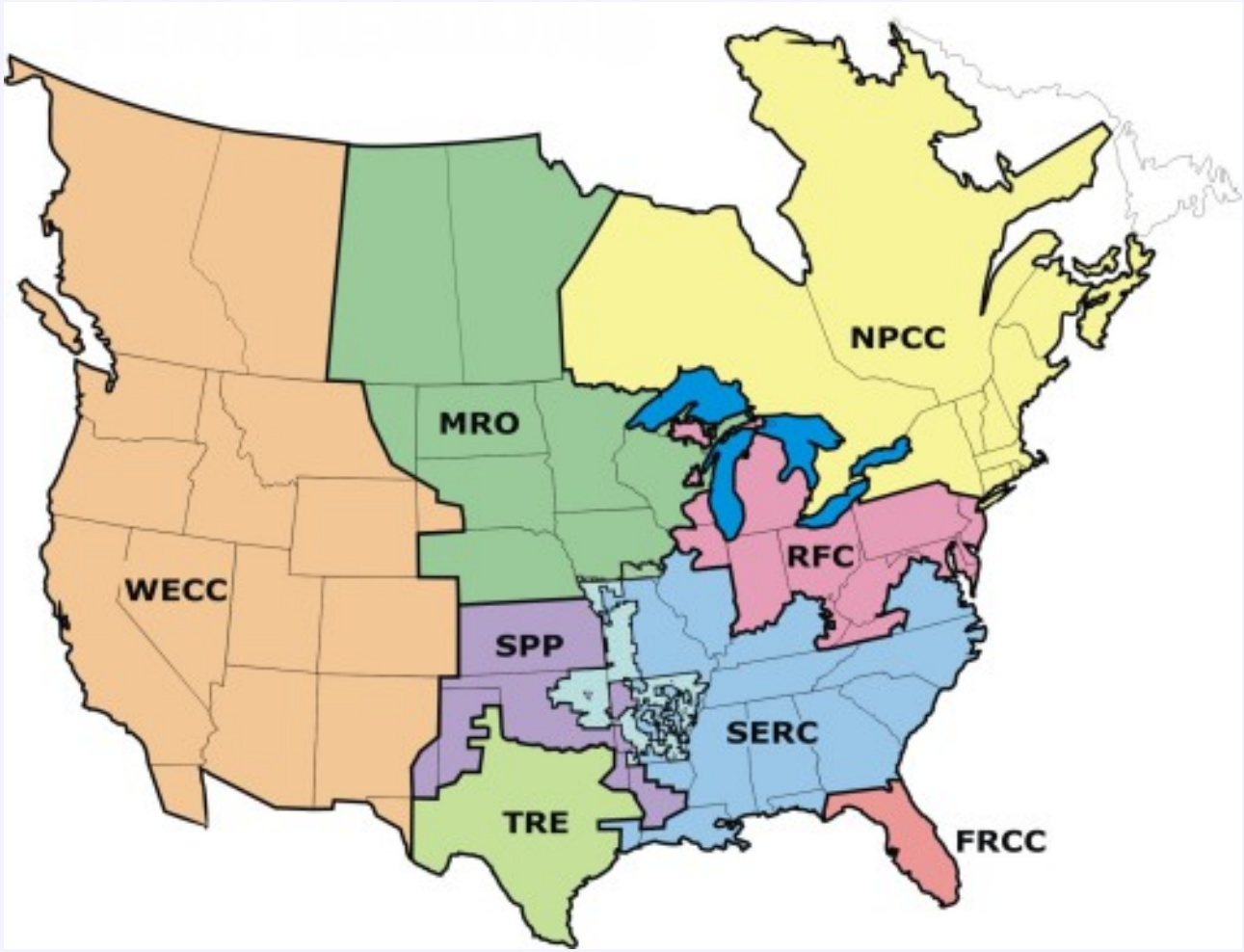


Source: www.geni.org

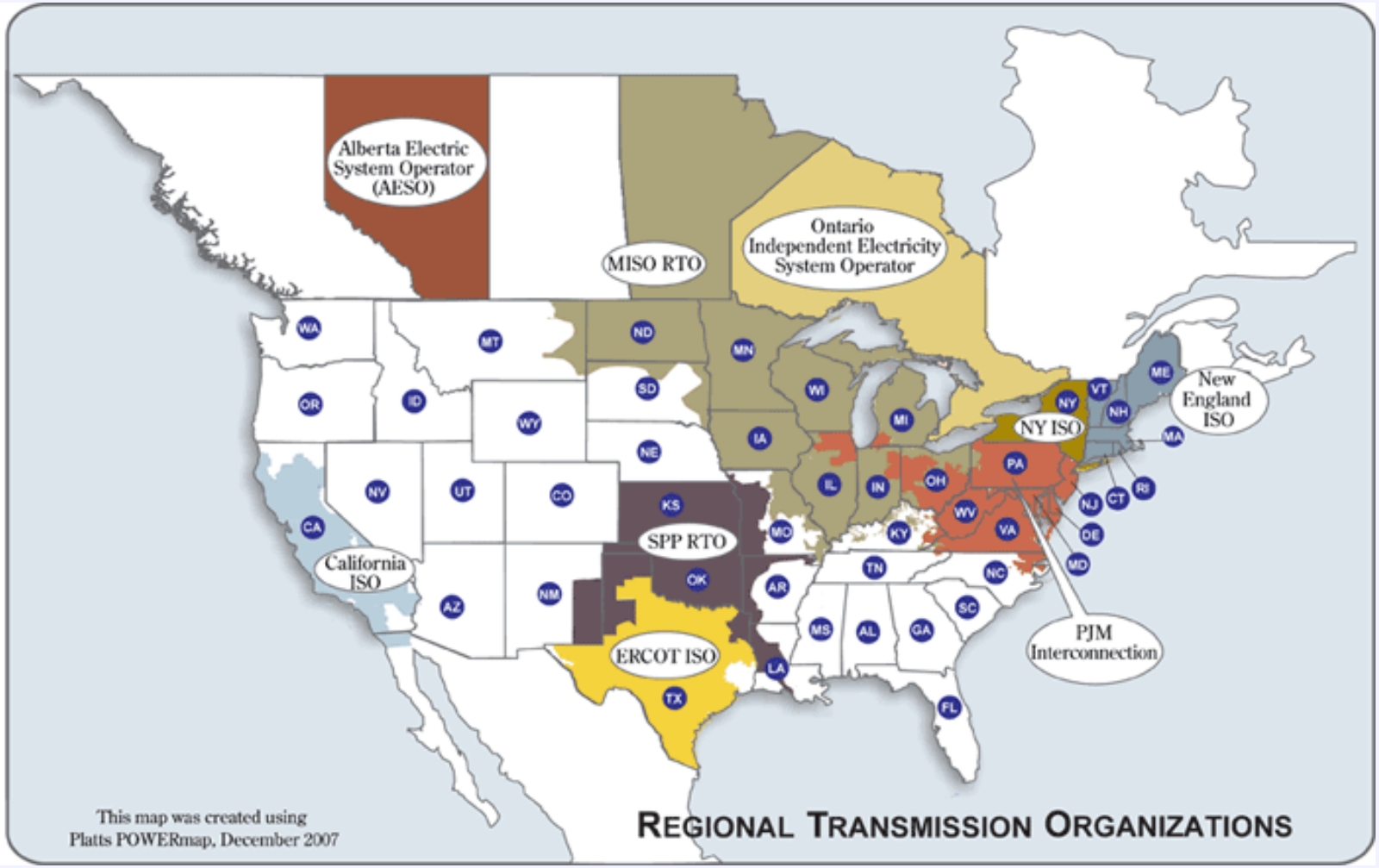
North American Interconnects



NERC Reliability Regions

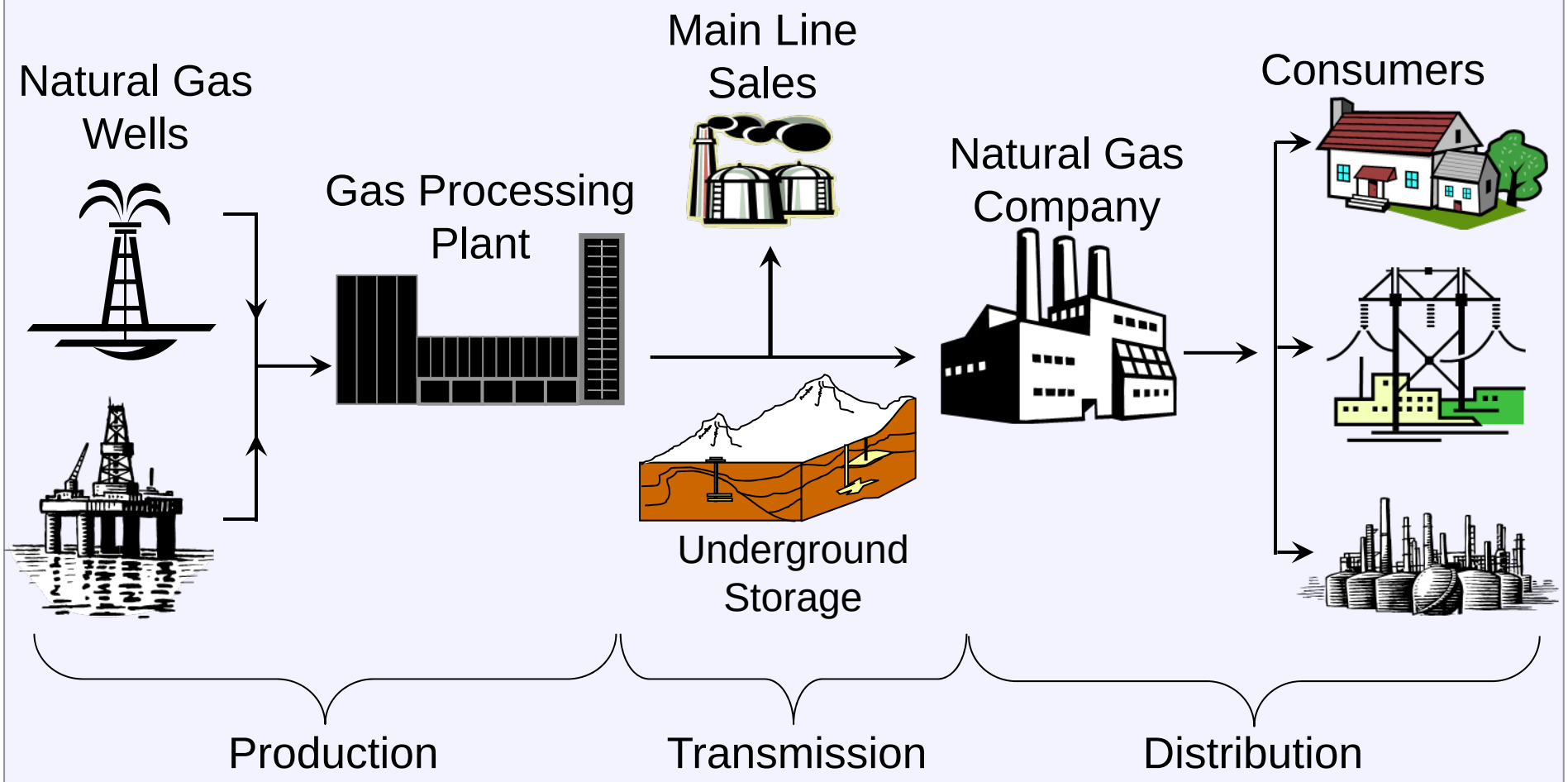


Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs)



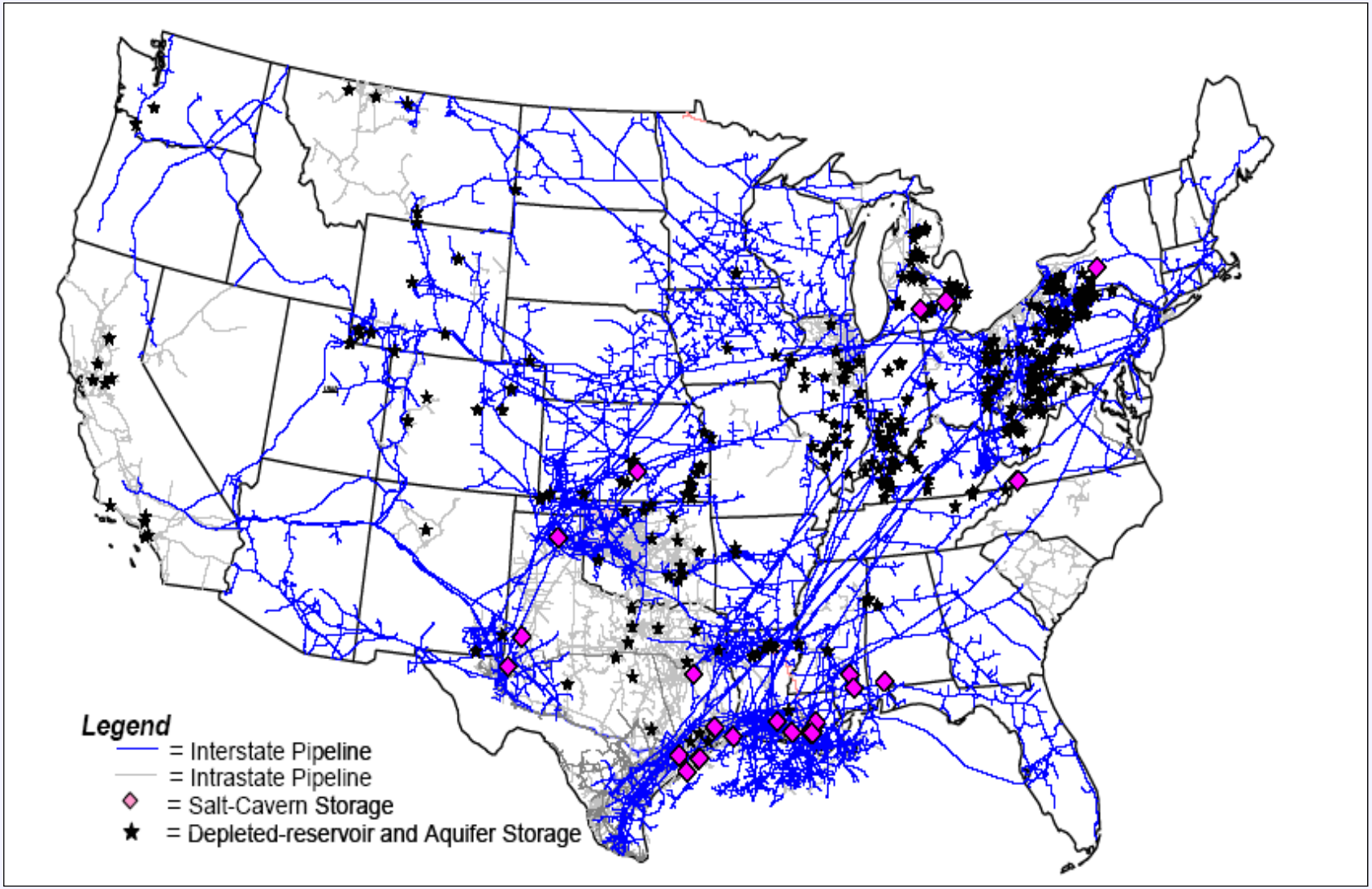
Structure of the Natural Gas Industry

The Natural Gas Industry

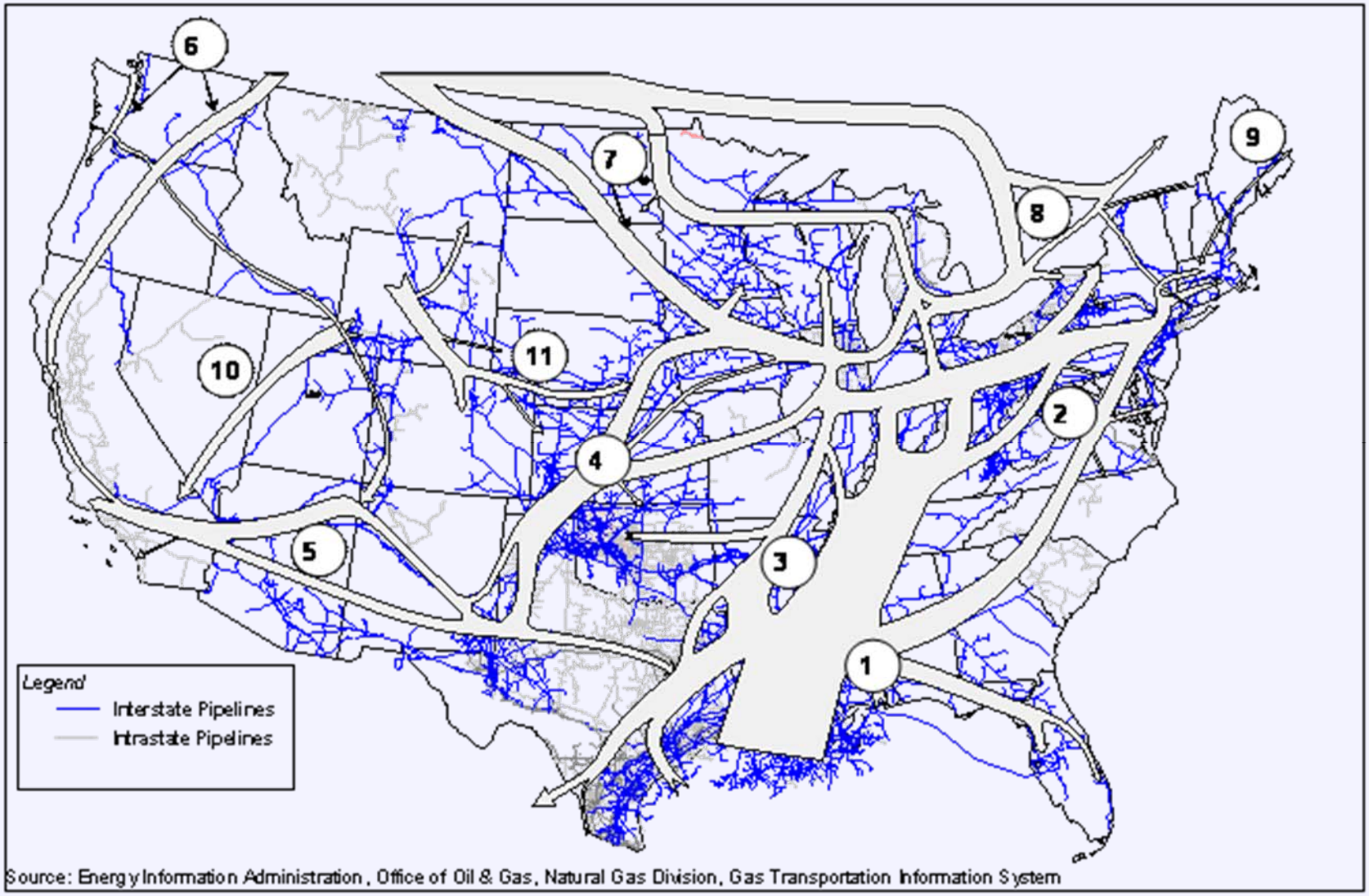


Source: Energy Information Administration, Department of Energy

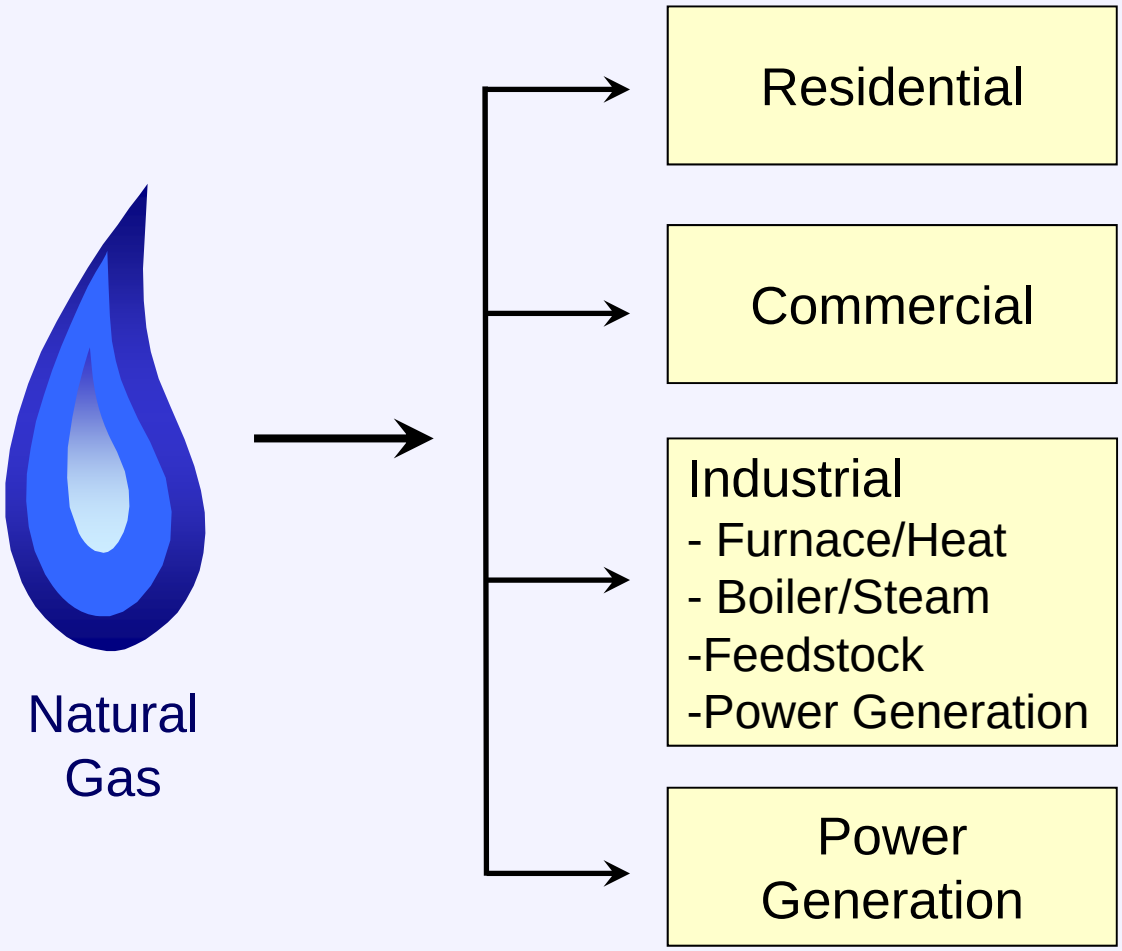
Natural Gas Pipeline and Storage Facilities



Natural Gas Pipeline Flows

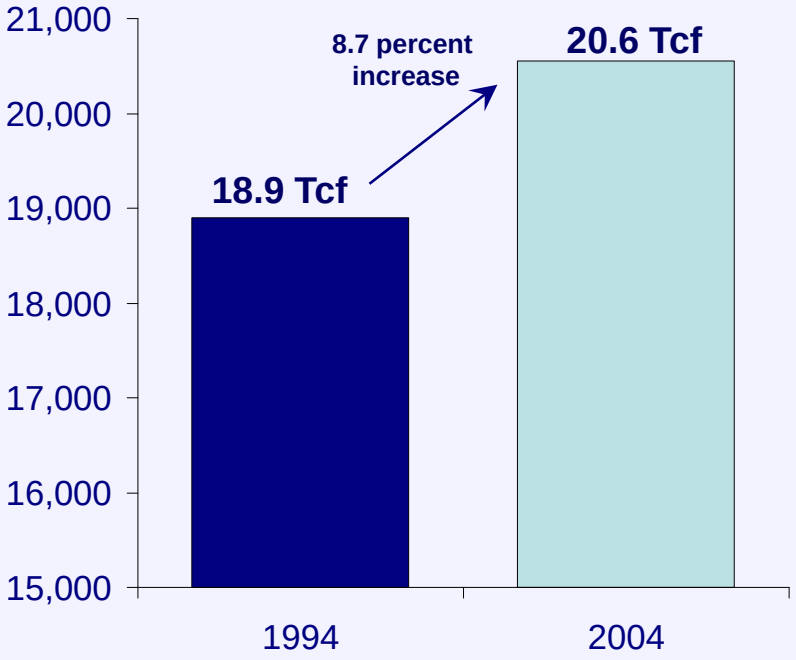


Natural gas important for all consumers

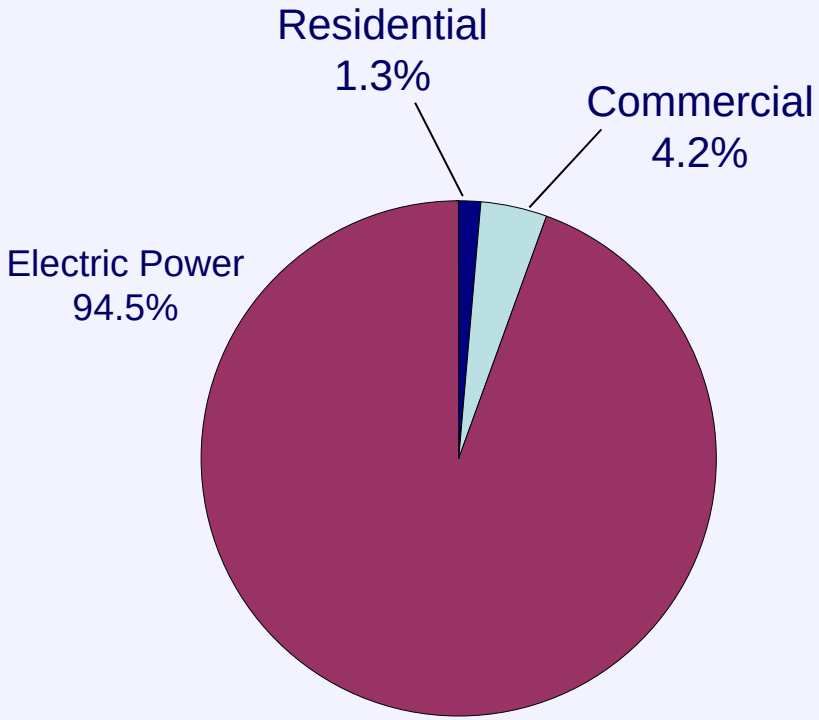


Increase in Natural Gas Usage by Major Sector (1994 and 2004)

Total Natural Gas Delivered to End Users



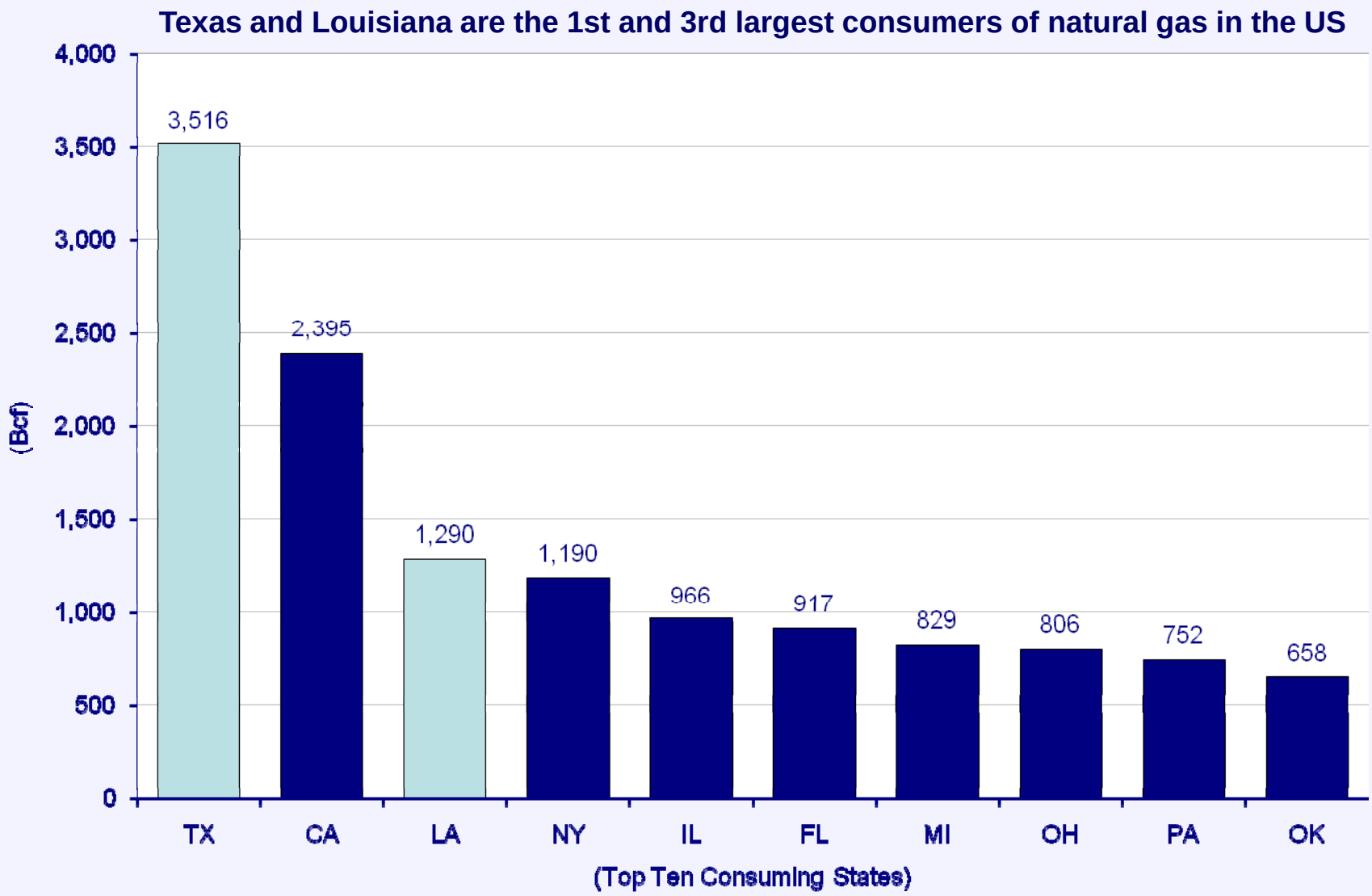
Increase by Sector



Note: Industrial consumption decreased by 11%

Source: Energy Information Administration, Department of Energy

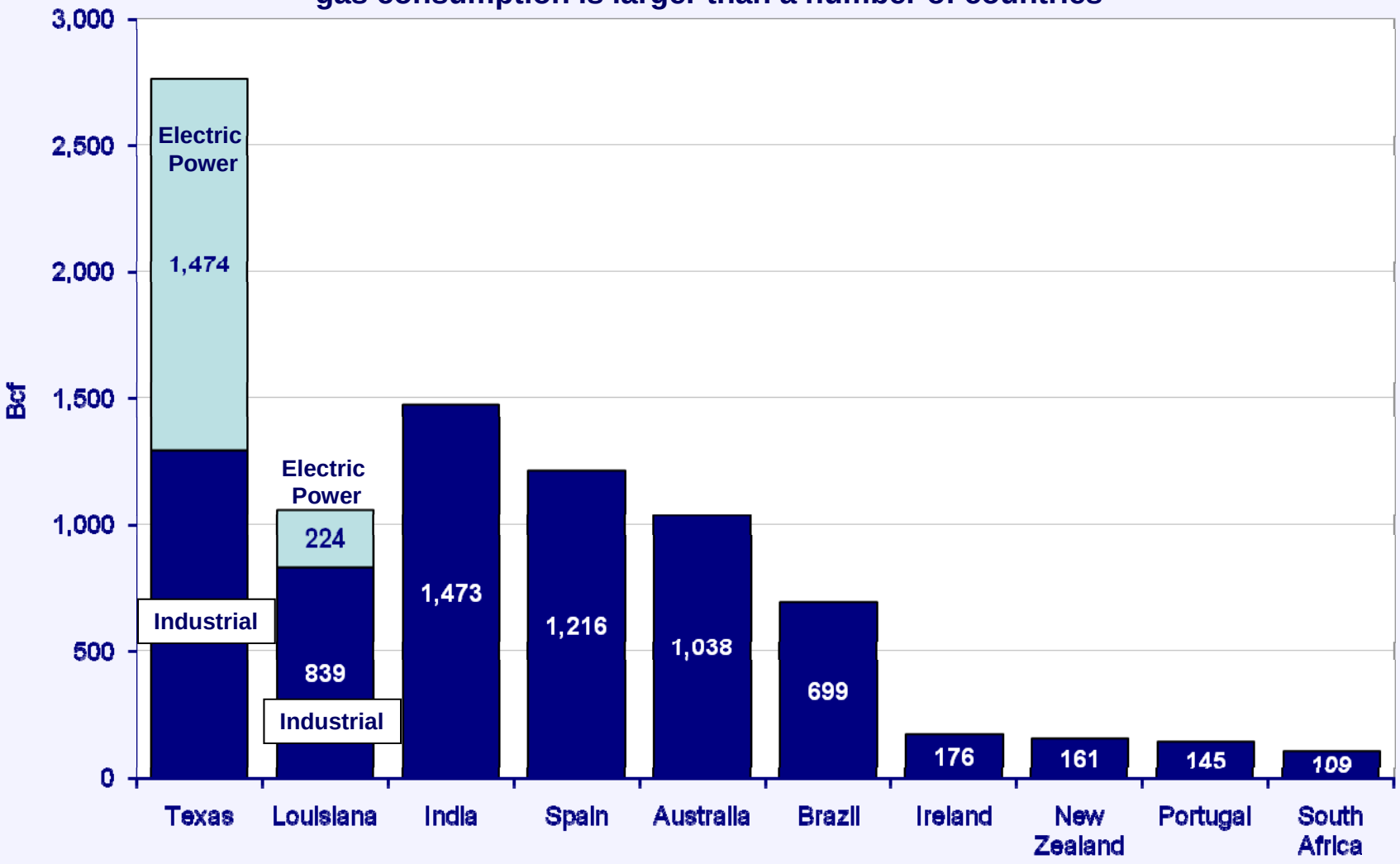
Natural Gas Consumption in the US (2007)



Source: Energy Information Administration, Department of Energy.

Natural Gas Consumption – Louisiana and World Comparison (2007)

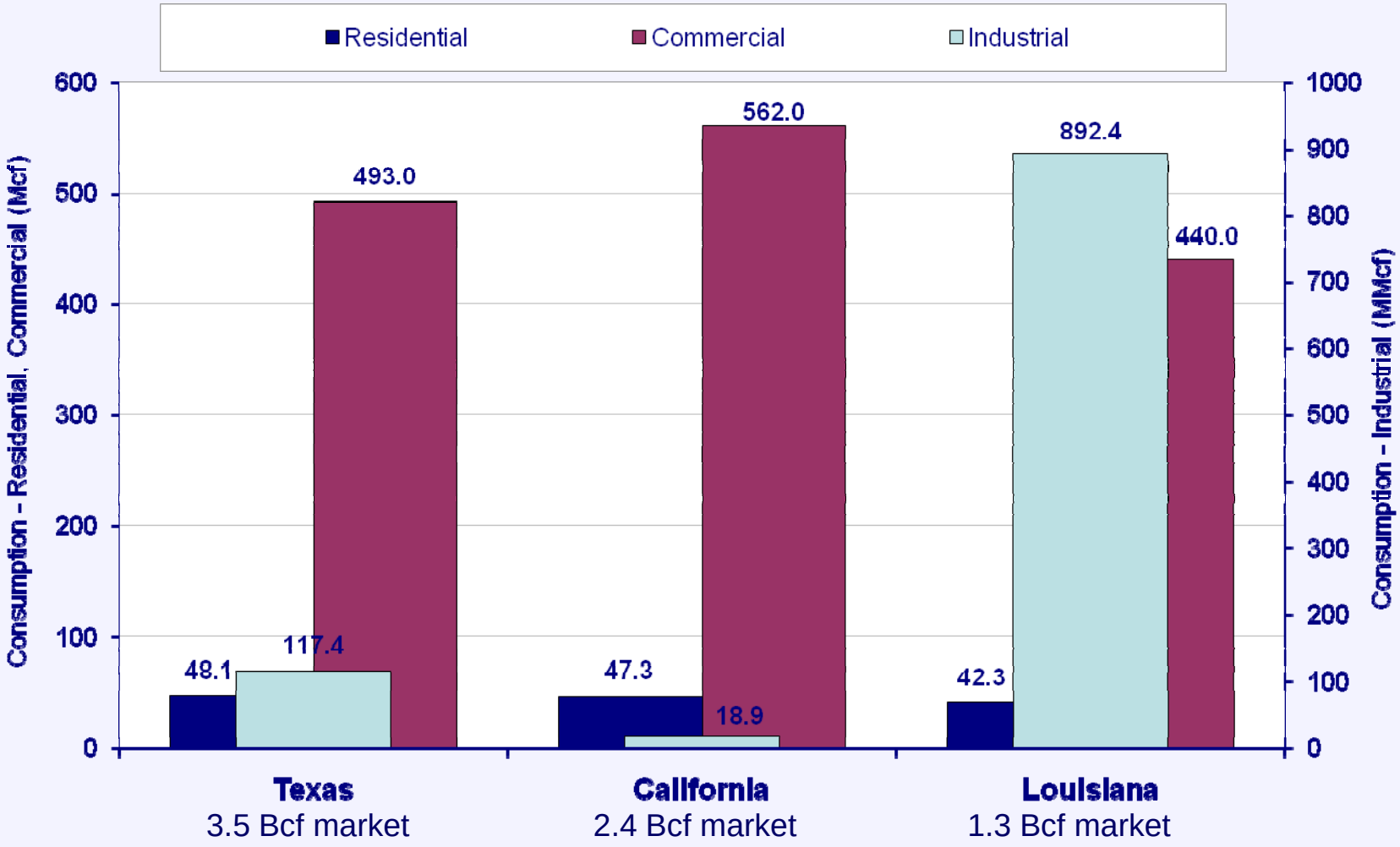
Texas' and Louisiana's industrial and power generation gas consumption is larger than a number of countries



Source: Energy Information Administration, Department of Energy.

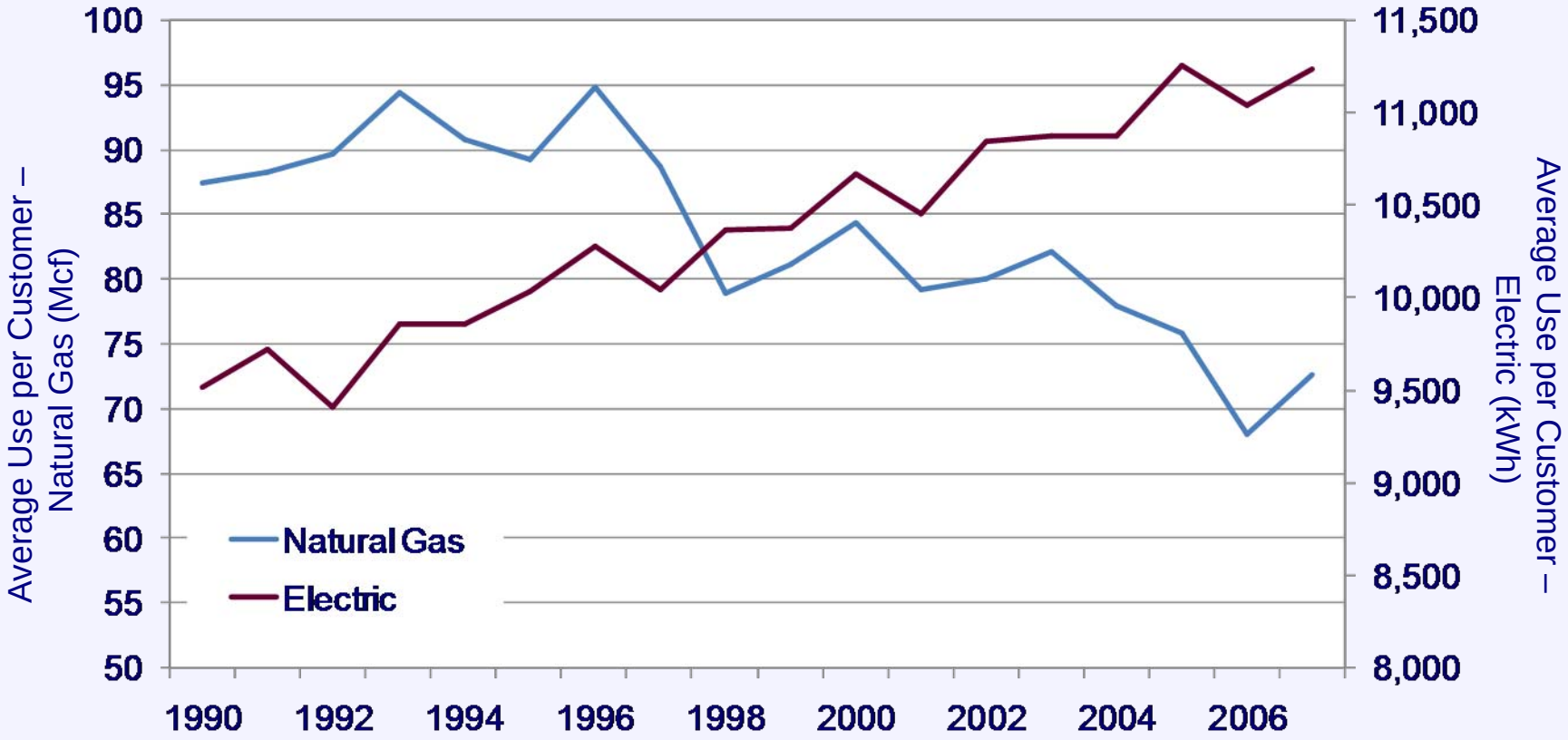
Per Customer Natural Gas Consumption by Sector (2007)

Louisiana's high national gas consumption ranking is due in large part to high industrial use per customer



Source: Energy Information Administration, Department of Energy.

U.S. Average Residential Use Per Customer
Natural Gas and Electric



Source: Energy Information Administration, U.S. Department of Energy.

Theory and Mechanics of Power and Gas Regulation

Wholesale versus Retail Transactions

Wholesale transaction: one in which a willing buyer and seller exchange power or gas in which either the source and/or the sink are engaged in interstate commerce and the buyer is not an end user but reseller to ultimate customer (i.e., utility) . FERC regulated.

Example: Coral energy sells 1 Bcf of natural gas to Centerpoint-Louisiana. (Merchant to utility)

Calpine sells 200 MW to Entergy-Louisiana (Merchant to Utility)

Entergy Louisiana sells 150 MW to Mississippi Power (Utility to Utility)

Retail transaction: one in which a willing buyer and seller exchange power or gas in which the purchaser is within a state jurisdiction and is an end user. State Utility Commission regulated.

Vertically-integrated state: utility-based rate regulated transaction.

Unbundled state: competitive based transaction or distribution company provided BGS service.

Wholesale Transaction Federal Regulation

Wholesale transactions are facilitated by a regulatory requirement of "open access" on power and gas transmission systems.

Natural Gas Policies Act of 1978
Public Utilities Regulatory Policies Act of 1978
Energy Policy Act of 1992.

Rules promulgated starting throughout the 1980s to "unbundle" gas and power transmission systems and create greater competition on supply resources by creating open networks for delivery.

FERC Order 636 (1992)

FERC Order 888 (1996)

Open access requires: (a) functional separation of transmission from merchant operations and (b) provision of access equal and non-discriminatory basis. Important for traditional and clean energy resources.

Regulated Wholesale Price Determination

Rates have historically been set on traditional rate of return regulation at the wholesale level.

Over the past two decades, rate cases on wholesale operations have become less common.

FERC is relying more on competition and "market-based rates."

Interstate services commonly given market- based rates if utility can prove it has no market power. FERC uses more antitrust measures for regulation (entry, concentration ratios, mark-ups, profit analysis) than traditional ROR approaches.

On those services that continue to be regulated on ROR basis, FERC relying on incentive returns, increased ROEs and cash earnings on CWIP to develop infrastructure.

Important risk sharing issues between utility shareholders and ratepayers arise in these policies. Attempt to build in additional profits could be interpreted as mechanism to mirror competitive markets that allow increased profits when supplies (capacity) becomes tight.

State (Retail) Regulatory Process

Regulation conducted by state "Public Utilities Commissions" or "Public Service Commissions" or "Board of Utility Control."

Commissioners sit in tribunal form: quasi-legislative and quasi-judicial functions.

Commissioners are appointed or elected.

Process is typically governed by given state Administrative Procedures Code (Act) and state Rules of Civil Procedure.

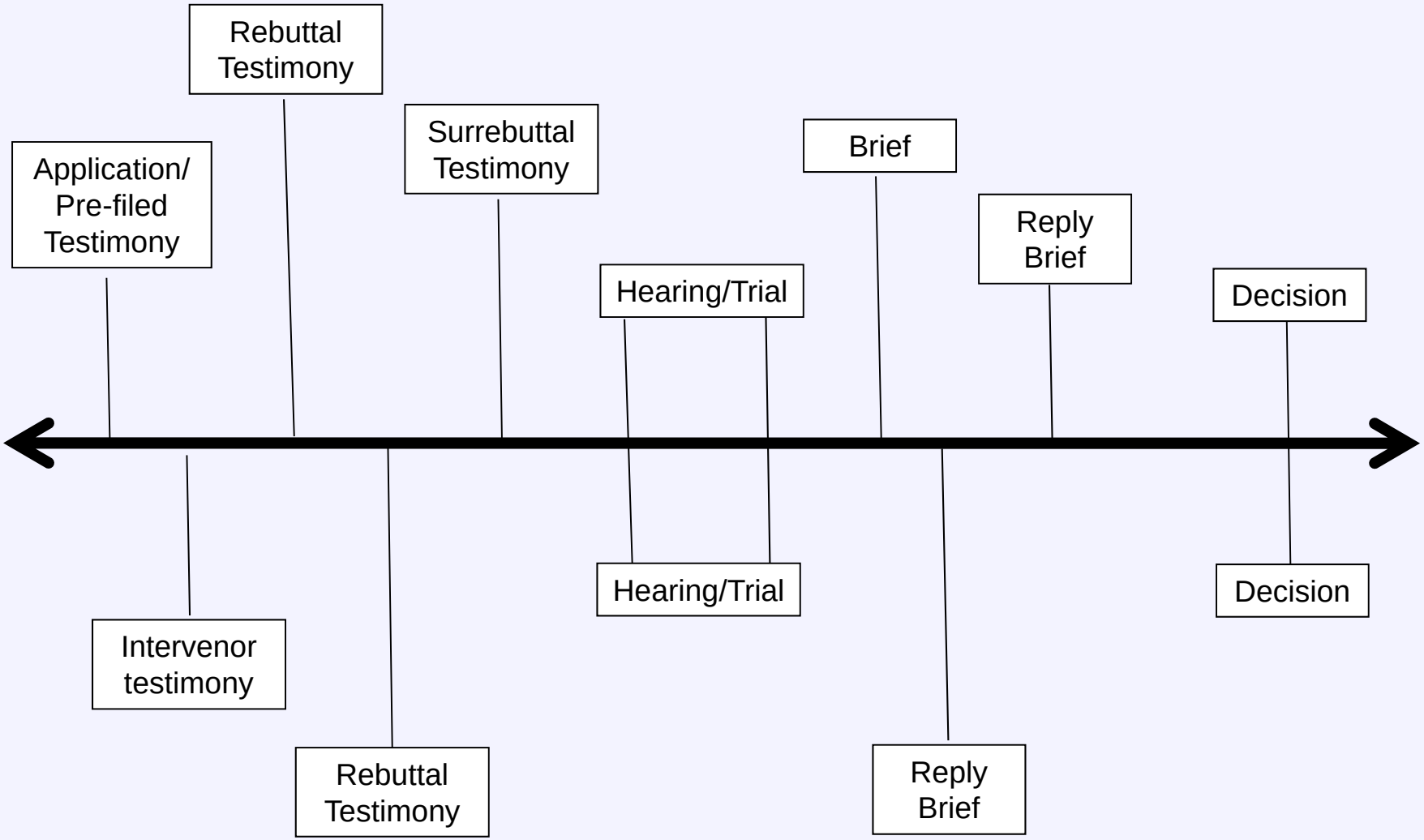
Rates typically set on rate of return (ROR or "traditional") basis or variation.

Rates of return is a bit of misnomer since rates are what are fixed (through a tariff) and actual rates of return vary.

Process can be criticized because it can lead to a variety of inefficiencies and rent seeking.

All parties that have "standing" allowed to participate and can include Attorneys General/Consumer Counsel (state agencies representing ratepayers), industrial customers, low-income groups, environmental groups, other state agencies.

State Regulatory Process (Typical Timeline)



Ratemaking 101

Retail Rate Setting Process

Originally services were often prices on a per appliance basis.

As usage became more diverse, pricing structures and regulation became more complicated.

Recall that the basic regulatory challenge is setting prices for a firm (industry) that has natural monopoly cost conditions (i.e., declining average costs throughout relevant rate of output).

Best (optimal) outcome is commonly characterized as attempt to formulate a "second-best solution" that sets prices at average costs, and attempts to allocate joint and common costs in a fashion that is efficient, fair, supports rate continuity, and give the utility and opportunity (not guarantee) to earn a reasonable rate of return on its investment.

Case Law and Historic Precedent

Case law and precedents setting the framework for utility regulation go back to the beginning of the 20th century and two important Supreme Court decisions.

***Bluefield* and *Hope*, collectively, define the regulatory standards that state commissions should follow in setting rates. These standards include:**

- **Allowing utility an opportunity to earn a return on and of its investments.**
- **Basing regulatory accounting on a book as opposed to market basis.**
- **Setting required returns at levels that make the utility a reasonably attractive investment, set at levels comparable to similar-situated companies, and allow the company to maintain itself as viable business enterprise.**

Rate Setting Components

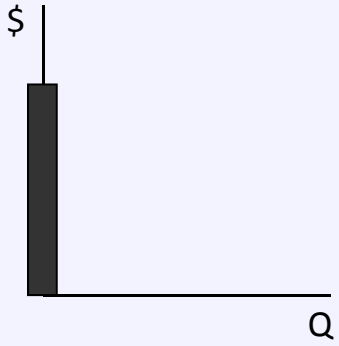
Rate Base (investment base) and the allowed rate for return (“cost of capital”).

Expenses and costs (“revenue requirements”).

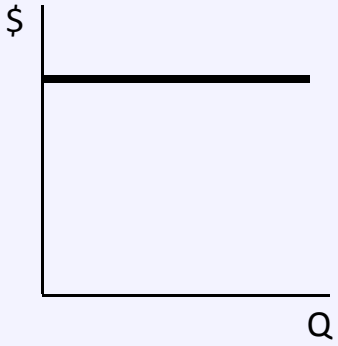
Policies, rates and tariffs (“revenue distribution” and “rate design”)

Rate Design Structures

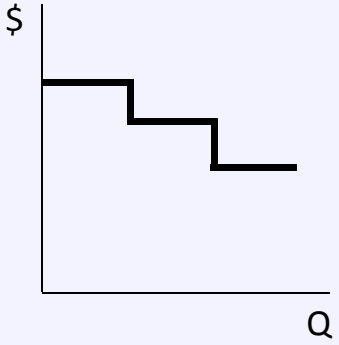
flat rate per period, no usage charge



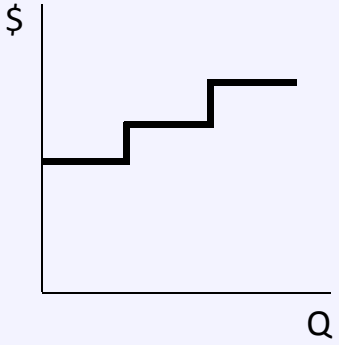
uniform: flat rate per unit



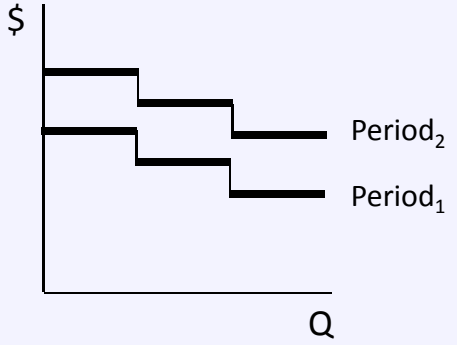
declining block



inverted block



seasonal or time-of-use



Costello, Ken. *Revenue Decoupling: Supplemental* Information. The National Regulatory Research Institute. Prepared for The Basics: Practical Skills for the Changing Electric, Natural Gas and Water Industries, sponsored by the Center for Public Utilities, New Mexico State University, October 18, 2007

Alternatives to “Traditional” Regulation

Other mechanisms being utilized by state regulatory commissions that differ from “traditional” rate of return regulation.

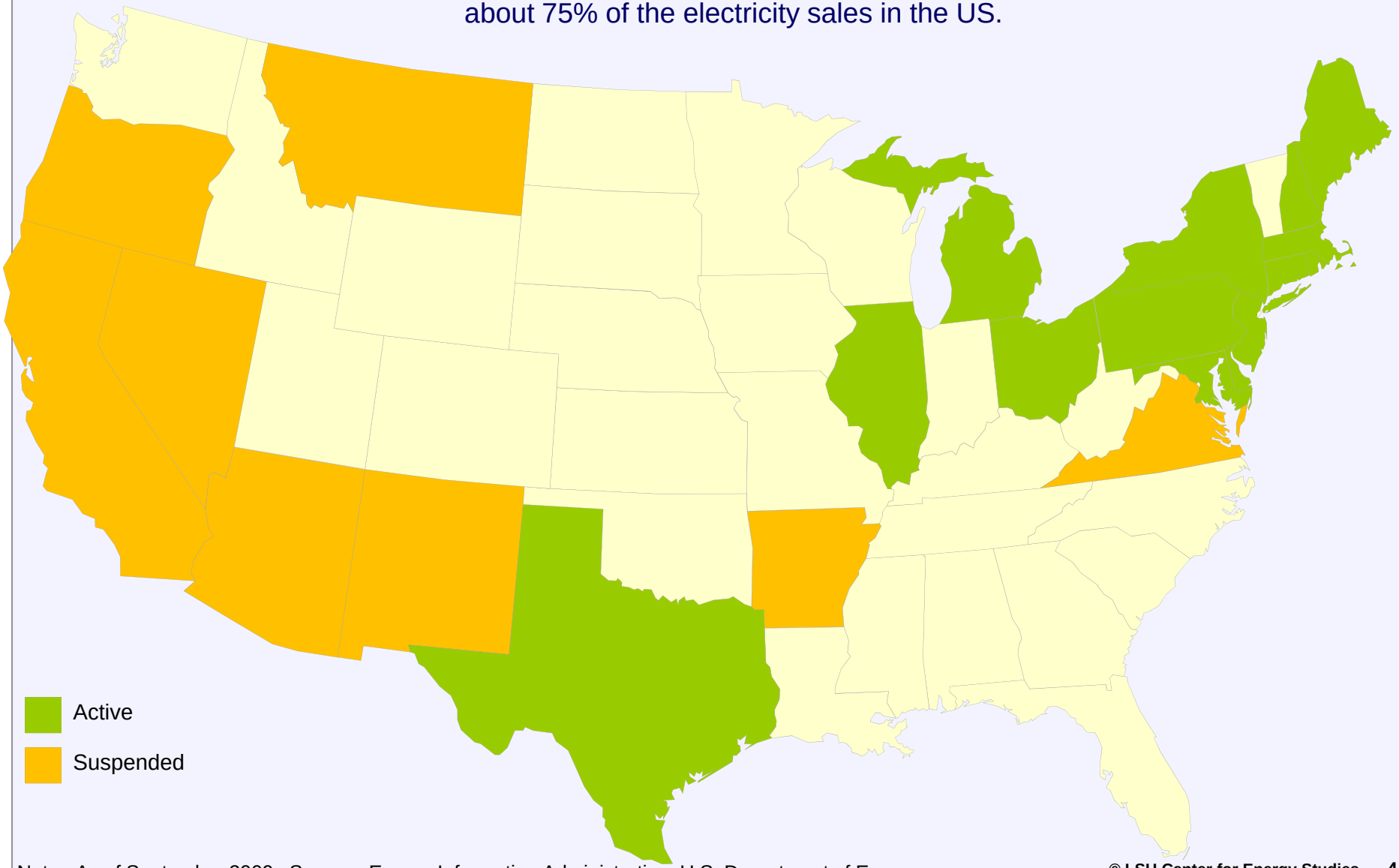
Retail competition and competitive procurement of supply resources (BGS service)

Incentive or Performance-Based Regulation

- **Shared earnings savings**
- **PBR mechanisms/price cap mechanisms**
- **Other alternatives and variations**

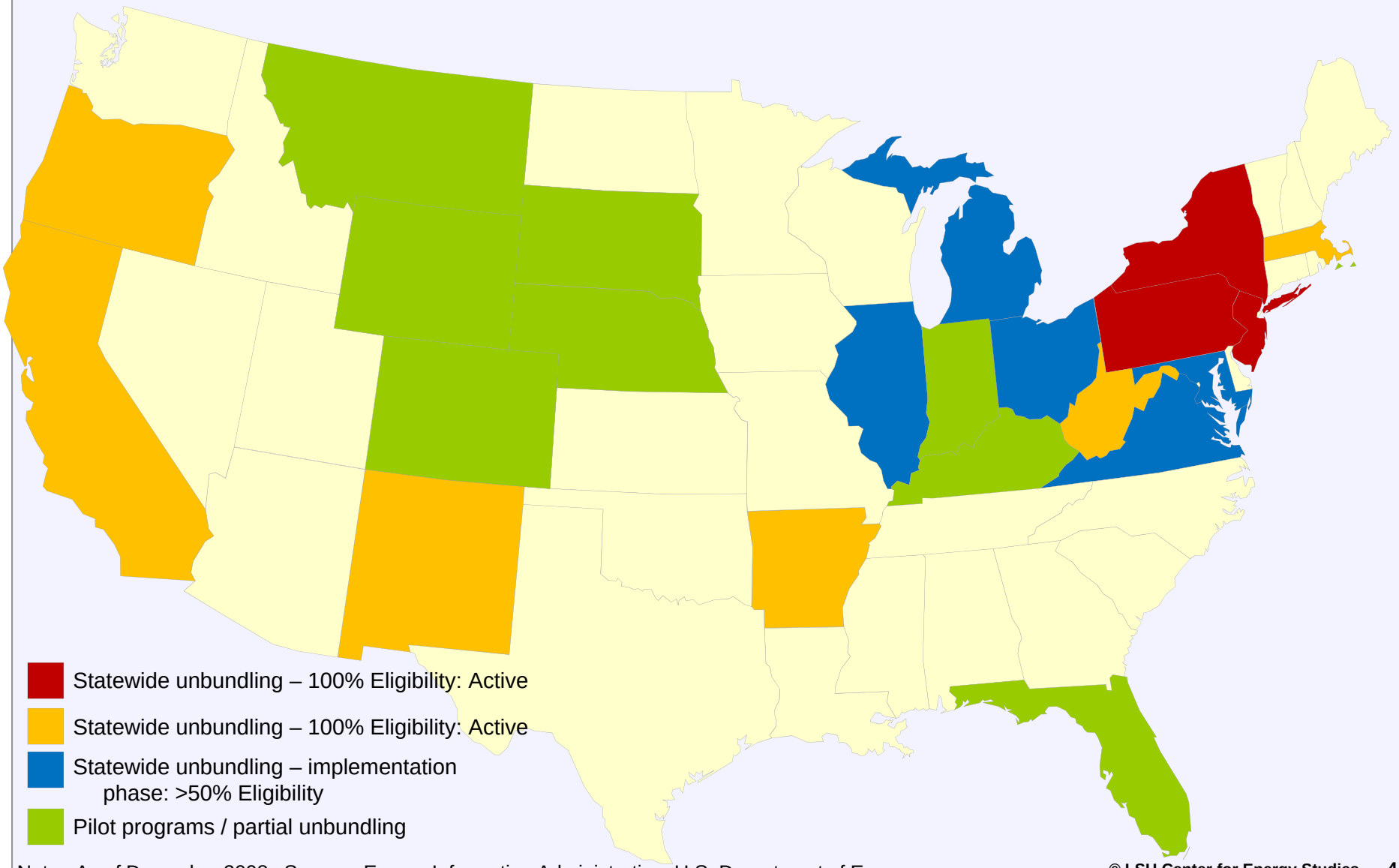
States with Retail Choice (Electric)

Currently there are 33 states that have RPS policies in place. Together these states account for about 75% of the electricity sales in the US.



Note: As of September 2009. Source: Energy Information Administration, U.S. Department of Energy.

States with Retail Choice (Gas)



Note: As of December 2008. Source: Energy Information Administration, U.S. Department of Energy.

Power and Gas Resource Planning

Historic Vs. Current Planning Practices

Historically, utilities developed resources and at the time those resources became operational, they would seek cost recovery into rates ("used and useful").

Commissions would make a prudence investigation before allowing these into rates (typically a rate case).

Negative experiences with this process in the 1980s, and corresponding prudence "disallowances" convinced many regulators that a more pro-active approach was necessary.

Gradual adoption throughout late 1980s, early 1990s of "integrated resource planning" ("IRP") which was a multi-faceted process that was much more "hands-on" from a regulatory perspective.

Major Components of Planning Process

Survey and assessment of existing resources, past planning challenges, anticipated challenges and resource constraints/requirements (i.e., mandates, new laws, etc.)

Forecast load requirements.

Examination of range of demand-side resources.

Examination of range of supply-side resources.

Rank order resources by costs and benefits, screening analysis.

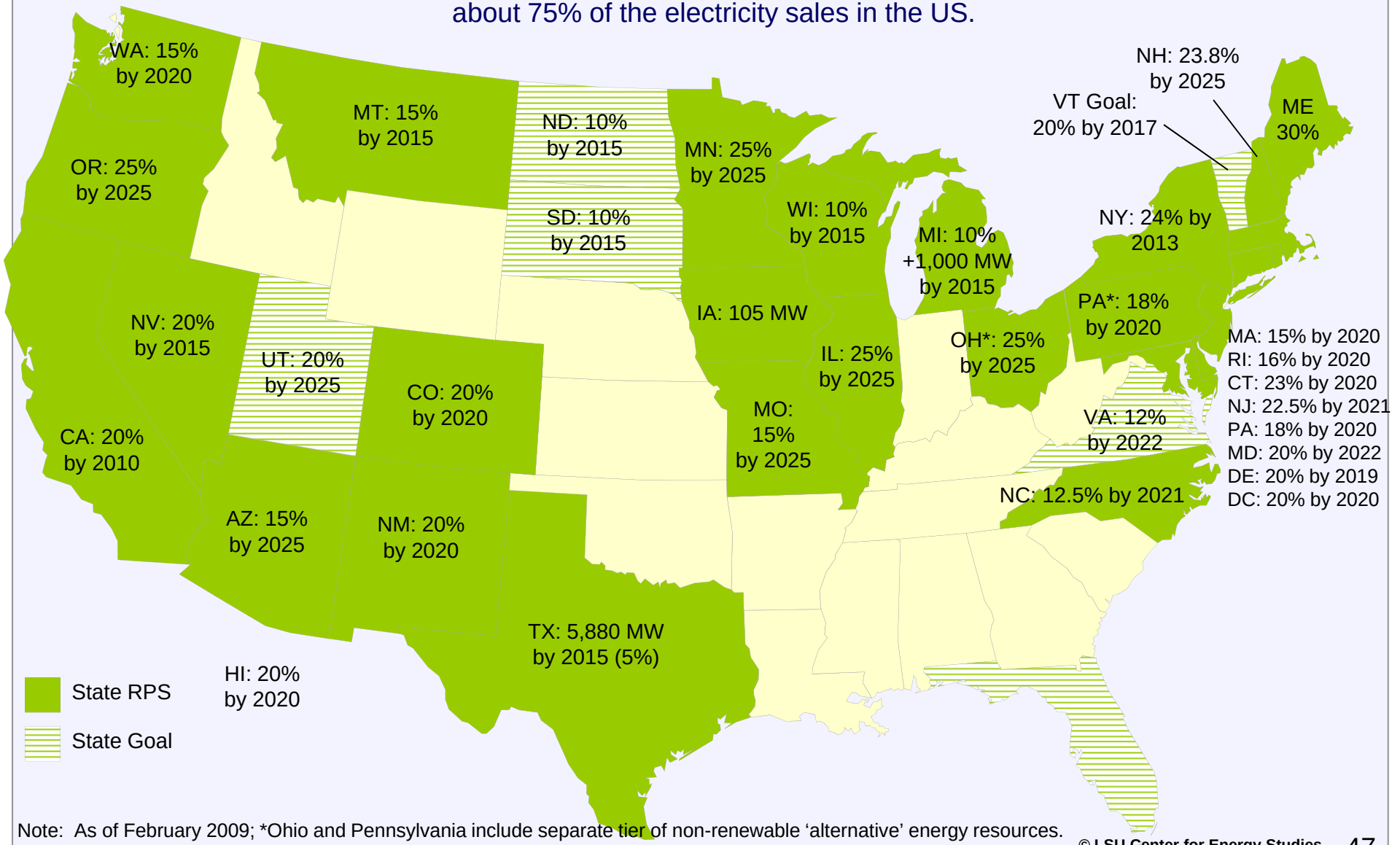
Scenario and sensitivity analysis.

Development of long-run plan and Five-Year Action Plan.

Emerging Resource Planning Issues in Alternative Energy and Efficiency

States with Renewable Portfolio Standards

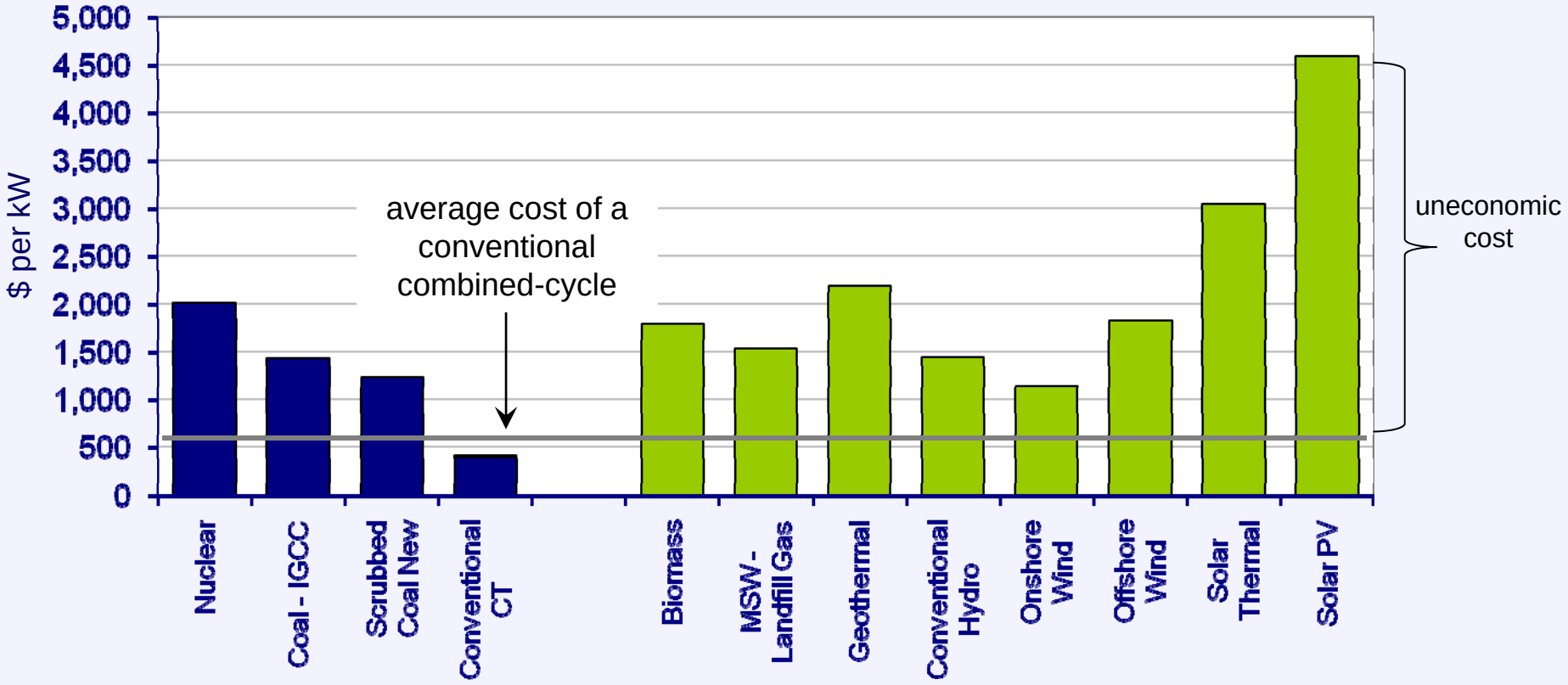
Currently there are 33 states that have RPS policies in place. Together these states account for about 75% of the electricity sales in the US.



Note: As of February 2009; *Ohio and Pennsylvania include separate tier of non-renewable 'alternative' energy resources.
Source: Database of State Incentives for Renewables and Efficiency.

Total Overnight Cost for New Plants

Resources are typically uneconomic without additional support

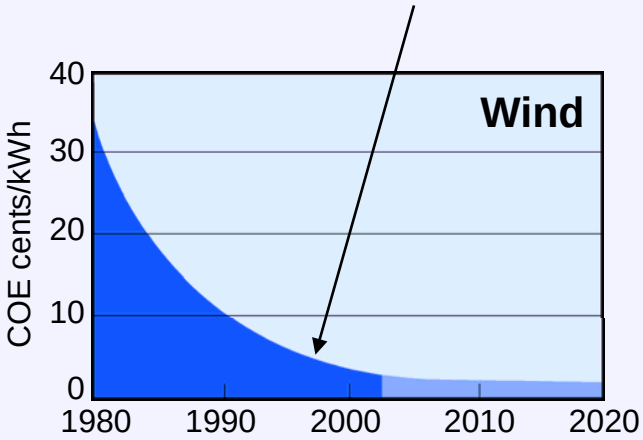


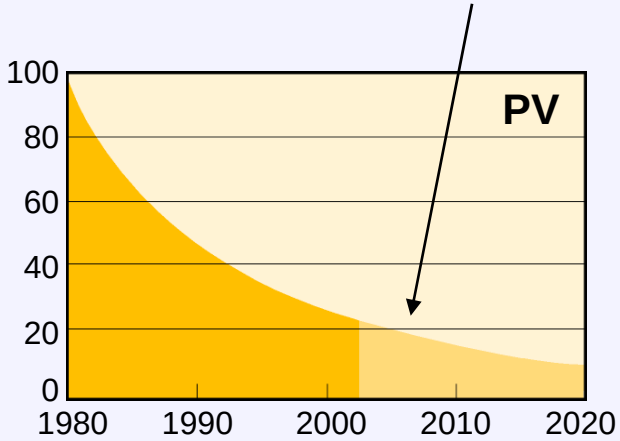
These differentials will have to be recovered from various funding sources

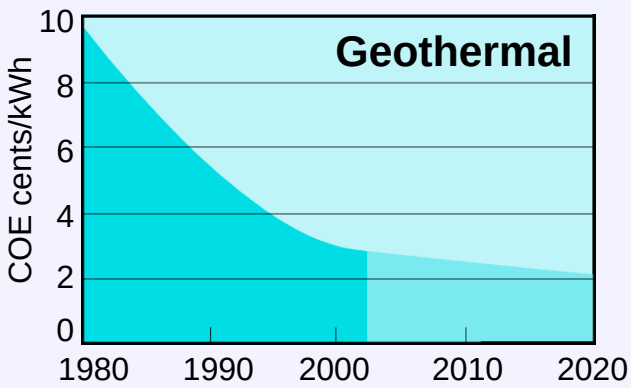
Source: Assumptions to the Annual Energy Outlook 2006

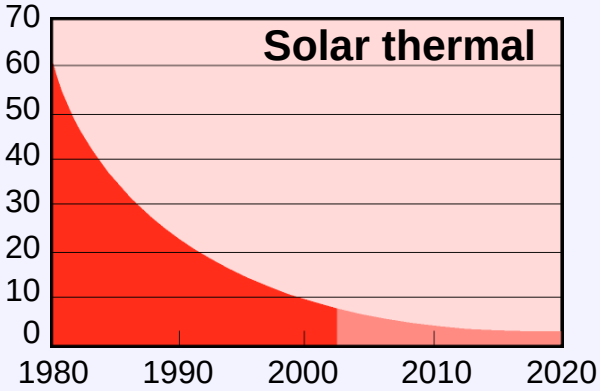
Renewable Energy Cost Trends

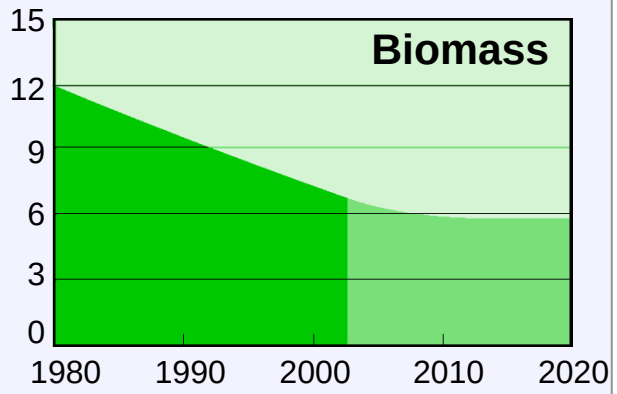
Will government support and policies reduce incentives to maintain cost efficiency trends











Levelized cents/kWh in constant $2000[1]

Source: NREL Energy Analysis Office

Energy Efficiency

Programs commonly referred to as "demand side management" – attempt to encourage more efficient use of electricity.

Energy efficiency programs: programs that encourage more efficient energy (kWh) consumption.

Load management programs: programs designed to encourage more efficient peak demand (kW) usage.

State Historic Energy Efficiency Performance (Electric Power End Use Efficiency)

State	ACEEE Rank	Average Rate to Retail Customers (cents/kWh)	Total EE Spending[1] 2006 ($000)	Total EE Spending[1] 2007 ($000)	Total EE Spending as a Percent of Total Revenues[2] 2006 (%)	Total EE Spending as a Percent of Total Revenues[2] 2007 (%)	EE Spending per Capita 2006 ($/per capita)	EE Spending per Capita 2007 ($/per capita)	EE Annual Savings Statewide Total 2006 (MWh)	EE Annual Savings Statewide Total 2007 (MWh)	EE Annual Savings as a Percent of Total State Sales 2006 (%)	EE Annual Savings as a Percent of Total State Sales 2007 (%)
California	1	12.3	$ 357,000	$ 645,800	1.1%	1.9%	$ 9.85	$ 17.64	1,912,000	2,275,000	0.7%	0.9%
Massachusetts	**3**	**14.6**	**$ 125,000**	**$ 120,157**	**1.5%**	**1.4%**	**$ 19.43**	**$ 18.49**	**455,000**	**489,622**	**0.8%**	**0.9%**
Connecticut	3	16.0	$ 70,999	$ 98,230	1.5%	2.1%	$ 20.31	$ 28.05	328,000	355,000	1.2%	1.3%
Vermont	4	12.2	$ 15,806	$ 23,690	2.4%	3.5%	$ 25.46	$ 37.78	62,872	105,243	1.1%	1.8%
Wisconsin	6	8.4	$ 77,683	$ 80,580	1.4%	1.4%	$ 13.94	$ 14.32	451,192	467,725	0.6%	0.7%
New York	6	14.7	$ 223,863	$ 241,543	1.0%	1.1%	$ 11.61	$ 12.40	823,837	n.a.	0.6%	n.a.
Oregon	7	7.3	$ 63,318	$ 69,107	2.0%	2.2%	$ 17.15	$ 18.54	369,827	437,494	0.8%	0.9%
Minnesota	7	7.1	$ 82,245	$ 91,239	1.8%	1.9%	$ 15.96	$ 17.53	411,999	463,543	0.6%	0.7%
New Jersey	9	12.4	$ 83,177	$ 95,914	0.9%	1.0%	$ 9.60	$ 10.96	227,764	242,270	0.3%	0.3%
Washington	9	6.6	$ 113,288	$ 126,678	2.2%	2.4%	$ 17.77	$ 19.67	630,691	635,062	0.7%	0.7%
Texas	11	9.7	$ 57,800	$ 79,500	0.2%	0.2%	$ 2.47	$ 3.36	397,305	457,808	0.1%	0.1%
Iowa	11	6.3	$ 55,296	$ 56,493	1.8%	1.8%	$ 18.60	$ 18.82	315,255	322,177	0.7%	0.7%
Rhode Island		13.5	$ 17,178	$ 17,400	1.6%	1.6%	$ 16.18	$ 16.23	96,048	64,995	1.2%	0.8%
Nevada		9.4	$ 24,000	$ 28,700	0.7%	0.8%	$ 9.63	$ 11.40	216,000	206,000	0.6%	0.6%
Average			**$ 97,618**	**$ 126,788**	**1.4%**	**1.7%**	**$ 14.85**	**$ 17.51**	**478,414**	**501,688**	**0.7%**	**0.8%**

Note:

[1] Includes utility and non-utility public benefit programs.

[2] Represents percent of total revenues for all utilities (IOUs and POUs).

Source: Kushler, M., York, D., and White, P. *Meeting Aggressive New State Goals for Utility-Sector Energy Efficiency: Examining Key Factors Associated with High Savings*. American Council for an Energy-Efficient Economy. ACEEE Report Number U091, March 2009.

Energy Efficiency Resource Standards

ID: Energy Plan sets conservation – DR and EE as priority resources

WA: pursue all cost effective conservation: ~10% by 2025

OR: IOU 2008 goals 34 MW; administered by Energy Trust OR

CA: 8% energy savings; 4,885 MW peak reduction by 2013 (from '04)

NV: EE up to 25% of RPS: ~5% electric reduction by 2015

UT: EE earns incentive credits in RE goal

CO:11.5% energy savings by 2020 ~ 3,669 GWh (from '08)

NM: 10% retail electric sales savings by 2020 (from '05)

NE: Interim Energy Plan stresses multi-sector EE improvements

KS: Voluntary utility programs

OK: PSC approved quick-start DR utility EE and DR programs

TX: 20% of load growth by 2010, using average growth rate of prior 5 years

HI: 30% electricity reduction: ~4,300 GWh by 2030 (from '09)

MI: 1% annual energy savings from prior year's sales

MN: 1.5% annual savings based on prior 3-years average, to 2015

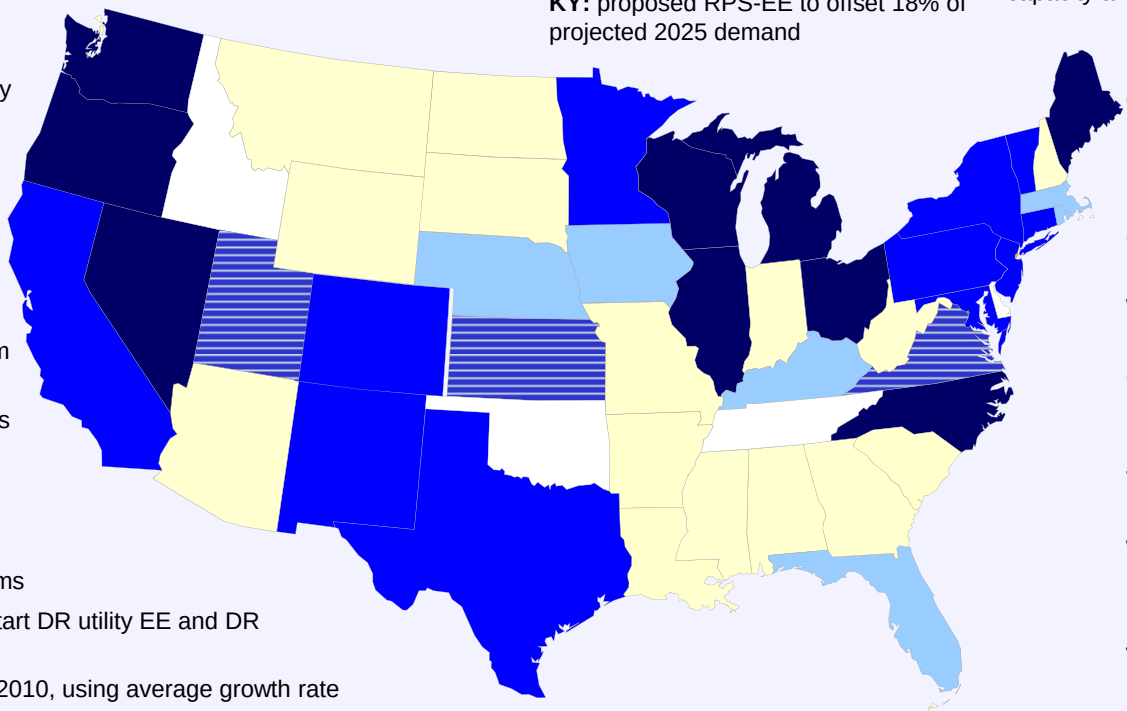
IA: 5.4% energy savings by 2020 ~ 1.5% annual

WI: RPS requires utility EE

IL: reduce energy use 2% by 2015 and peak 0.1% from prior year

OH: 22% energy savings by 2025 (from '09); reduce peak 8% by 2018

KY: proposed RPS-EE to offset 18% of projected 2025 demand



ME: 30% energy savings; 100 MW peak electric reduction by 2020

VT: 11% energy reductions by 2011 (2% annual) administered by Efficiency VT

MA: 25% of electric load from DSR, EE by 2020: capacity and energy

NY: reduce electric use 15% by 2015 from levels projected in 2008

CT:4% energy savings (1.5% annual) and 10% peak reduction by 2010 (from '07)

RI: reduce 10% of 2006 sales by 2022

NJ: BPU proceeding to reduce consumption, peak

DE: Sustainable Energy Utility charged with 30% energy reduction by 2015

PA: reduce use 3%; peak 4.5% by 2013 as % of 2009-10 sales

MD: reduce per capita electricity use and peak by 2015 (from '07)

VA: reduce electric use 10% by 2022 (from '06)

WV: EE & DR earn one credit for each MWh conserved in the 25% by 2025

NC: EE to meet up to 25% of RPS by 2011

TVA: reduce energy use 25% and cut peak 1,400 MW by 2012 (from '08)

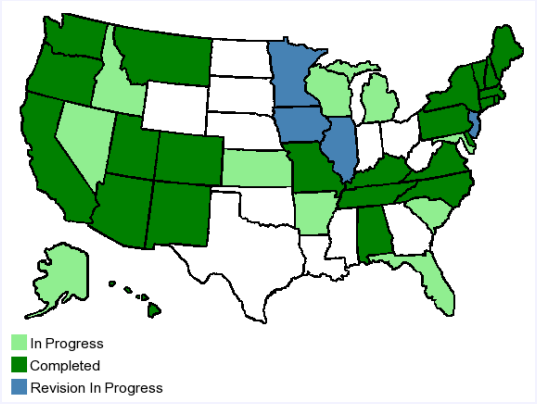
- EE only as part of an RPS law, rule or goal
- EERS by regulation or law (stand-alone)
- Voluntary standards (in or out of RPS)
- EE goal proposed/being studied
- Other EE or DSM rule or goal

Source: Federal Energy Regulatory Commission

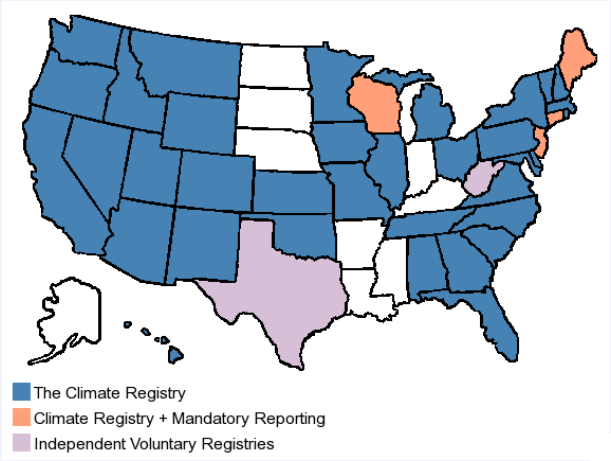
Climate Change

State Initiatives on Climate Change Policies & Activities

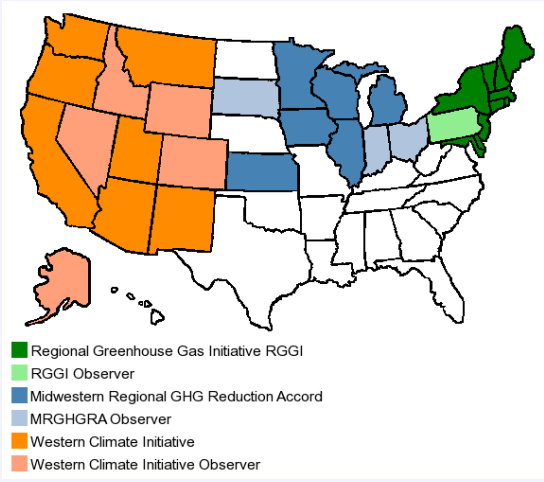
States with Climate Plans

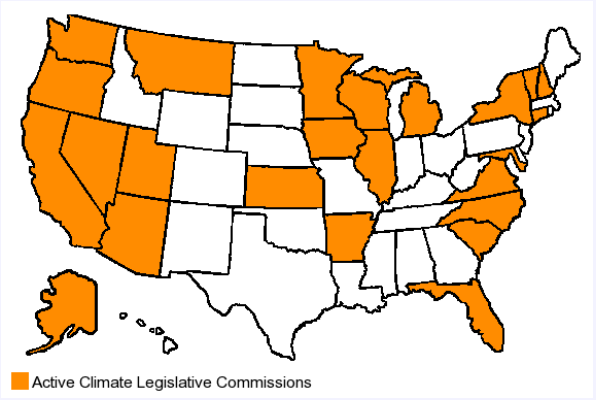


States with GHG Registries

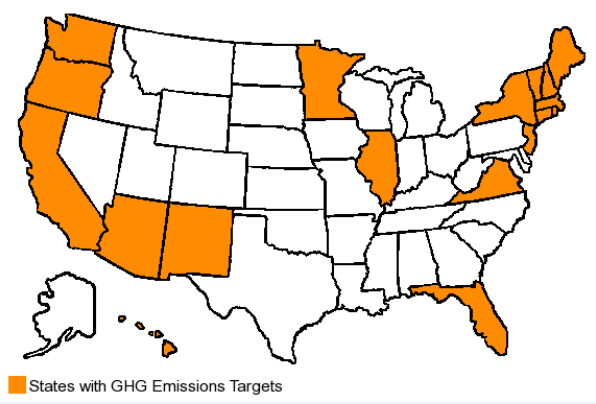


Regional Initiatives





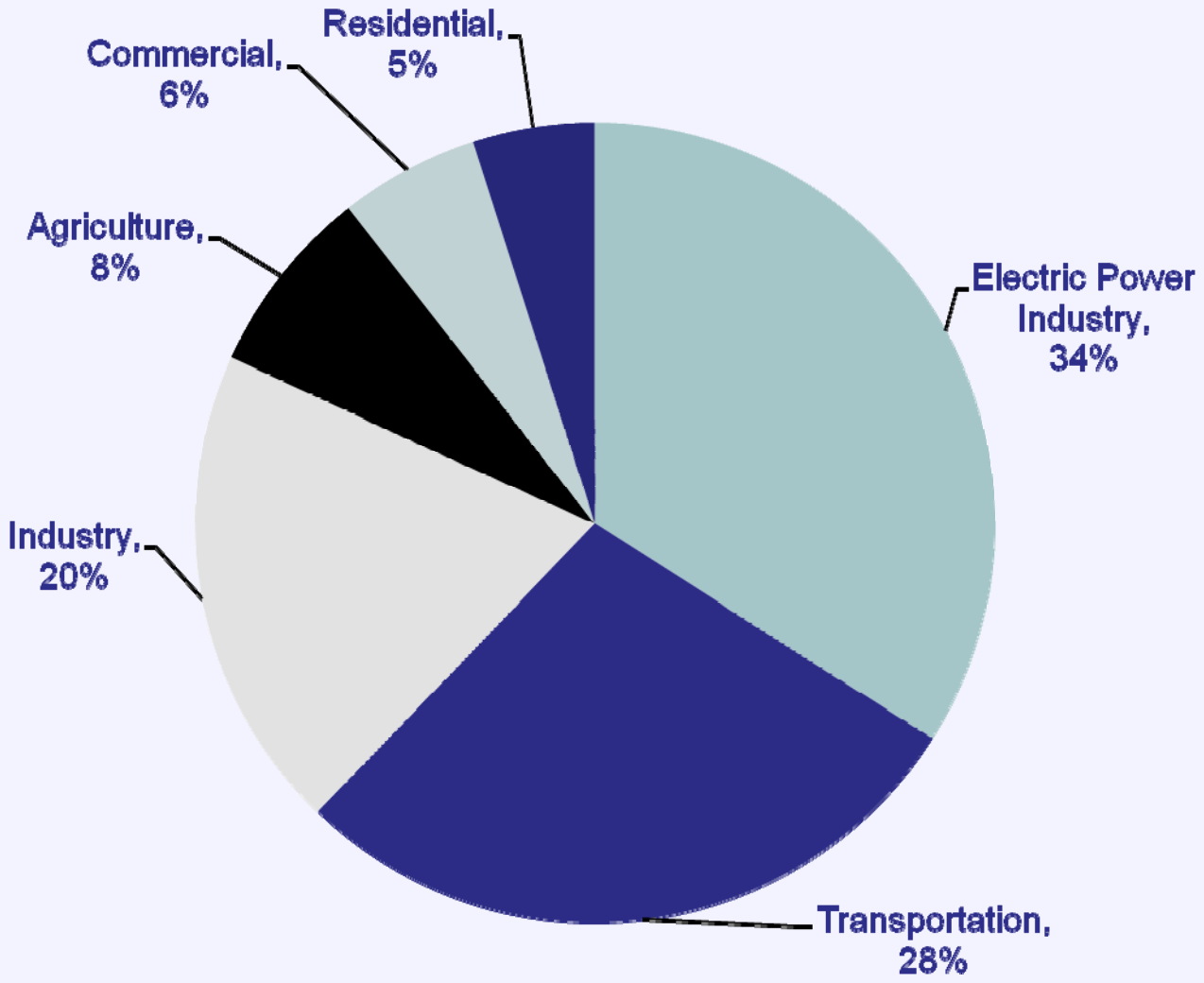
States with Climate Policy Groups



States with GHG Emissions Targets

Source: Pew Center on Global Climate Change

U.S. Greenhouse Gas Emissions Allocated to Economic Sector (Tg CO_2 Eq.)



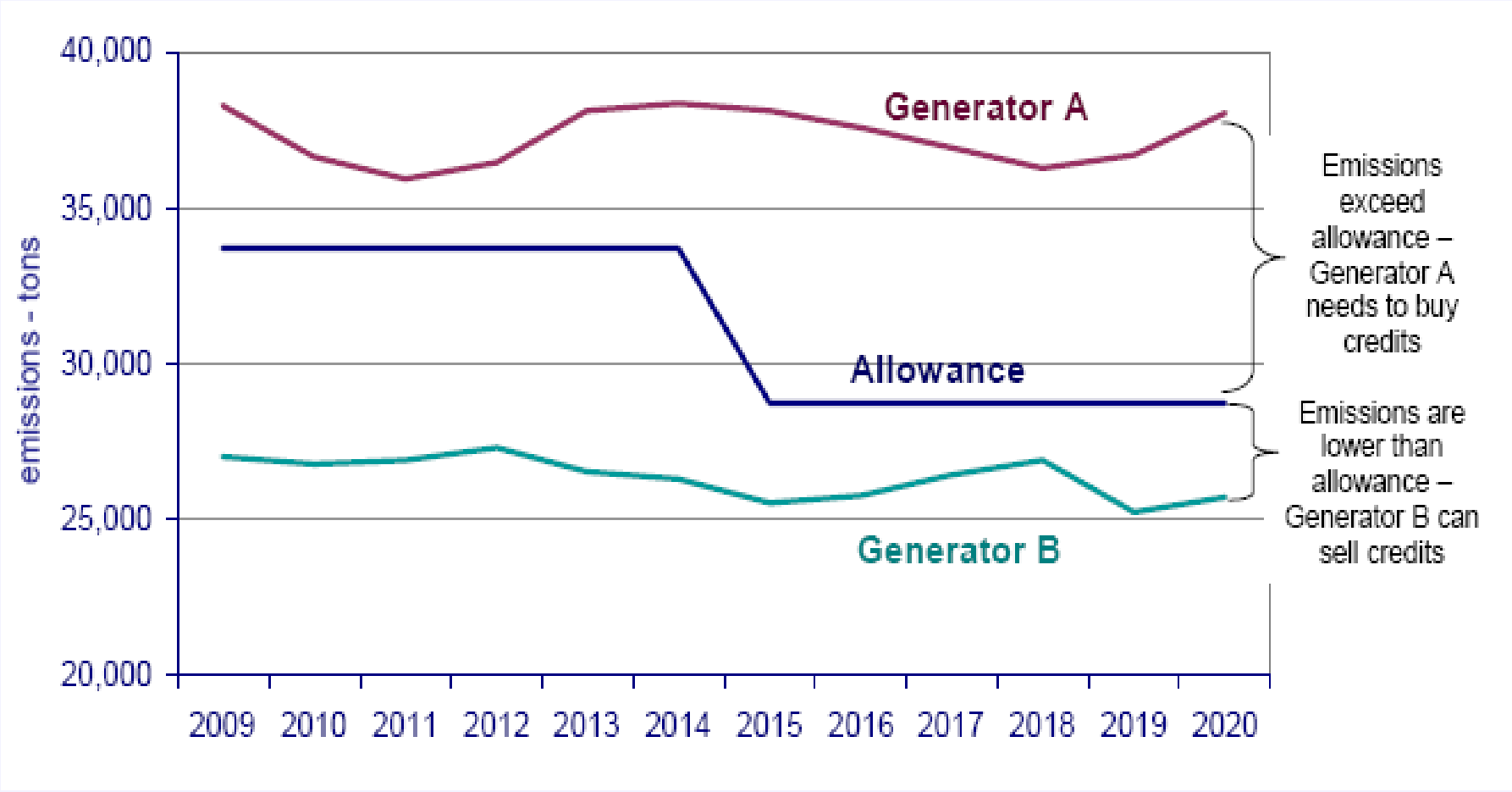
Source: U.S. Environmental Protection Agency

Different Policy Frameworks

Policy Type	Definition
Carbon Tax	Places a fixed tax on end-user energy usage.
Cap and Trade (Downstream, Emissions Type)	Would require certain emitting sectors to acquire emission credits for fuel burned in production processes.
Standards	Would change the efficiency (emissions) standards of appliances, motors, equipment, automobiles, etc.

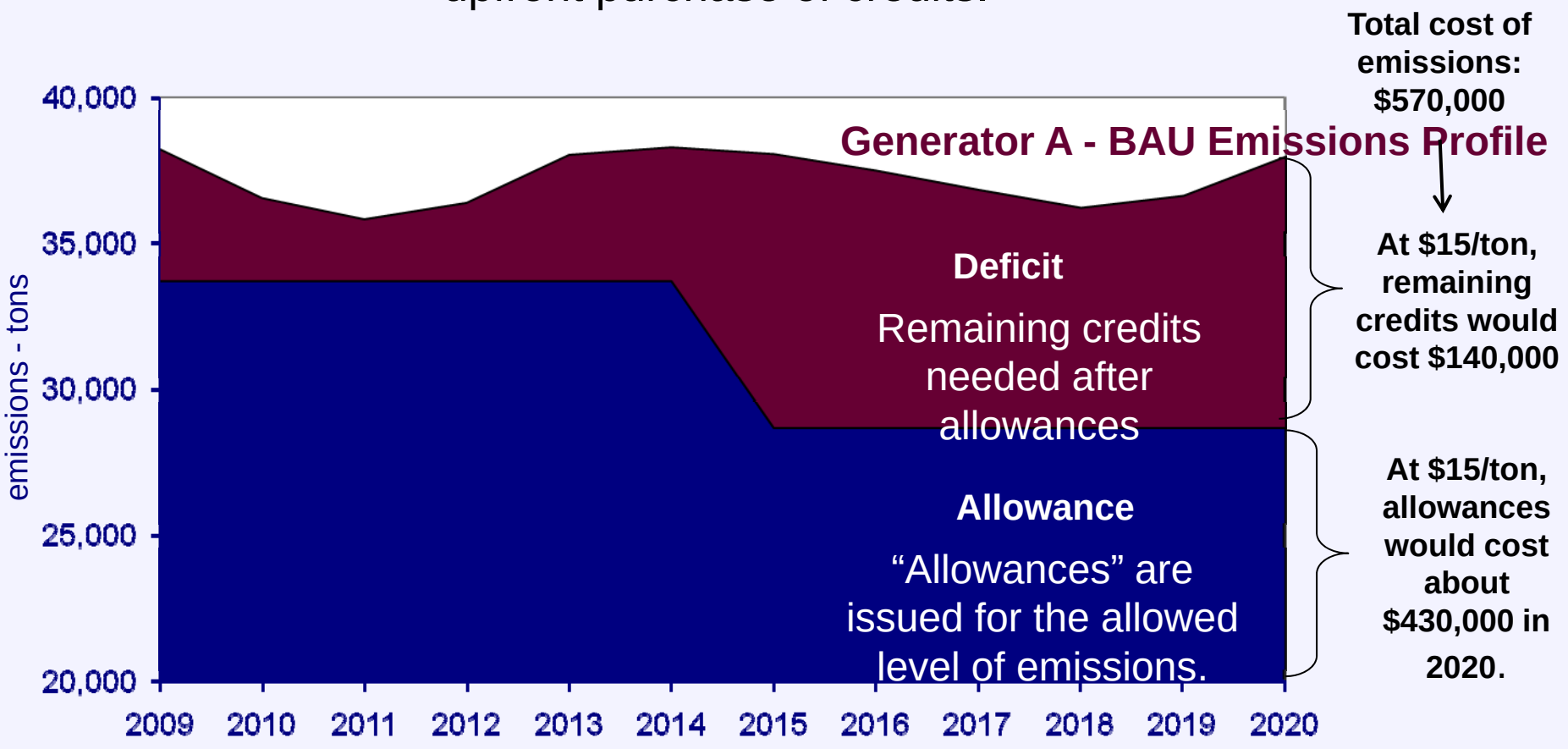
How Does Cap & Trade Work?

Simply speaking, sources “long” on credits will trade with those that are “short.”



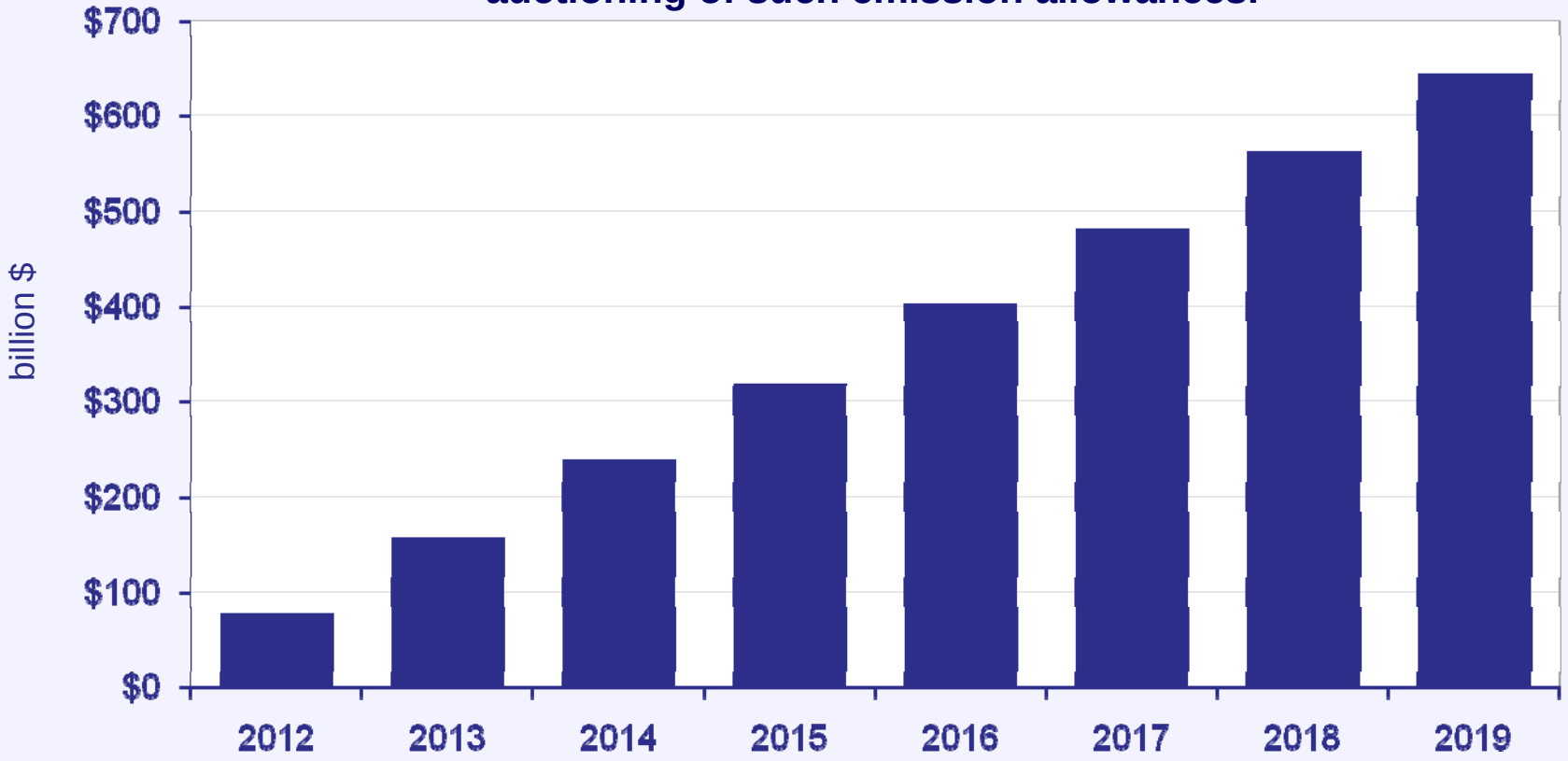
Auction Versus Allowance

An auction system is more expensive because it requires a larger upfront purchase of credits.



Revenue Projections in Budget for Cap and Trade

The Obama budget assumes that by 2012, the Treasury will collect $78.6 billion in new revenue from carbon emissions permits. From 2012 to 2019, it envisions that a total of $645.7 billion would be raised from auctioning of such emission allowances.



Conclusions

Conclusions

Electric and gas industry are both important components of overall energy business.

Outside of transportation, one of the larger sectors influencing end-use energy consumption.

Sectors face various different levels of regulation, competition, and policy initiatives.

Climate change and clean energy initiatives will be felt significantly in these sectors.

Most all clean energy initiatives have to deal with the regulatory process. Effective development of clean energy resources REQUIRES a thorough understanding of the byzantine nature of utility/energy regulation.

Questions, Comments, & Discussion

dismukes@lsu.edu

www.enrg.lsu.edu