New Jersey

Current Energy Landscape

RUTGERS
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Outline

Current Energy and Environmental Status

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Energy Data

This presentation provides a picture of the current energy landscape in New Jersey. The main purpose is to illustrate trends and relationships of fuel sources, end uses, prices, and economic and environmental impacts over time. The New Jersey Energy Data Center provides energy consumption, price and revenue data; environmental data; and economic data for New Jersey and other regional states. The data is available at www.njenergydatacenter.org

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1. Energy Master Plan

The Energy Master Plan, published in October 2008, proposes a road map toward an energy future with adequate, reliable energy that is environmentally responsible and competitively priced.

Maximize energy conservation and energy efficiency

- Transition the State energy efficiency programs to the utilities;
- Establish a new state building code by the end of 2009 where new construction is at least 30% more energy efficient than current new construction;
- Enhance standards for new appliances and other equipment.

Reduce peak electricity demand by 5,700 MW by 2020

Meet 30% of the State's electricity needs from renewable sources by 2020

- Develop renewable capacity: 900 MW of biomass, at least 3,000 MW of offshore wind and 200 MW of onshore wind;
- Increase the solar energy goal from 2.12% to 2,120 GWh by 2020;
- 50 MW carve out for new and emerging technologies;
- Increase the Renewable Portfolio Standard for the years 2021 to 2025.

Develop a 21st century energy infrastructure

- Develop utility master plans through 2020;
- Install 1,500 MW of combined heat and power cogeneration facilities by 2020.

Invest in innovative clean energy technologies and businesses

- Expand the Edison Innovation Fund to invest and support innovative clean energy technologies and business development;
- Develop timely and industry recognized job training programs;
- Establish the Energy Institute of New Jersey to support energy research efforts at New Jersey colleges and universities.

Reference: New Jersey Energy Master Plan (October 2008). Accessed at http://www.nj.gov/emp/

2. Greenhouse Gas Reduction

Global Warming Response Act

- Signed into law on July 6, 2007.
- Was preceded by Executive Order 54, released February 13, 2007.
- Greenhouse gases are to be reduced 20% by 2020 (to 1990 emissions levels) and 80% below 2006 levels by 2050.
- The legislation requires the New Jersey Department of Environmental Protection to develop a greenhouse gas emissions monitoring and reporting system.

New Jersey Department of Environmental Protection (NJDEP)

- Proposed a greenhouse gas emissions monitoring and reporting system on January 21, 2009.
- Member of the Midwest Regional Carbon Sequestration Partnership. Currently conducting a preliminary assessment of geological sequestration in New Jersey.
- Low Emission Vehicle rules went into effect in 2009.
- Reports:
  - Global Warming Response Act Recommendation Report (December 15, 2008).
  - New Jersey Greenhouse Gas Inventory and Reference Case Projections 1990-2020 (November 2008).
    - Electricity consumption accounted for 21% of greenhouse gas emissions in 2000.
    - 33% of New Jersey's greenhouse gas emissions are from the residential, commercial and industrial sectors.

References: New Jersey Department of Environmental Protection. Office of Climate and Energy. Accessed at http://www.nj.gov/dep/oce/index.htm
The State of New Jersey. Global Warming. Accessed at http://www.state.nj.us/globalwarming/initiatives/
The State of New Jersey, Office of the Governor. News Release: Corzine Administration on Global Warming (July 11, 2009). Accessed at http://www.nj.gov/governor/news/news/2007/approved/20070711b.html

2.1 Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort of 10 Northeast and Mid-Atlantic states to limit greenhouse gas emissions from the power sector.

Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont have capped CO_2 emissions from the power sector at 188 million short tons per year, and will require a 10% reduction in emissions by 2018.

The ten individual state programs together function as a single regional compliance market for carbon emissions

- Regulated power plants must submit allowances in an amount equal to their emissions at the end of each compliance period. The plants can use a CO_2 allowance issued by any participating state to comply with their respective state program.
- Nearly all allowances issued by participating states are auctioned and auction proceeds are used to invest in consumer benefits such as energy efficiency and clean energy technologies.

New Jersey's RGGI auctions have raised more than $50 million in 2009

The use of RGGI auction proceeds is set forth in the Global Warming Solutions Fund Act, signed January 13, 2008. The Act established a special, non-lapsing Global Warming Solutions Fund. The auction proceeds are dedicated:

- 60% to the New Jersey Economic Development Authority for end-use energy efficiency, combined heat and power, and renewable energy project grants and loans in the commercial, institutional, and industrial sectors;
- 20% to the New Jersey Board of Public Utilities to support programs to reduce electricity costs for low- and moderate-income customers;
- 20% to the New Jersey Department of Environmental Protection to support local government programs to implement greenhouse gas emissions reduction measures (10%) and programs to enhance forest stewardship and tidal marsh restoration for carbon sequestration (10%).

References: Regional Greenhouse Gas initiative. Accessed at http://www.rggi.org/home
New Jersey Department of Environmental Protection. Office of Climate and Energy. Regional Greenhouse Gas Initiative. Accessed at http://www.nj.gov/dep/oce/rggi.htm

3. Energy Efficiency

New Jersey's Clean Energy Program (NJCEP), administered by the NJBPU, promotes increased energy efficiency and renewable energy. NJCEP offers financial incentives, programs and services for residential, commercial, and municipal customers.

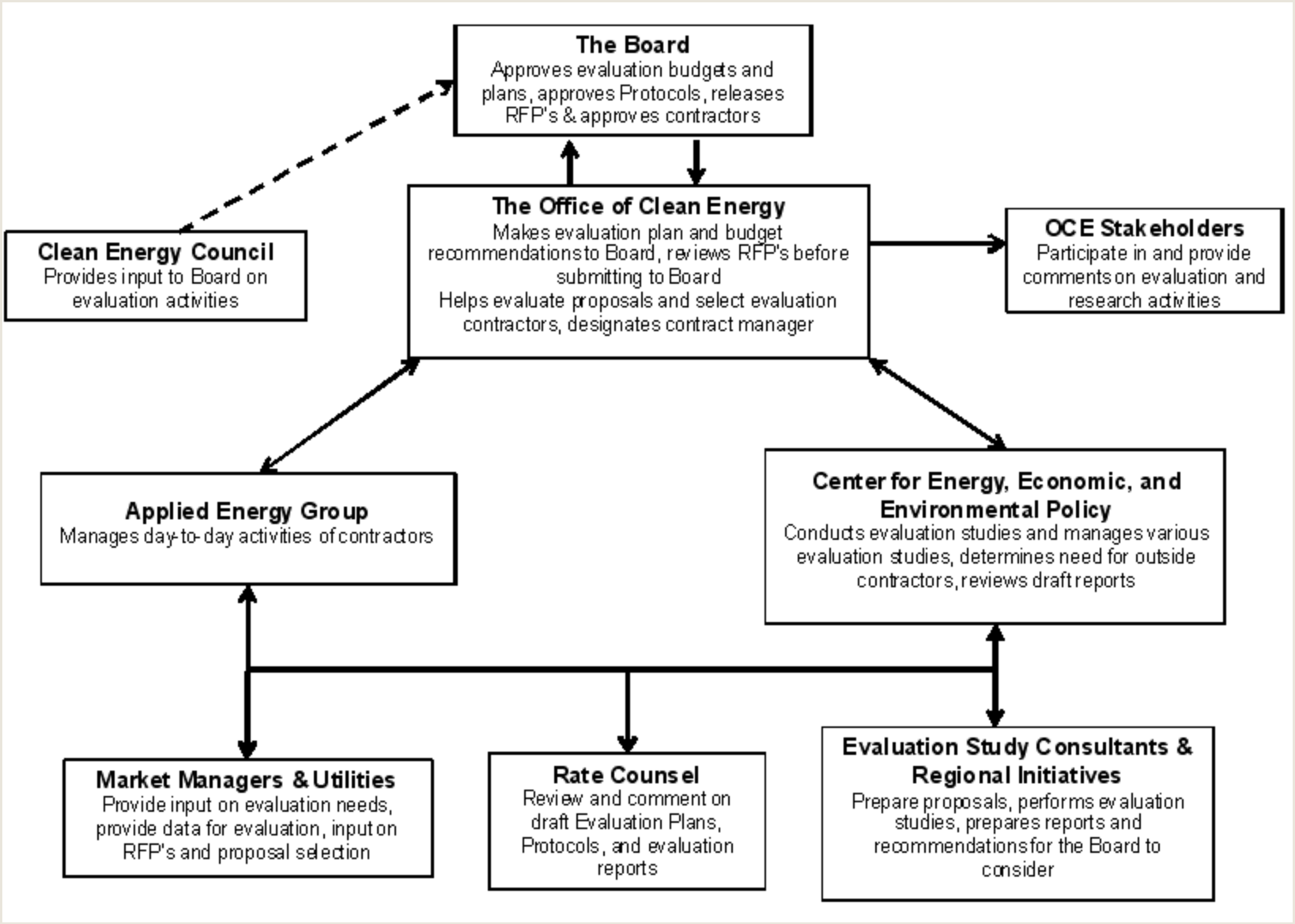
Clean Energy Council

- Established in 2003 by the New Jersey Board of Public Utilities (NJBPU)
- Comprised of a cross section of government and industry representatives, energy experts, public interest groups, and academics
- Provides input to the NJBPU regarding the design, budgets, objectives, goals, administration and evaluation of New Jersey's Clean Energy Program

An organizational chart of the New Jersey Clean Energy Program is provided on the next slide.

References: New Jersey Clean Energy Program. 2010-2011 Evaluation and Research Plan DRAFT Report (December 1, 2009).
New Jersey Clean Energy Program. Accessed at http://www.njcleanenergy.com

New Jersey Clean Energy Program Organizational Chart



3.1 Energy Efficiency Programs

Current Programs 2009

- The Energy Efficiency Programs are administered by third-party contractors, or Market Managers. Honeywell International administers the residential energy efficiency and renewable energy programs and TRC Energy Services administers the commercial and industrial energy efficiency programs.
- The New Jersey Clean Energy Program is funded through the Societal Benefits Charge, a charge included in the rates of natural gas and electric customers. The funds are collected by the utilities and, after netting their program expenses, sent to the New Jersey Clean Energy Trust Fund held by the New Jersey Department of the Treasury. The program currently has a budget of approximately $260 million.

2009 New Jersey Energy Efficiency Programs	
Residential	***Commercial/Industrial***
Home Performance with Energy Star	SmartStart Buildings
New Jersey Energy Star Homes	Pay for Performance
Energy Efficient Products	Local Government Energy Audit
COOL & WARM Advantage	Combined Heat and Power
New Jersey Comfort Partners	Direct Install
Freezer and Refrigerator Recycling	Teaching Energy Awareness with Children's Help
Home Energy Analysis	
Community Partners Initiative	
Solar Domestic Hot Water Heater	

Reference: New Jersey Clean Energy Program. Accessed at http://www.njcleanenergy.com

3.2 2006 Benefit-Cost Analysis

- The 2006 benefit-cost analysis reviewed 11 New Jersey Clean Energy Program energy efficiency programs for the New Jersey Board of Public Utilities.
- Five benefit-cost analyses are run, including the Participant Cost Test, Program Administrator Cost Test, Ratepayer Impact Measure, Total Resource Cost Test, and Societal Cost Test.

	Residential Programs					
	New Construction	HVAC	Low Income	Home Performance	Conservation Kits	Energy Star Room AC
Participant Cost Test	$29,449,938	$42,909,251	$18,217,619	$15,201	($4,540)	$253,794
Benefits-Cost Ratio	3.1	4.3	0	11.1	0.9	1.6
Program Administration Cost Test	$9,308,381	$24,724,889	($5,987,865)	($1,937,277)	($363,837)	($147,794)
Benefits-Cost Ratio	1.5	2.8	0.7	0.01	0.01	0.7
Ratepayer Impact Measure	$5,490,040	$17,231,703	($12,378,190)	($1,938,525)	($363,837)	($403,603)
Benefits-Cost Ratio	1.2	1.8	0.5	0.01	0.01	0.4
Total Resource Cost Test	$8,044,360	$24,496,600	($4,507,653)	($1,937,565)	($371,836)	($365,087)
Benefits-Cost Ratio	1.4	2.5	0.8	0.01	0.01	0.5
Societal Cost Test	$9,579,745	$26,442,540	($4,172,823)	($1,936,686)	($371,600)	($365,014)
Benefits-Cost Ratio	1.5	2.7	0.8	0.01	0.01	0.5

	Commercial & Industrial Programs				
	Cool Cities	New Schools	Combined Heat & Power	New Construction	Retrofit
Participant Cost Test	$228,184	$5,627,012	$6,366,712	$18,379,080	$104,566,559
Benefits-Cost Ratio	0	5.2	1.6	14.7	8.3
Program Administration Cost Test	($978,492)	$2,986,334	$7,391,818	$10,437,632	$53,856,434
Benefits-Cost Ratio	0.1	2.9	5.3	8.8	4.4
Ratepayer Impact Measure	($1,075,242)	$1,666,377	$1,184,517	$2,611,020	$16,008,128
Benefits-Cost Ratio	0.1	1.6	1.1	1.3	1.3
Total Resource Cost Test	($945,244)	$3,340,266	$1,251,758	$12,784,684	$65,657,589
Benefits-Cost Ratio	0.2	3.0	1.1	8.6	5.0
Societal Cost Test	($945,206)	$3,589,314	$1,254,851	$12,812,589	$67,195,260
Benefits-Cost Ratio	0.2	3.1	1.1	8.6	5.0

Reference: Cost-benefit Analysis of the New Jersey Clean Energy Program Energy Efficiency Programs (January 9, 2008). Accessed at http://policy.rutgers.edu/ceeep/publications/2008/costbenefitclean.pdf

3.3 2009 Utility Stimulus Benefit-Cost Analysis

Economic Stimulus Plan

- The Economic Stimulus Plan is a multi-pronged proposal to stimulate New Jersey's economy. As part of the proposal, the New Jersey Board of Public Utilities was to accelerate current projects to strengthen current economic activity and employment, including providing the State's electric and gas utilities $500 million for energy efficiency programs.
- The electric and natural gas utilities have proposed or begun implementing 1-2 year energy efficiency programs. The energy efficiency programs vary by utility, but all or most of the utilities proposed Home Performance with Energy Star, Residential HVAC (heating, ventilation and air conditioning), and Commercial Direct Install.
- The benefit-cost analysis results for the all of the programs proposed by each utility:

	Total Program					
	South Jersey Gas	PSE&G	New Jersey Natural Gas	Jersey Central Power & Light	Atlantic City Electric	Elizabethtown Gas
Participant Cost Test	$47,909,515	$25,840,986	$56,403,306	$72,047,218	$96,405,773	$35,575,691
Benefits-Cost Ratio	7.4	2.8	6.4	7.9	6.0	5.2
Program Administration Cost Test	($6,124,391)	($3,736,747)	($13,606,107)	$30,251,478	$51,373,748	$375,156
Benefits-Cost Ratio	0.7	0.8	0.5	2.4	2.8	1.0
Ratepayer Impact Measure	($11,758,852)	($10,412,255)	($19,804,941)	$13,283,981	$30,389,129	($4,681,827)
Benefits-Cost Ratio	0.6	0.5	0.5	1.3	1.6	0.8
Total Resource Cost Test	$22,412,726	$4,752,610	$22,100,894	$44,233,932	$66,343,191	$18,339,063
Benefits-Cost Ratio	3.1	1.2	2.5	4.0	4.1	2.6
Societal Cost Test	$23,050,497	$5,673,485	$22,743,781	$39,752,217	$61,654,215	$18,841,281
Benefits-Cost Ratio	3.2	1.3	2.6	3.7	3.9	2.6

References: New Jersey Board of Public Utilities. BPU Docket No. GR0901: In the Matter of the Petition of New Jersey Natural Gas Company for Approval of Energy Efficiency Programs with an Associated Cost Recovery Mechanism (January 19, 2009).
Utility Energy Efficiency Petitions available at http://www.state.nj.us/bpu/agenda/announcements/approved/stimulus.html
Center for Energy, Economic & Environmental Policy. Benefit-Cost Analysis of the Proposed Energy Efficiency Utility Programs Associated with the New Jersey Economic Stimulus Plan (January 2010).

3.4 Energy Efficiency Evaluation

Evaluation and research activities serve to provide a continual feedback loop to policymakers and program administrators and managers. Entities in oversight, delivery, evaluation, and management of the program include the BPU, Office of Clean Energy, CEEEP, Applied Energy Group and the Market Managers.

- Annual, recurring evaluation activities include updating the evaluation plan, performing program cost-benefit analyses, and revising and updating the New Jersey Protocols to Measure Resource Savings.

Proposed 2010 Evaluation Studies

Study	Type of Study	Description
Residential Appliance Saturation Survey	Market Assessment	Gather statistically significant, on-site information on the penetrations of a wide range of energy consuming devices, and the use of different heating fuels in NJ facilities, ownership and systems. Sufficient data gathered to permit assessment of differences by building type, owner vs. renter, age of building, and region within the state.
C&I Equipment Saturation Survey	Market Assessment	
Avoided Cost Assessment of Energy Costs	Avoided Cost Assessment	Develop a set of avoided costs to be used for screening all efficiency measures and programs and to characterize the benefits from renewable generation and capacity. Include an assessment of avoided transmission and distribution costs, demand reduction induced price effects, and environmental externalities.
Renewable Energy Portfolio Standards	Market Assessment	Examine and quantify the progress and barriers to market development required to meet NJ's Renewable Portfolio Standard goals, for solar and non-solar resources.
HVAC Baseline Update	Market Assessment	Define current residential HVAC technology and installation practice baseline, for both gas and electric heating and cooling systems.
Home Performance with Energy Star Impact Evaluation	Impact Evaluation	Assess actual energy bill savings from program participants.
Green New Jersey Resource Team Process Evaluation	Process Evaluation	Assess the initiative's effectiveness in achieving those objectives (reach customers who have never used CFLs and change their attitudes regarding CFLs and conservation).
SmartStart Buildings Program Process Evaluation	Process Evaluation	Assess program processes to determine effectiveness and recommend improvements. Interview participants and market actors involved in the projects to gather feedback on the programs.
Follow-up to 2009 KEMA Impact Evaluation Studies	Impact Evaluation	Studies conducted following up on: 1. Focused research to develop attribution factors for application in the 2011 Protocols; 2. Research to develop appropriate "baselines" for use in the 2011 Protocols' calculations of savings

Reference: New Jersey Clean Energy Program. 2010-2011 Evaluation and Research Plan DRAFT Report (December 1, 2009).

3.4 Energy Efficiency Evaluation (continued)

New Jersey Evaluation Timeline: 1999 - 2012

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
BPU Proceedings			CRA Funding Cycle 2001-2004				CRA Funding Cycle 2005-2008				CRA Funding Cycle 2009-2012			
EDECA														
CRA Proceeding														
EMP														
Major Evaluation Studies														
Evaluation Plan														
Cost-Benefit Analysis														
Retrospective							EE			EE	EE	EE/RE	EE/RE	EE/RE
Prospective											EE	EE/RE	EE/RE	EE/RE
Market Potential	EE/RE					EE/RE				EE			EE/RE	
Market Assessment								EE		RE		RE		
Baseline Study		EE	EE									EE	EE	
Impact Evaluation											EE/RE	EE	EE	
Process Evaluation						RE						EE/RE	EE	
Tracking System Assessment														
Protocols						EE/RE			EE/RE		EE/RE	EE/RE	EE/RE	EE/RE
Economic Impact Study						RE					RE			
Survey & Focus Group									EE/RE	EE/RE				

Completed Study
Proposed Study

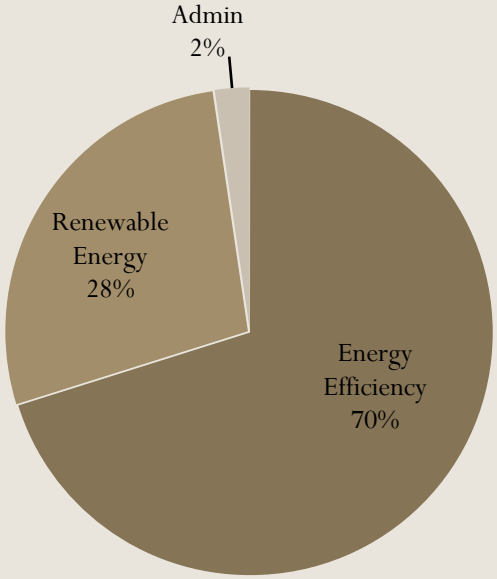
EE = Energy Efficiency
RE = Renewable Energy

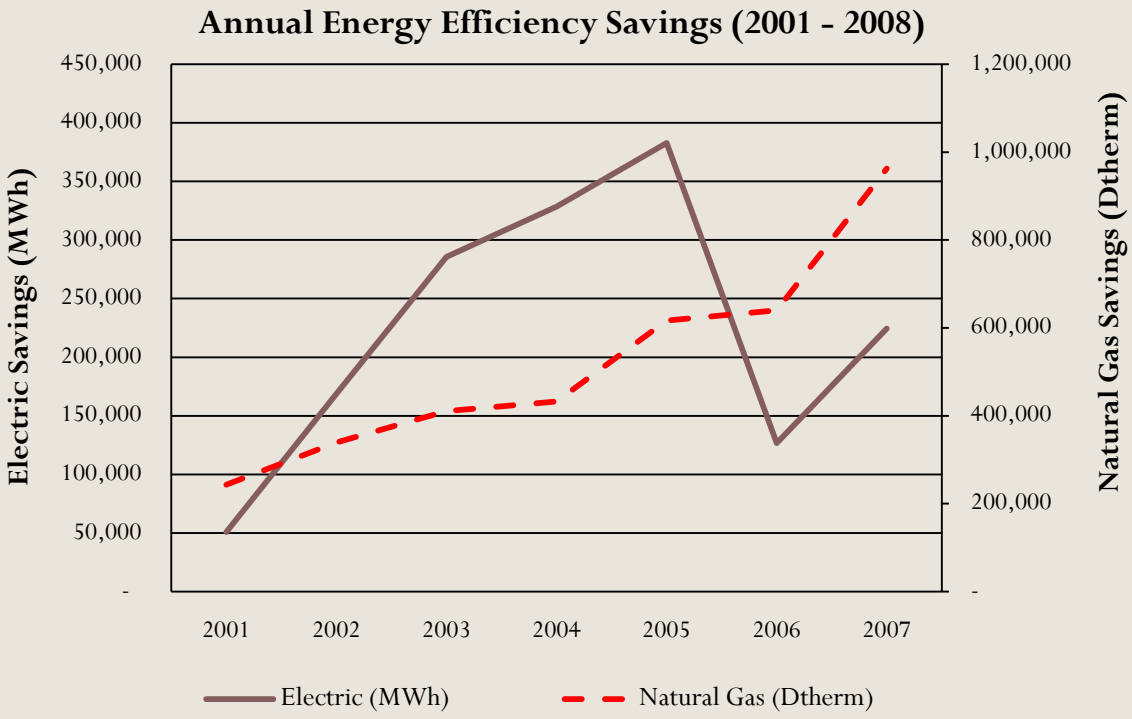
Reference: New Jersey Clean Energy Program. 2010-2011 Evaluation and Research Plan DRAFT Report (December 1, 2009).

3.5 Clean Energy Program

Renewable Installations and Energy Savings (as of 10/31/09)								
	Wind		Biomass		Fuel Cell		Solar	
	Annual kW	Installations	Annual kW	Installations	Annual kW	Installations	Annual kW	Installations
2001	-	-	-	-	-	-	8	3
2002	0.4	1	150	1	200	1	623	37
2003	20	2	150	2	450	2	1,177	95
2004	-	-	-	-	250	1	2,037	289
2005	10	1	1,850	2	-	-	9,908	729
2006	2,625	1	-	-	600	3	18,320	867
2007	1	1	1,150	2	-	-	15,258	693
2008	22	3	1,185	2	-	-	22,720	835
2009	128	10	250	1	-	-	38,036	974
Total	**2,806**	**19**	**4,735**	**10**	**1,500**	**7**	**108,088**	**4,522**

NJCEP Expenditures 2001 - 2007 (in thousands)
Total expenditures = $835,344





References: New Jersey Clean Energy Program Annual Reports.
NJCEP. Installation Summary by Technology.
New Jersey Energy Data Center.

4. Energy Efficiency and Conservation Block Grant Program

The federal Energy Efficiency and Conservation Block Grant Program (EECBG) provides grants to U.S. local governments, states, territories and Indian tribes to fund programs and projects that reduce energy use and fossil fuel emissions, improve energy efficiency and spur economic growth. The EECBG was authorized in the Energy Independence and Security Act (December 2007) and funded for the first time by the American Recovery and Reinvestment Act of 2009.

The Department of Energy will award $3.2 billion in grants: over $2.7 billion will be distributed via formula grants and approximately $455 million will be awarded through competitive grants (coming soon). On July 24, 2009, the Department of Energy awarded more than 1,800 grants totaling over $2 billion.

Formula Grants (formula inputs and input allocations)

States/Territories/District of Columbia ($767,480,000)

1. Total state population (33.3%)
2. State population, after subtracting the eligible city and county populations in that state (33.3%)
3. Total state energy consumption, less consumption in the industrial sector (33.3%)

City/County ($1863,880,000)

1. Resident population (70%)
2. Daytime (commuter) population (30%)

Tribal ($54,820,000)

1. Tribal population (75%)
2. Climatic conditions in each tribe's state, derived from heating and cooling degree days (25%)

Reporting Requirements:

- Jobs created/retained;
- Energy savings on a per dollar invested basis;
- Renewable energy capacity installed;
- Greenhouse gas emissions reduced;
- Funds leveraged.

Reference: United States Department of Energy. Energy Efficiency and Conservation Block Grant Program: Frequently Asked Questions. Accessed at www.eecbg.energy.gov/about/faq.html#lc3

5. Energy Savings Improvement Program

The New Jersey Energy Savings Improvement Program (ESIP) allows a board of education to implement energy savings measures and retrofits when the energy savings will cover the cost of the energy conservation measures.

The ESIP may be financed through:

1. A lease-purchase agreement in which ownership is passed to the board of education when all lease payments have been made. The agreement cannot exceed 15 years (except for a combined heat and power project, which cannot exceed 20 years); OR
2. An energy savings obligations which is funded through appropriations for utility services in the annual budget of the board and may be issued as refunding bonds, provided the bonds and notes mature within the authorized periods.

The financing options may not be used to finance maintenance, guarantees or verification of conservation measures.

The awarded energy services company offers the board of education the option to purchase an energy savings guarantee, for an additional amount. If purchased, the guarantee insures that the energy savings will be sufficient to defray all required payments; if the savings are not sufficient, the energy services company will reimburse the board for any additional amounts.

To implement an ESIP, a board of education will develop an energy savings plan consisting of:

- The results of an energy audit and a description the energy conservation measures;
- Estimated greenhouse gas reductions;
- Identification of all design and compliance issues that require professional services and who will provide these services;
- An assessment of the costs and risks of implementation;
- Identification of the eligibility for the PJM Independent System Operator for demand response;
- Identification of maintenance requirements to ensure continued energy savings; and
- Cost estimates of an energy savings guarantee, if applicable.

Energy-related capital improvements that do not reduce energy usage may be included in an energy savings improvement program but the cost of such improvements cannot be financed as a lease-purchase or through energy savings obligations.

Reference: The State of New Jersey. Public Law 2009 Chapter 4 (January 21, 2009). Accessed at http://www.njleg.state.nj.us/2008/Bills/PL09/4_.PDF

6. Renewable Portfolio Standards

The current Renewable Portfolio Standard (RPS) requires that 22.5% of all electricity sold to retail customers must be from qualifying renewables in 2020.

- In 2020, 20% of all renewables must be Class I and 2.5% must be Class II.

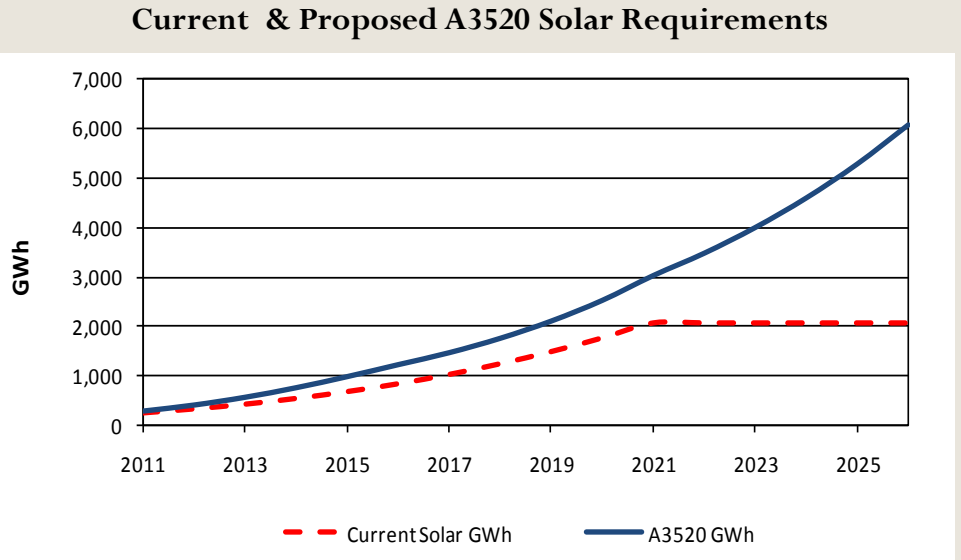
There are two classes of renewables:

- Class I: solar, wind, wave or tidal action, geothermal, landfill gas, anaerobic digestion, fuel cells using renewable fuels;
- Class II: generated by hydropower facilities no greater than 30 MW and resource-recovery facilities located within New Jersey.

Energy Master Plan proposed increases:

- Increase the RPS to 30% by 2020 (aka. 30% of electricity sales must be from renewable sources);
- Change the current solar requirement from a percentage of retail sales to a GWh obligation.

The Solar Energy Advancement and Fair Competition Act (Assembly Bill A3520), currently under consideration, would increase the solar requirement. The increase would require over 6,000 GWh of solar by 2026 as opposed to 2,000 GWh currently in place.



References: New Jersey Energy Master Plan (October 2008). Accessed at http://www.nj.gov/emp/
The State of New Jersey. "Assembly No. 3520: The Solar Energy Advancement and Fair Competition Act." Introduced December 8, 2008 (May 21, 2009).
Database of State Incentives for Renewables and Efficiency. New Jersey: Incentives/Policies for Renewable and Efficiency. Accessed at www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R&re=1&ee=1

6.1 Renewable Energy Credits

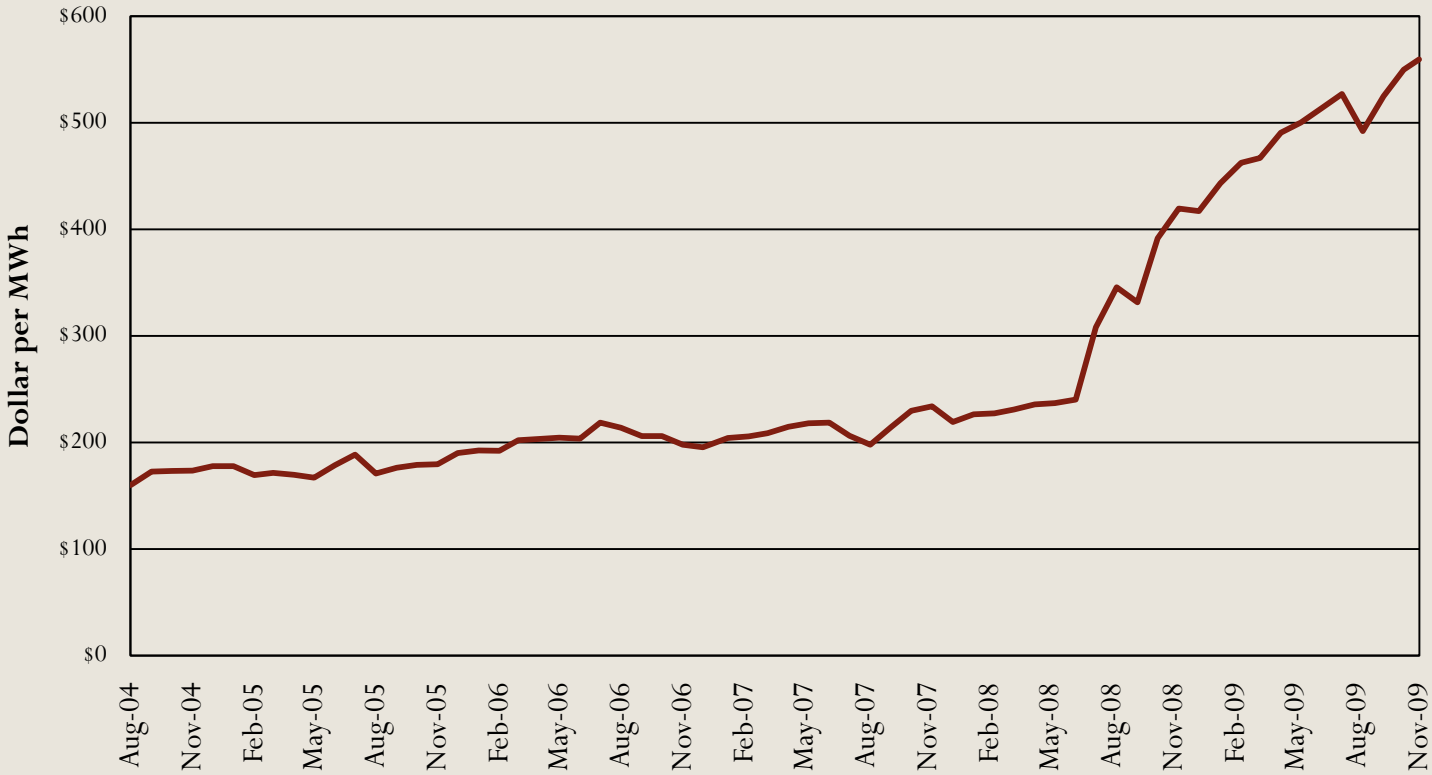
A solar renewable energy credit (SREC) is 1 MWh of solar generation.

- SRECs are sold in the New Jersey solar marketplace for the first 15 years of a system's life.

A renewable energy credit (REC) is 1 MWh of renewable energy generation.

- RECs are sold on the market via various brokers for approximately $10 per MWh.

Cumulative Weighted Average SREC Price (August 2004 - November 2009)



SREC Weighted Average Price ($/MWh)	
2008	$235
2007	$209
2006	$203
2005	$194

References: New Jersey Clean Energy Program. SREC Pricing. Accessed at www.njcleanenergy.com/renewable-energy/project-activity-reports/srec-pricing/srec-pricing
Evolution Markets. Renewable Energy. Accessed at http://new.evomarkets.com/index.php?page=Renewable_Energy

7. Wind

The Energy Master Plan calls for 1,000 MW of offshore wind capacity by 2012 and a minimum of 3,000 MW and 200 MW of onshore wind by 2020.

Current Offshore Wind Project Proposals and Costs

- Current project proposals include Fishermen's Energy for 350 MW, Garden State Offshore Energy for 345 MW, and Bluewater Wind for 348 MW. Though the projects are similar in size, there is a wide range in capital and decommissioning costs.

Offshore Wind Renewable Energy Credits

- Retail electricity suppliers will be required to obtain Offshore Wind Renewable Energy Credits (ORECs) under a process still in development by the NJBPU. The number of required ORECs will increase over time as new facilities are built and placed into service.

Onshore Wind Potential

- The annual onshore wind potential in New Jersey is 1,328 MW with an average annual capacity factor of 21%.

References: New Jersey Energy Master Plan (October 2008). Accessed at http://www.nj.gov/emp/
New Jersey Board of Public Utilities. DRAFT Offshore Wind Financing Rule Proposal (July 1, 2009).
National Renewable Energy Laboratory. Accessed at ftp://ftp2.nrel.gov/pub/ewits/TimeSeries/LandBased/

8. Biomass

The Energy Master Plan has a goal of developing 900 MW of biomass by 2020.

Biomass is an organic material made from plants and animals which stores energy from the sun. The energy from biomass materials is released when burned.

A 2007 report by the New Jersey Agricultural Experiment Station found that:

- New Jersey produces an estimated 8.2 million dry tons of biomass annually.
- Approximately 5.5 MDT (65%) of New Jersey's biomass could ultimately be available to produce up to 1,124 MW of bioenergy (approximately 9% of the statewide energy consumption).
- Almost 75% of New Jersey's biomass resources are produced directly by the state's population, the majority in solid waste, and is concentrated in the central and northeastern counties.
- Agriculture and forestry management are also important potential sources of biomass and account for the majority of the remaining amount of biomass.

Potential MWh Produced Annually by County

Atlantic	52,391
Bergen	80,753
Burlington	168,625
Camden	23,037
Cape May	16,039
Cumberland	54,979
Essex	60,866
Gloucester	55,963
Hundson	23,524
Hunterdon	22,548
Mercer	21,463
Middlesex	124,997
Monmouth	81,466
Morris	51,351
Ocean	30,997
Passaic	27,233
Salem	29,936
Somerset	19,622
Sussex	35,098
Union	14,171
Warren	51,351
Total	1,046,410

References: New Jersey Energy Data Center. Rutgers Agricultural Experimental Station Biomass Data.
Rutgers Agricultural Experimentation Station Biomass Data. Assessment of Biomass Energy Potential in New Jersey (July 2007).

9. Combined Heat and Power

Combined heat and power (CHP), also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source.

CHP provides:

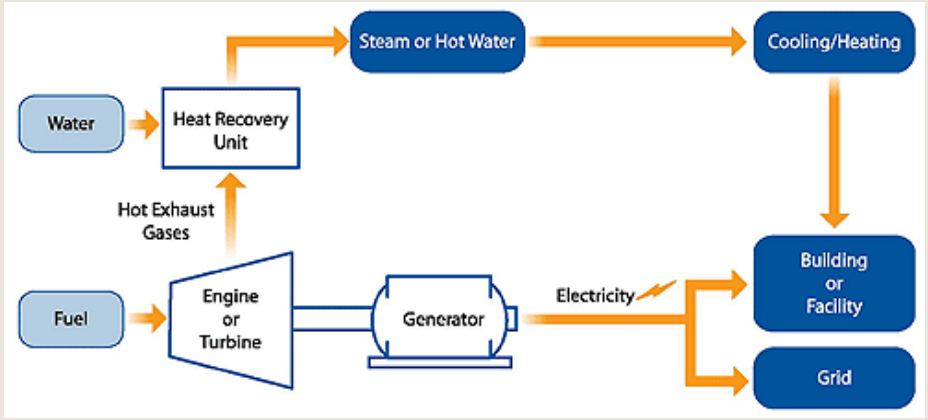
- Onsite generation of electrical and/or mechanical power;
- Waste-heat recovery for heating, cooling, dehumidification, or process applications;
- Seamless system integration for a variety of technologies, thermal applications and fuel types into existing building infrastructure.

The two most common CHP systems are:

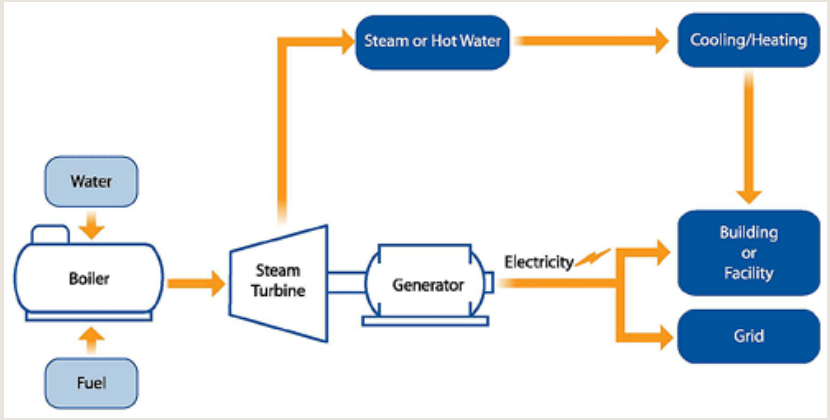
- Gas turbine or engine with heat recovery unit
- Steam boiler with steam turbine

The Energy Master Plan has a goal of installing 1,500 MW of CHP facilities by 2020.

Gas Turbine/Engine with Heat Recovery Unit



Steam Boiler with Steam Turbine



Reference: United States Environmental Protection Agency. Combined Heat and Power Partnership: Basic Information. Accessed at www.epa.gov/chp/basic/index.html

10. Demand Response

Demand response allows end-use retail customers to reduce their electricity consumption in response to hourly or daily price changes. Economic signals from the competitive wholesale market alters prices in response to power grid needs. Methods of engaging customers in demand response efforts include offering a retail electricity rate that reflects the time-varying nature of electricity costs or programs that provide incentives to reduce load at critical times.

The Energy Master Plan goal for demand response is to reduce peak electricity demand by 5,700 MW by 2020.

The Mid-Atlantic Distributed Resources Initiative (MADRI) seeks to identify and remedy retail barriers to the deployment of distributed generation, demand response and energy efficiency in the Mid-Atlantic region. The initiative was established in 2004 by the public utility commissions of Delaware, District of Columbia, Maryland, New Jersey and Pennsylvania in conjunction with the United States Department of Energy, United States Environmental Protection Agency, Federal Energy Regulatory Commission and PJM Interconnection.

- MADRI's guiding principle is that distributed resources should compete with generation and transmission to ensure grid reliability and a fully functioning wholesale electric market.
- Institutional barriers and lack of market incentives appear to be slowing deployment of cost-effective distributed resources in the Mid-Atlantic.

References: United States Department of Energy. Demand Response. Accessed at www.oe.energy.gov/demand.htm
Mid-Atlantic Distributed Resources Initiative Working Group. Accessed at http://sites.energetics.com/madri/

11. Smart Grid

The electric grid delivers electricity from points of generation utilizing the transmission and distribution systems. The transmission system delivers electricity from power plants to distribution substations and the distribution system delivers electricity from distribution substations to consumers. The grid also includes local area networks that use distributed energy resources to serve local loads and/or meet specific application requirements for remote power and critical load protection.

Smart grid uses digital technology to improve reliability, security, and efficiency of the electric system from large generation, through the delivery systems to electricity consumers and a growing number of distributed-generation and storage resources.

Reference: U.S. Department of Energy. Smart Grid.

11.1 Smart Grid Pilots and Investments

PSE&G myPower Pilot Program (June 2006 to September 2007)

Utilized two-way communication technologies to understand the potential for changing the way customers think about energy delivery and consumption. Customers were provided with additional consumption information and flexible pricing options and they consistently lowered their energy use in response to price signals and achieved bill savings.

Jersey Central Power & Light (March 2009)

Electric Power Research Institute selected JCP&L as a smart grid demonstration host site. The project includes an 8 MW Integrated Distributed Energy Resources management pilot program and technologies to enhance peak load shifting, substation electricity storage and grid monitoring and control.

PEPCO Holdings PHI (March – April 2007)

PEPCO Holdings (the parent company of Atlantic City Electric) instituted a Blueprint for the Future in Maryland and Washington D.C. The blueprint is a plan to meet future energy and environmental challenges through energy efficiency programs and new technologies. The plan includes installing smart meters to help customers track and manage their electricity use and developing a smart grid to improve reliability.

U.S. Department of Energy Smart Grid Investments (October 2009)

- Grant recipients affiliated with New Jersey utilities and PJM:

Utility	Project Type	Description	DOE Funding	Total Project Cost
Atlantic City Electric	Electric Distribution	Utilize devices and communications infrastructure to enhance grid reliability, optimize grid operation, and empower consumers to control their energy usage.	$18,700,000	$37,400,000
Consolidated Edison	Electric Distribution	Wide-range of grid-related technologies to make the electric grid more efficient and enable the integration of renewable and energy efficient technologies.	$136,170,899	$272,341,798
First Energy (JCP&L parent co.)	Integrated/Crosscutting Systems	Modernize the electrical grid and reduce peak energy demand.	$57,470,137	$114,940,273
PJM	Electric Transmission	Deploy digital monitoring and analysis technologies across 10 states that will provide real-time data on the operating conditions of the transmission system.	$13,698,091	$27,840,072

References: PSE&G. Accessed at www.pseg.com/media_center/pressreleases/articles/2008/2008-02-13.jsp
Jersey Central Power & Light. Electric Power Research Institute Selects JCP&L for Smart Grid Demonstration. Press Release (March 23, 2009).
PEPCO Holdings. Accessed at www.pepco.com/home/education/dcblueprint/default.aspx
United States Department of Energy. Accessed at www.energy.gov/recovery/smartgrid_maps/SGIGSelections_Category.pdf

11.2 Smart Meters

- Smart meters are digital two-way communication devices that record customer daily energy use and submit that data to the utility for operations, billing and customer service.

Benefits of Smart Meters

- Customers receive their energy usage data, such as consumption and pricing, allowing for energy conservation and money saving changes;
- Improves customer privacy because meter reader's no longer need to enter properties;
- The utility can identify and fix outage problems faster;
- Reduces peak demand, thereby reducing strains on the distribution system and the energy prices.

Reference: SDGE. Smart Meter. Accessed at http://www.sdge.com/documents/smartmeter/SM-Fact_Sheet-Green.pdf

12. Edison Innovation Fund

The Edison Innovation Fund seeks to create, sustain, and grow high-tech businesses that will lead to well-paying job opportunities for all New Jersey residents.

Launched in October 2006, the Fund is an integrated set of resources that support technology and life science initiatives throughout all stages of discovery, development, and commercialization. To date, New Jersey has delivered over $350 million in financing, assistance, business incentives and tax credits to early-stage and established technology and life sciences businesses.

The Fund supports:

- Colleges, universities and companies to develop the commercial potential of research;
- Accelerate the commercialization of technology;
- Provide technical, financial, and facility-based support to the State's technology businesses.

The Fund will continue to support:

- University research and development in areas of life sciences, stem cell research, clean energy, and information and communication technologies;
- Encourage clean and renewable energy.

Reference: State of New Jersey. Edison Innovation Fund. Accessed at www.state.nj.us/njbusiness/njadvantage/initiatives/approved/20071030_04edison.shtml

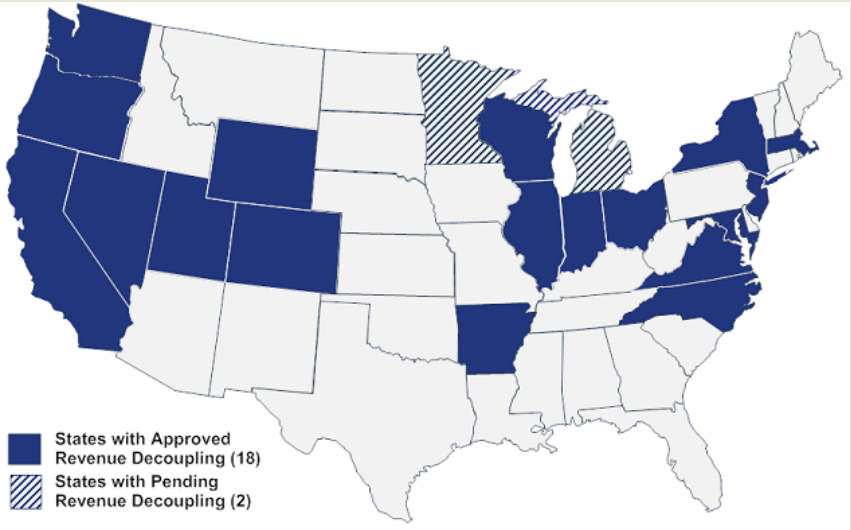
13. Natural Gas & Electric Rate 'Decoupling'

Decoupling is a means of separating a utility's revenues from changes in energy consumption. Decoupling mechanisms compensate for increases/decreases in energy sales due to variations from normal weather, recessions and energy efficiency.

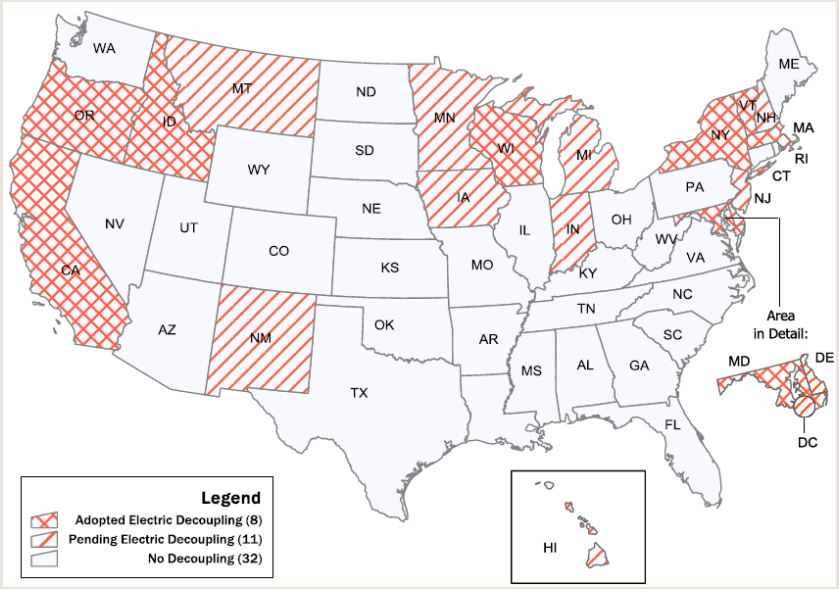
- Example: adjust actual sales volumes to the weather-normalized sales volumes approved during the last rate case. If sales volumes deviate from the level forecasted in the rate case, a price adjustment mechanism adjusts the distribution charge. This allows the utility to recover its fixed costs regardless of fluctuations in energy use.

There are currently 31 natural gas utilities in 18 states and 14 electric utilities in eight states with decoupling mechanisms.

Natural Gas



Electric



References: Eto, J., Stoft, S. and Belden, T. "The Theory and Practice of Decoupling Utility Revenues from Sales." Utilities 6.1 (1997): 43-55.
American Gas Association. Decoupling and Natural Gas Utilities Fact Sheet: Rethinking Rate Structures to Promote Energy Efficiency (July 2009).
National Resources Defense Council. "Electric Decoupling in the U.S." (August 2009).
Center for Energy, Economic & Environmental Policy. Decoupling Resources. Accessed at http://policy.rutgers.edu/ceeep/projects/decoupling.php

14. Green Jobs

Green jobs involve protecting wildlife or ecosystems, reducing pollution or waste, or reducing energy usage and lowering carbon emissions.

The Federal American Recovery and Reinvestment Act includes $500 million for energy efficiency and renewable energy sector workforce training and placement programs. Associated Workforce Investment Act industries:

1. Energy-efficient building, construction, and retrofit
2. Renewable electric power
3. Energy efficient and advanced drive train vehicle
4. Biofuels
5. Deconstruction and materials use
6. Energy efficiency assessment industry serving residential, commercial, or industrial
7. Manufacturers that produce sustainable products using environmentally sustainable processes and materials

Green Job Estimates:

- A Center for American Progress report determined that if New Jersey invested $3.2 billion over two years in six green infrastructure investment areas, 57,228 jobs would be created.
- Utilizing a jobs impact calculator developed by ACEEE, if the $600 million in federal money is invested over a period of two years, without assuming any energy savings, approximately 10,400 jobs will be created in the United States over two years
- According to the U.S. Conference of Mayors , in 2006 there were 750,000 green jobs in the United States. The following table presents the forecasted jobs:

Potential New Green Jobs 2038 - U.S. Total			
	2018	2028	2038
Renewable Power Generation	407,200	802,000	1,236,800
Residential & Commercial Retrofitting	81,000	81,000	81,000
Renewable Transportation Fuels	1,205,700	1,437,700	1,492,000
Engineering, Legal, Research & Consulting	846,900	1,160,300	1,404,900
Total	**2,540,800**	**3,481,000**	**4,214,700**

References: Federal Register. Department of Labor: Employment and Training Administration. V.74, N. 120 (June 24, 2009). Accessed at www.doleta.gov/grants/pdf/SGA-DFA-PY-08-18.pdf

Pollin, R. *et al*. Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy. Center for American Progress (Sept 2008).

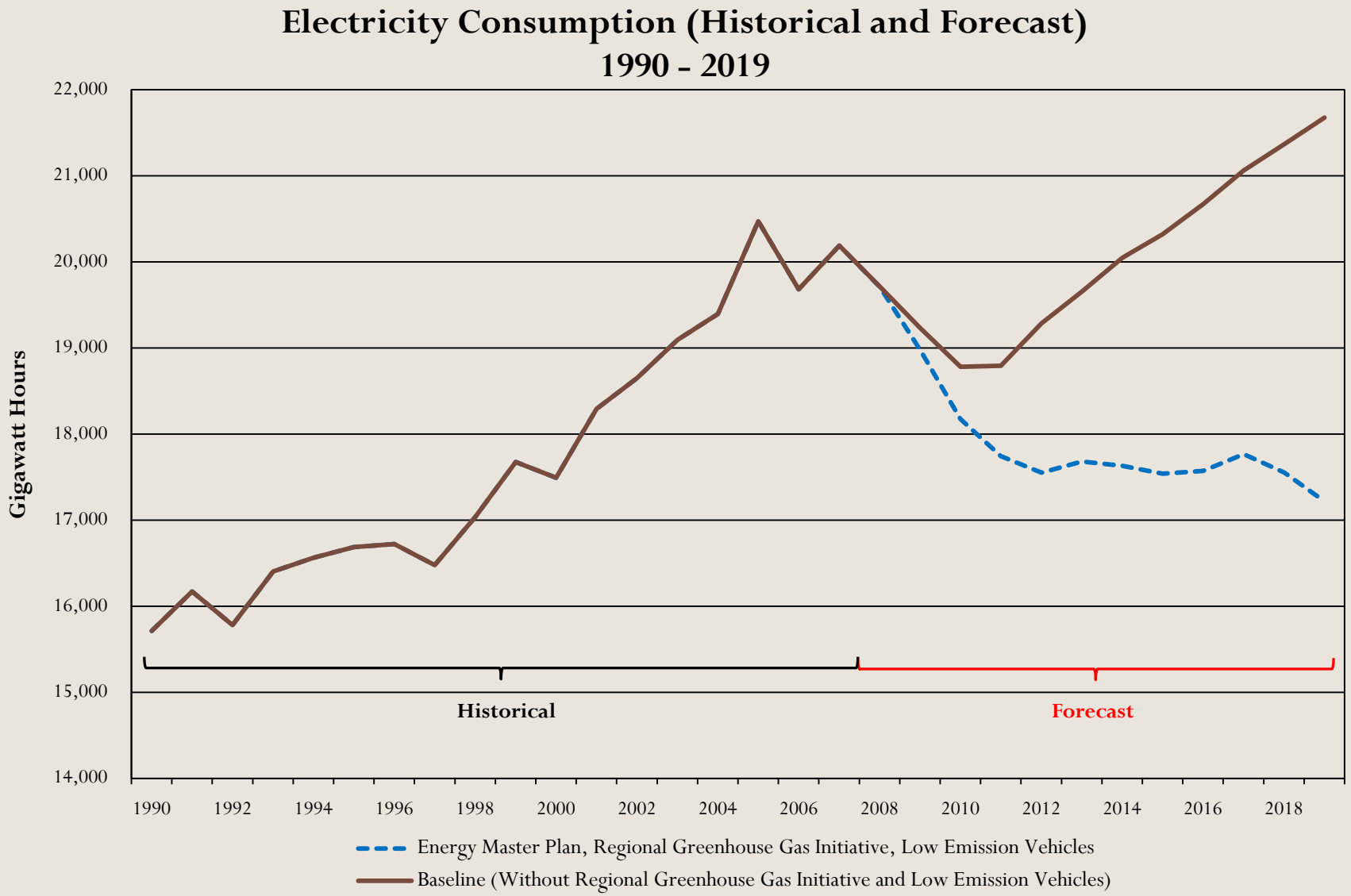
ACEEE Energy Stimulus Jobs Impact Calculator (July 2009). Accessed at http://www.aceee.org/energy/national/recovery.htm

The United States Conference of Mayors. U.S. Metro Economics: Current and Potential Green Jobs in the U.S. Economy, prepared by Global Insight (October 2008).

15. New Jersey Energy Overview

- 15.1 Total Energy Consumption
- 15.2 Consumption by End Use and Fuel
- 15.3 Fuel Sources
- 15.4 Energy and Economic Growth
- 15.5 Utility-Related Energy Industry Jobs
- 15.6 Residential Heating Fuel
- 15.7 New Jersey Emissions

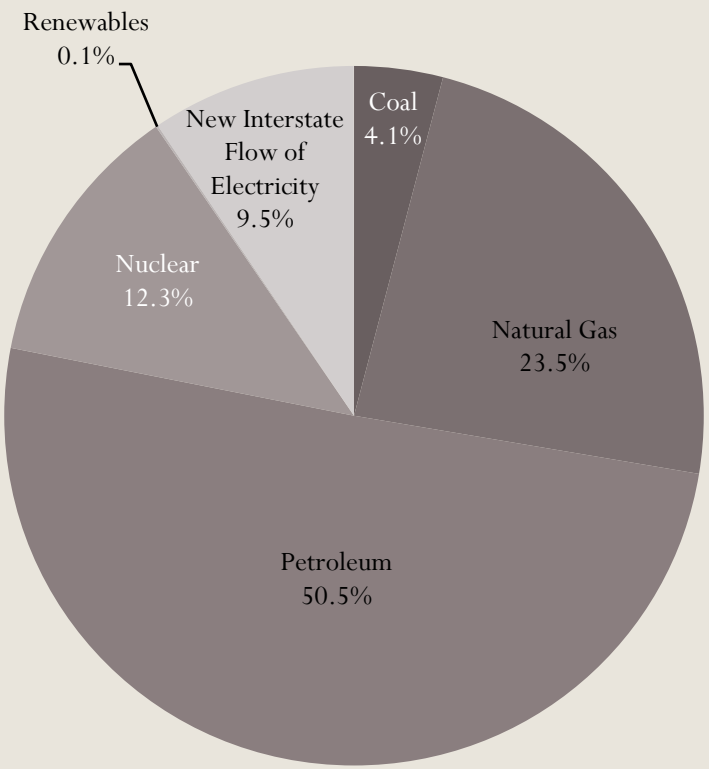
15.1 Total Energy Consumption



References: R/ECON™ (11/19/09).
New Jersey Department of Environmental Protection. Appendix 2: Economic Model Results of Core Recommendations. Accessed at www.state.nj.us/dep/oce/njgrwa_final_report_appendix_2_Dec2009.pdf

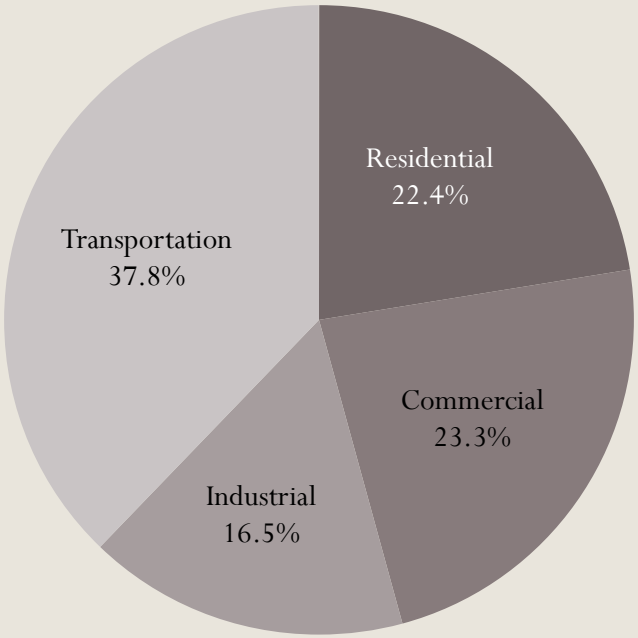
15.2 Consumption by End Use and Fuel

New Jersey Energy Consumption by Fuel, 2007 (Trillion Btu)



Total Energy Consumption = 2,744 Trillion BTU

New Jersey Energy Consumption by End-Use, 2007 Sector (Trillion Btu)



Reference: Energy Information Administration. State Energy Data System 2007: New Jersey.

15.3 Fuel Sources

Nuclear

51% of electricity generated in New Jersey comes from nuclear power plants.

Coal

100% of coal consumed in New Jersey is through electricity generation and use.

Of electricity generated in the state in 2007, 16.3% is from coal.

Natural Gas

Natural Gas consumed in New Jersey is primarily for heating, cooking, and electricity generation; a substantial amount is used in industrial processes (31%) and a miniscule amount is used in transportation (0.14%).

The residential sector consumed 23 % of natural gas in 2008. The commercial sector consumed 15% in 2008.

In 2008, the electric power sector consumed 6.3% of total natural gas delivered in the state; 31 % of all electricity consumed in New Jersey (in-state + out-of-state generation) is produced from natural gas.

Petroleum

Less that 1% of petroleum in New Jersey is used for electricity generation.

In 2008, 99.5% of fuel used in transportation is petroleum; 0.001% is covered by natural gas and 0.03% is ethanol.

Renewable Energy Resources

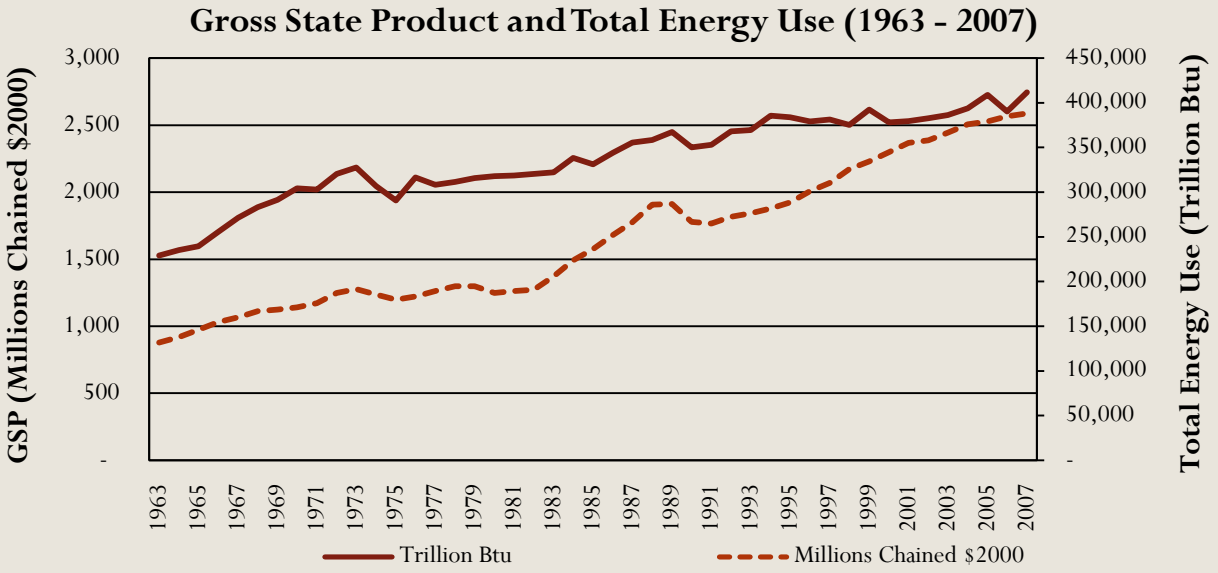
About 1.3 % of electricity generated in New Jersey in 2007 comes from renewable resources (primarily hydro, wind and biomass).

As of 2008, there are 4,552 solar installations in New Jersey, equal to about 2 MW of installed capacity.

As of 2007, there is just over 215 MW of installed renewable capacity in New Jersey (including hydroelectric and biomass type).

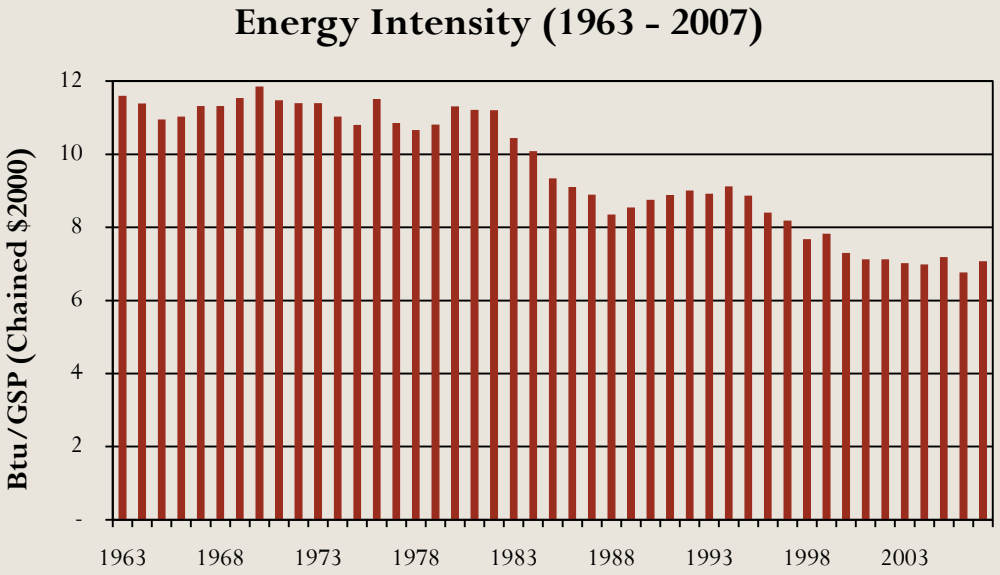
References: New Jersey Clean Energy Program
PJM State of the Market Report, 2005
Energy Information Administration. Forms 861, 920

15.4 Energy and Economic Growth



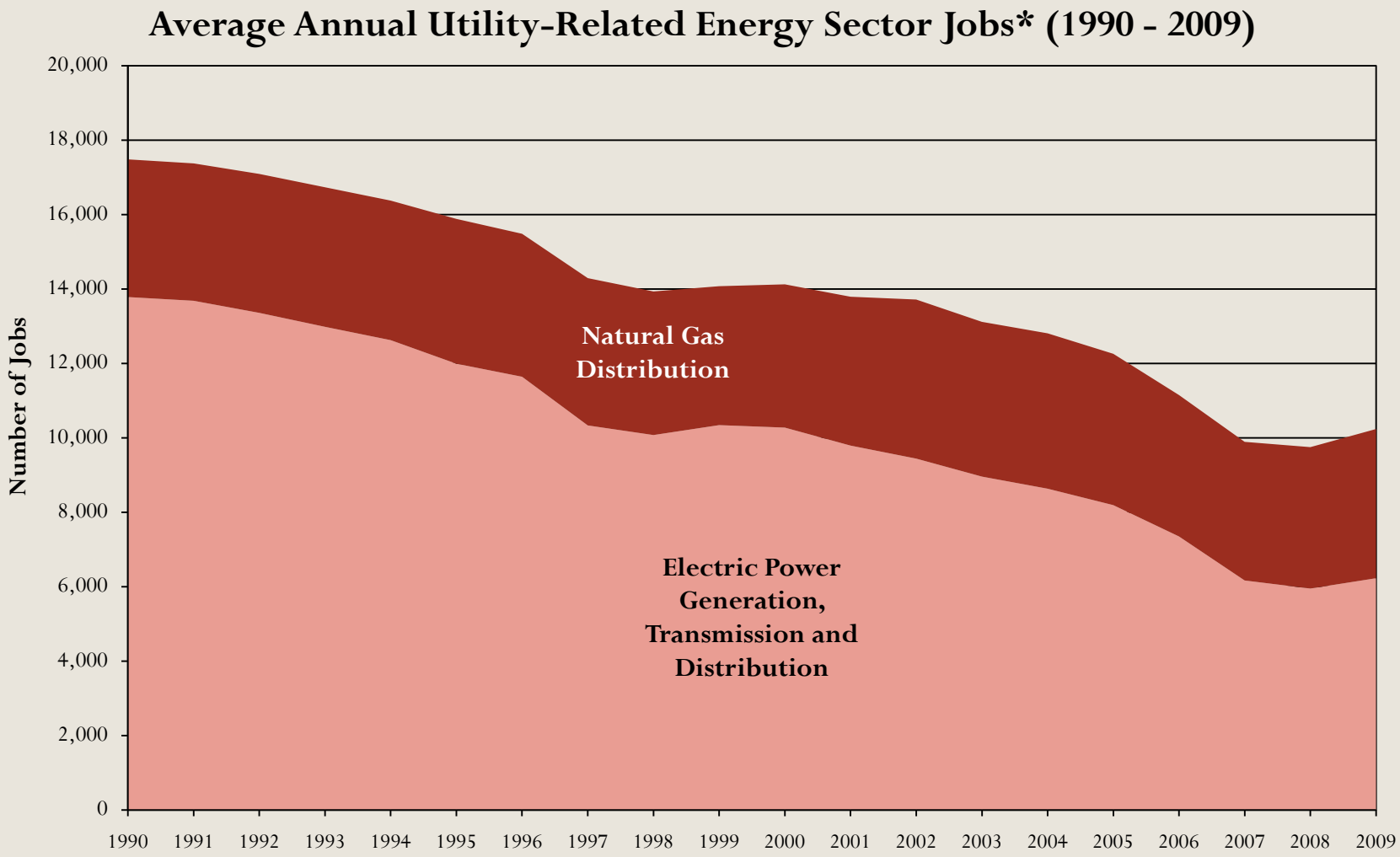
Energy Intensity is total energy consumption per gross state product in any given year.

The gross state product is in 2000 dollars (chained $2000); i.e. current dollars have been adjusted for inflation. Therefore, the annual gross state product are comparable because increases due to inflation since, or prior to, 2000 have been removed.



References: Energy Information Administration. Energy Consumption Estimates by Source and End-Use Sector, 2007.
U.S. Bureau of Economic Analysis. Gross Domestic Product by State, 1997-2008.

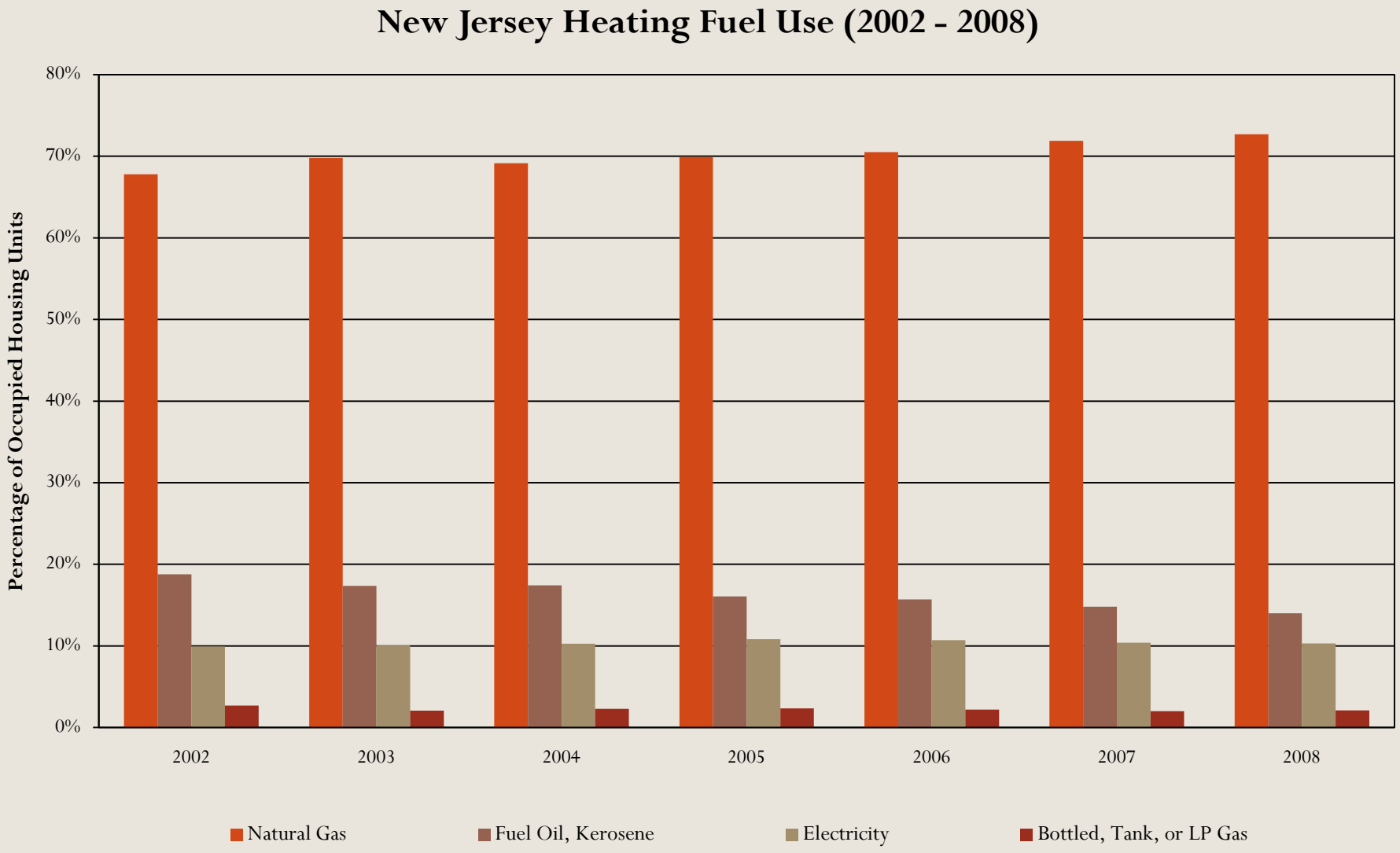
15.5 Utility-Related Energy Industry Jobs



- Job data is not seasonally adjusted
- 2009 is January through November

Reference: United States Department of Labor. Bureau of Labor Statistics. State and Metro Area Employment, Hours & Earnings.

15.6 Residential Heating Fuel



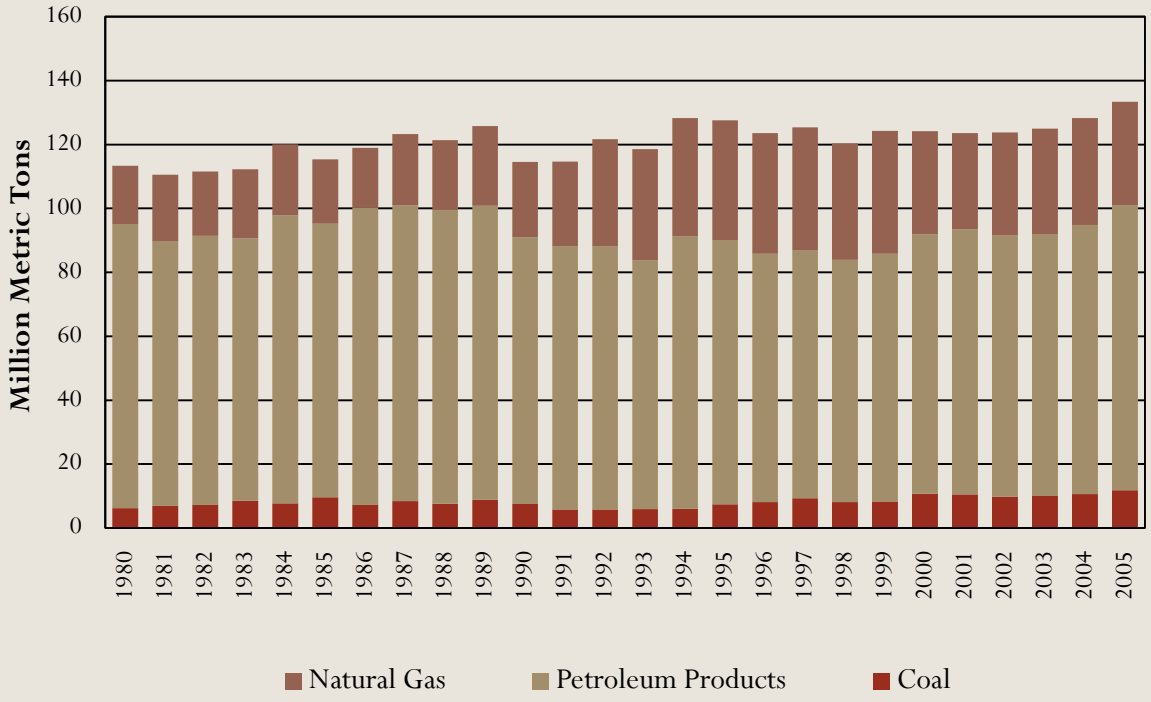
Reference: United States Census Bureau. American Community Survey. Selected Housing Characteristics.

15.7 New Jersey Emissions

New Jersey Emissions (metric tons)

	Total Emissions			NJCEP Emissions Savings			Emissions Saved (%)		
	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX
2003	20,204,981	48,555	34,745	224,141	390	865	1%	1%	2%
2004	21,289,387	48,839	34,362	254,487	444	989	1%	1%	3%
2005	21,103,015	64,738	34,855	317,467	550	1,217	2%	1%	3%
2006	19,861,416	56,386	28,179	153,435	246	511	1%	0%	2%
2007	20,585,235	46,389	21,271	424,528	726	1,589	2%	2%	7%

Carbon Dioxide Emissions by Fuel (1980 - 2005)

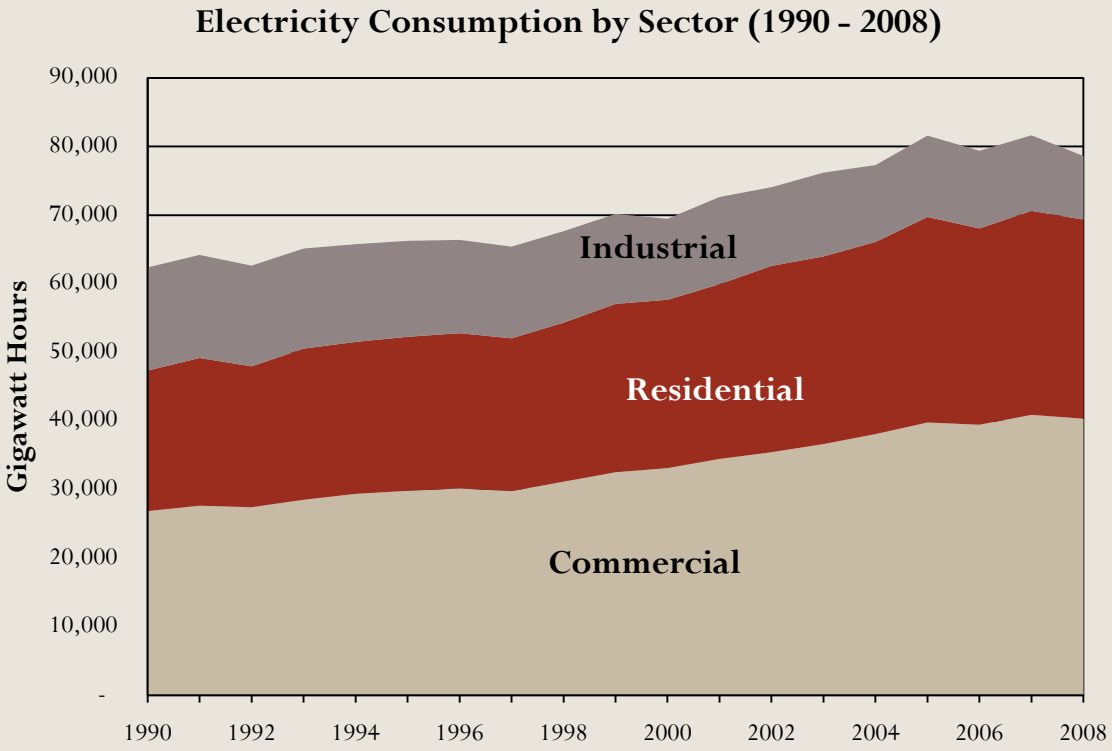


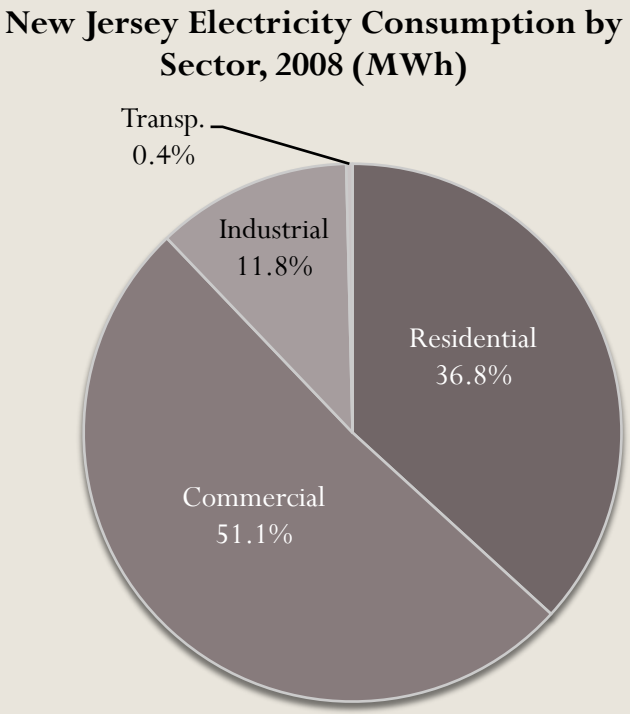
References: New Jersey Clean Energy Program Annual Reports.
Energy Information Administration. Emissions Details by State. Accessed at http://www.eia.doe.gov/oiaf/1605/state/state_emissions.html

16. New Jersey Electricity Data

- 16.1 Electricity Consumption by Sector
- 16.2 PJM Interconnection
- 16.3 Wholesale Electricity Prices
- 16.4 Average Retail Electricity Prices
- 16.5 Retail Electricity Prices by Utility
- 16.6 Electricity Price and Consumption
- 16.7 Electricity Consumption per Customer
- 16.8 Average Customer Bill
- 16.9 Electric Power Industry Emissions

16.1 Electricity Consumption by Sector

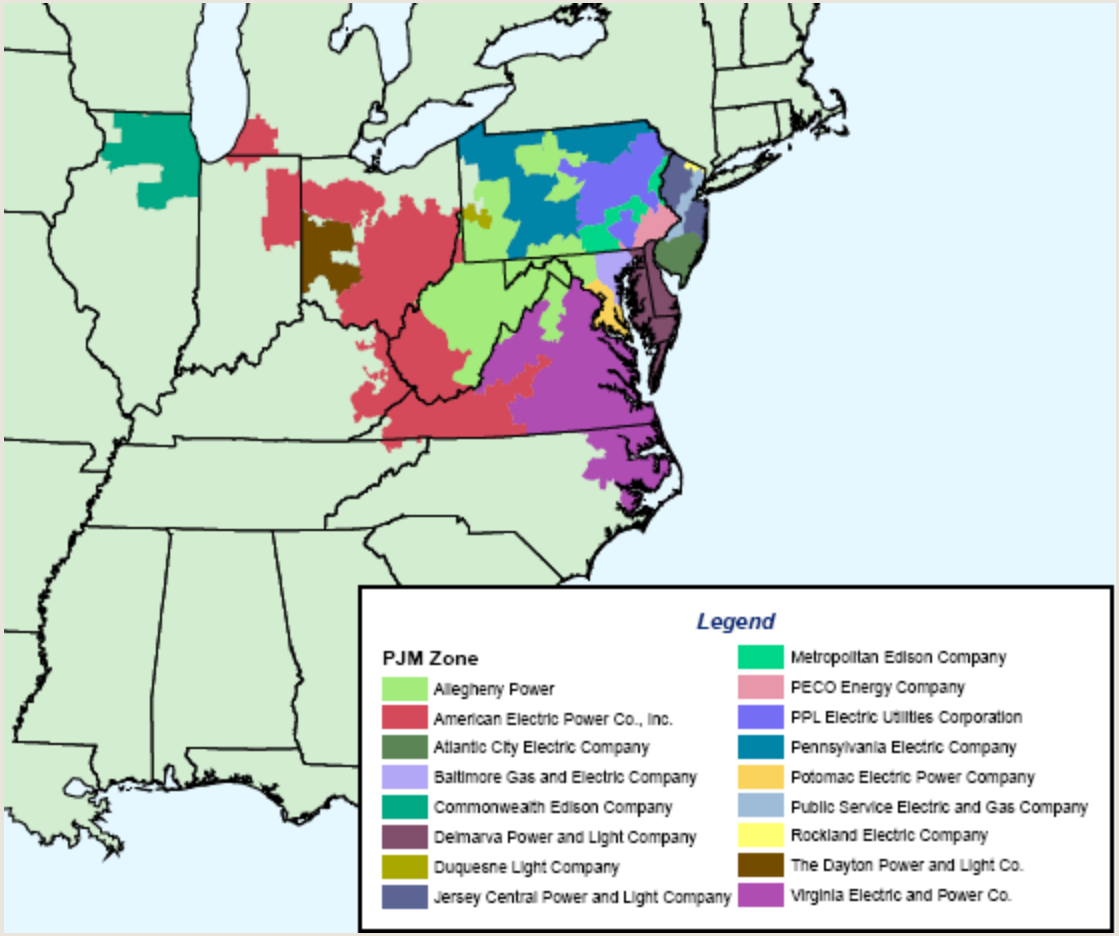




References: New Jersey Energy Data Center.
Energy Information Administration. State Energy Profiles.

16.2 PJM Interconnection

PJM Interconnection Transmission Zones



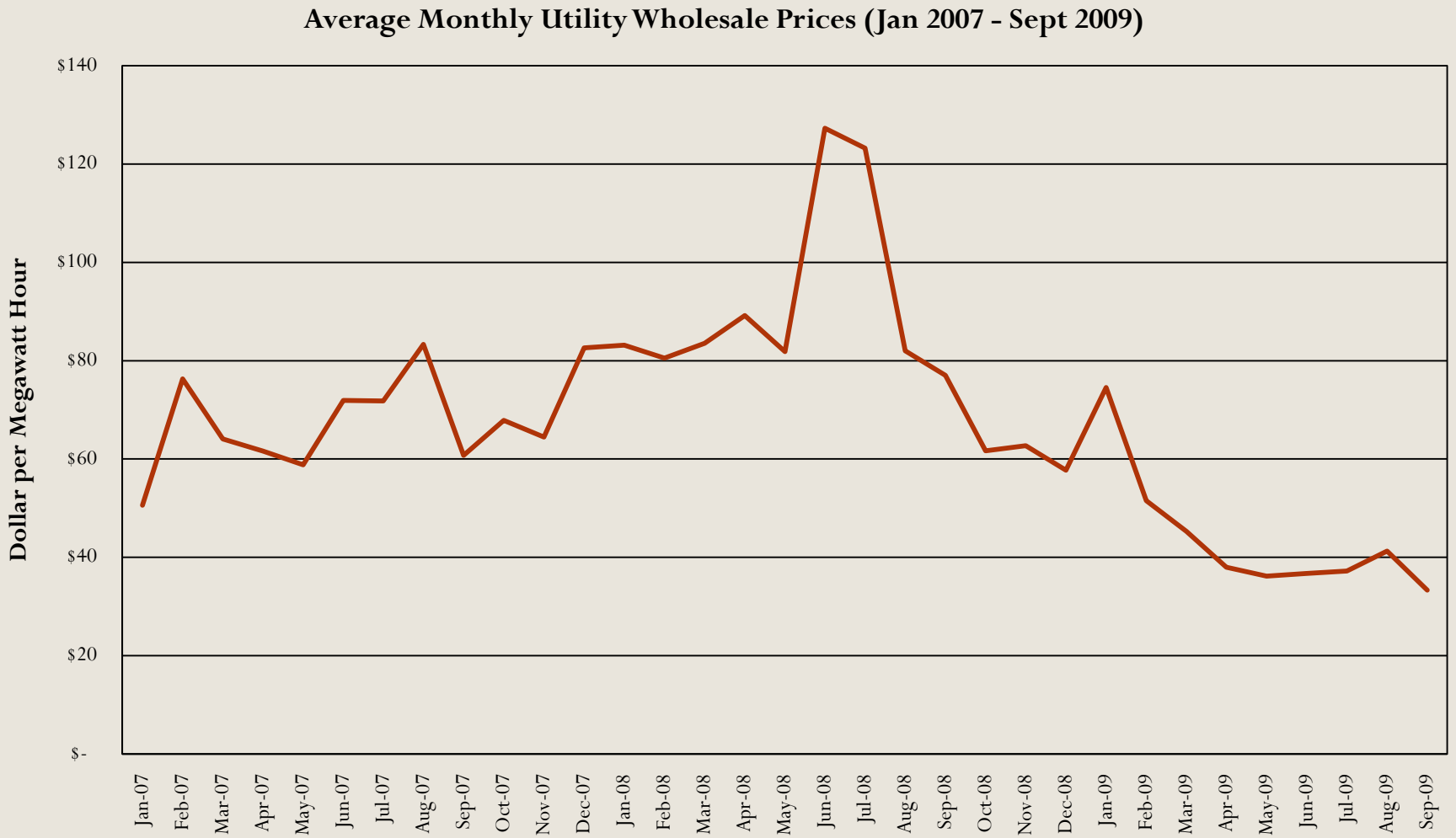
PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

PJM operates a competitive wholesale electricity market and manages the high-voltage electricity grid to ensure reliability for more than 51 million people.

Reference: PJM. Maps. Accessed at http://www.pjm.com/documents/maps.aspx

16.3 Wholesale Electricity Prices

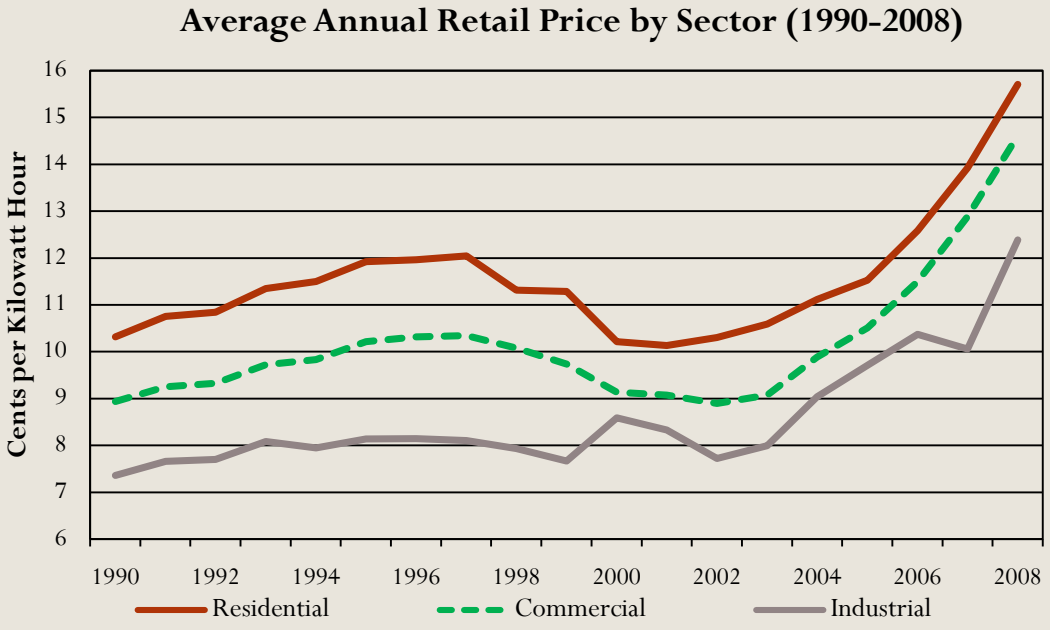
Prices peaked around June 2008 and have dropped dramatically since then.

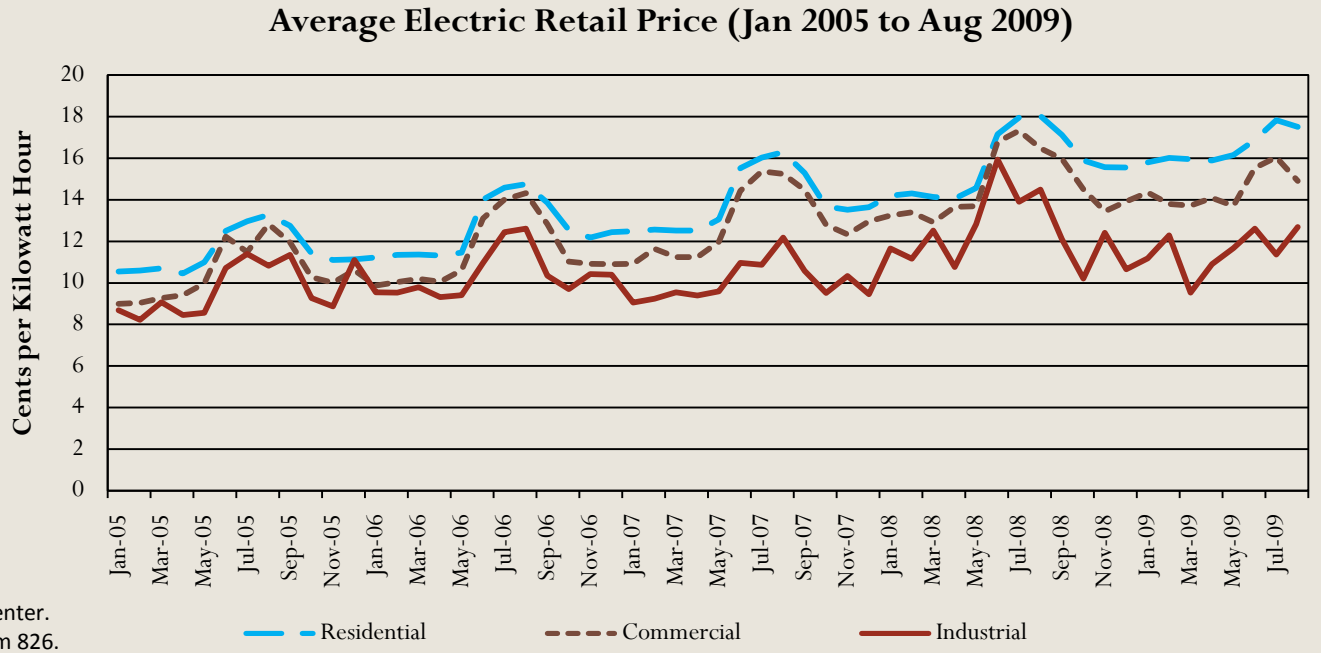


Reference: New Jersey Energy Data Center. PJM Load Weighted LMP.

16.4 Average Retail Electricity Prices

As with the wholesale electricity prices, retail prices peaked around June 2008. The current economic recession along with changes in weather have resulted in the summer 2009 prices being lower than the summer 2008 prices.

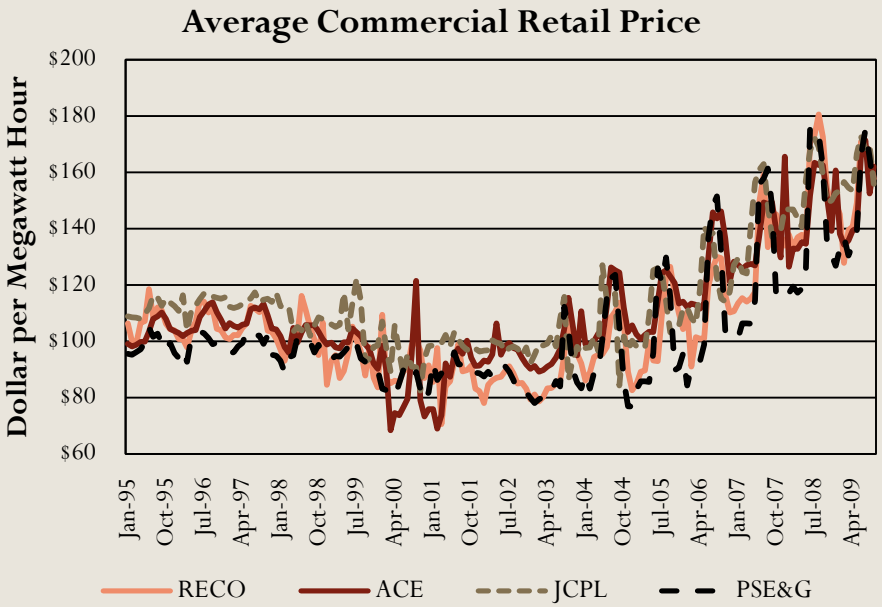


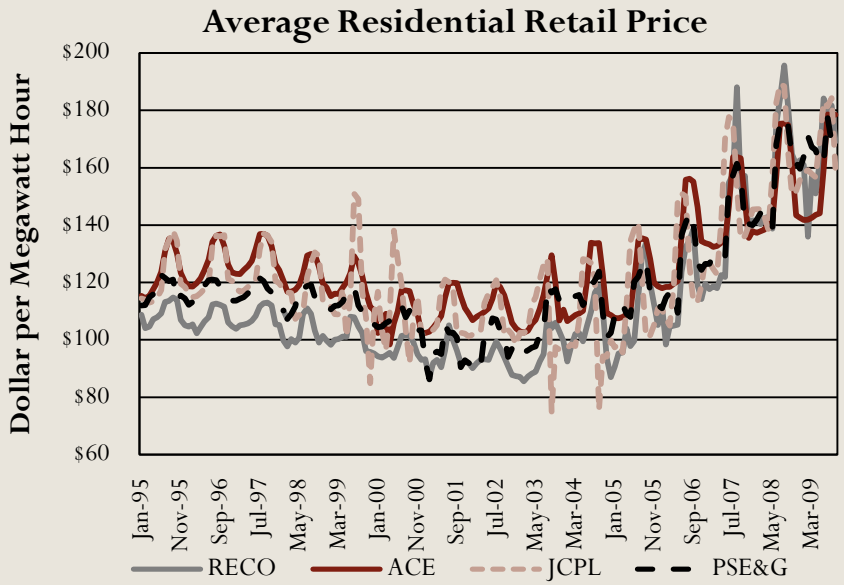


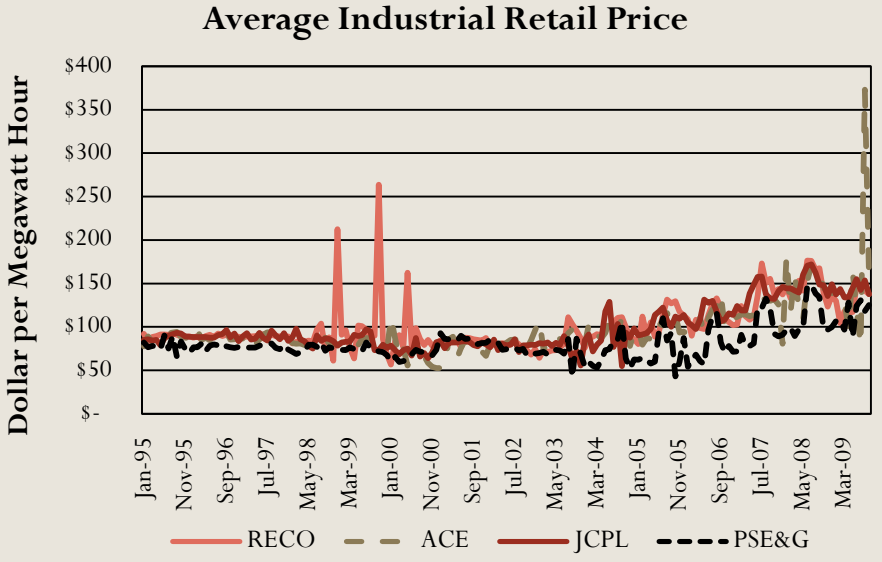
References: New Jersey Energy Data Center.
Energy Information Administration Form 826.

16.5 Retail Electricity Prices by Utility

January 1995 – September 2009

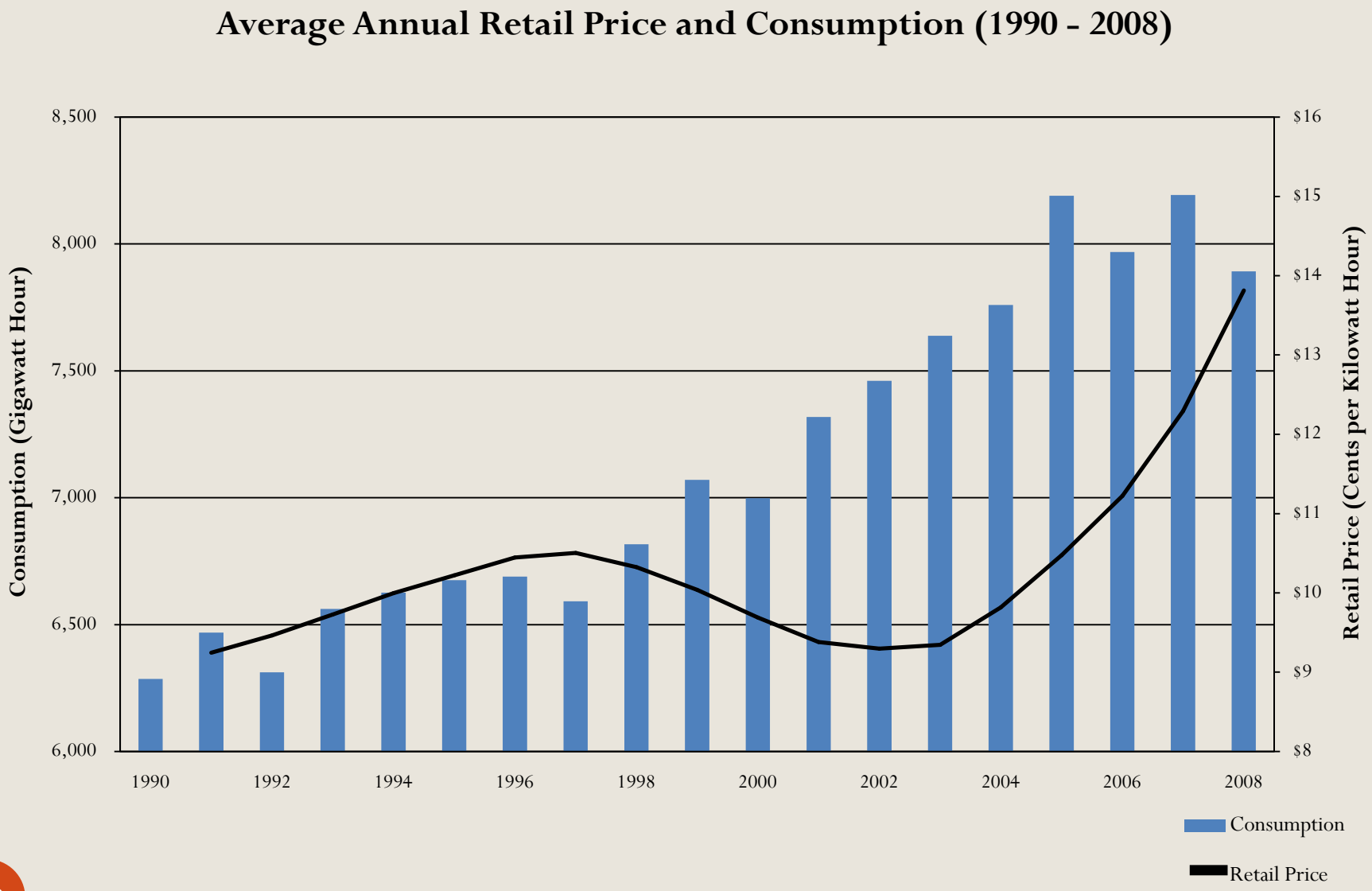






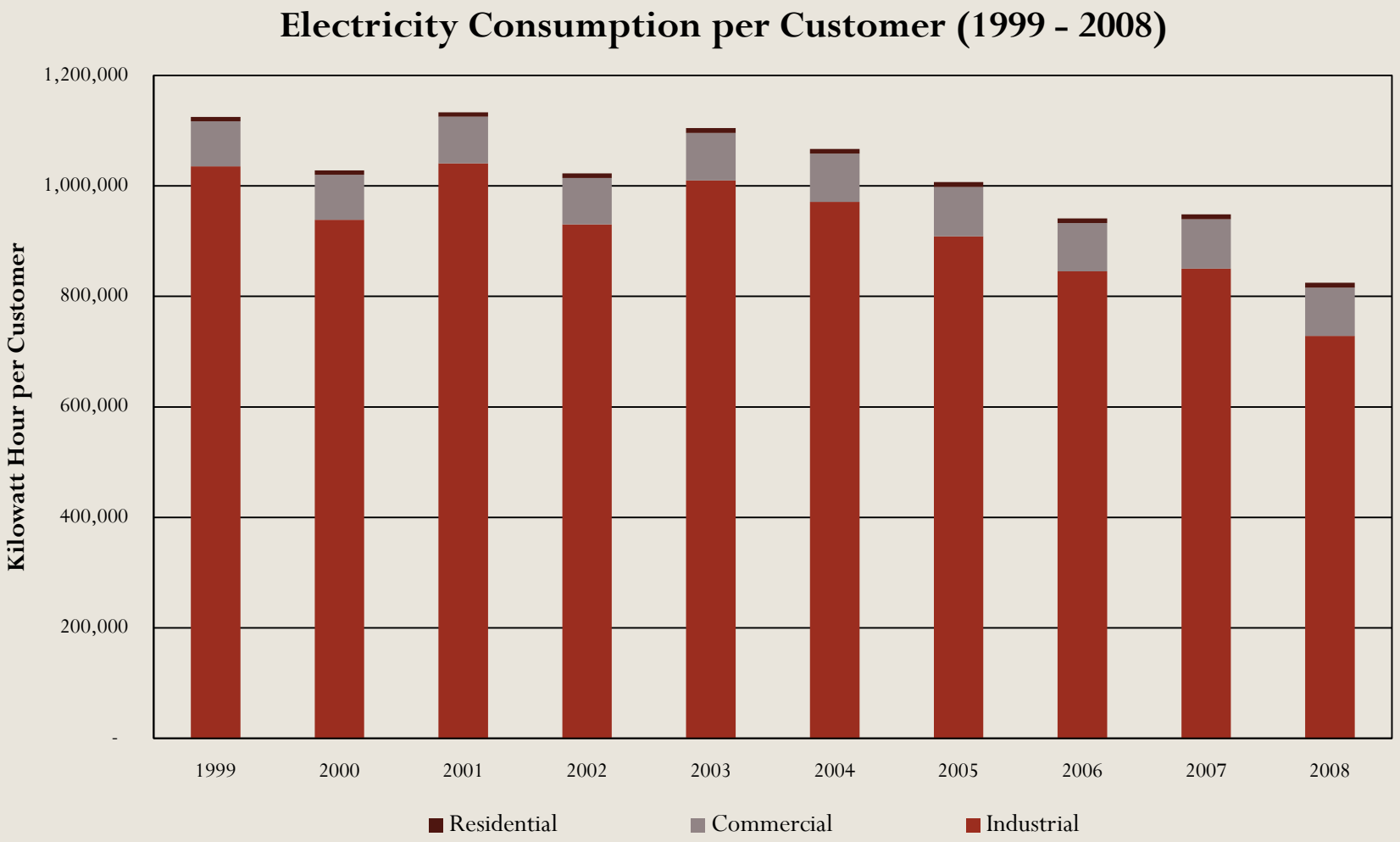
Reference: Energy Information Administration Form 826.

16.6 Electricity Prices and Consumption



Reference: New Jersey Energy Data Center.

16.7 Electricity Consumption per Customer



2008 New Jersey Electricity Consumption (kWh) per Customer		
Residential	*Commercial*	*Industrial*
8,683	87,633	728,335

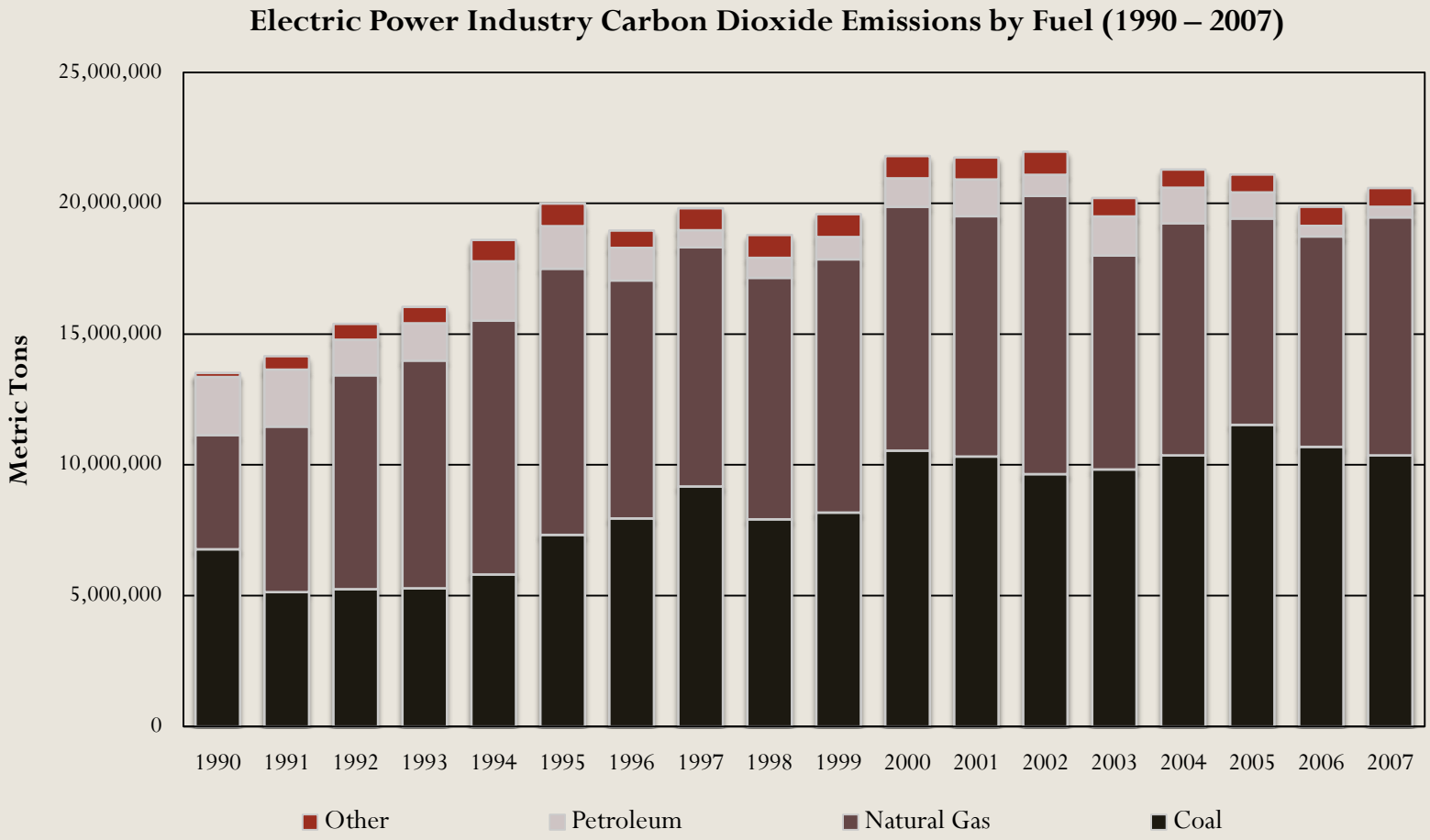
Reference: New Jersey Energy Data Center.

16.8 Average Customer Bill

New Jersey Average Electric Customer Bill				
	Residential	*Commercial*	*Industrial*	*All Sectors*
1990	$ 733	$ 6,216	$ 91,343	$ 1,726
1991	$ 800	$ 6,576	$ 89,028	$ 1,842
1992	$ 762	$ 6,872	$ 81,425	$ 1,804
1993	$ 851	$ 7,363	$ 85,120	$ 1,954
1994	$ 859	$ 7,587	$ 82,889	$ 1,971
1995	$ 896	$ 7,891	$ 83,950	$ 2,041
1996	$ 898	$ 7,978	$ 83,220	$ 2,044
1997	$ 883	$ 7,750	$ 82,084	$ 2,002
1998	$ 859	$ 7,719	$ 81,512	$ 1,977
1999	$ 888	$ 7,284	$ 74,960	$ 1,956
2000	$ 792	$ 6,998	$ 81,290	$ 1,819
2001	$ 810	$ 7,396	$ 83,446	$ 1,872
2002	$ 868	$ 7,349	$ 66,412	$ 1,873
2003	$ 891	$ 7,477	$ 78,557	$ 1,938
2004	$ 951	$ 8,380	$ 83,197	$ 2,115
2005	$ 1,053	$ 9,265	$ 84,730	$ 2,340
2006	$ 1,090	$ 9,931	$ 84,722	$ 2,460
2007	$ 1,239	$ 11,396	$ 81,765	$ 2,752

References: Energy Information Administration Form 826.
Energy Information Administration Form 861.
United States Bureau of Economic Analysis. State Annual Personal Income. "Income and Employment Summary."

16.9 Electric Power Industry Emissions



Sulfur dioxide and nitrous oxides comprise less than 1% of annual New Jersey emissions.

References: Energy Information Administration Form 767.
Energy Information Administration Form 906.

17. New Jersey Natural Gas Data

- 17.1 Natural Gas Consumption by Sector
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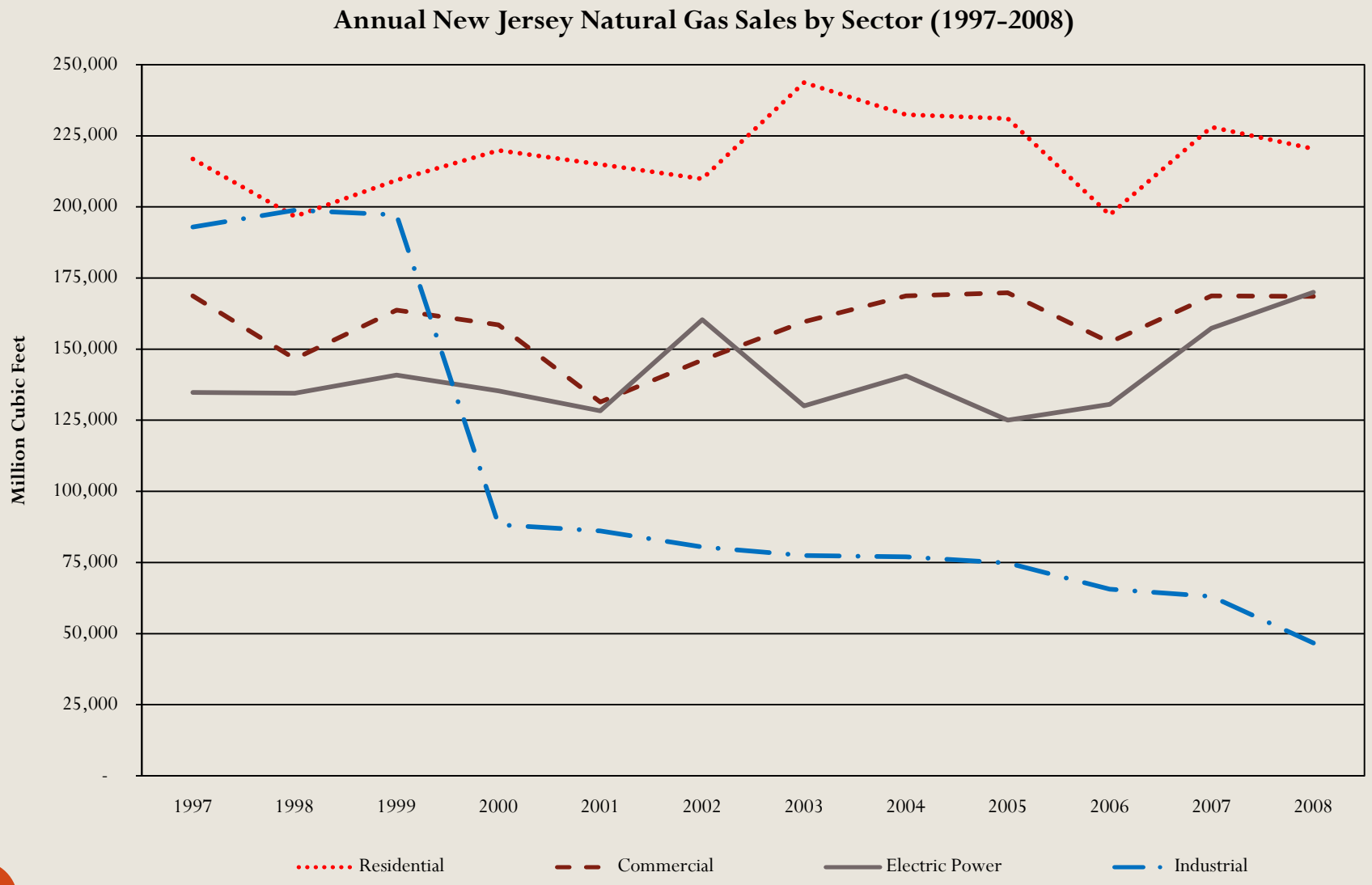
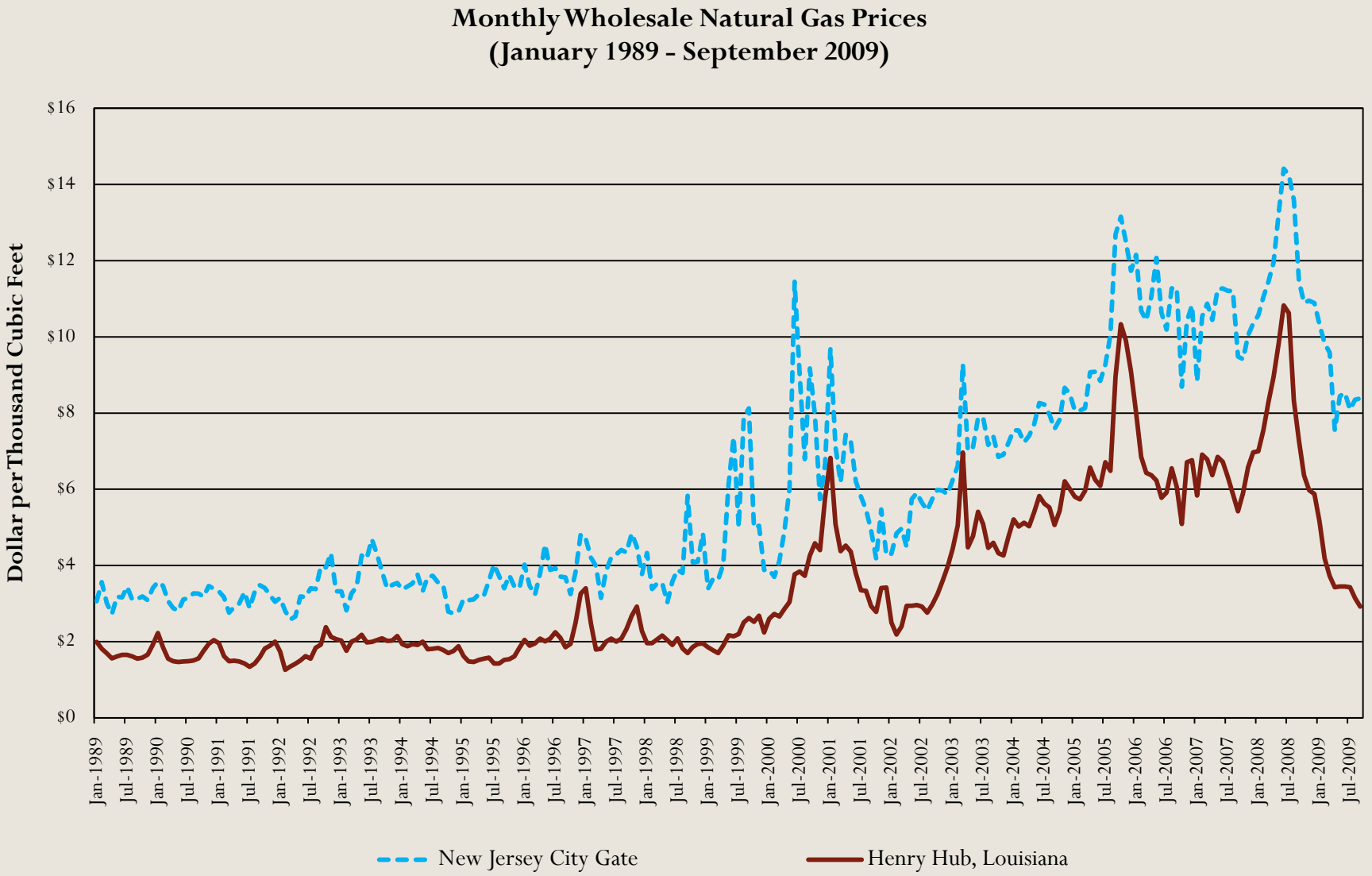
- 17.3 Retail Natural Gas Prices
- 17.4 Natural Gas Price and Consumption
- 17.5 Natural Gas Consumption per Customer
- 17.6 Average Customer Bills
- 17.7 Shale Deposits
- 17.8 Shale Natural Gas Extraction

17.1 Natural Gas Consumption by Sector



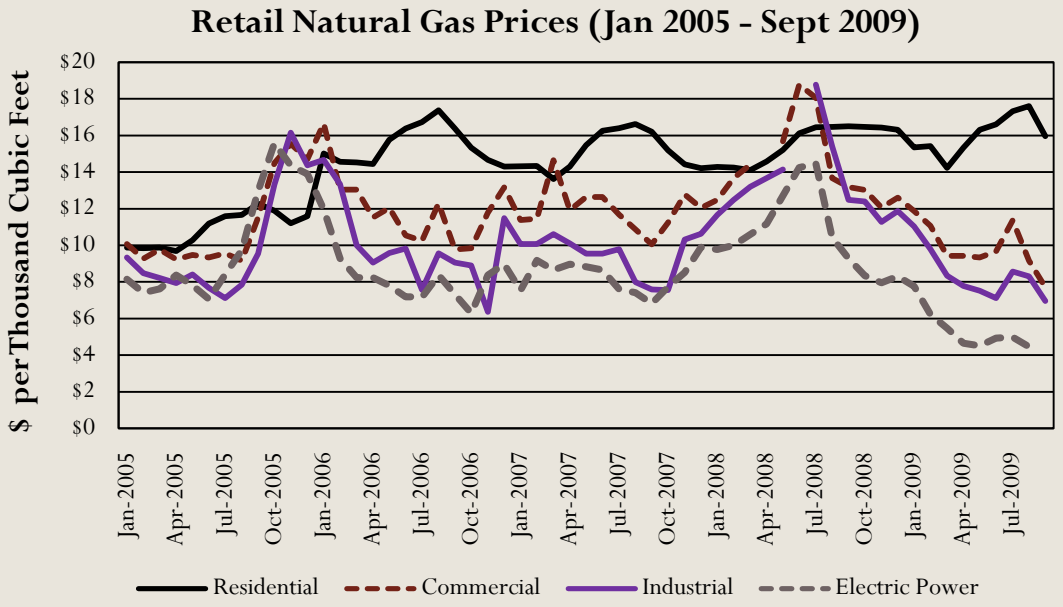
Reference: New Jersey Energy Data Center.

17.2 Wholesale Natural Gas Prices



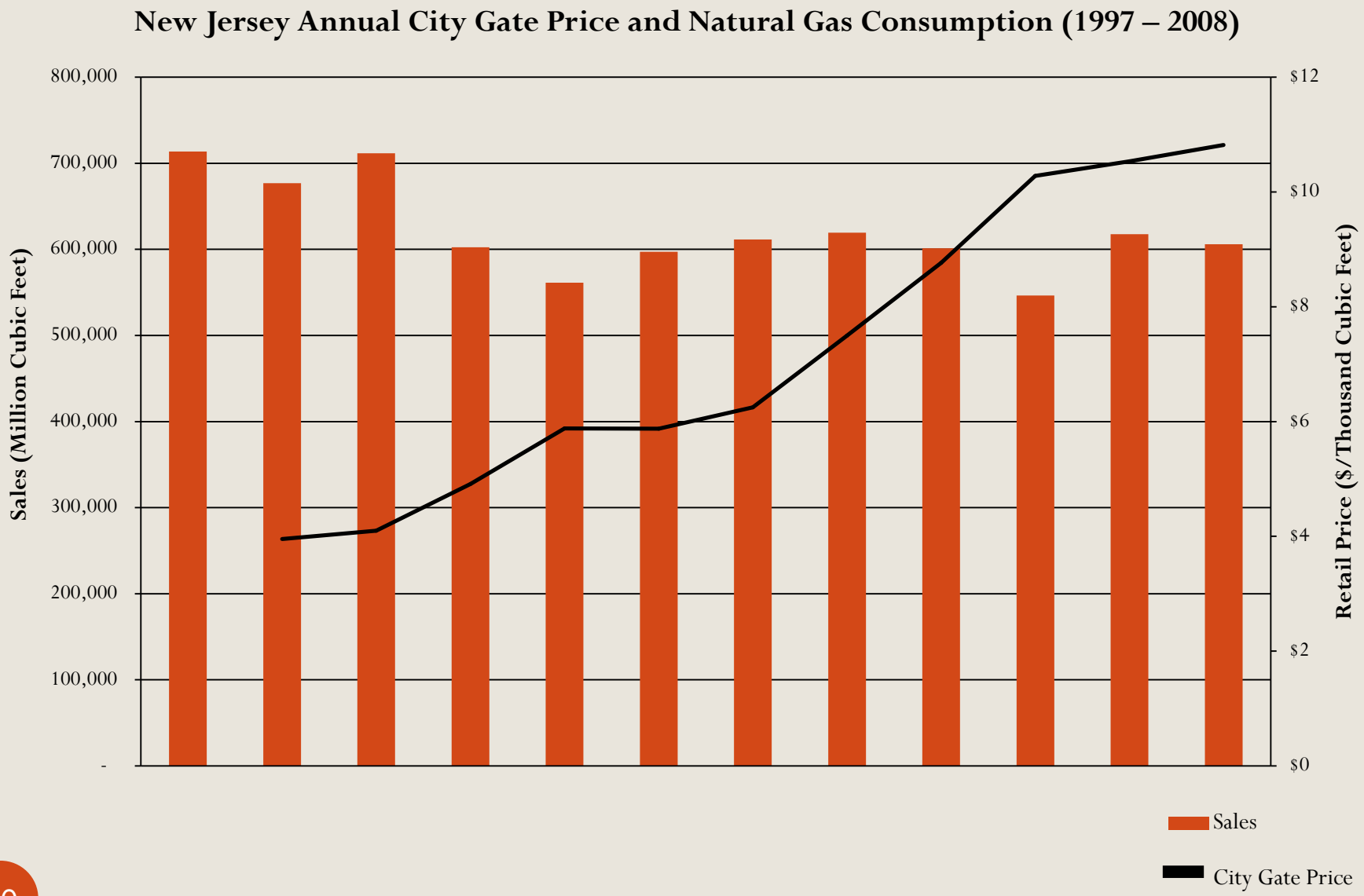
Reference: Energy Information Administration. Natural Gas Prices.

17.3 Retail Natural Gas Prices



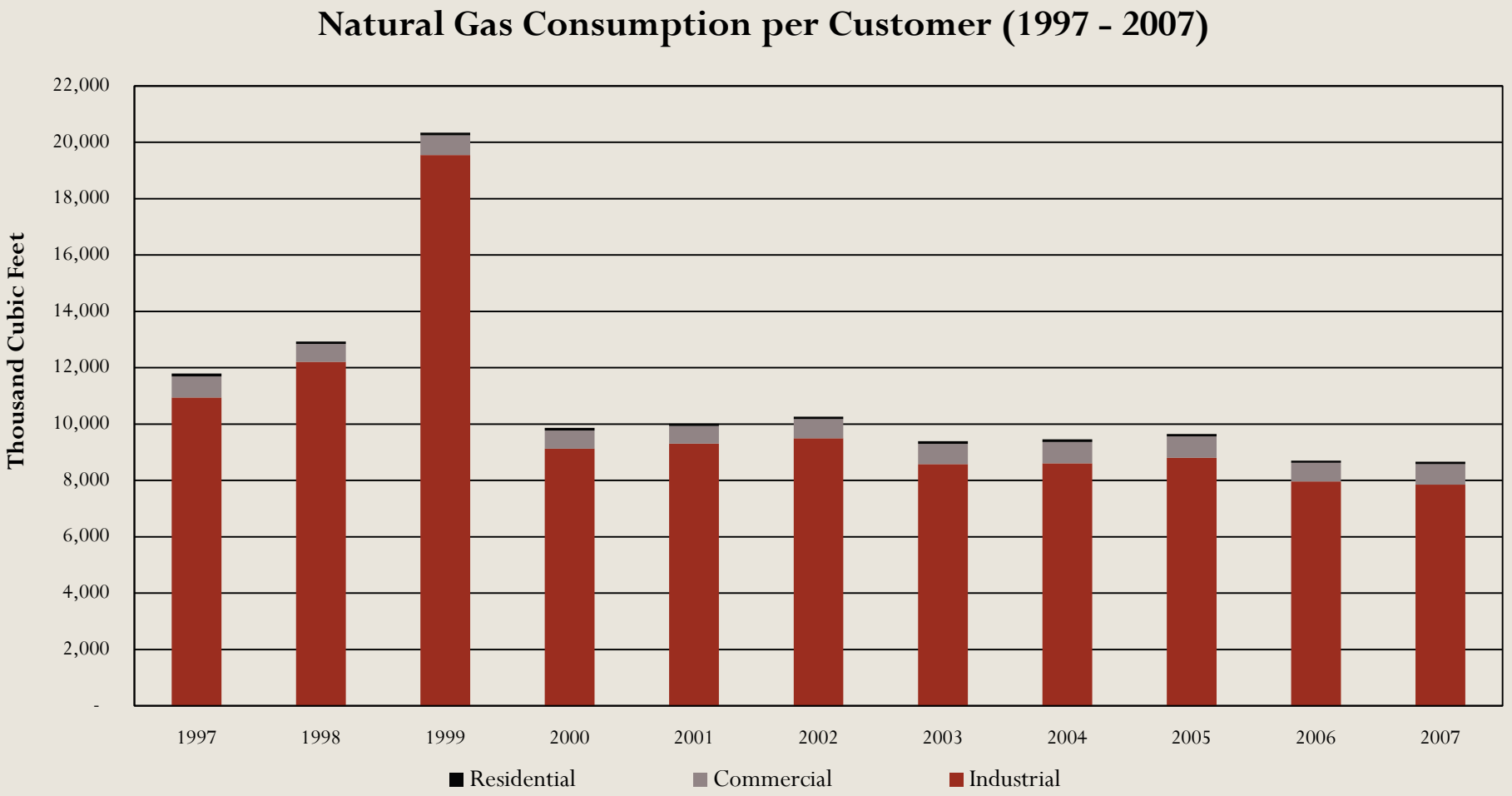
References: New Jersey Energy Data Center.
Energy Information Administration. Natural Gas Prices.

17.4 Natural Gas Price and Consumption



Reference: New Jersey Energy Data Center.

17.5 Natural Gas Consumption per Customer

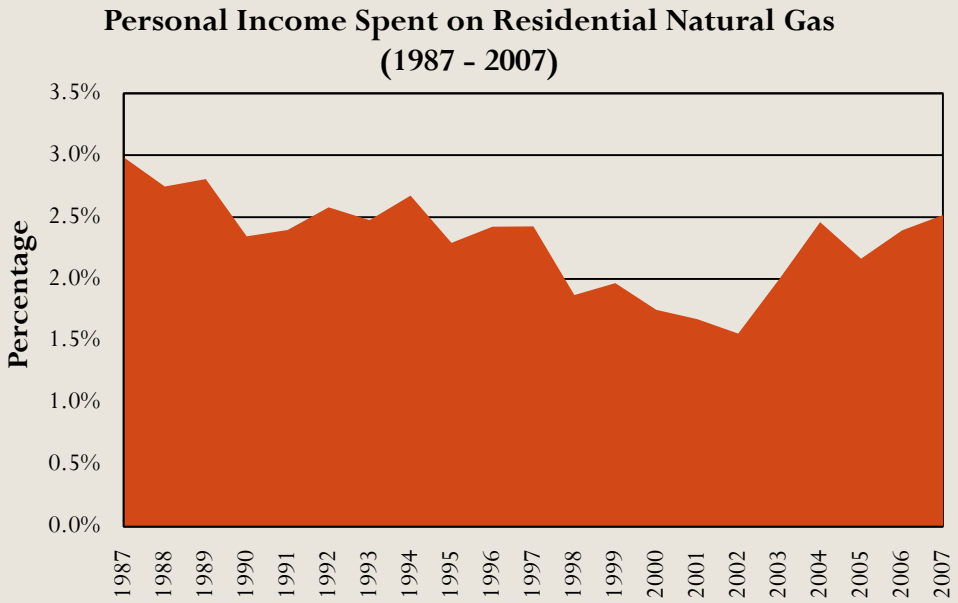


2007 New Jersey Consumption (Thousand Cubic Foot) per Customer		
Residential	***Commercial***	***Industrial***
87	731	7,849

References: New Jersey Energy Data Center
Energy Information Administration. Number of Natural Gas Consumers. Accessed at http://tonto.eia.doe.gov/dnav/ng/ng_cons_num_dcu_SNJ_a.htm

17.6 Average Customer Bills

Average Annual Natural Gas Customer Bill				
	Residential	*Commercial*	*Industrial*	*All Sectors*
1987	$ 595	$ 2,611	$ -	$ -
1988	$ 598	$ 2,574	$ -	$ -
1989	$ 652	$ 2,926	$ -	$ -
1990	$ 571	$ 2,760	$ -	$ -
1991	$ 593	$ 2,932	$ -	$ -
1992	$ 678	$ 3,411	$ -	$ -
1993	$ 664	$ 3,341	$ -	$ -
1994	$ 738	$ 3,633	$ -	$ -
1995	$ 665	$ 3,594	$ -	$ -
1996	$ 742	$ 4,110	$ -	$ -
1997	$ 784	$ 4,377	$ 41,383	$ 1,232
1998	$ 640	$ 2,314	$ 36,276	$ 1,007
1999	$ 696	$ 2,806	$ 61,376	$ 1,288
2000	$ 677	$ 3,854	$ 46,711	$ 1,235
2001	$ 665	$ 4,887	$ 62,289	$ 1,347
2002	$ 623	$ 4,266	$ 46,639	$ 1,201
2003	$ 809	$ 6,241	$ 62,548	$ 1,570
2004	$ 1,043	$ 8,280	$ 74,553	$ 1,724
2005	$ 952	$ 8,260	$ 87,539	$ 2,106
2006	$ 1,140	$ 8,689	$ 81,832	$ 2,110
2007	$ 1,265	$ 8,846	$ 75,587	$ 2,219



References: Energy Information Administration. Natural Gas Consumption by End Use. Accessed at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_SNJ_a.htm
Energy Information Administration. Natural Gas Prices. Accessed at http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SNJ_m.htm
Energy Information Administration. Number of Natural Gas Consumers. Accessed at http://tonto.eia.doe.gov/dnav/ng/ng_cons_num_dcu_SNJ_a.htm
United States Bureau of Economic Analysis. State Annual Personal Income. "Income and Employment Summary."

17.7 Shale Deposits

Shale is a fine-grained sedimentary rock that is easily broken into thin, parallel layers and can contain a large amount of natural gas.

- Millions of acres of shale exist in the Appalachian Basin, the oldest and deepest shale layer is Marcellus.
- It is estimated that there is approximately 616 trillion cubic feet of recoverable gas, although some sources expect that only 10% is recoverable. The Appalachian Basin is estimated to have 227 trillion cubic feet.

Extraction of natural gas from shale is expected to reduce natural gas prices in the Northeast and Middle Atlantic regions because natural gas resources will be available from the region rather than being imported from the southwest and midwestern states. The extent of the reduction is currently unknown. One environmental concern includes protecting water sheds.

Share of Total 2007 Natural Gas Production	
Texas	30%
Federal Offshore Gulf of Mexico	14%
Wyoming	10%
Oklahoma	9%
New Mexico	8%

References: NaturalGas.org. Unconventional Natural Gas Resources.
Rotman, David. "Natural Gas Changes the Energy Map." Technology Review (November/December 2009): 45-51.
Energy Information Administration. Natural Gas Explained.

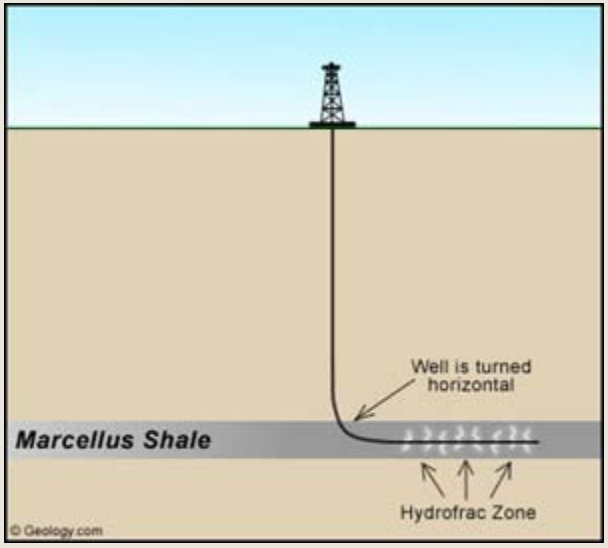
17.8 Shale Natural Gas Extraction

Extraction of shale natural gas is more difficult and expensive than the extraction of conventional natural gas.

Extensive efforts such as horizontal drilling and creating artificial fractures in the rock are needed to extract the natural gas.

The common extraction process:

- About six wells, spaced a few feet apart, are drilled approximately 2,000 meters into the shale (vertically).
- The drill turns and enters the shale layer horizontally, drilling the wells up to 1,600 meters horizontally. The wells spread out under the surface, accessing the natural gas of hundreds of acres of shale.
- Hydraulic facture simulation, or hydrofacturing, is performed once the drills are removed. Millions of gallons of water mixed with fine sand and chemical additives are forced into the well at high pressure, enlargening the cracks in the shale and allowing the natural gas out of the shale into the pipeline after the water is pumped back out.

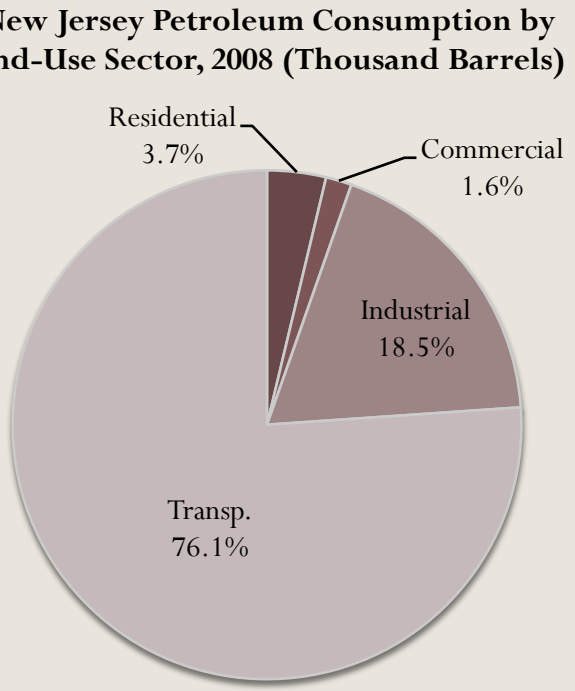


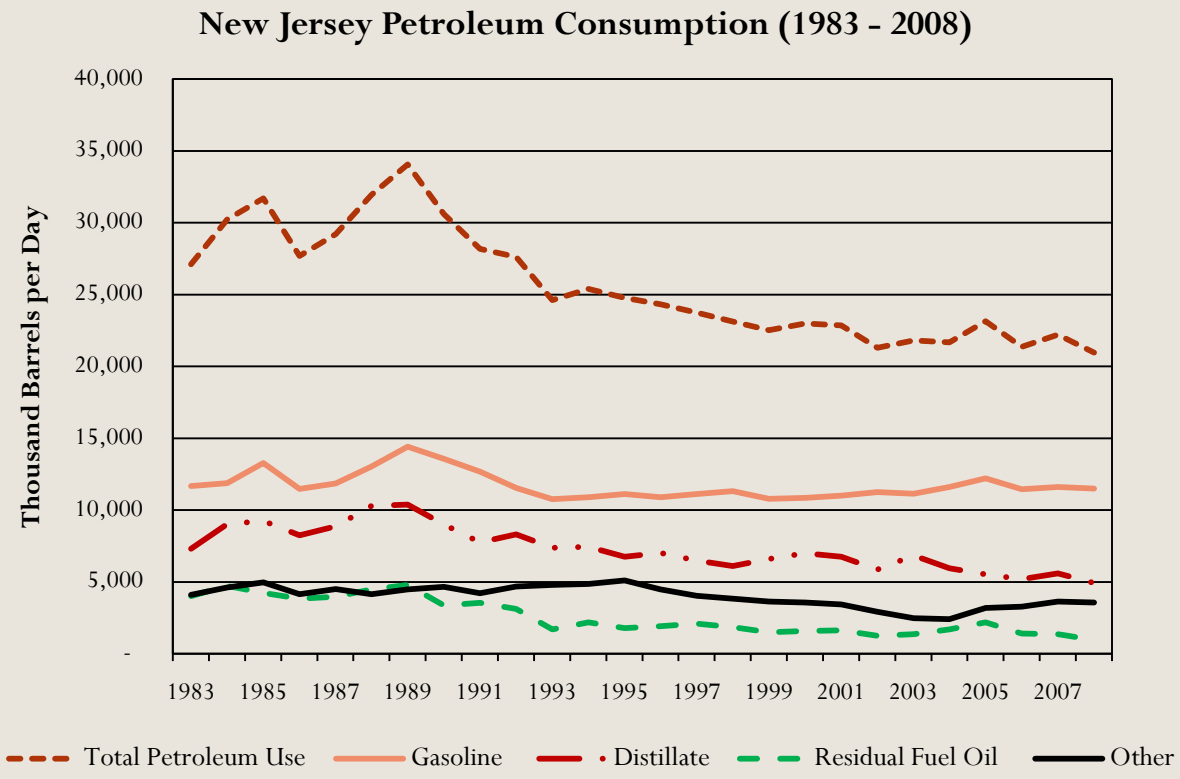
References: NaturalGas.org. Unconventional Natural Gas Resources.
Rotman, David. "Natural Gas Changes the Energy Map." Technology Review (November/December 2009): 45-51.
New York State Department of Environmental Conservation. Marcellus Shale.

18. New Jersey Petroleum Data

- 18.1 Petroleum Demand
- 18.2 Distillate No. 2 Consumption
- 18.3 Residual Fuel Oil Consumption
- 18.4 Motor Gasoline
- 18.5 Motor Gasoline Sources
- 18.6 Average Household Motor Gasoline Bill
- 18.7 Motor Gasoline and Vehicle Miles Traveled

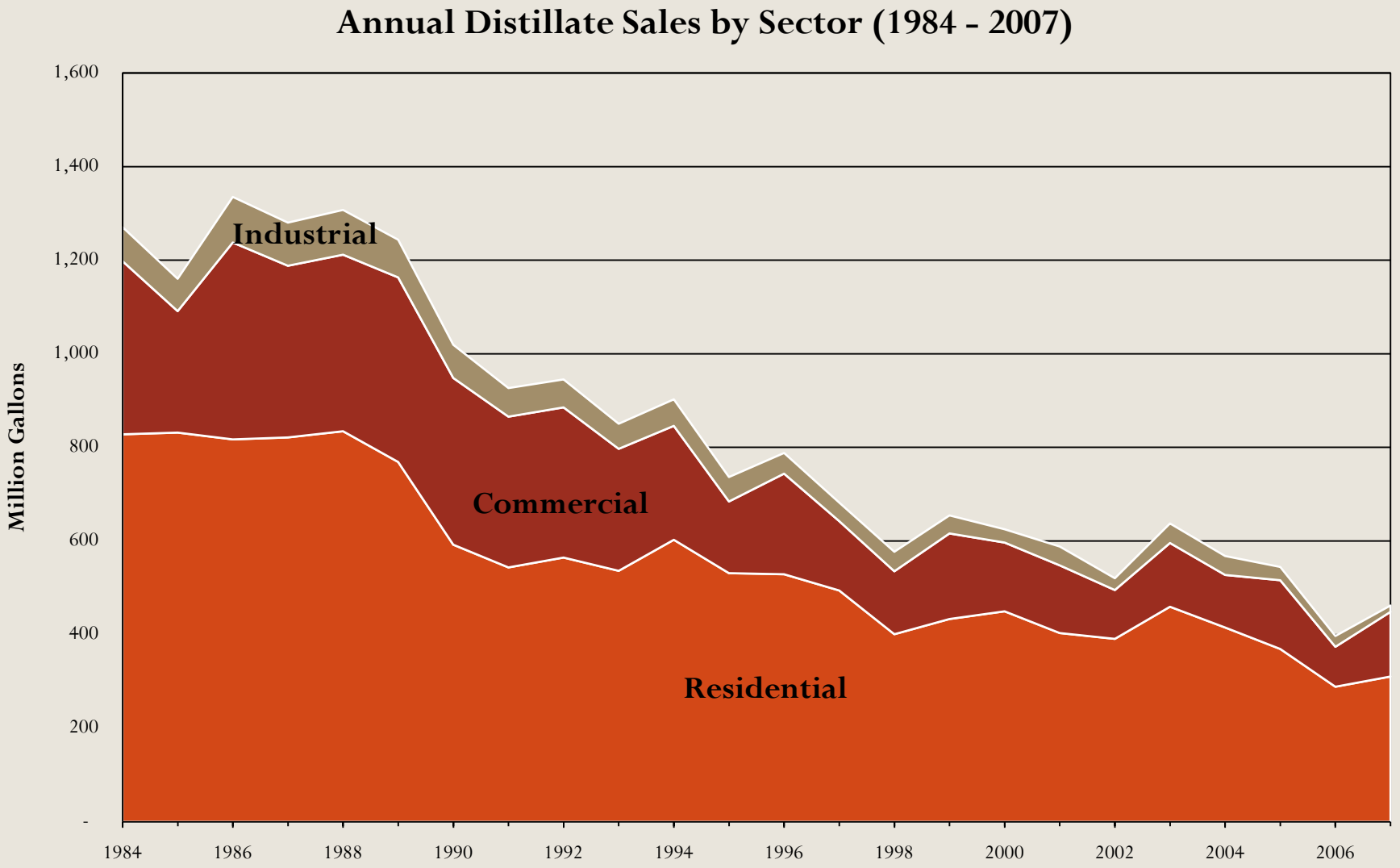
18.1 Petroleum Demand





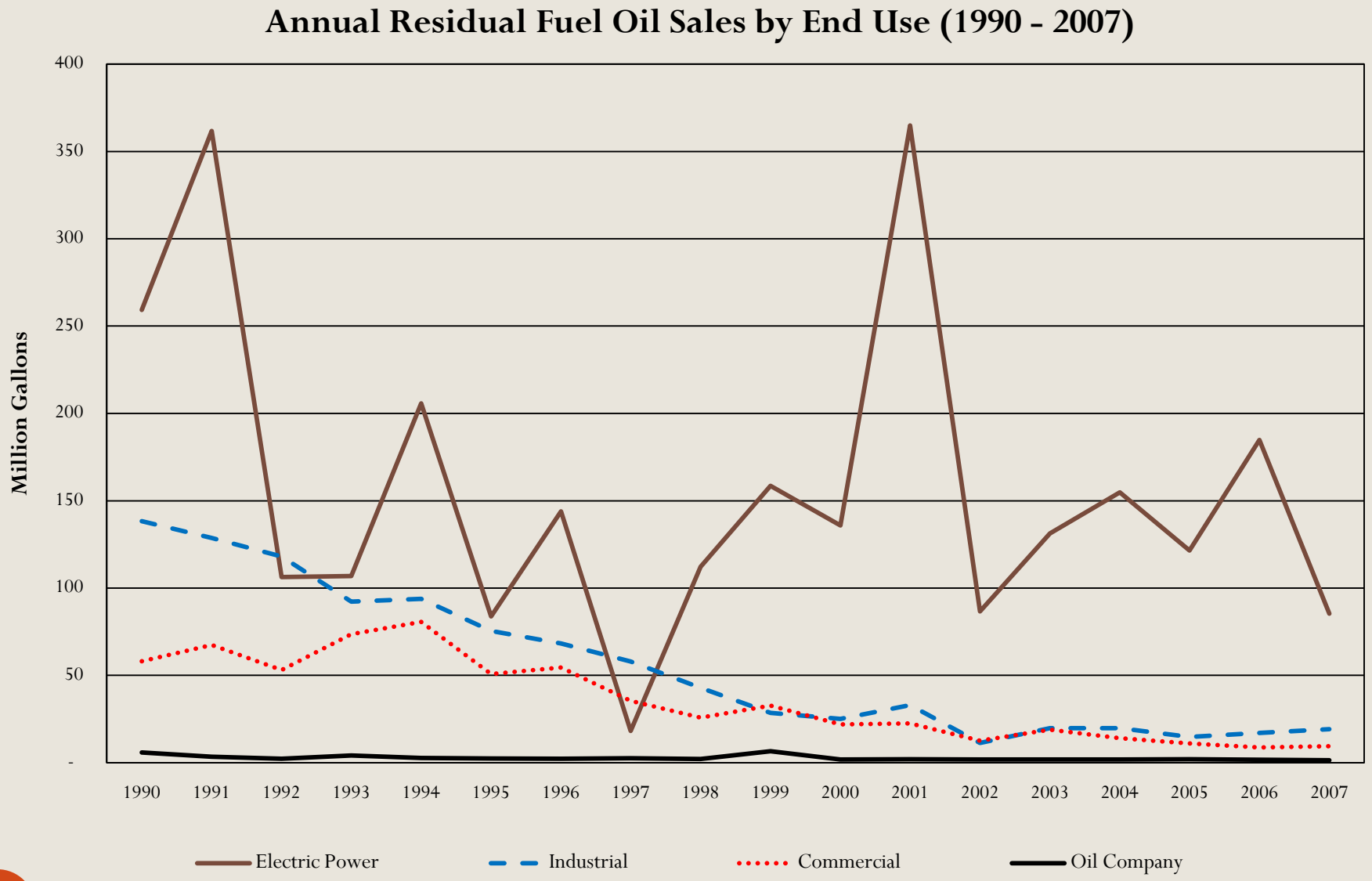
Reference: U.S. Energy Information Administration. Prime Supplier Sales Volumes. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_SNJ_a.htm

18.2 Distillate No. 2 Consumption



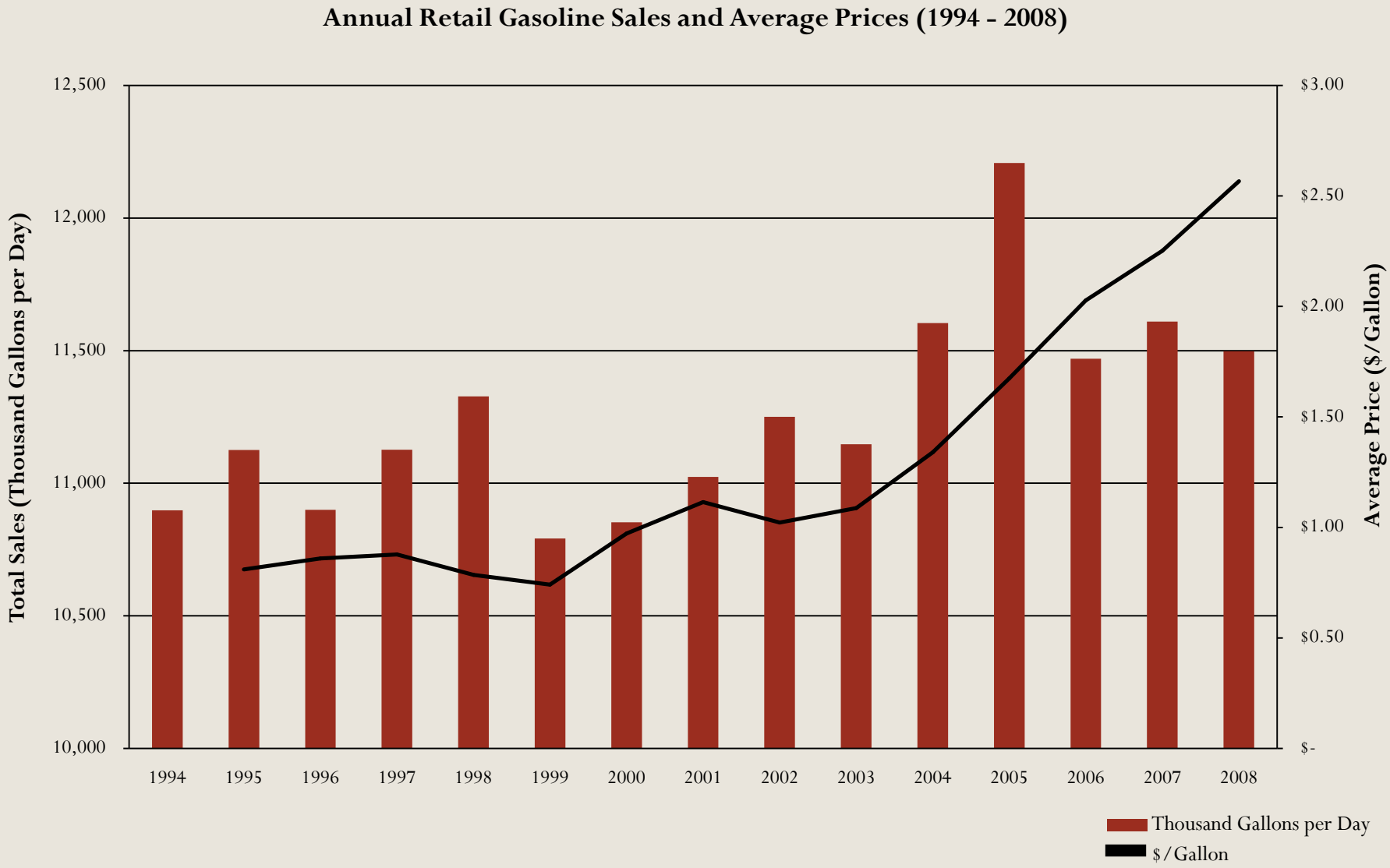
References: U.S. Energy Information Administration. Sales of Distillate Fuel Oil by End Use. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_821dst_dcu_SNJ_a.htm

18.3 Residual Fuel Oil Consumption



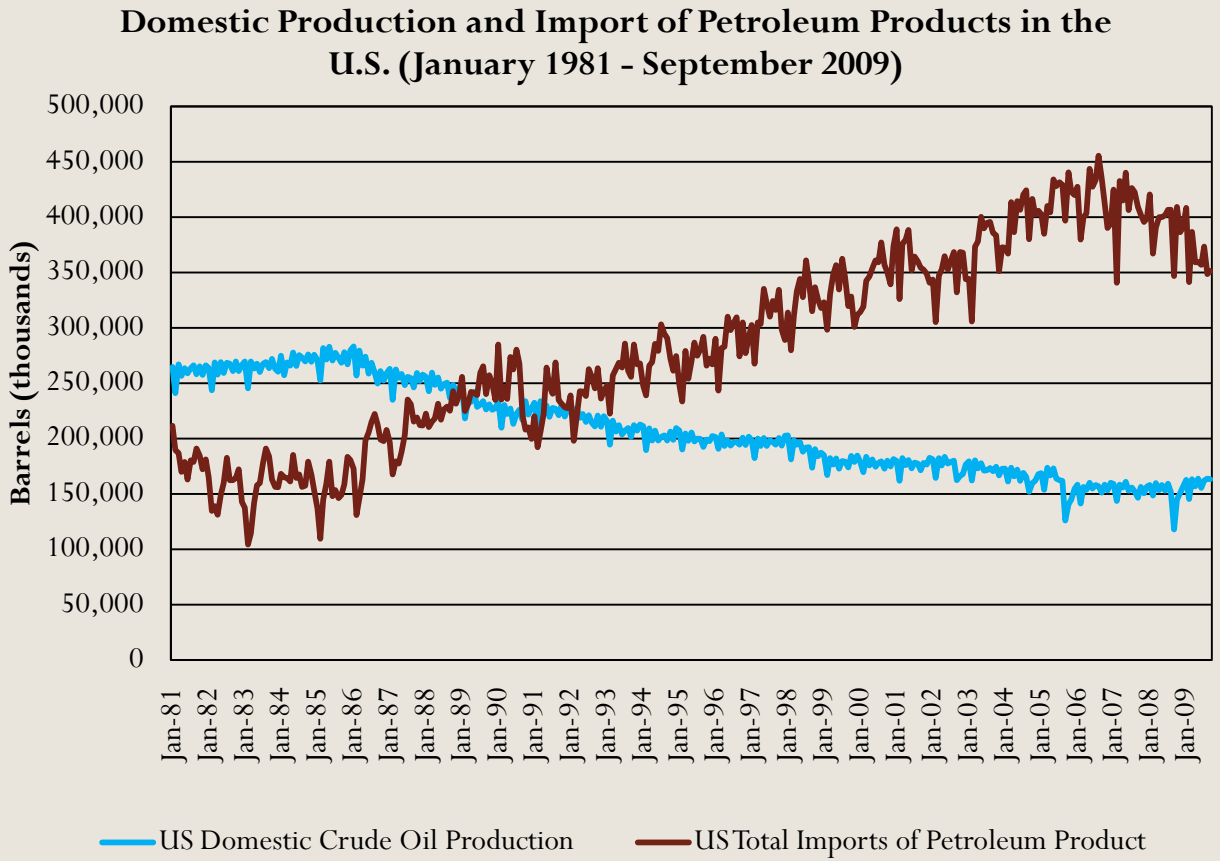
Reference: U.S. Energy Information Administration. Sales of Residual Fuel Oil by End Use. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_821rsd_dcu_SNJ_a.htm

18.4 Motor Gasoline



References: Energy Information Administration. Gasoline Prices by Formulation, Grade, Sales Type. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_pri_allmg_d_SNJ_PTA_cpgal_a.htm
Energy Information Administration. Prime Supplier Sales Volumes. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_SNJ_a.htm

18.5 Motor Gasoline Sources

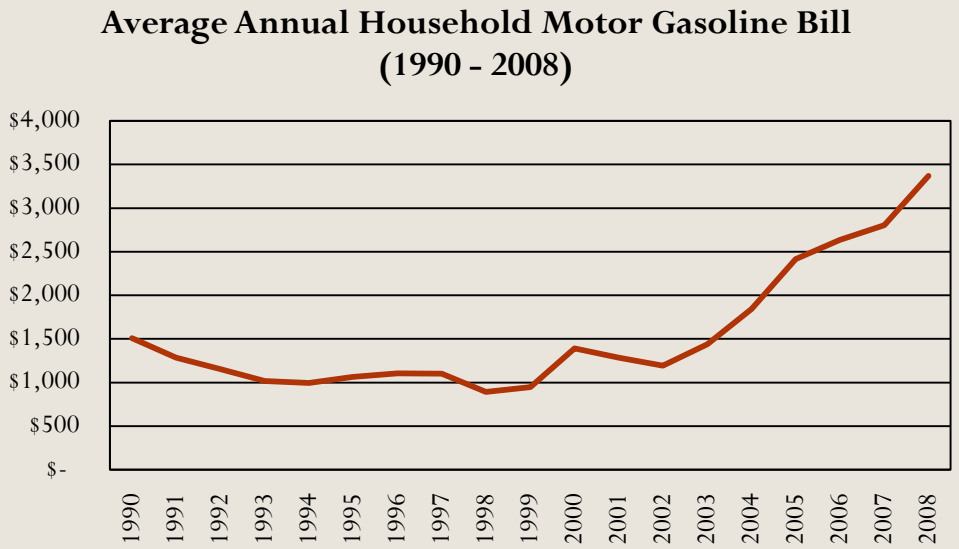


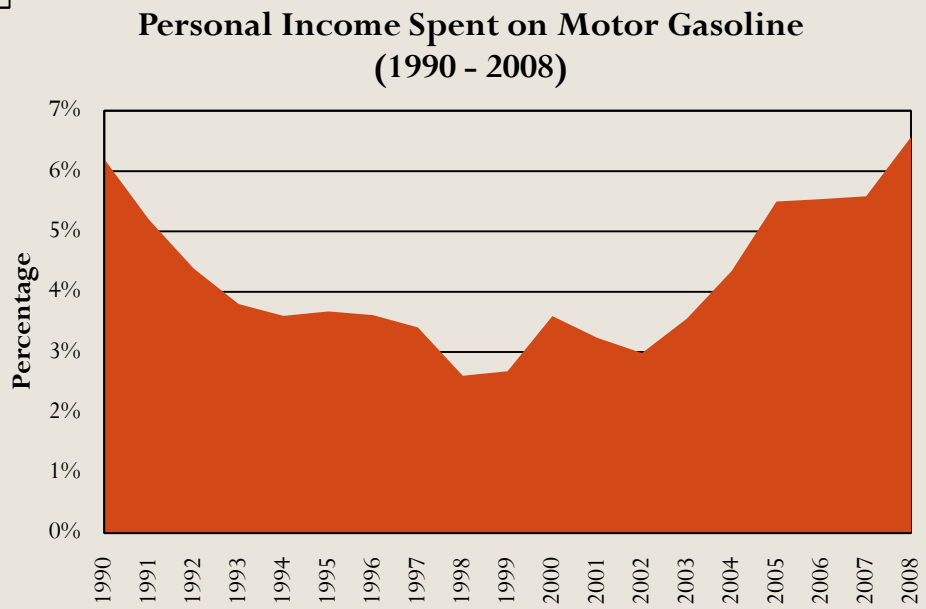
Top Ten Countries Providing Petroleum Imports to the United States (2008)

	(1,000 barrel)
Canada	912,263
Saudi Arabia	559,750
Mexico	476,366
Venezuela	435,029
Nigeria	361,659
Iraq	229,300
Algeria	200,652
Angola	187,790
Russia	170,264
Brazil	94,519

Reference: Energy Information Administration. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_move_top.asp

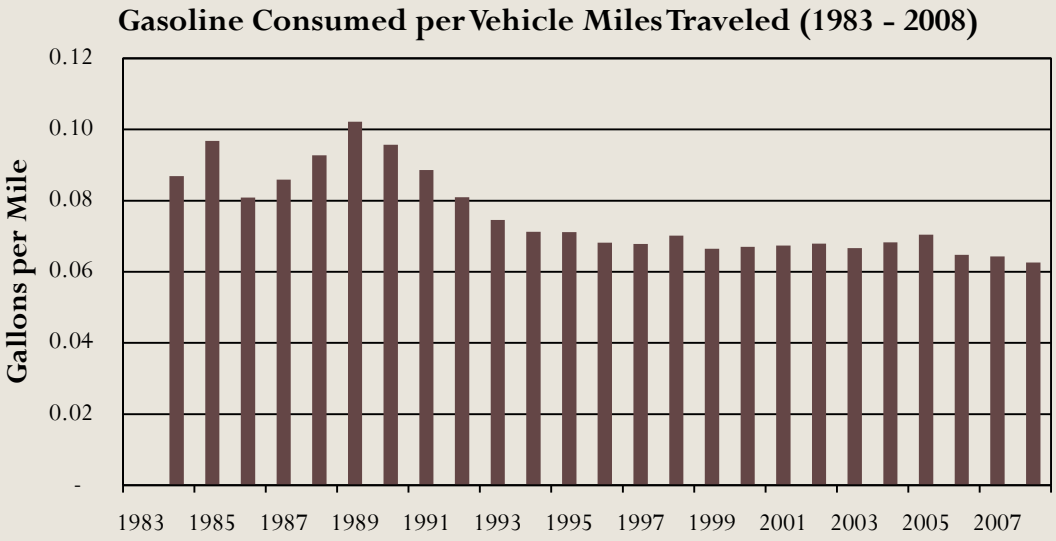
18.6 Average Household Motor Gasoline Bill

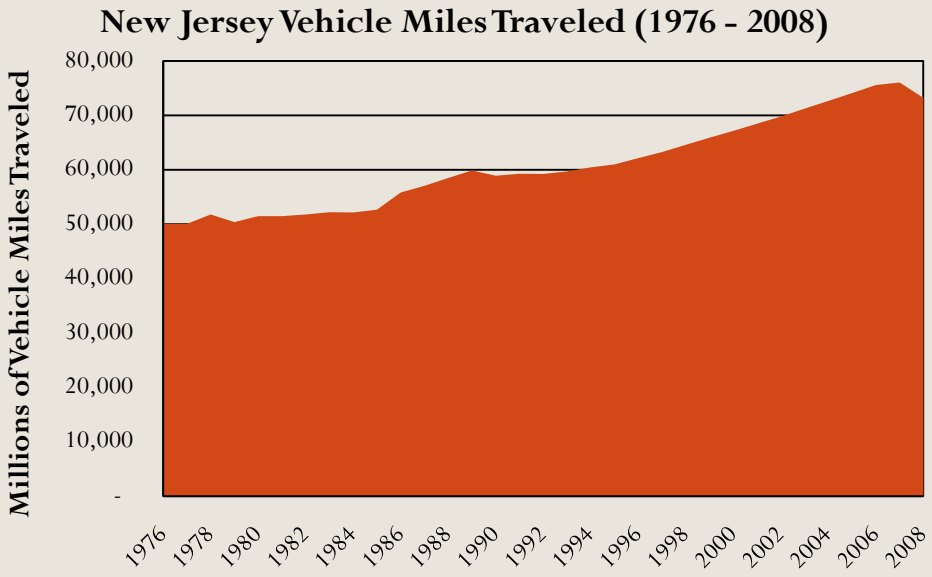




References: Energy Information Administration. Gasoline Prices by Formulation, Grade, Sales Type. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_pri_allmg_d_SNJ_PTA_cpgal_a.htm
Energy Information Administration. Prime Supplier Sales Volumes. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_SNJ_a.htm
U.S. Census. State Housing Unit Estimates: 2000 to 2008. Accessed at http://www.census.gov/popest/housing/housing.html
United States Bureau of Economic Analysis. State Annual Personal Income. "Income and Employment Summary."

18.7 Motor Gasoline and Vehicle Miles Traveled

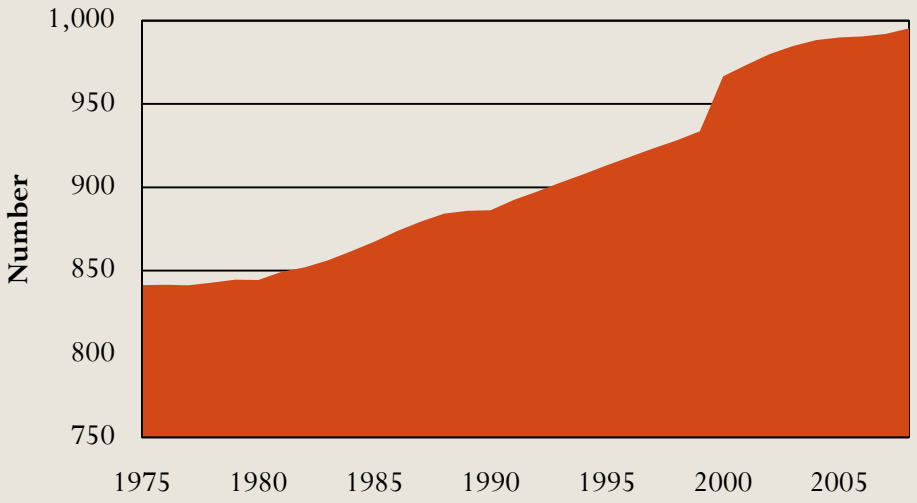




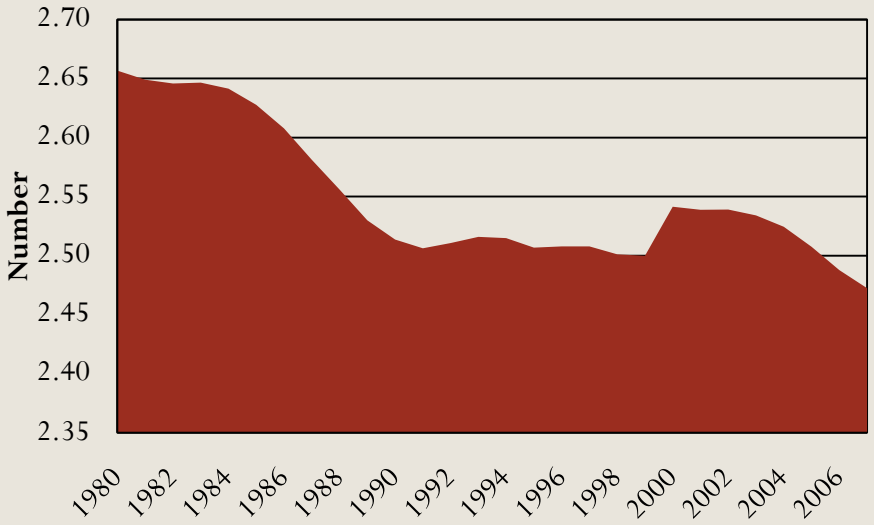
References: Energy Information Administration. Prime Supplier Sales Volumes. Accessed at http://tonto.eia.doe.gov/dnav/pet/pet_cons_prim_dcu_SNJ_a.htm
New Jersey Bureau of Transportation Data Development, Roadway Systems Section. New Jersey's Annual Certified Public Road Mileage and VMT Estimates. Accessed at http://www.state.nj.us/transportation/refdata/roadway/pdf/hpms2008/prmvmt_08.pdf

19. New Jersey Demographic Data

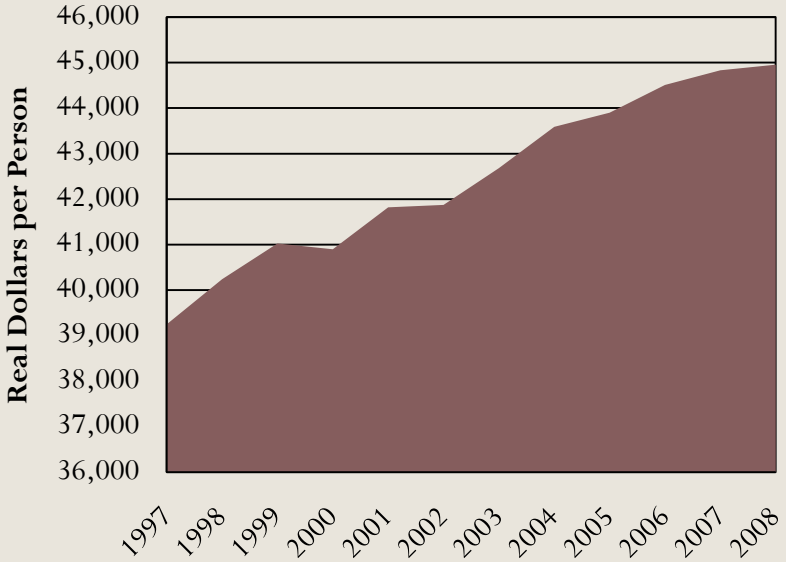
Population per Square Mile (1975 - 2008)



Persons per Household (1980 - 2007)

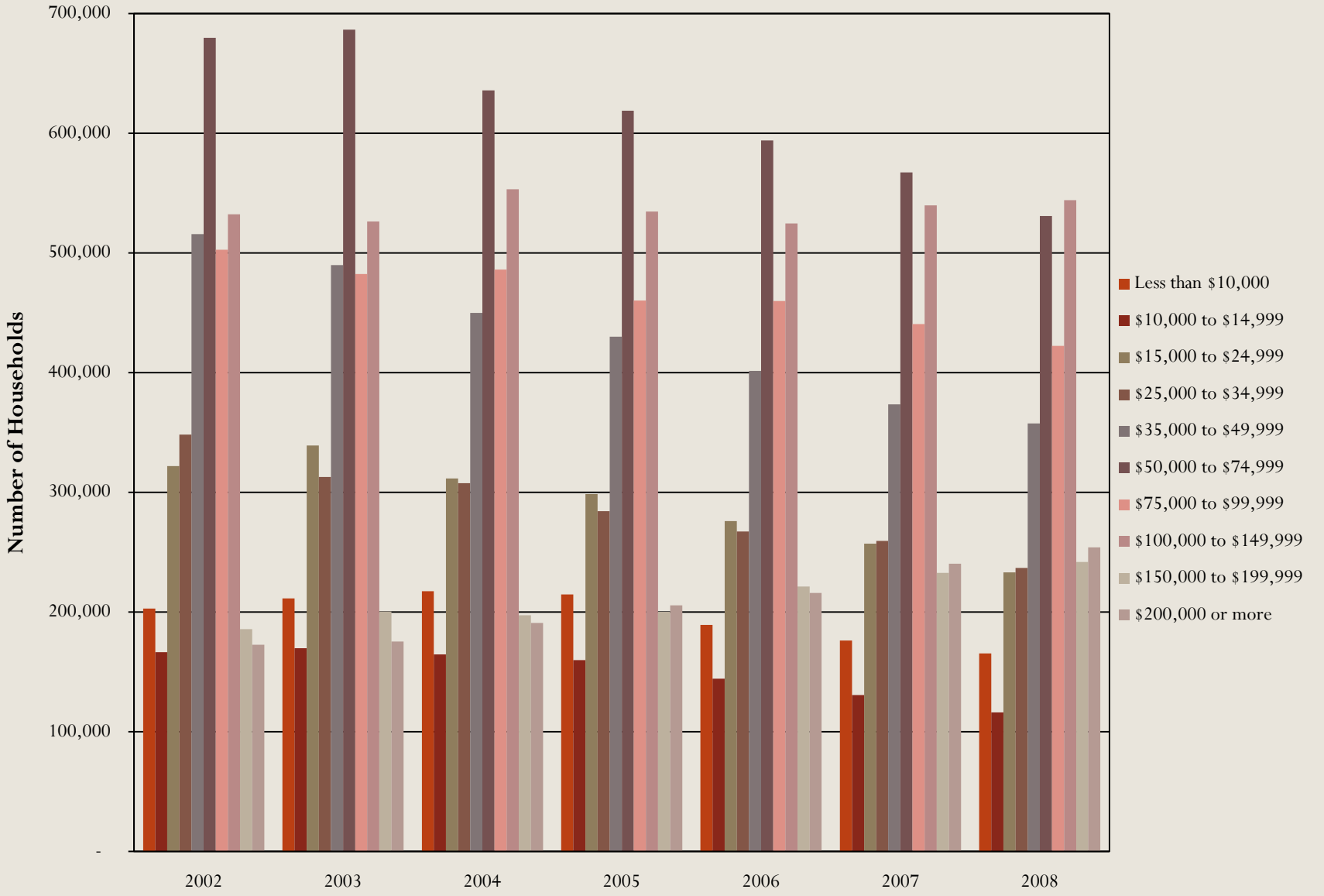


Gross State Product per Person (1997 - 2008)



References: US Census Bureau
New Jersey Department of Labor and Workforce Development.

Income Distribution by Household Unit



Reference: US Census Bureau. American Community Survey.

20. Key Terms and Abbreviations

Energy

- *British Thermal Unit (Btu)*: a measurement of the heat content in all energy sources; can be used to compared diverse energy sources. The quantity of heat required to raise the temperature of one pound of liquid water by 1° Fahrenheit at the temperature at which water has its greatest density (approximately 39° Fahrenheit).

Btu conversion factors:*

Electricity (point of use) ..... 3,412 Btu/kWh
Electric Power Plant (U.S. average) ….. 10,500 Btu/kWh
Natural Gas ..... 1,031 Btu/cf
Fuel Oil No.1 ..... 135,000 Btu/gallon
Kerosene ..... 135,000 Btu/gallon
Fuel Oil No.2 ..... 138,690 Btu/gallon
LPG (Propane) ..... 91,330 Btu/gallon
Wood ..... 20 million Btu/cord
Gasoline …..approx. 115,000 Btu/gallon

20.1 Key Terms and Abbreviations

Electricity

- *Megawatt Hour (MWh)*: the amount of electricity generated by a MW electric generator operating/producing electricity for one hour (1 MWh = 1,000 kWh). On a typical residential or commercial electric bill, electricity usage is reported in kWh. Ten 100 watt light bulbs left on for one hour use 1 kWh of electricity.
- *Megawatt (MW):* a unit of electric capacity or electric load (volume demand). Generators have rated capacities based on their size given in MW, kW, or watts. The capacity of all operating electric generators must match the load at all times. An average home load is 2 to 4 kW (1 MW = 1,000 kW).
- *Locational Marginal Pricing (LMP)*: the hourly integrated market clearing marginal price for energy at the location the energy is delivered or received.

Natural Gas

- *Cubic Foot (cf):* the amount of natural gas contained at standard temperature and pressure (60° Fahrenheit and 14.73 lbs/in.^{2}) in a cube with edges = 1 ft.
- *One Million Cubic Feet (Mmcf):* the standard measure for large scale natural gas consumption (1 Mmcf = 1,000,000 cf).
- *Decatherm (DTherm):* a standard unit used to report natural gas consumption on home/commercial gas bills (1 Dtherm = 10 Therms or 1,000,000 Btu).
- *City Gate:* a point or measuring station at which a distributing gas utility receives gas from a natural gas pipeline or transmission system. Equivalent to the natural gas wholesale price utilities face.
- *Liquefied Natural Gas (LNG):* natural gas (primarily methane) that has been liquified by reducing its temperature to -260° Fahrenheit at atmospheric pressure.

20.2 Key Terms and Abbreviations

Petroleum

- *Barrel* – a unit volume of pre-processed petroleum equivalent to 42 U.S. gallons
- *Gallon* – a volumetric measure equal to 4 quarts (231 cubic inches) used to measure fuel oil and gasoline.
- *Crude Oil* – a mixture of hydrocarbons that exist in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Depending upon the characteristics of the crude stream, it may also include:
  - Small amounts of hydrocarbons that exist in gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being recovered from the oil well and then commingled with the crude;
  - Small amounts of nonhydrocarbons produced with the oil, such as sulfur and various metals;
  - Drip gases and liquid hydrocarbons produced from tar sands, oil sands, gilsonite, and oil shale.
  - Liquids produced at natural gas processing plants are excluded.
  - Crude oil is refined to produce a wide array of petroleum products, including heating oils; gasoline, diesel, and jet fuels; lubricants; asphalt; ethane, propane, and butane; and many other products used for their energy and chemical content.
- *Motor Gasoline* – a complex mixture of relatively volatile hydrocarbons with or without additives that are blended to form a fuel suitable for use in spark-ignition engines. Motor gasoline includes conventional, reformulated, and oxygenated gasoline (including gasohol) but excludes aviation gasoline.
- *Distillate Fuel Oil:* a general classification for one of the petroleum fractions produced in conventional distillation operations primarily for space heating and electric power generation.
  - **No. 1 Distillate:** A light petroleum that can be used as either a diesel fuel or a fuel oil.
  - **No. 2 Distillate:** A petroleum that can be used as either a diesel fuel or a fuel oil.
  - **No. 4 Fuel:** A distillate fuel oil made by blending distillate fuel oil and residual fuel oil stocks. It is used extensively in industrial plants and in commercial burner installations that are not equipped with preheating facilities.
- *Residual Fuel Oil:* a general classification for the heavier oils, known as No. 5 and No. 6 fuel oils, that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations.

20.3 Key Terms and Abbreviations

Energy Efficiency

- Programs aimed at mitigating the use of energy, reducing harmful emissions, and decreasing overall energy consumption.

Decoupling

- A means of separating a utility's revenues from changes in energy sales. Revenue adjustments that compensate for increases/decreases in energy sales due to variations from normal weather, recessions, and energy efficiency.

Green Jobs

- Jobs that involve protecting wildlife or ecosystems, reducing pollution or waste, or reducing energy usage and lowering carbon emissions.

Renewable Electric Power Industry

- Electricity generated from solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project

Smart Grid

- Utilizes digital technology to improve reliability, security, and efficiency of the electric system from large generation, through the delivery systems to electricity consumers and a growing number of distributed-generation and storage resources (U.S. Department of Energy).

Capacity Factor

- Capacity is a comparison of the actual wind production over a given period and the wind that could have been produced if the turbine had run at full capacity over the given period.