Analysis for the 2011 Draft New Jersey Energy Master Plan Update

RUTGERS
Edward J. Bloustein School
of Planning and Public Policy

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I. INTRODUCTION

The New Jersey Board of Public Utilities (NJ BPU) has asked the Center for Energy, Economics and Environmental Policy (CEEEP) along with the Rutgers Economic Advisory Service (RECON™), both part of the Bloustein School of Planning and Policy, Rutgers University to provide data collection and analysis as New Jersey updates and revises its Energy Master Plan (EMP).

In this brief introduction, the role of data collection, analysis and uncertainty in energy planning, raised in CEEEP's *Modeling Report for the New Jersey Energy Master Plan* [1](2008), is discussed. Readers are encouraged to revisit that document as well as its many other reports, which contain similar discussions. In the context of the EMP, planning should be an iterative process that articulates fundamental objectives, establishes measurable targets, assigns resources and responsibilities for meeting those targets, and reevaluates and adjusts the EMP's strategies over time. In the remainder of this introduction, the role of data collection and analysis is discussed, the importance of acknowledging uncertainty is raised, and a short description of CEEEP and RECON™'s approach is provided.

1. Role of Data Collection and Analysis

The purpose of data collection and analysis is to inform the process, not to be dispositive. The engineering, economic, and policy issues are so complex and intertwined that there is not a single "right" solution that the modeling is supposed to calculate. Sometimes the relationship between policies and outcomes can get lost in all the calculations. The data collection and analysis should provide a means to test and understand the EMP's themes and strategies, not become the focus of the EMP. Regardless of the results, the process of modeling is extremely helpful. These efforts may narrow areas of disagreement, help to identify uncertainties that matter and those that do not given the policy choices, identify key tradeoffs, and establish the conditions under which certain outcomes can occur. Obviously, it is intended that the results themselves contribute to the planning process and discussions, but not that the model determines the specific policy design.

2. Role of Uncertainty in Energy Planning

The planning process must account for the fact that the future is unknown. The process must be able to identify major uncertainties, determine when events depart substantially from what the plan assumed, and make changes as appropriate. An inappropriate response to uncertainty, however, is to assume that planning has no value. Its value is in establishing the conditions under which policies will be successful and thereby in defining the framework that would need to be adjusted if those conditions fail to materialize.

As CEEEP noted in 2008, a cursory review of energy events over the last several decades reveals that the unexpected is the norm, not the exception. In the late 1970's and early 1980's, there were serious concerns about the possibility of prices reaching $100 per barrel of oil. During the 1990's oil and natural gas prices were at very low levels. Now natural gas prices are very low but oil prices are approximately $100 a barrel. In the 1970's, natural gas was not permitted to be used to generate electricity. In the 1990's and until the spike in natural gas prices starting in 2002, natural gas became the dominant fuel for

[1] CEEEP reports are available at: http://policy.rutgers.edu/ceeep/publications/

new generation plants, and it may be so again given its current low prices. In 1979, the meltdown at Three Mile Island precipitated a halt in the construction of new nuclear power plants. Until very recently, discussion was of a possible resurgence with the extension of licenses by twenty years and preliminary plans for building more than 20 new plants throughout the country (including one in New Jersey). Air emissions concerns in the 1970s revolved around sulfur dioxide (SO_2) and nitrogen oxide (NO_x); today they also include emissions of greenhouse gases like carbon dioxide (CO_2) and methane. Finally, new technologies are being developed and improved, including those for hybrid vehicles, fuel cells, carbon sequestration, biomass, wind turbines, and solar power.

The Energy Master Plan must explicitly deal with uncertainty and the prospect that things will turn out differently from what was assumed. Some assumptions made in the modeling will be wrong. Unforeseen events will require changes in direction and policies. Planning in general and data collection and analysis in particular can help anticipate these possibilities and determine appropriate responses at the appropriate times. This often gets lost in the discussions as modeling is frequently assumed to be a forecasting effort with definite outcomes.

3. The CEEEP Approach

From its inception in 2003 and with its first major report on the *Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard* (2004)[2], CEEEP in conjunction with RECON™ has, and continues to, emphasize transparency in its analysis and has third parties, both stakeholders and independent experts, publicly review and critique data, analysis and findings. In general, CEEEP and RECON™ make draft data publicly available prior to finalizing data used in its final reports, cites publicly available documents including those that have alternative views, invites comments from all parties, and uses well established and tested models. CEEEP and RECON™ participate in public forms and stakeholder meetings, organize panels of technical experts to review its assumptions, and are engaged in other activities such as academic conferences and submissions of its work to peer-reviewed journals in order to ensure that its work is sound and credible. Finally, CEEEP and RECON™ caution policymakers and stakeholders on the limits and uncertainty associated with the data and analysis that we provide, including the analysis of alternative scenarios and conducting sensitivity analysis.

[2] Report available at: http://policy.rutgers.edu/ceeep/publications/2004/rpsreport.pdf

DRAFT: Working Document

Preliminary Data Update of the 2008 New Jersey Energy Master Plan

August 13, 2010 (Revised January 3, 2011)

RUTGERS
Edward J. Bloustein School of Planning and Public Policy

Center for Energy, Economic & Environmental Policy (CEEEP)

Acknowledgement

CEEEP would like to thank the following BPU staff for their assistance:

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All errors and omissions are the responsibility of CEEEP

Overview of Presentation's Contents

This DRAFT presentation contains three main sections:

- First, it provides a summary of the New Jersey Energy Master Plan Statute and the major goals of the 2008 Energy Master Plan. The complete Energy Master Plan Statute along with more details regarding the 2008 Energy Master Plan is provided in Appendix A to the presentation.

- Second, the presentation contains a comparison of projections made in 2008 with updated projections based primarily but not exclusively on the R/ECON™ State Economic model. The 2008 projections include the *Business as Usual Scenario* and the *EMP Scenario*. The 2010 projection is a *Baseline* projection based upon the recent runs of the R/ECON™ model and does not account for the 2008 Energy Master Plan or Offshore Wind Economic Development Act. Projections should not be treated as forecasts; instead, they are the result of a modeling exercise given a particular set of assumptions.

- Finally, the presentation contains information regarding costs of various generation technologies and associated assumptions. These data, culled from numerous publicly available reports, include capital costs, fixed and variable operations and maintenance costs, capacity factors, cost-of-capital, and other related costs.

Energy Master Plan Statute (52:27F-14)

- Originally enacted in 1977.
- The State will create a new Energy Master Plan every 10 years and update every 3 years.
- A 1987 amendment to the statute mandated a standing committee representing all relevant state policymaking agencies (including Commerce, Energy and Economic Development; Community Affairs; Environmental Protection; Health; Human Services; Transportation; and Treasury).

The Statute details that the Energy Master Plan shall:

- Include long-term objectives but shall provide for the interim implementation of measures consistent with its objectives.
- Give due consideration to the energy needs and supplies in the several geographic areas of the State.
- Consult and cooperate with any federal or State agency having an interest in the production, distribution, consumption or conservation of energy.

The complete Energy Master Plan Statute can be found in Appendix A at the end of the presentation.

The latest Energy Master Plan was issued in October 2008 and its 3-year update is due in October 2011.

Energy Master Plan (October 2008)

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

Goal 1 Maximize the State's energy conservation and energy efficiency to achieve reduction in energy consumption of at least 20% by 2020

Goal 2 Reduce peak electricity demand by 5,700 MW by 2020

Goal 3 Strive to exceed the current RPS and achieve 30% of the State's electricity needs from renewable sources by 2020

Goal 4 Develop a 21st Century energy infrastructure that supports the goals and action items of the EMP, ensures reliability of the system, and makes available additional tools to consumers to manage their energy consumption

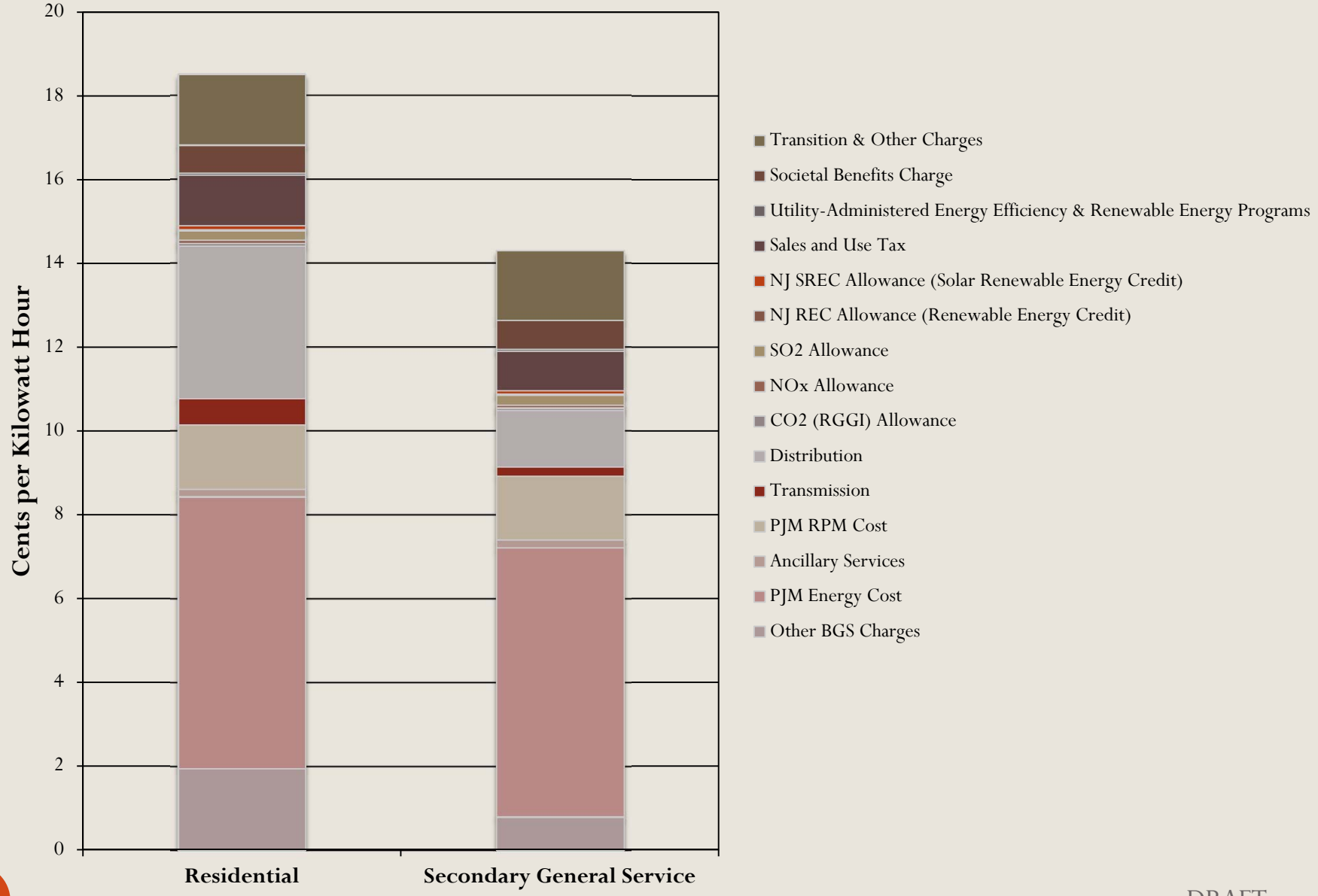
Goal 5 Invest in innovative clean energy technologies and businesses to stimulate the industry's growth in New Jersey

The EMP goals and associated action items are discussed in the following slides. The key references are:

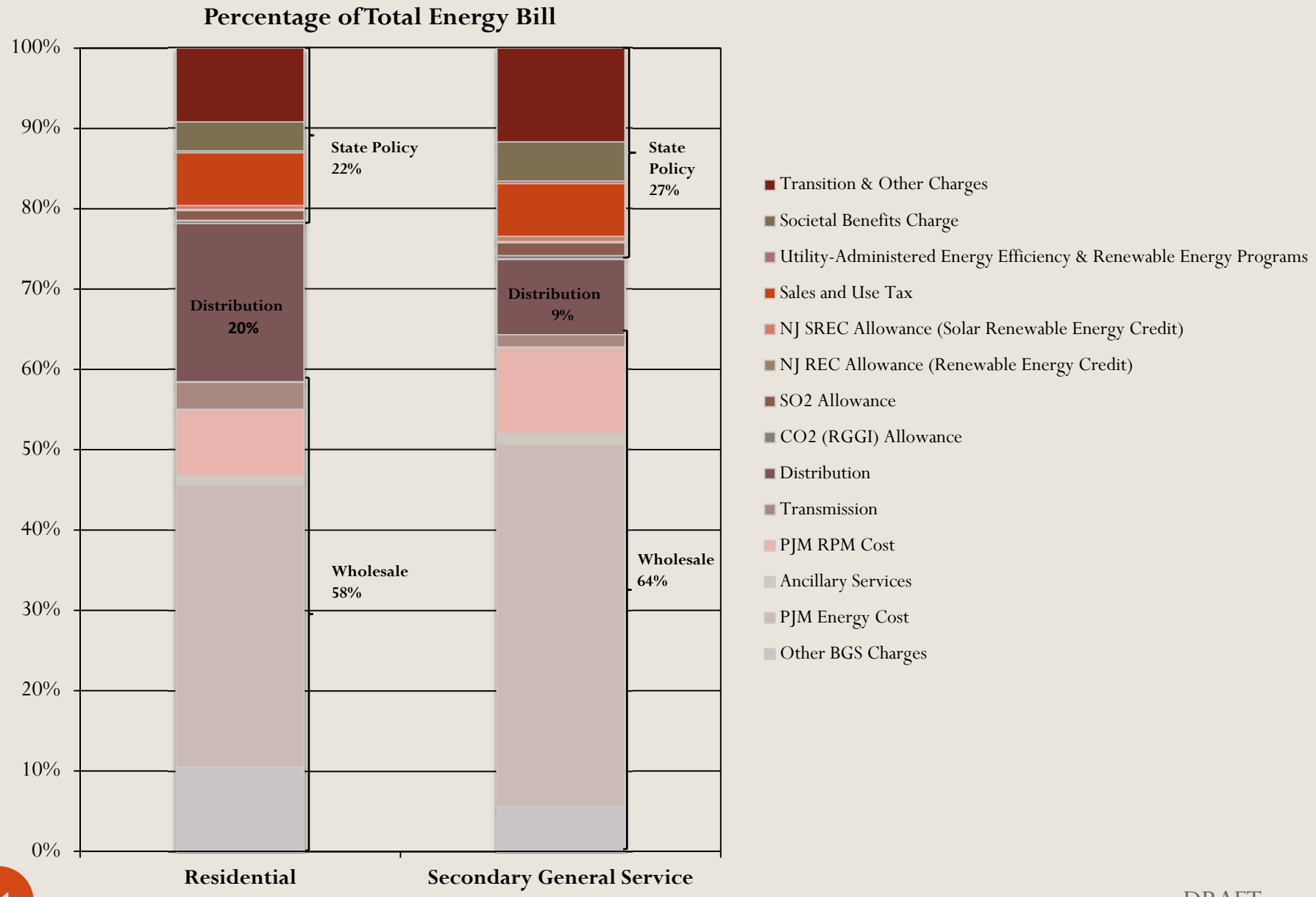
1. Energy Master Plan, October 2008
2. Modeling Report for the New Jersey Energy Master Plan, October 2008
3. 2008 EMP – 2008 Energy Master Plan R/ECON™ output, September 2008
4. 2008 Baseline – 2008 Baseline R/ECON™ output, September 2008
5. 2010 Baseline – 2010 Baseline R/ECON™ output, November 2010

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

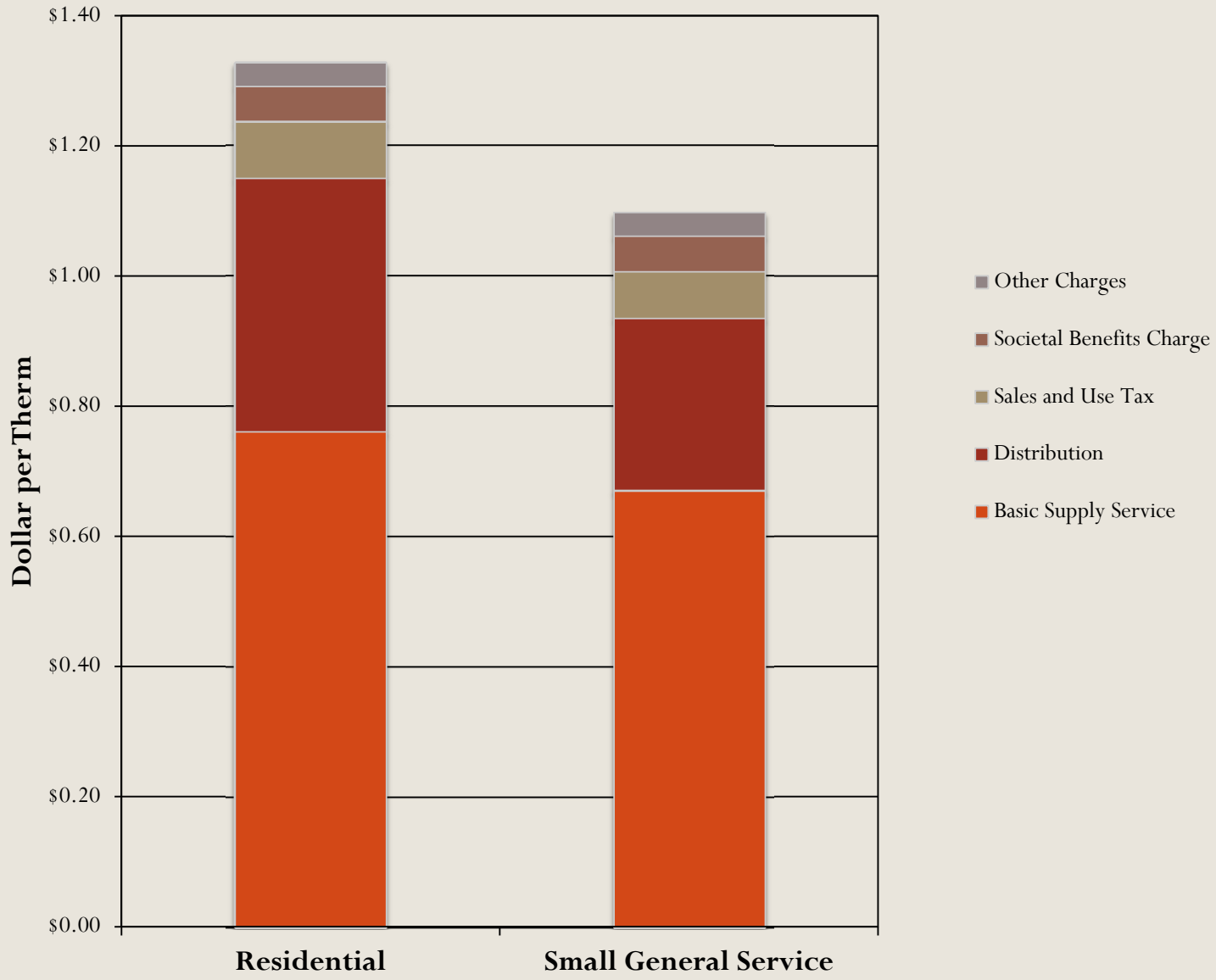
2010 New Jersey Electric Rate Cost Drivers



2010 New Jersey Electricity "Rate"



2010 New Jersey Natural Gas "Rate"



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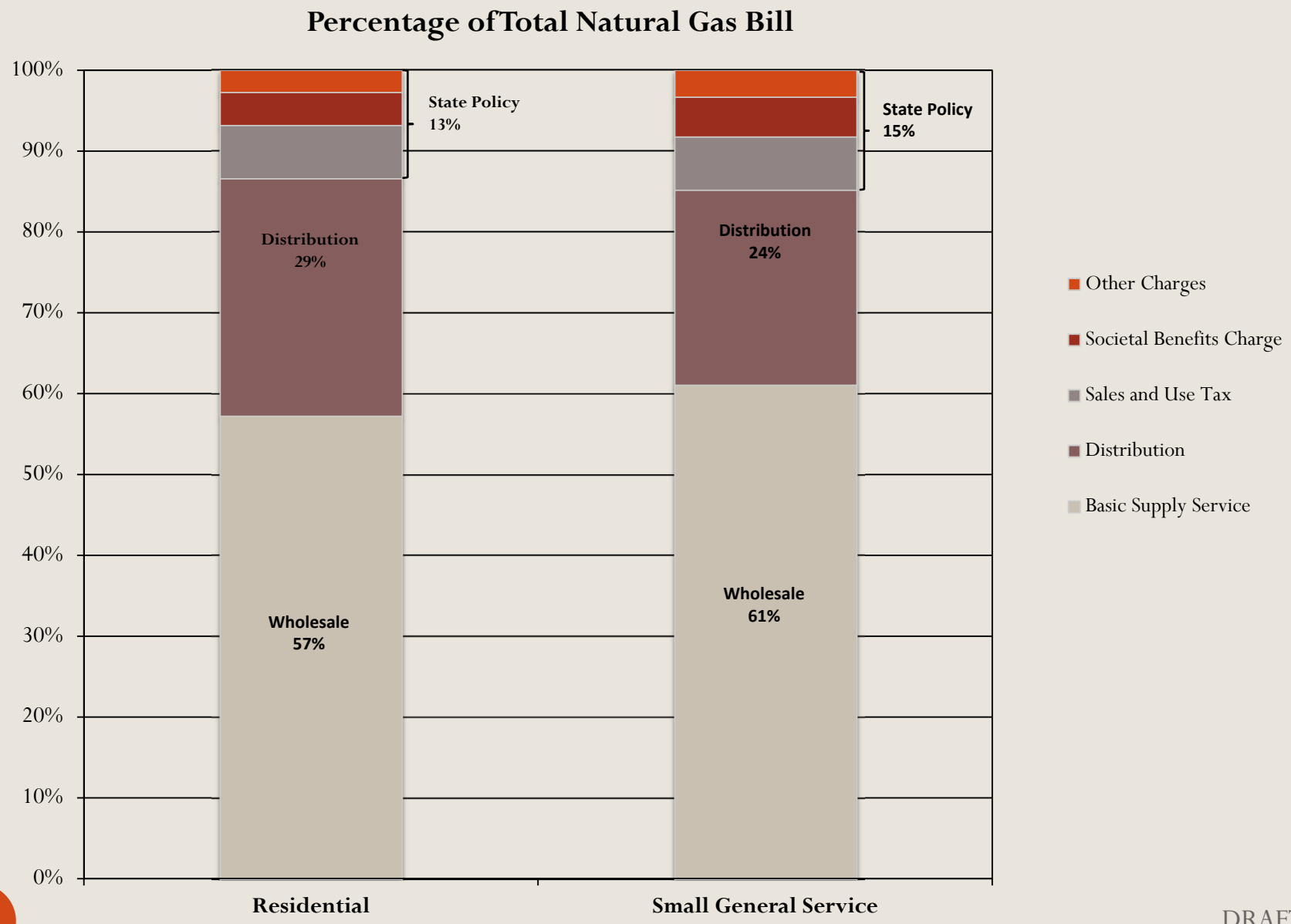
2010 New Jersey Natural Gas "Rate"



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R/ECON Data & Model

R/ECON™ is an econometric model of New Jersey. It includes over 300 equations, based on historical data for New Jersey and the United States, which are solved simultaneously to produce forecasts for the state's economy. The heart of the model is a set of equations modeling employment, wages, and prices by industry. In general, employment in an industry depends on demand for that industry's output and the state's wages and prices relative to the nation's. Demand is represented by a variety of variables including (but not limited to) New Jersey personal income, population, and sectoral output or U.S. employment in the sector. Other sectors in the model include population, housing, vehicle registrations, state tax revenue, and energy. The historical and forecast data for the U.S. comes from IHS Global Insight, Inc., a national leader in economic forecasting. The R/ECON™ model does not try to predict the timing and degree of future business cycles.

- The 22.5% RPS in 2020 (not the Offshore Wind Economic Development Act) is modeled in the 2010 Baseline.

Historic Data

- 2008 BAU and EMP Case: historic data through 2006/2007
- 2010 Baseline: R/ECON™ Estimates

*The graphs in the following distinguish between historic and projected data, based on the 2010 Baseline R/ECON™ model. Therefore, the baseline is shown as 2008. All data is for New Jersey, unless stated otherwise.

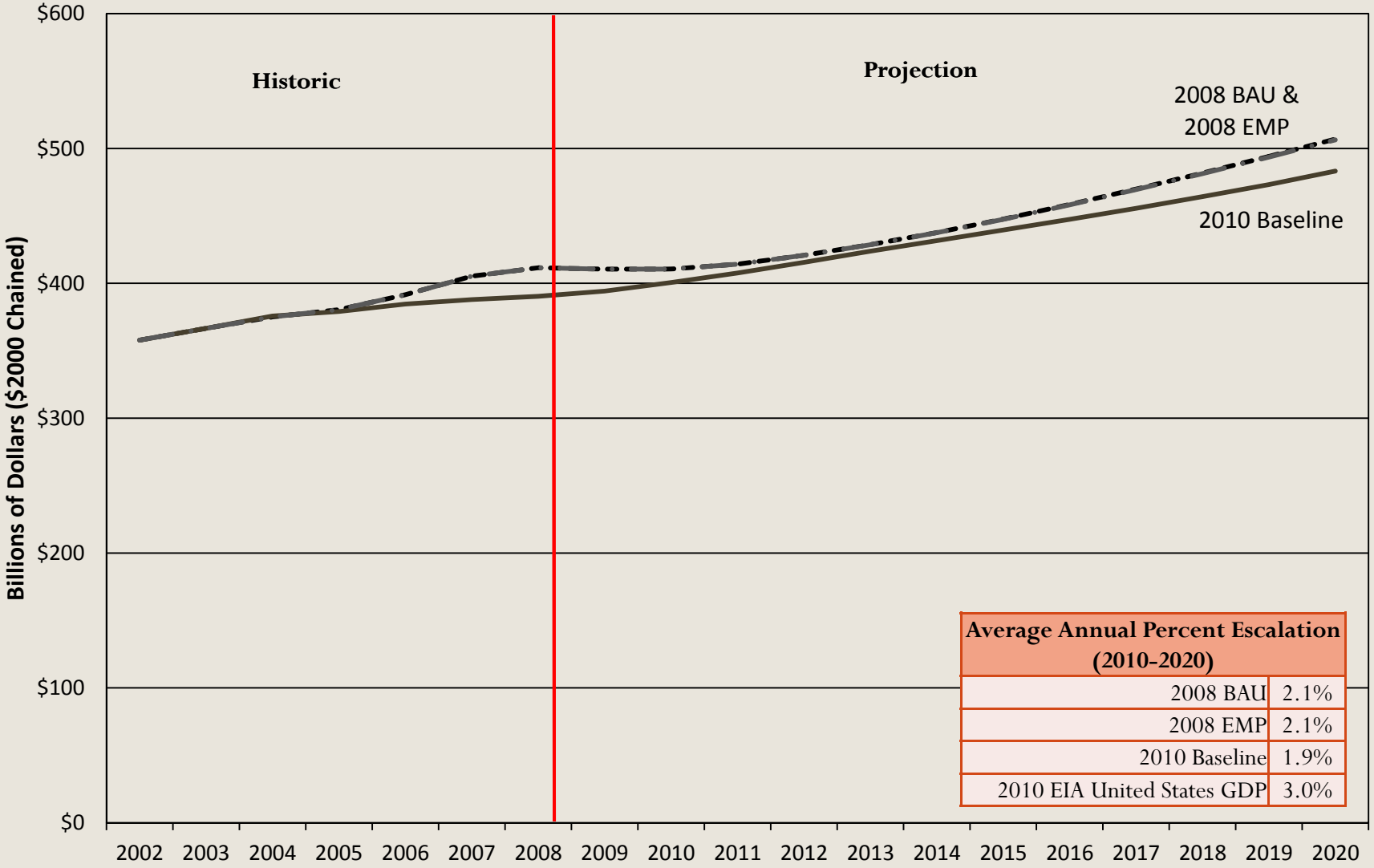
Note: Most of the preliminary results are through 2020, although some go out to 2025.

R/ECON Data & Model: Global Insight Assumptions

IHS Global Insight, Inc. provides historic and baseline, optimistic and pessimistic forecast data. The June 2010 R/ECON™ forecast model is based on the baseline May 2010 IHS Global Insight, Inc. historic and forecast data.

	2020 Value (Nominal)			Percent Change from the Baseline in 2020	
	Pessimistic	*Baseline*	*Optimistic*	*Pessimistic*	*Optimistic*
U.S. Non-Agricultural Employment (Millions)	145.7	149	150.4	-2.3%	0.9%
U.S. Real GDP ($ Billions)	$16,559	$17,573	$18,400	-5.8%	4.7%
U.S. Consumer Price Index (1984=100)	2.81	2.67	2.60	5.0%	-2.8%
Crude Oil Prices at West Texas Intermediary ($/Barrel)	$121	$105	$94	15.5%	-10.1%
Natural Gas Price at Henry Hub ($/MMBtu)	$6.61	$5.89	$4.89	12.1%	-17.0%
U.S. Motor Gasoline Price ($/Gallon)	$4.08	$3.64	$3.37	12.0%	-7.6%
U.S. Unemployment Rate	6.5%	5.20%	4.5 %	24.8%	-12.9%
Federal Funds Rate	6.0%	4.70%	4.5%	26.3%	-5.3%

New Jersey Gross State Product



Average Annual Percent Escalation (2010-2020)	
2008 BAU	2.1%
2008 EMP	2.1%
2010 Baseline	1.9%
2010 EIA United States GDP	3.0%

The values are adjusted for the year 2000.

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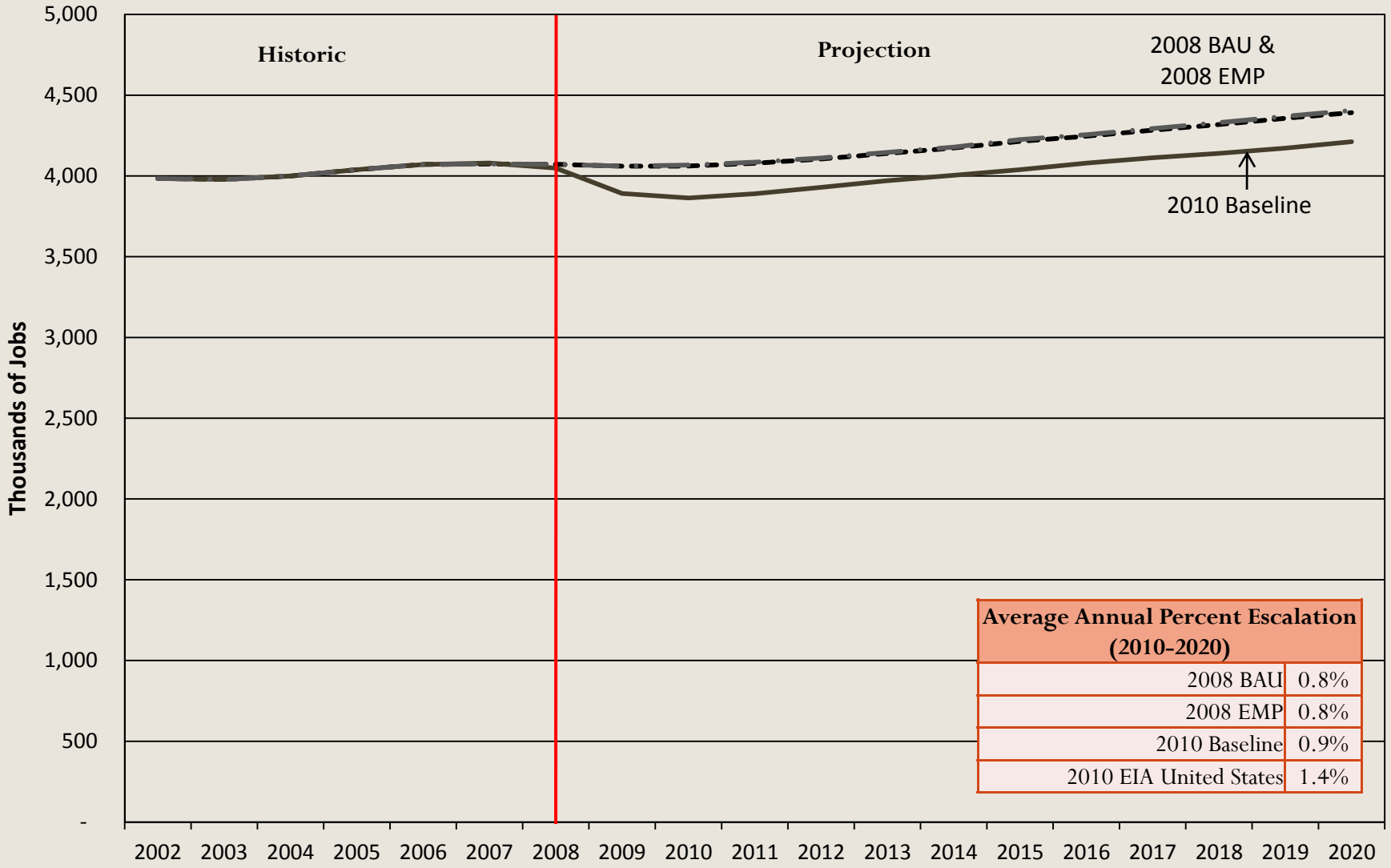
References: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

New Jersey Non-Agricultural Employment



Average Annual Percent Escalation (2010-2020)	
2008 BAU	0.8%
2008 EMP	0.8%
2010 Baseline	0.9%
2010 EIA United States	1.4%

References: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

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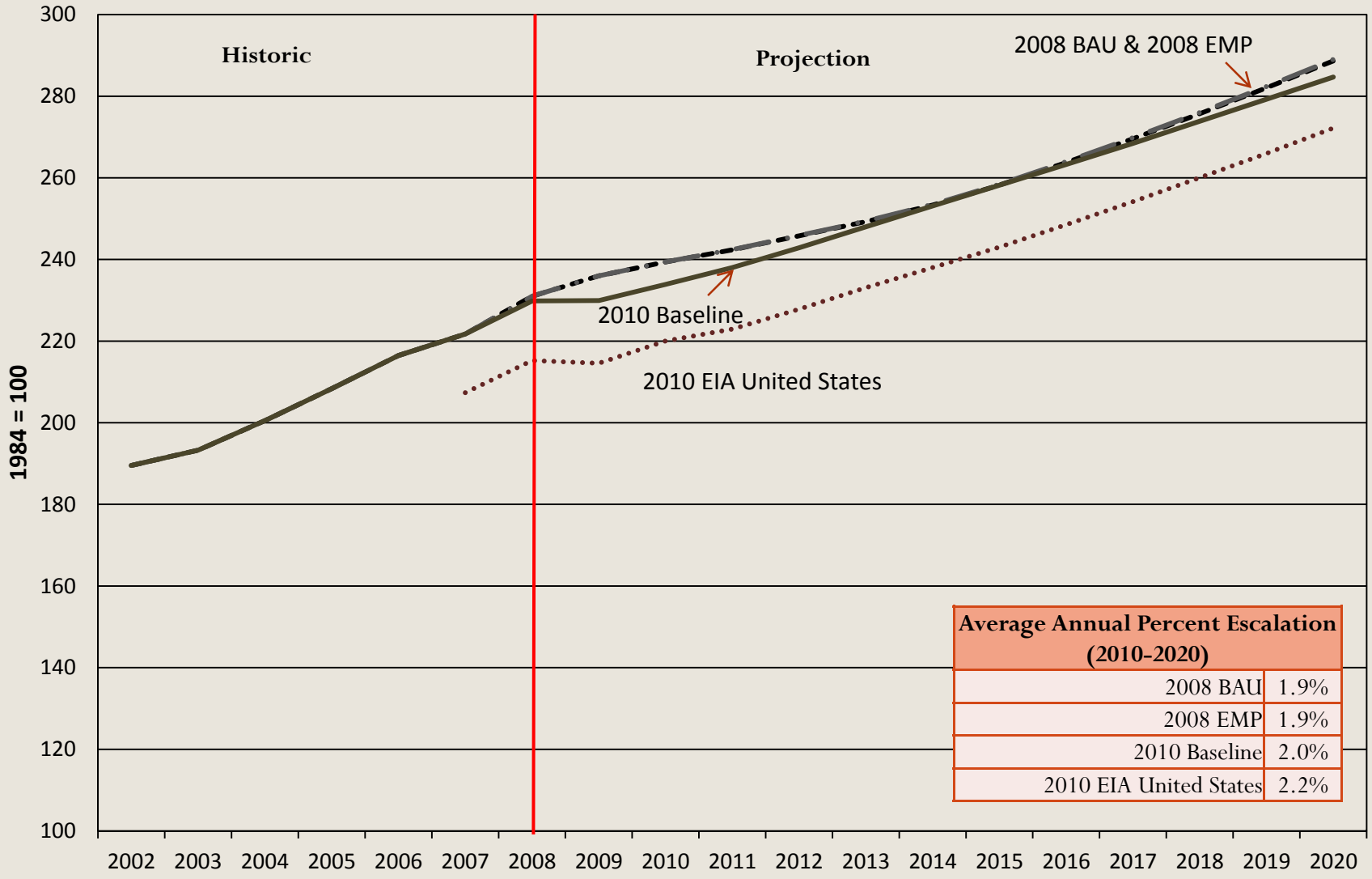
Consumer Price Index



Average Annual Percent Escalation (2010-2020)	
2008 BAU	1.9%
2008 EMP	1.9%
2010 Baseline	2.0%
2010 EIA United States	2.2%

References: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

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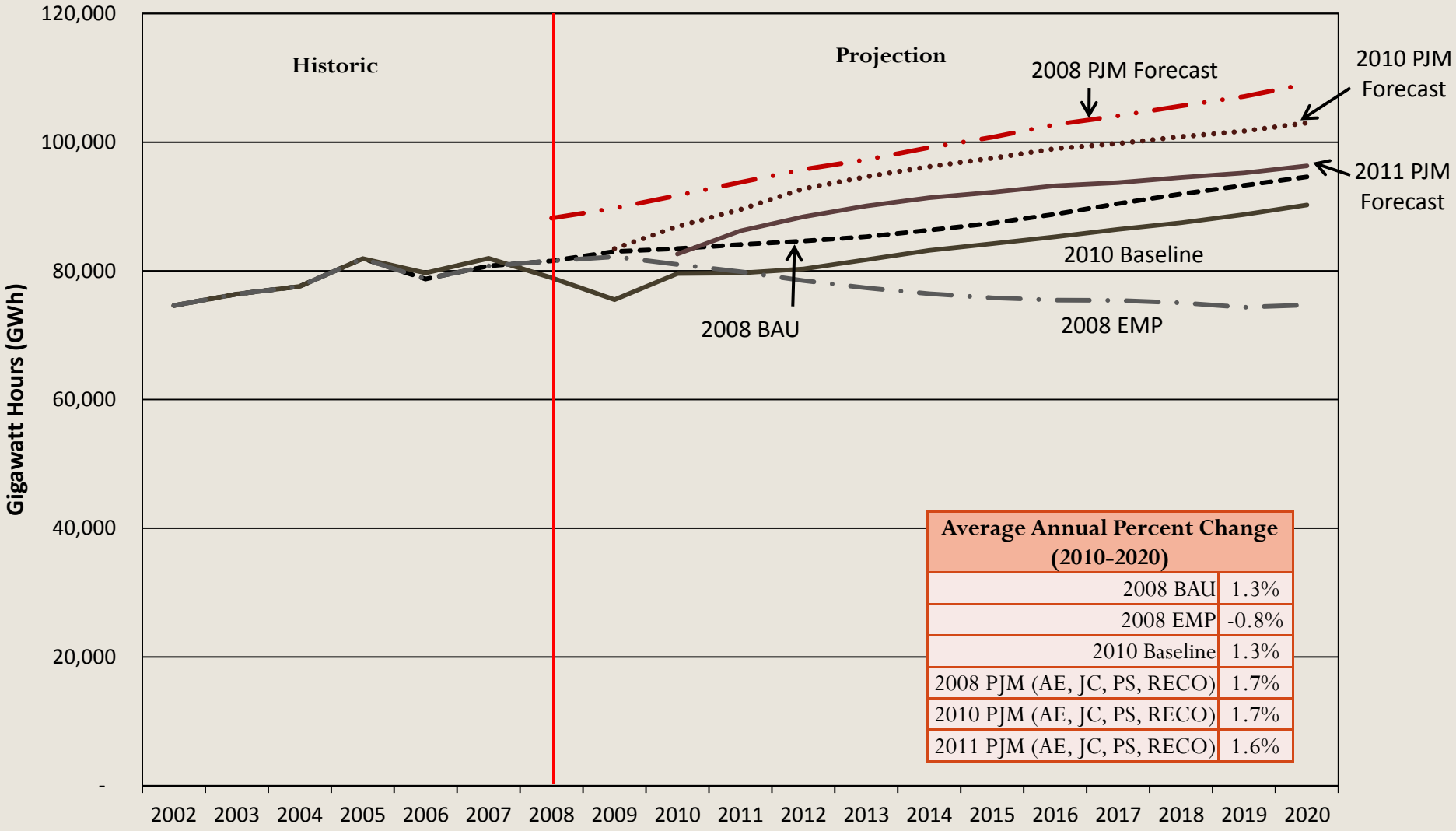
Total Electricity Demand



Average Annual Percent Change (2010-2020)	
2008 BAU	1.3%
2008 EMP	-0.8%
2010 Baseline	1.3%
2008 PJM (AE, JC, PS, RECO)	1.7%
2010 PJM (AE, JC, PS, RECO)	1.7%
2011 PJM (AE, JC, PS, RECO)	1.6%

Note: R/ECON not weather normalized, PJM weather normalized.

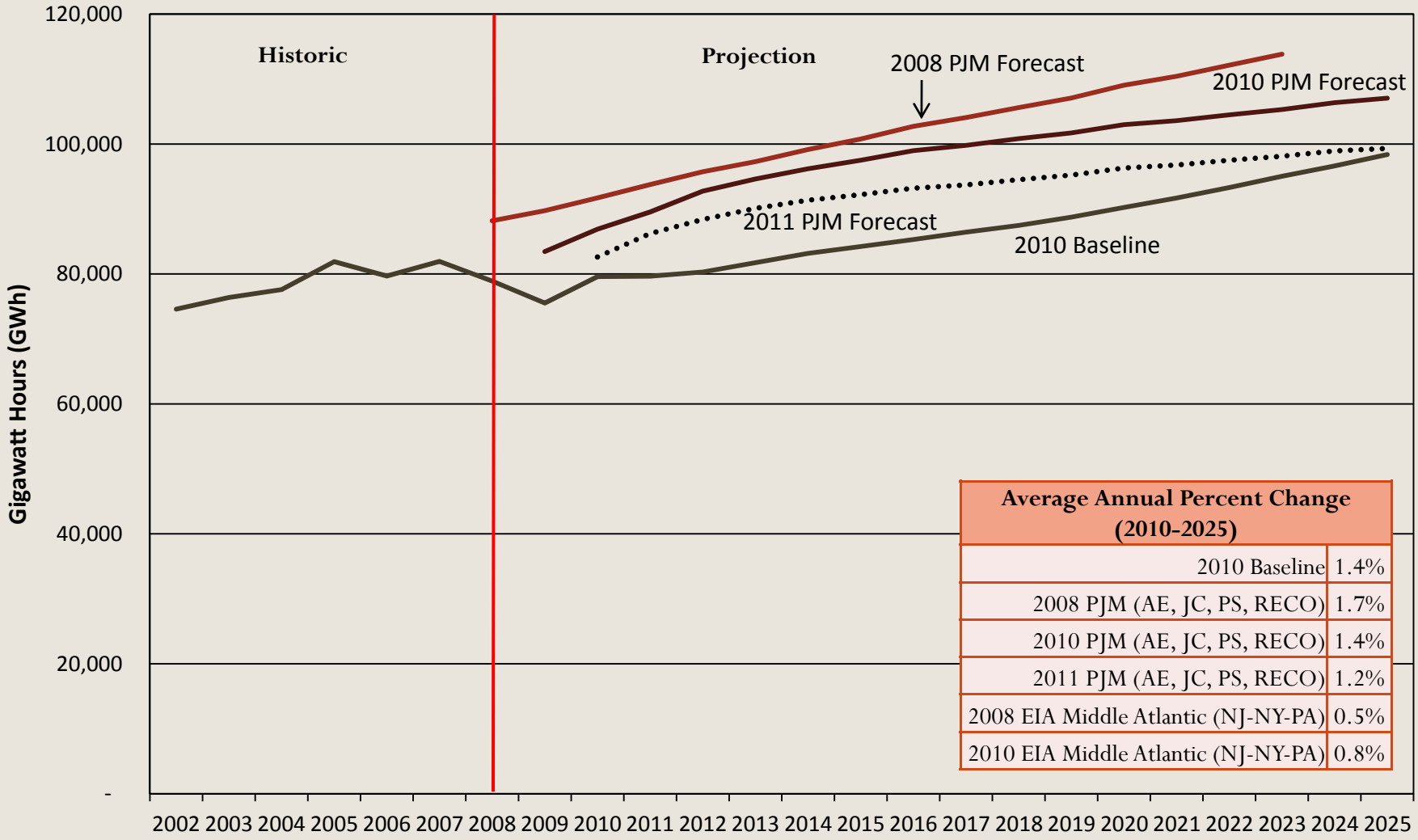
PJM forecast is at transmission-distribution interface.

Reference: R/ECON™ (9/30/08) and (11/20/10).

PJM Load Forecast Report s. Accessed at www.pjm.com/planning/resource-adequacy-planning/load-forecast-dev-process.aspx

Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Total Electricity Demand through 2025



Average Annual Percent Change (2010-2025)	
2010 Baseline	1.4%
2008 PJM (AE, JC, PS, RECO)	1.7%
2010 PJM (AE, JC, PS, RECO)	1.4%
2011 PJM (AE, JC, PS, RECO)	1.2%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.5%
2010 EIA Middle Atlantic (NJ-NY-PA)	0.8%

Note: R/ECON not weather normalized, PJM weather normalized.
PJM forecast is at transmission-distribution interface.

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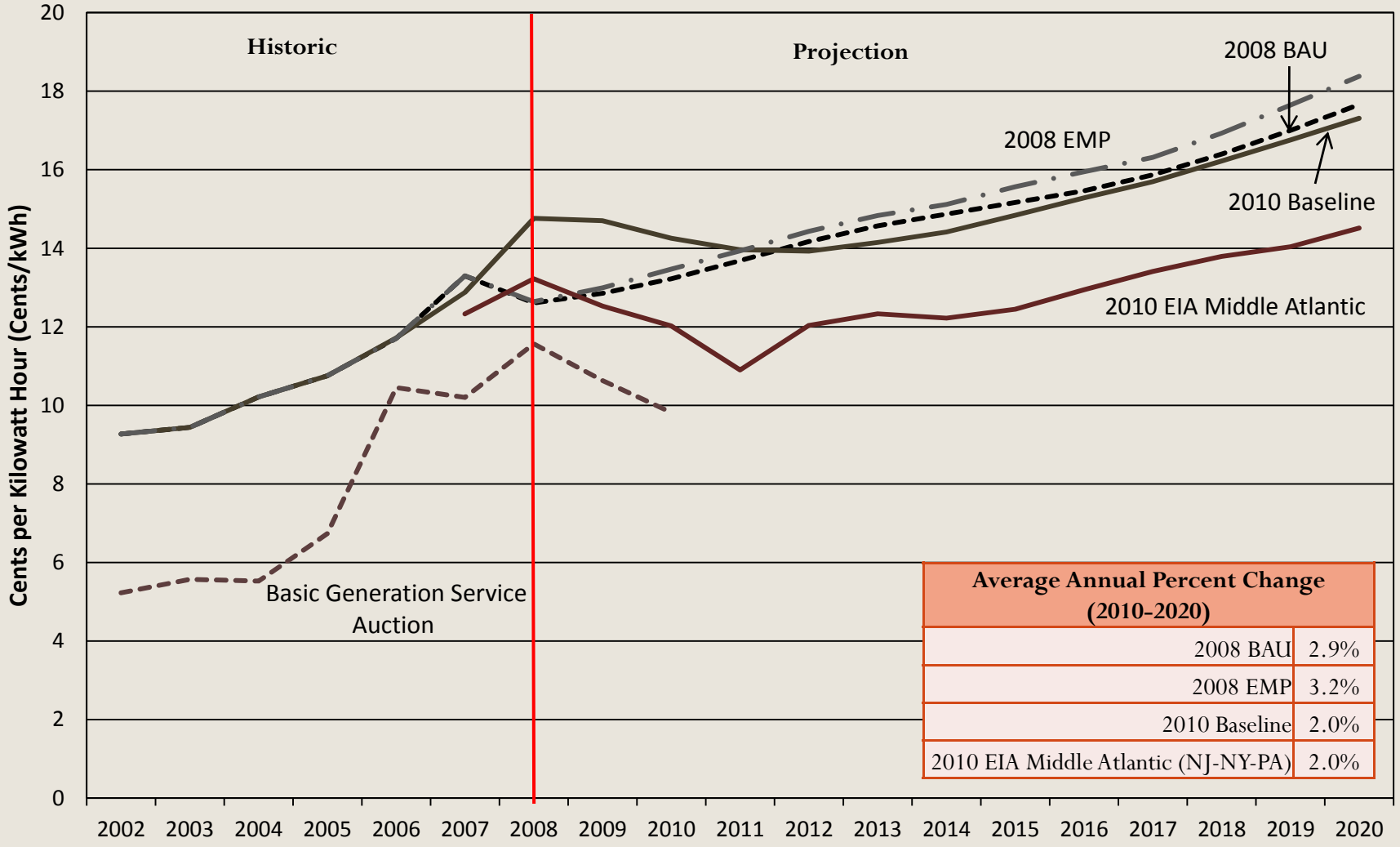
Reference: R/ECON™ (11/20/10).
PJM Load Forecast Report s. Accessed at www.pjm.com/planning/resource-adequacy-planning/load-forecast-dev-process.aspx

Weighted Average Electricity Rate



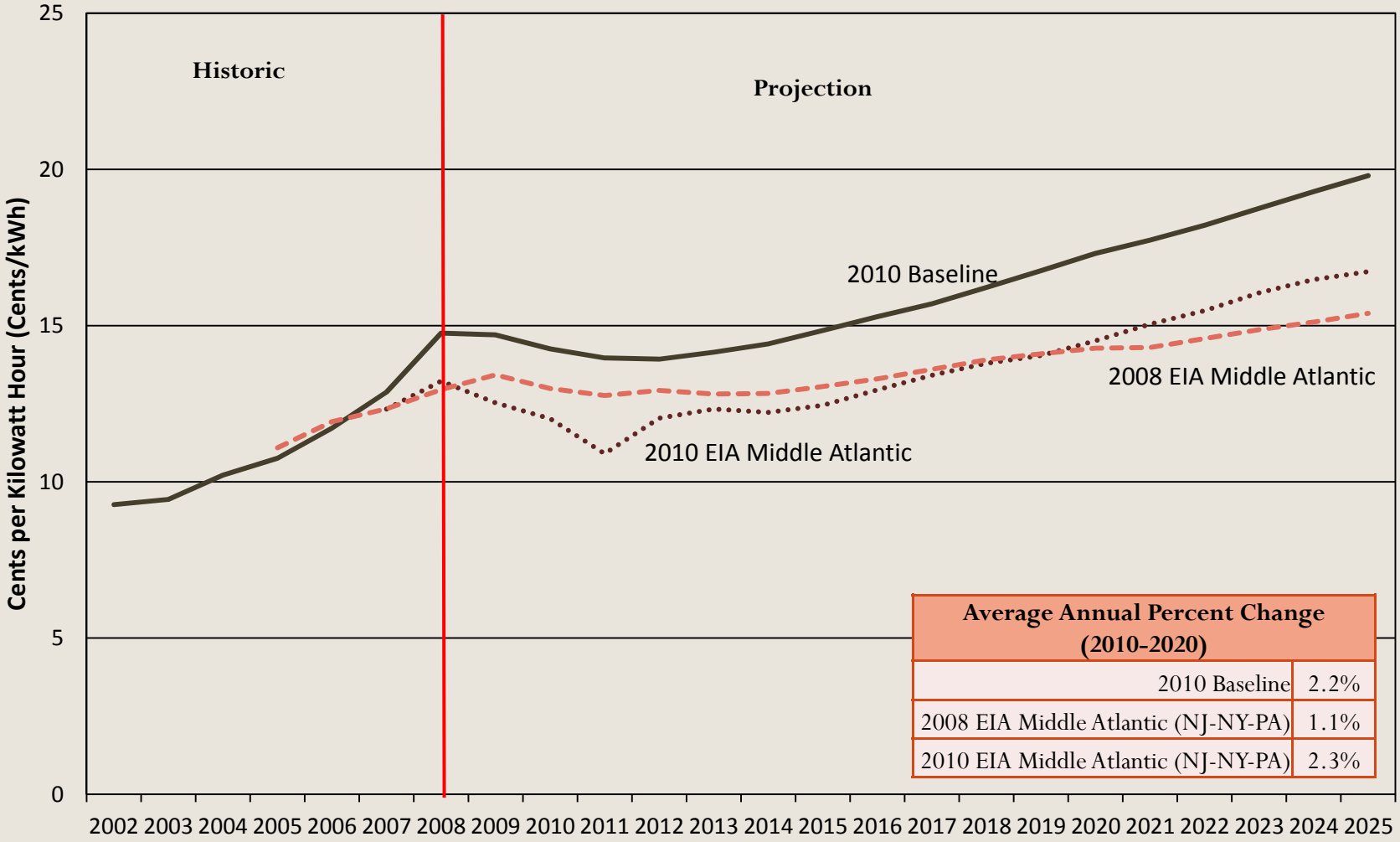
Average Annual Percent Change (2010-2020)	
2008 BAU	2.9%
2008 EMP	3.2%
2010 Baseline	2.0%
2010 EIA Middle Atlantic (NJ-NY-PA)	2.0%

Note: not weather normalized; not including SBC and taxes

10 cents/kWh = $100/MWh

Reference: R/ECON™ (9/30/08) and (11/20/10).
Annual BGS-FP Auction Results. Accessed at www.bgs-auction.com/bgs.auction.prev.asp
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Weighted Average Electricity Rate through 2025



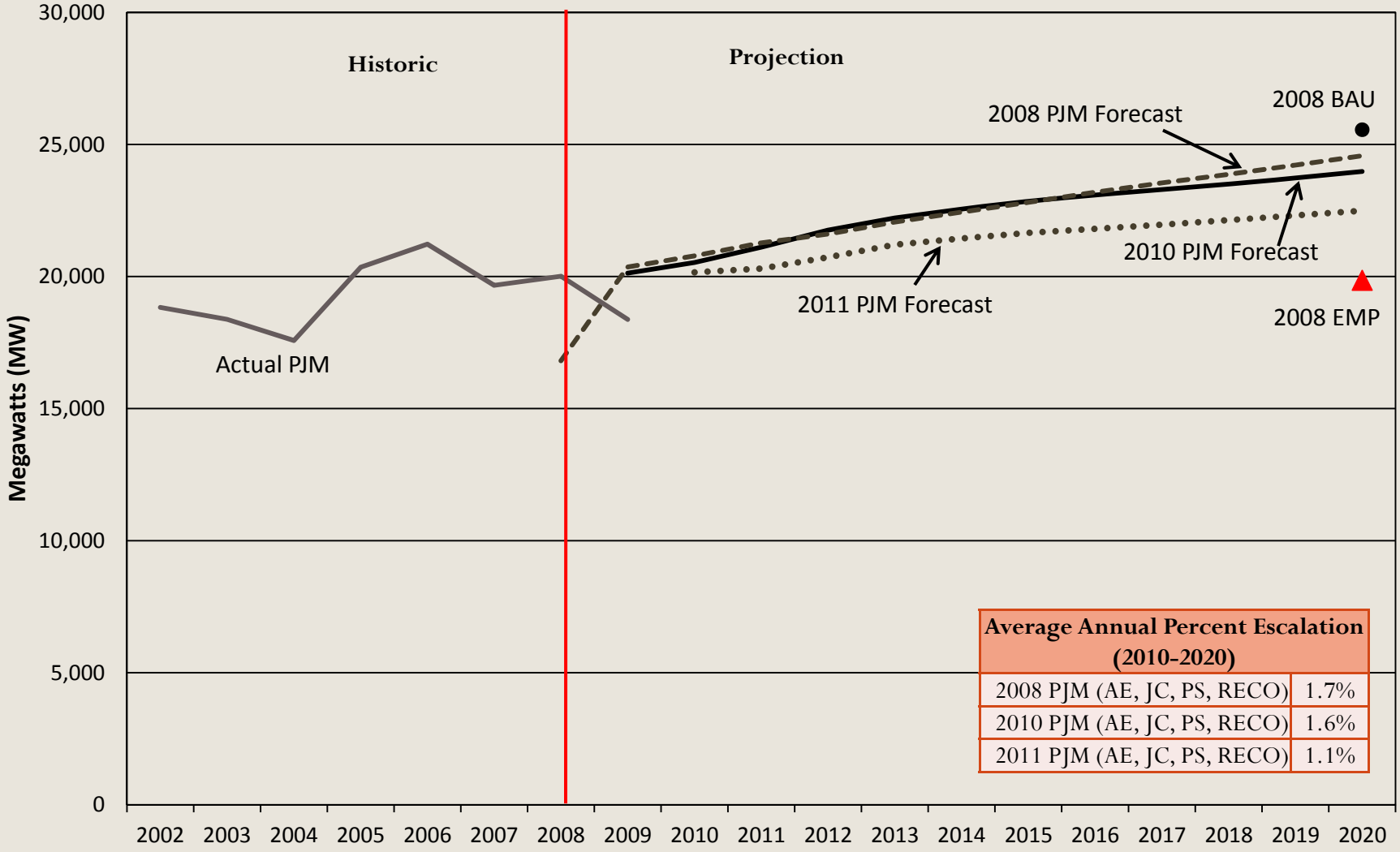
Average Annual Percent Change (2010-2020)	
2010 Baseline	2.2%
2008 EIA Middle Atlantic (NJ-NY-PA)	1.1%
2010 EIA Middle Atlantic (NJ-NY-PA)	2.3%

Note: not weather normalized; not including SBC and taxes

10 cents/kWh = $100/MWh

Reference: R/ECON™ (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Peak Electric Demand



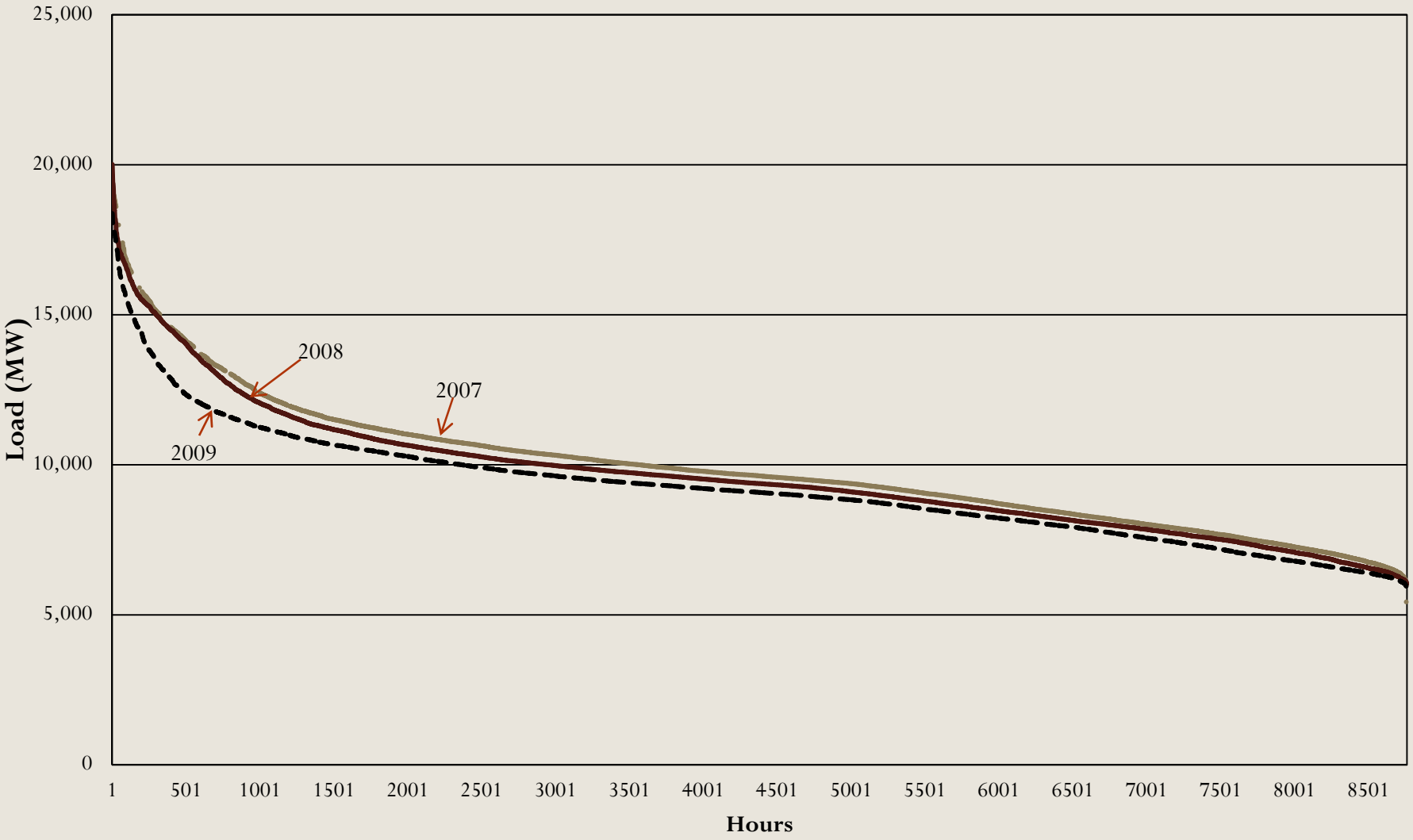
Average Annual Percent Escalation (2010-2020)	
2008 PJM (AE, JC, PS, RECO)	1.7%
2010 PJM (AE, JC, PS, RECO)	1.6%
2011 PJM (AE, JC, PS, RECO)	1.1%

Note: not weather normalized.

PJM forecast is at transmission-distribution interface.

References: New Jersey Energy Master Plan (October 2008). Accessed at www.nj.gov/emp/
Historic PJM Annual Reports. Accessed at www.epowermarkets.com/services/system-performance/historical.html
PJM Load Forecast Report . Accessed at www.pjm.com/planning/resource-adequacy-planning/load-forecast-dev-process.aspx

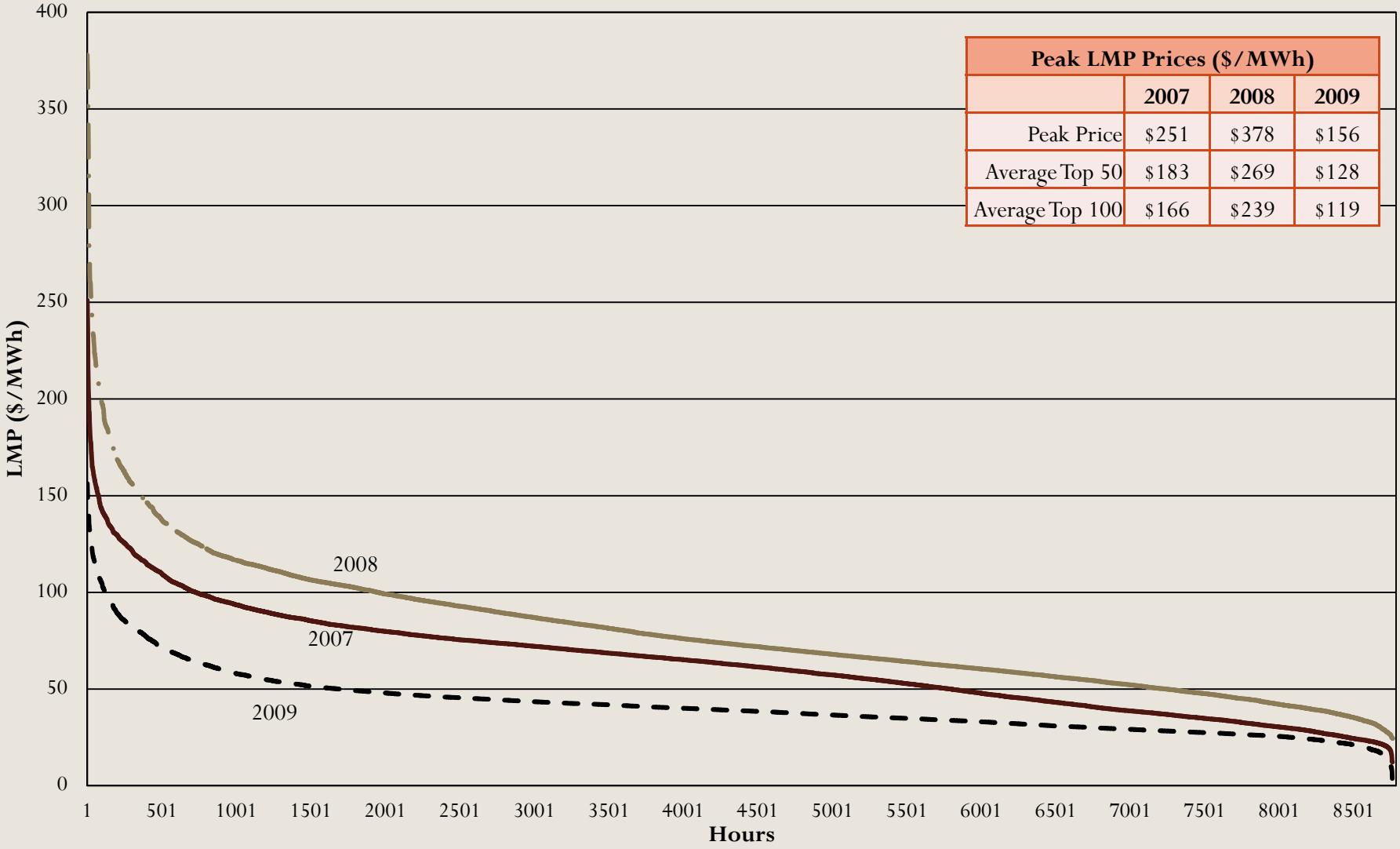
New Jersey Load Duration Curves 2007-2009



Note: Total load is the sum of the hourly loads of New Jersey based utilities (AE, RECO, JC and PS). A non-leap year has 8760 hours.

Reference: Historic PJM Annual Reports. Accessed at www.epowermarkets.com/services/system-performance/historical.html

New Jersey Electricity Price (LMP) Duration Curves 2007-2009



Peak LMP Prices ($/MWh)			
	2007	2008	2009
Peak Price	$251	$378	$156
Average Top 50	$183	$269	$128
Average Top 100	$166	$239	$119

Note: Locational Marginal Prices (LMPs) are the load weighted average of New Jersey based utilities (AE,RECO, JC and PS). A non-leap year has 8760 hours.

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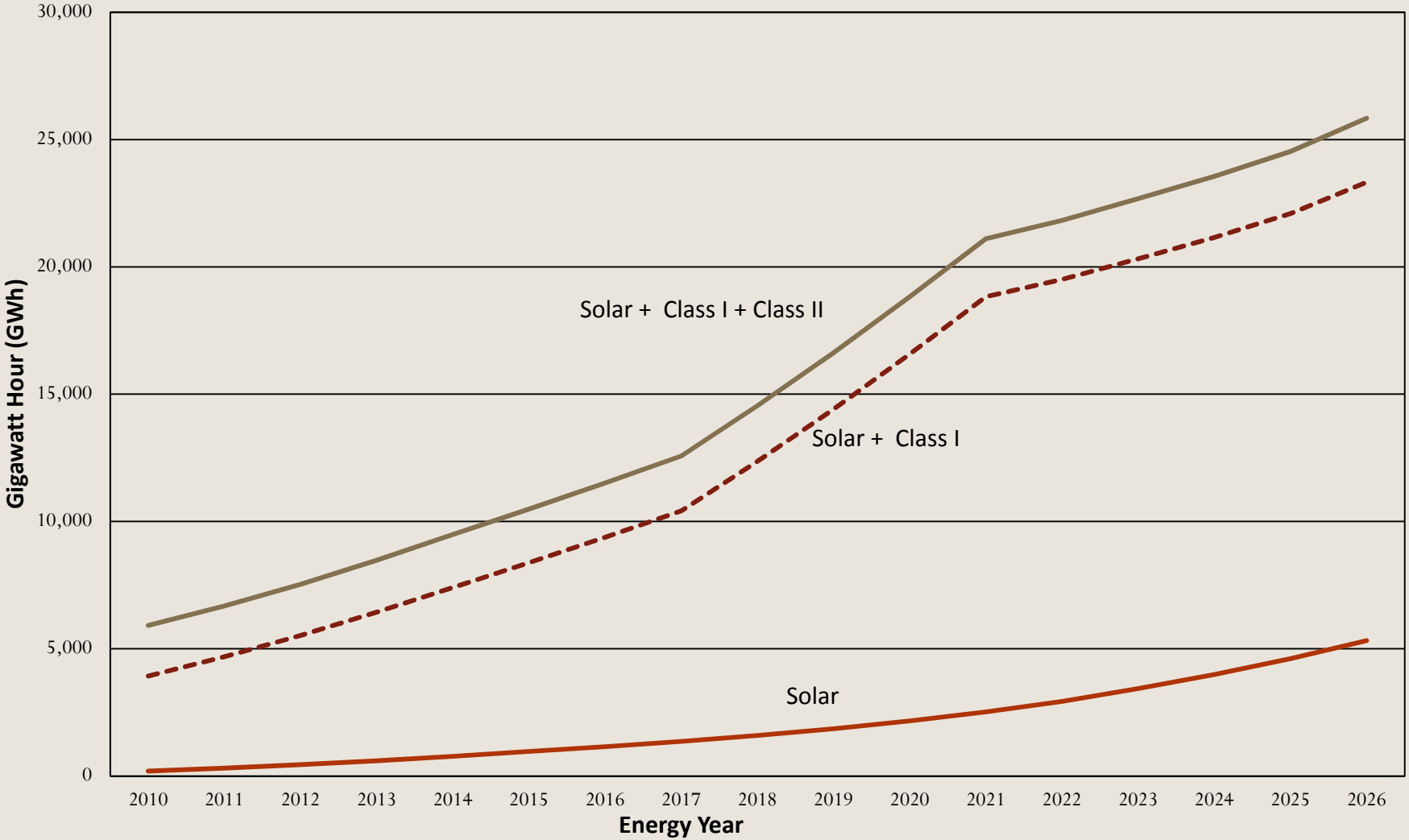
Reference: PJM Load and LMP Data (2007, 2008 and 2009).

Current Renewable Portfolio Standard Requirements



Note: "Energy year" means the 12-month period from June 1st through May 31st, numbered according to the calendar year in which it ends.

Class I and Class II goals are assumed to remain at 2020 levels, as a percentage, from 2012 to 2026

Reference: Solar Advancement and Fair Competition Act (A3520)

Current Renewable Portfolio Standard Requirements

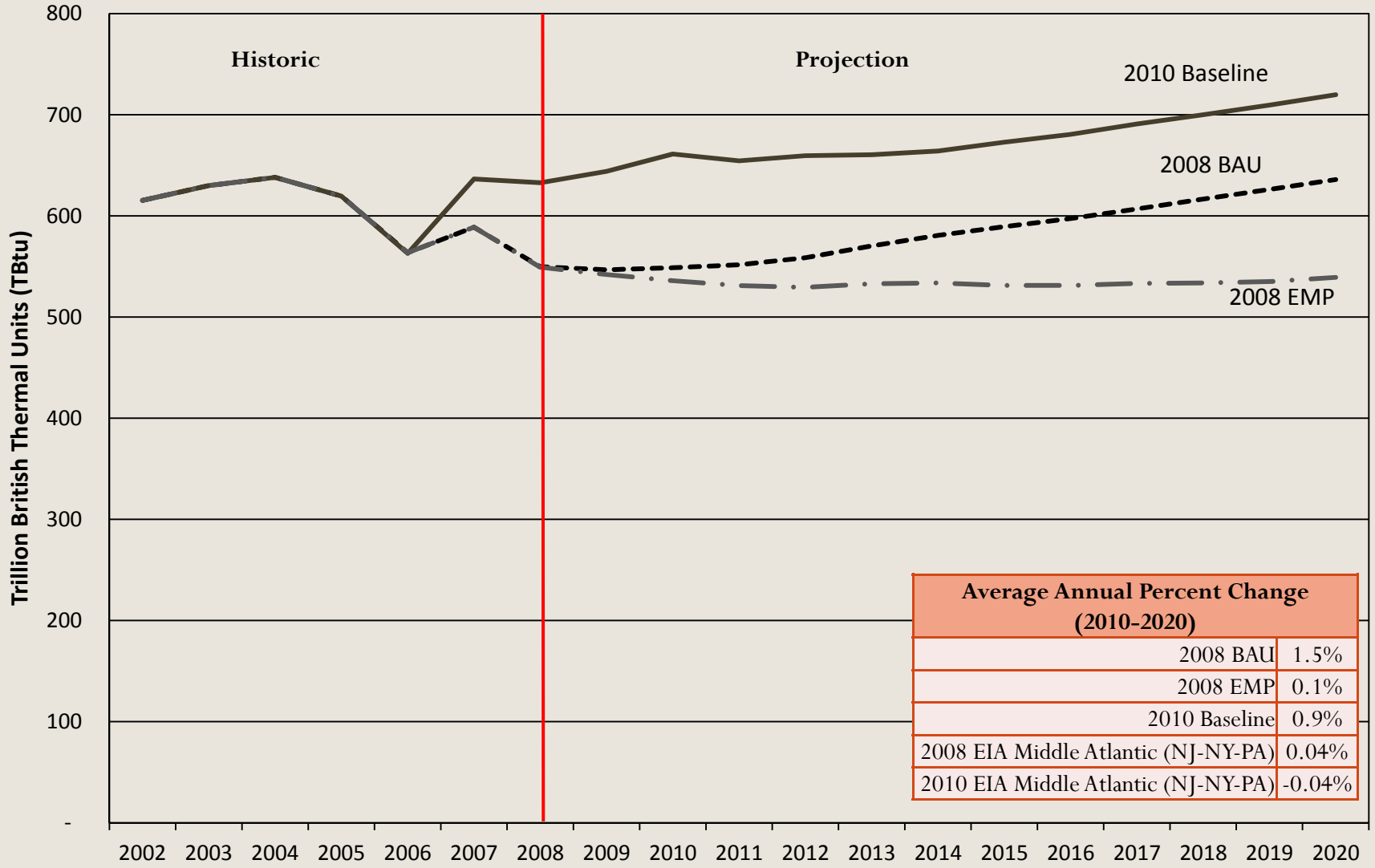
Energy Year	Solar Requirement (GWh)	Class I (%)	Class I (GWh)	Class II (%)	Class II (GWh)	Total RPS (GWh)
2010	192	4.69%	3,732	2.50%	1,991	5,915
2011	306	5.49%	4,380	2.50%	1,994	6,680
2012	442	6.32%	5,078	2.50%	2,009	7,529
2013	596	7.14%	5,839	2.50%	2,044	8,479
2014	772	7.98%	6,633	2.50%	2,079	9,484
2015	965	8.81%	7,415	2.50%	2,105	10,485
2016	1,150	9.65%	8,228	2.50%	2,132	11,510
2017	1,357	10.49%	9,057	2.50%	2,160	12,574
2018	1,591	12.33%	10,770	2.50%	2,185	14,546
2019	1,858	14.18%	12,554	2.50%	2,214	16,626
2020	2,164	16.03%	14,415	2.50%	2,248	18,827
2021	2,518	17.88%	16,309	2.50%	2,280	21,107
2022	2,928	17.88%	16,578	2.50%	2,318	21,824
2023	3,433	17.88%	16,886	2.50%	2,361	22,680
2024	3,989	17.88%	17,169	2.50%	2,401	23,559
2025	4,610	17.88%	17,482	2.50%	2,444	24,536
2026	5,316	17.88%	18,007	2.50%	2,518	25,841

Total RPS = Solar Requirement + Class I + Class II

The current Renewable Portfolio Standard compliance schedule ends in Energy Year 2021. By statute, the BPU will adopt rules to determine the minimum percentages for energy year 2022 and beyond. The requirements must be equal to or greater than the minimum percentages required for reporting year 2021.

Reference: Solar Advancement and Fair Competition Act (A3520)
New Jersey Administrative Code at N.J.A.C. 14:8-2.1

Total Natural Gas Demand (including Electric Generation)



Average Annual Percent Change (2010-2020)	
2008 BAU	1.5%
2008 EMP	0.1%
2010 Baseline	0.9%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.04%
2010 EIA Middle Atlantic (NJ-NY-PA)	-0.04%

Note: not weather normalized

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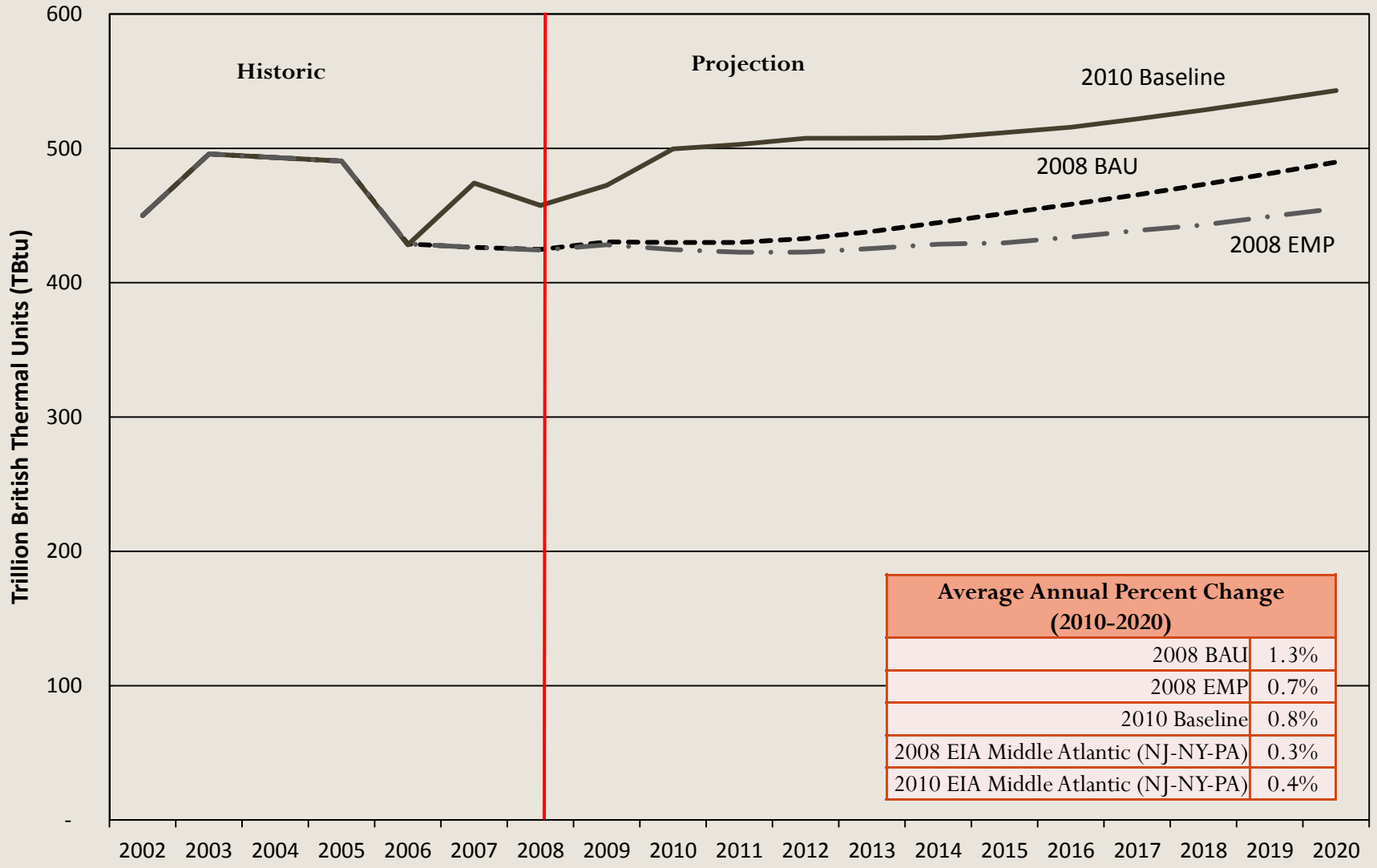
Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Total Retail Natural Gas Demand (not including Electric Generation)



Average Annual Percent Change (2010-2020)	
2008 BAU	1.3%
2008 EMP	0.7%
2010 Baseline	0.8%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.3%
2010 EIA Middle Atlantic (NJ-NY-PA)	0.4%

Note: not weather normalized

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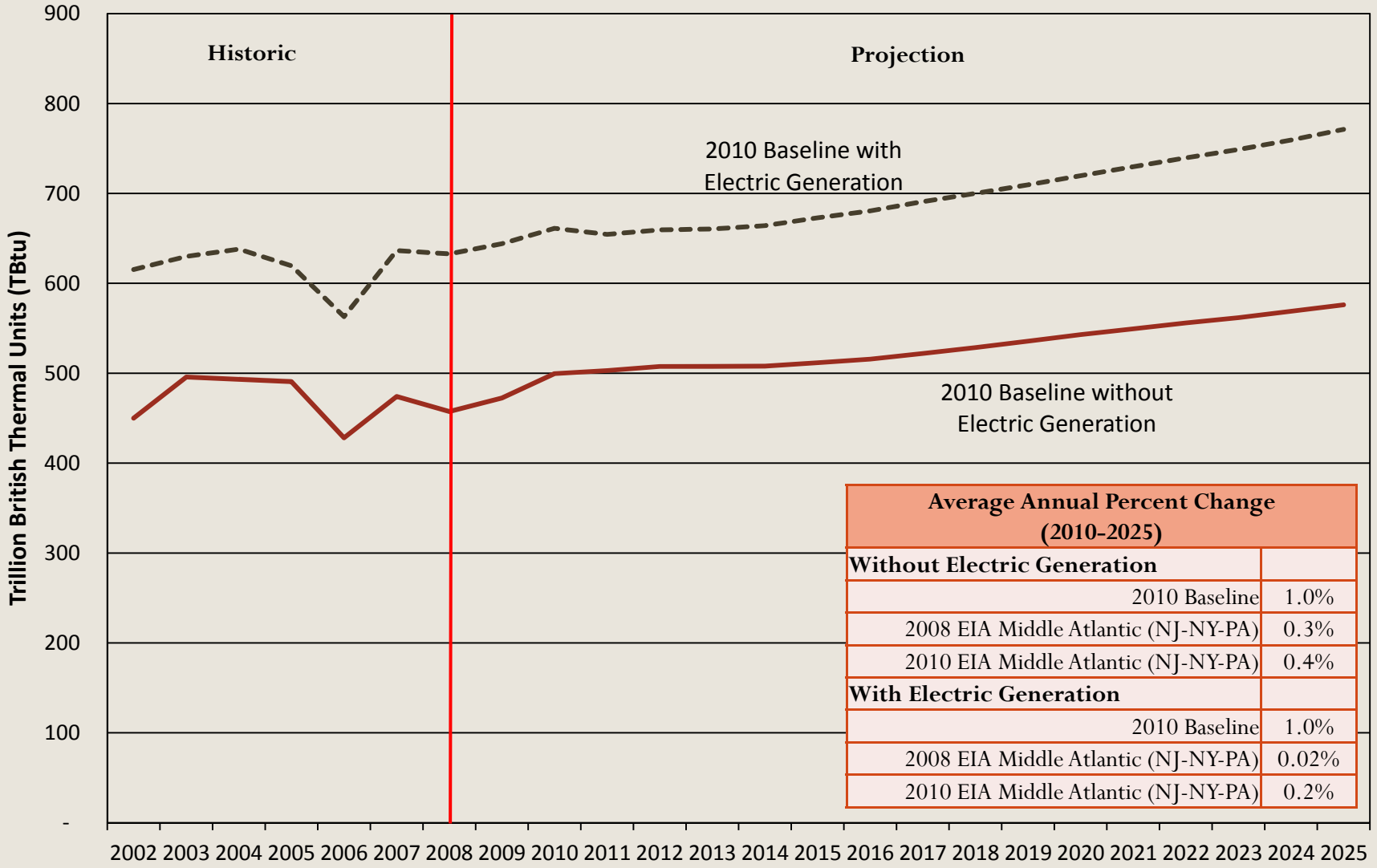
Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Total Natural Gas Demand through 2025

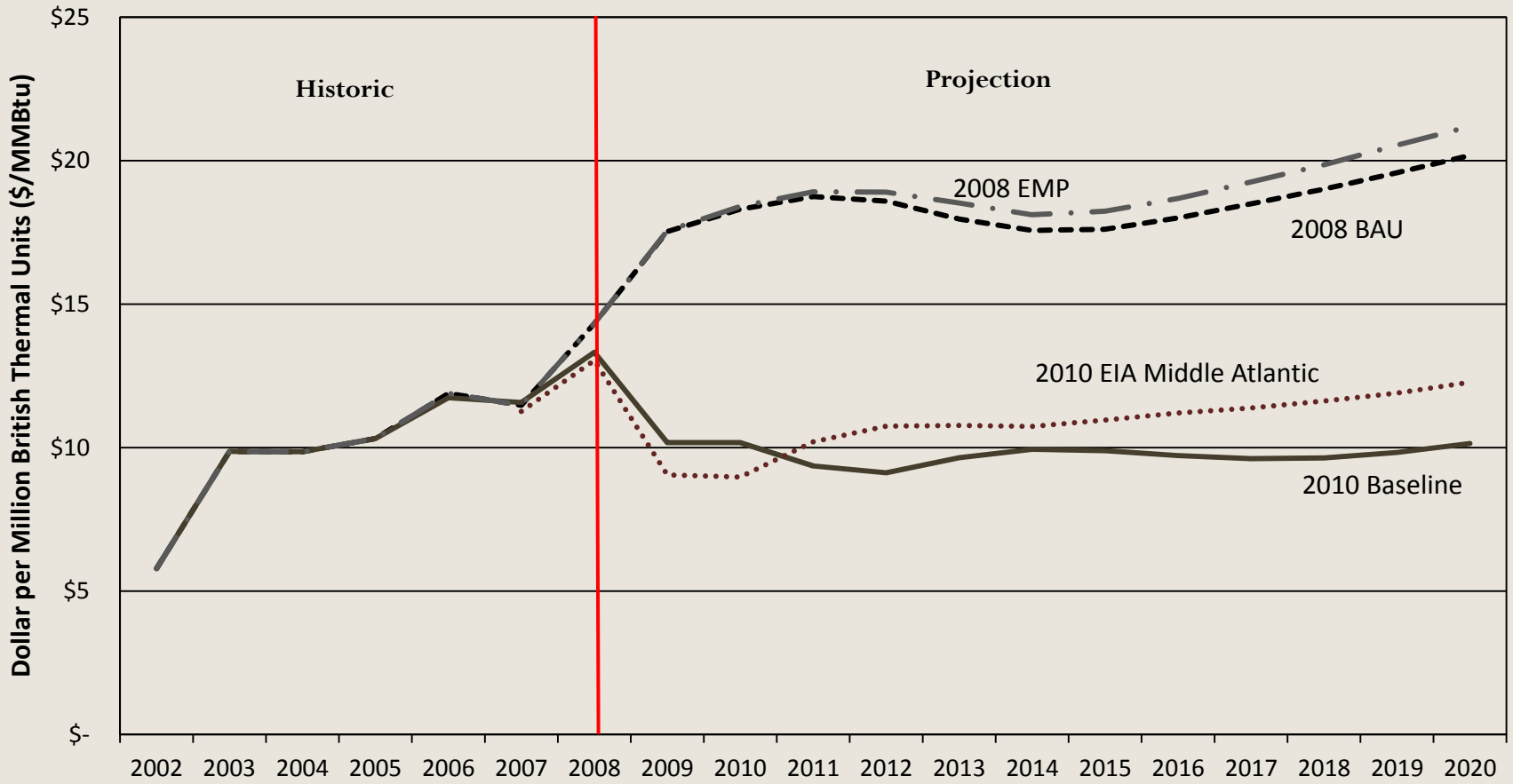


Average Annual Percent Change (2010-2025)	
Without Electric Generation	
2010 Baseline	1.0%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.3%
2010 EIA Middle Atlantic (NJ-NY-PA)	0.4%
With Electric Generation	
2010 Baseline	1.0%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.02%
2010 EIA Middle Atlantic (NJ-NY-PA)	0.2%

Note: not weather normalized

Reference: R/ECON™ (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Weighted Average Natural Gas Rate (including Electric Generation)

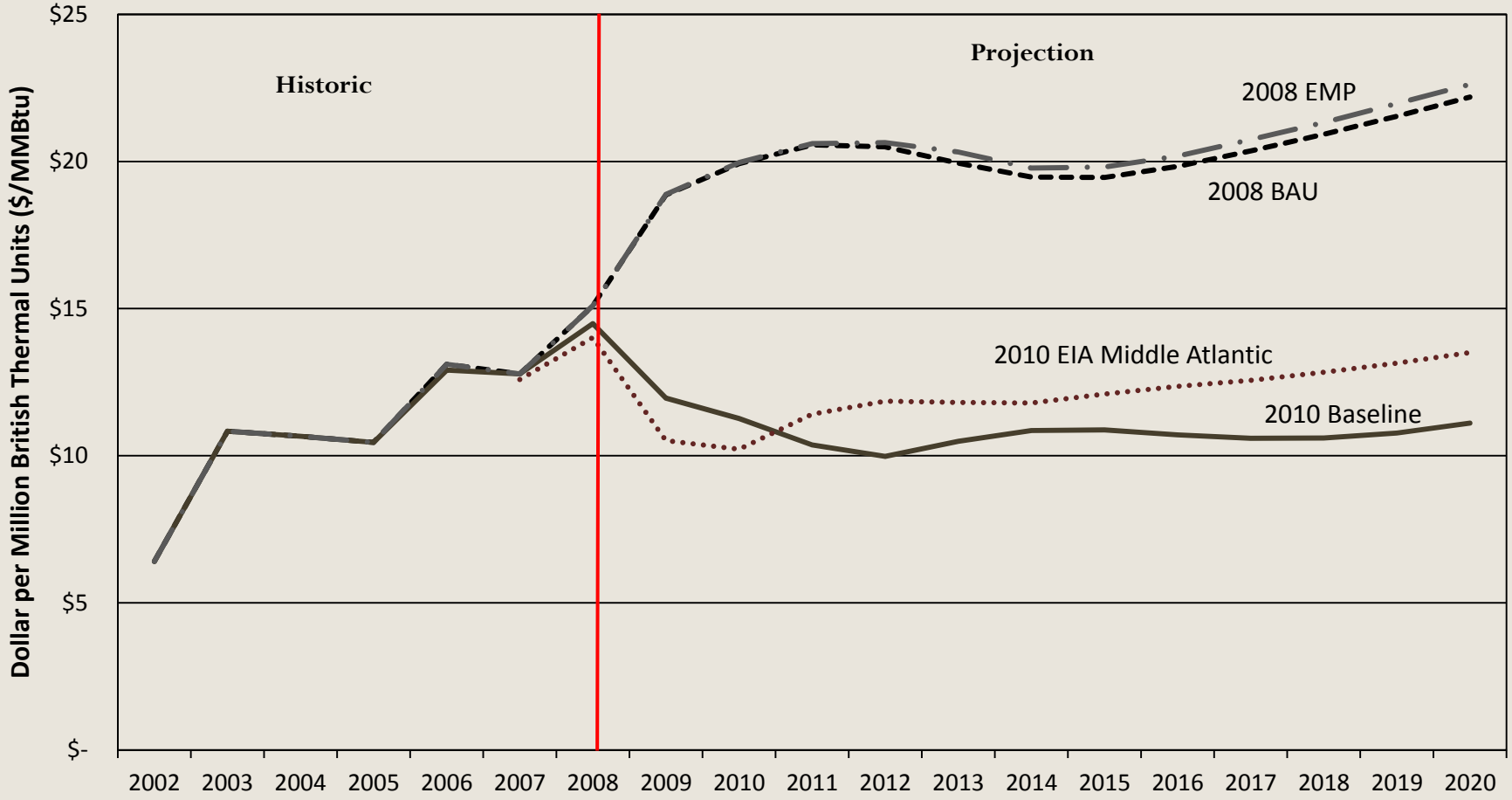


Average Annual Percent Change (2010-2020)	
2008 BAU	1.0%
2008 EMP	1.4%
2010 Baseline	0.0%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.7%
2010 EIA Middle Atlantic(NJ-NY-PA)	3.2%

Note: not weather normalized; not including SBC and taxes

Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Weighted Average Natural Gas Rate (not including Electric Generation)

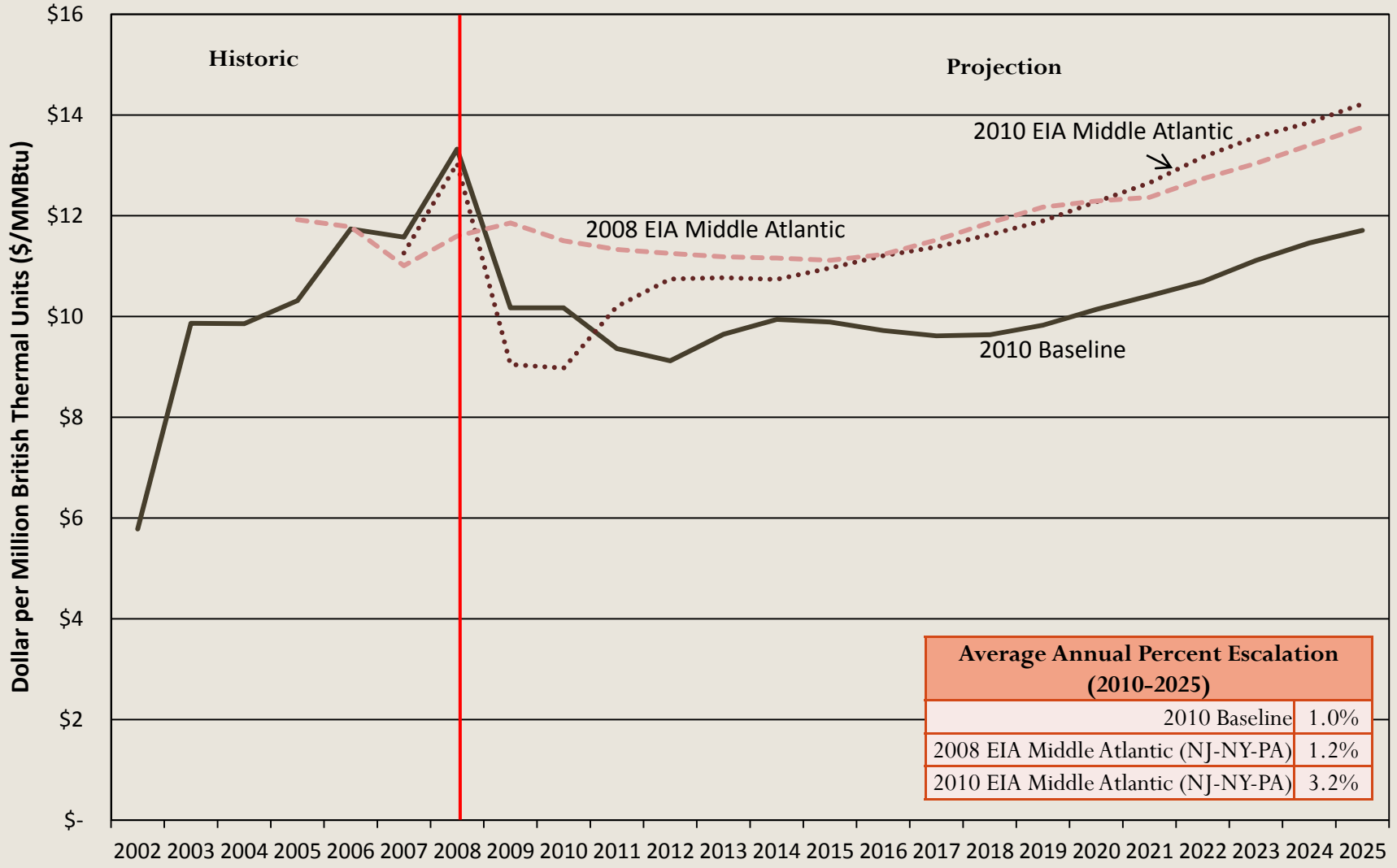


Average Annual Percent Escalation (2010-2020)	
2008 BAU	1.1%
2008 EMP	1.3%
2010 Baseline	-0.1%
2008 EIA Middle Atlantic (NJ-NY-PA)	0.7%
2010 EIA Middle Atlantic (NJ-NY-PA)	2.9%

Note: not weather normalized

Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Weighted Average Natural Gas Rate through 2025 (including Electric Generation)



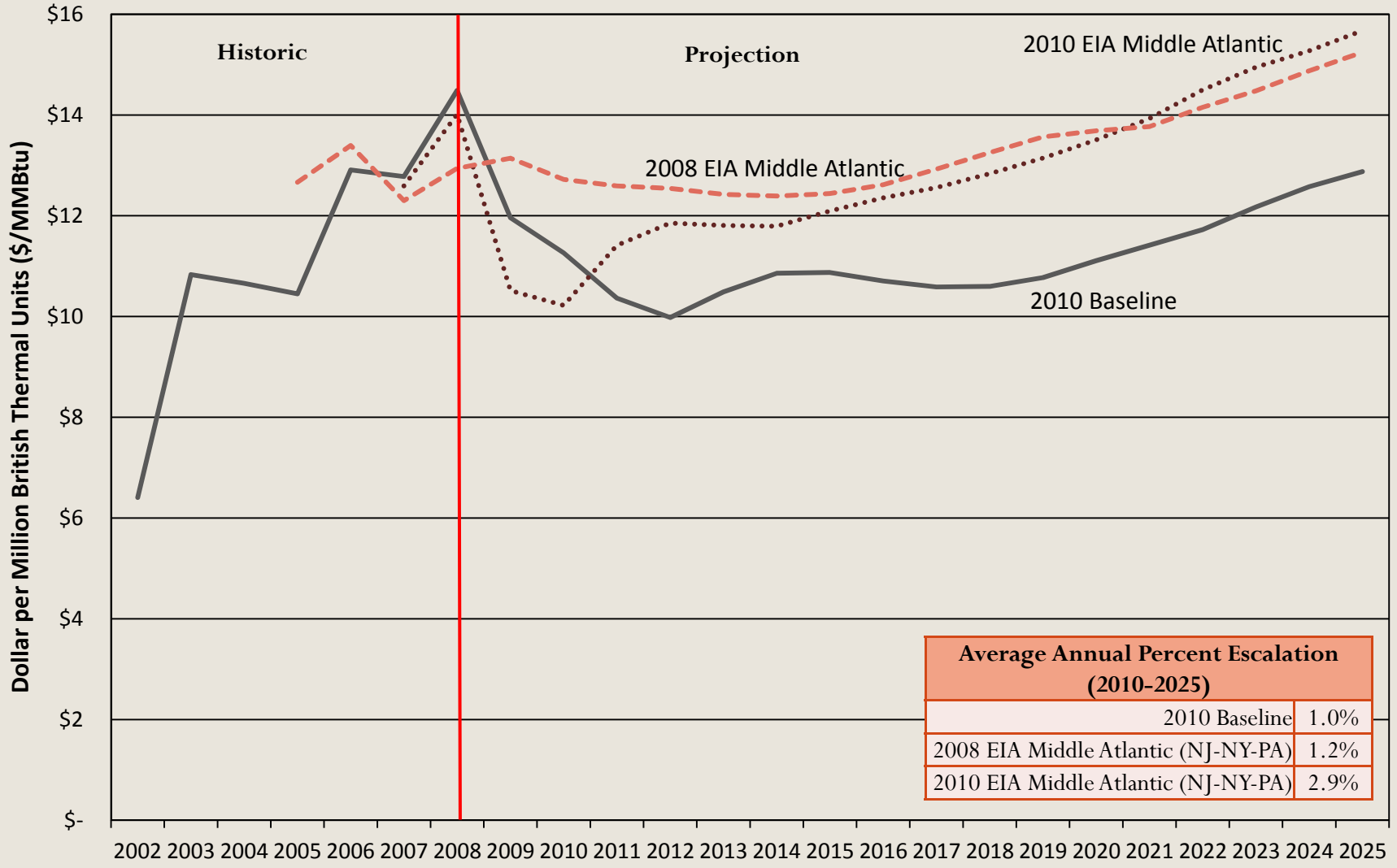
Average Annual Percent Escalation (2010-2025)	
2010 Baseline	1.0%
2008 EIA Middle Atlantic (NJ-NY-PA)	1.2%
2010 EIA Middle Atlantic (NJ-NY-PA)	3.2%

Note: not weather normalized

DRAFT

Reference: R/ECON™ (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Weighted Average Natural Gas Rate through 2025 (not including Electric Generation)

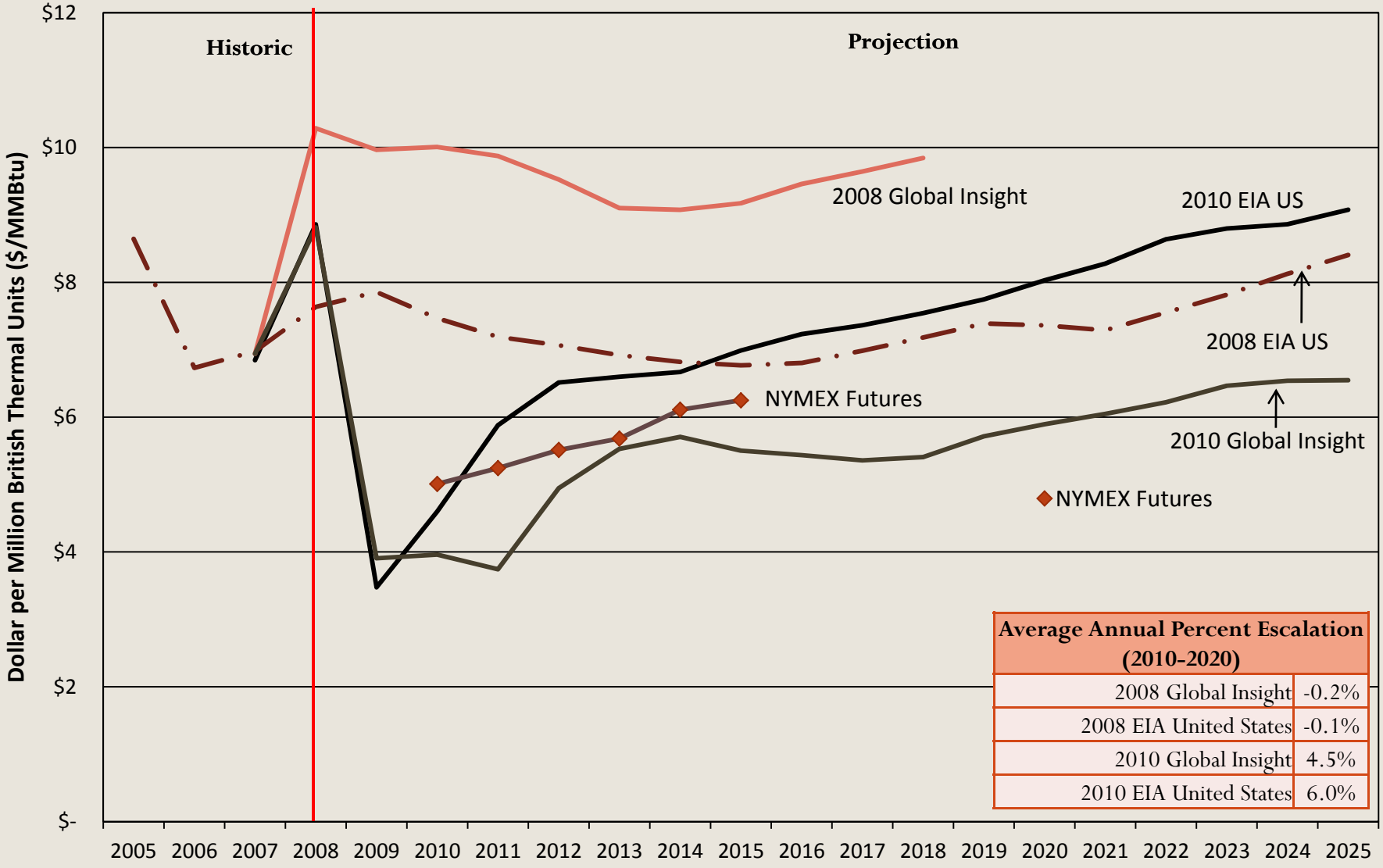


Average Annual Percent Escalation (2010-2025)	
2010 Baseline	1.0%
2008 EIA Middle Atlantic (NJ-NY-PA)	1.2%
2010 EIA Middle Atlantic (NJ-NY-PA)	2.9%

Note: not weather normalized

Reference: R/ECON™ (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

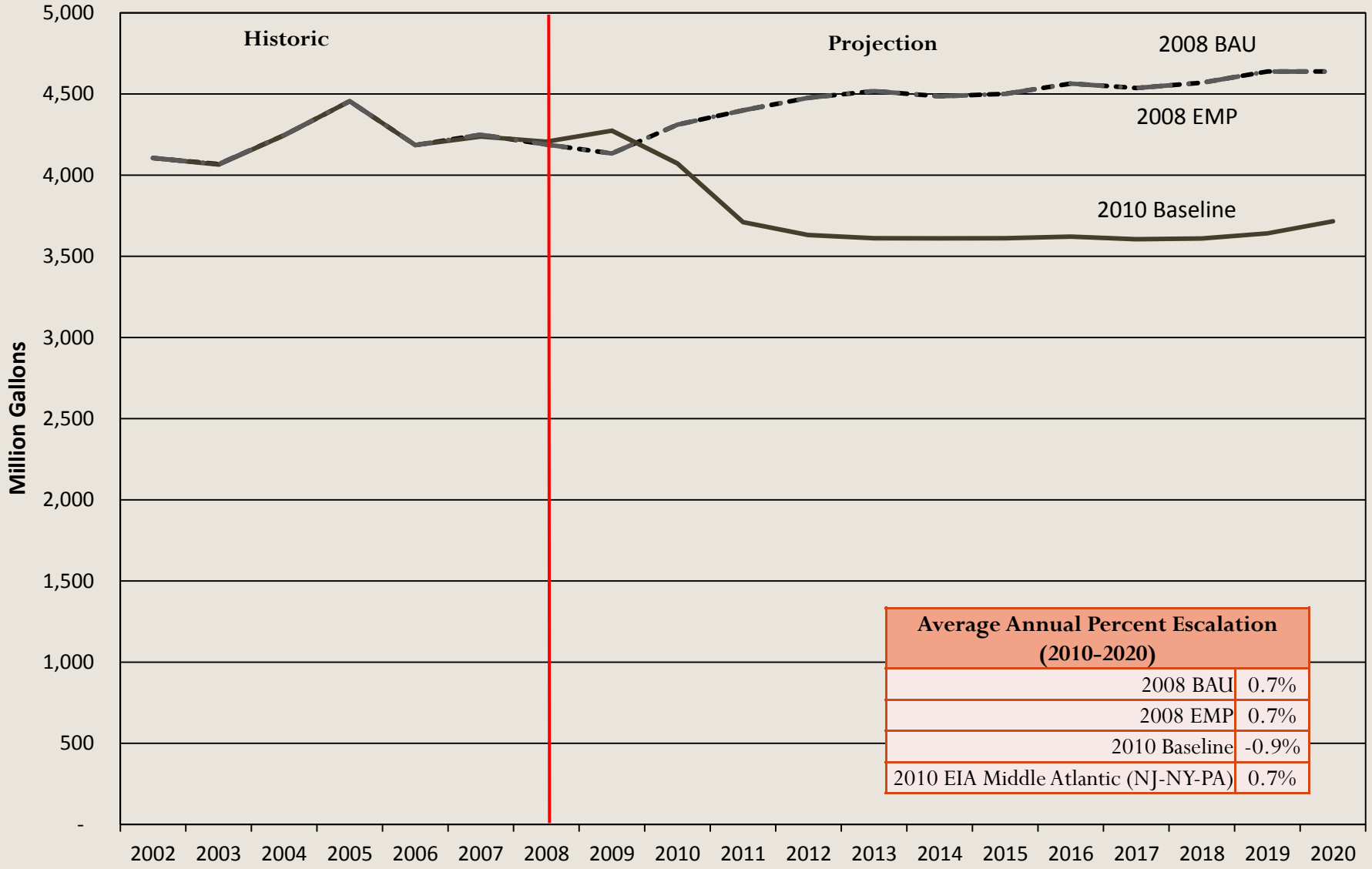
Wholesale Natural Gas Prices at Henry Hub



Average Annual Percent Escalation (2010-2020)	
2008 Global Insight	-0.2%
2008 EIA United States	-0.1%
2010 Global Insight	4.5%
2010 EIA United States	6.0%

Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.
NYMEX Henry Hub Futures. Accessed at www.cmegroup.com/trading/energy/natural-gas/natural-gas.html on 8/2/2010 at 11:00 AM.

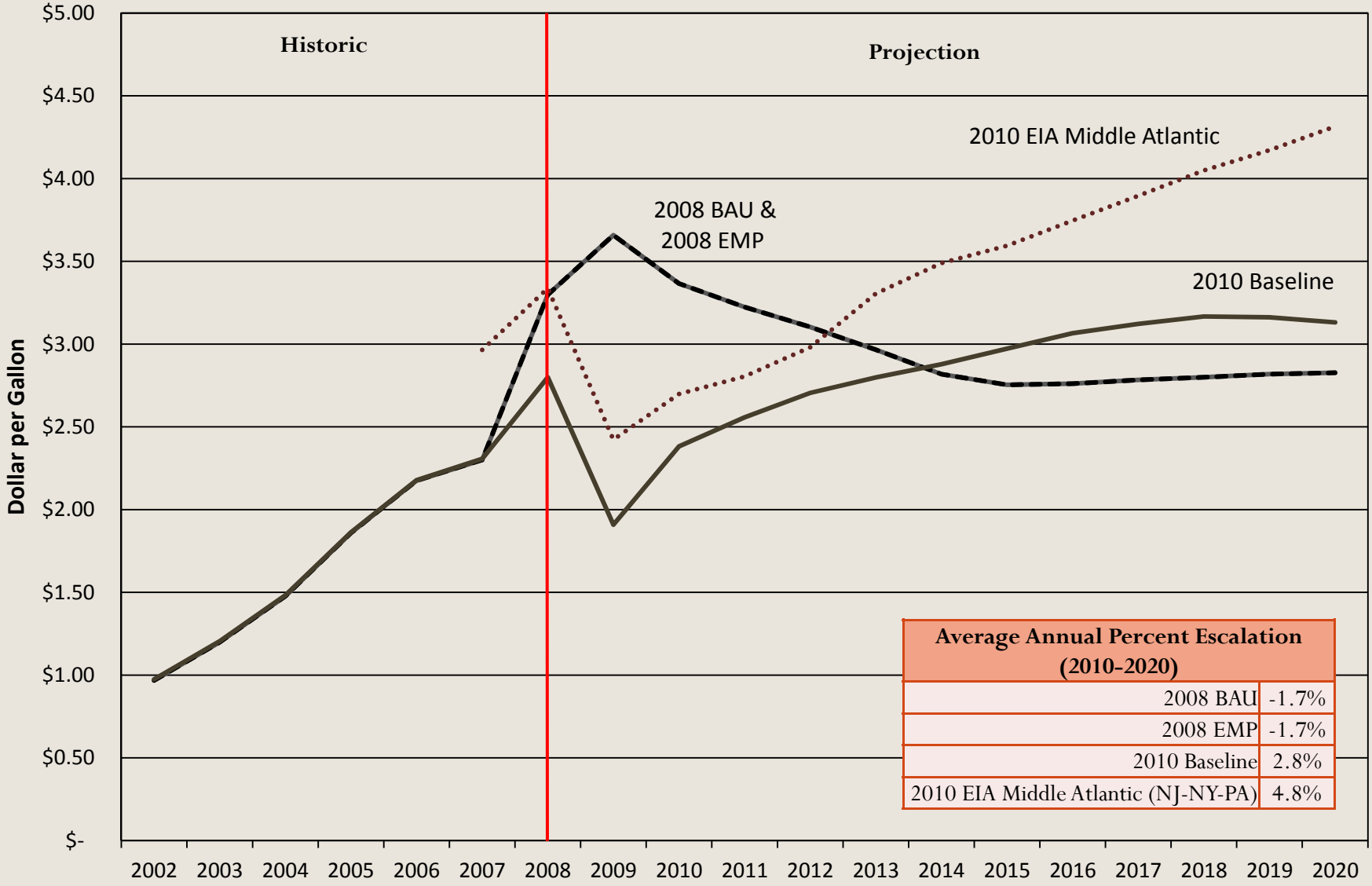
Gasoline Consumption



Average Annual Percent Escalation (2010-2020)	
2008 BAU	0.7%
2008 EMP	0.7%
2010 Baseline	-0.9%
2010 EIA Middle Atlantic (NJ-NY-PA)	0.7%

Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

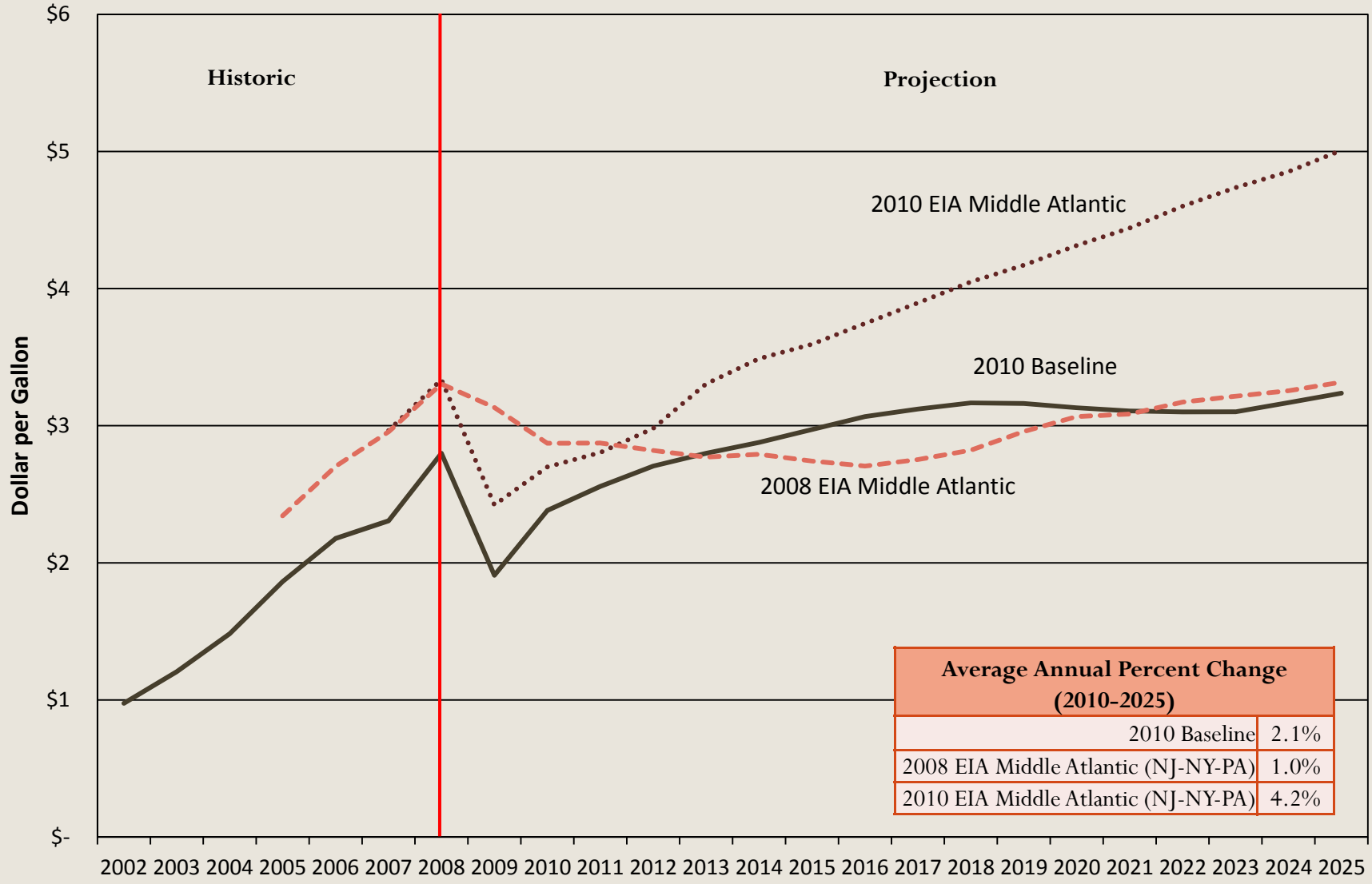
Gasoline Price



Average Annual Percent Escalation (2010-2020)	
2008 BAU	-1.7%
2008 EMP	-1.7%
2010 Baseline	2.8%
2010 EIA Middle Atlantic (NJ-NY-PA)	4.8%

Reference: R/ECON™ (9/30/08) and (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

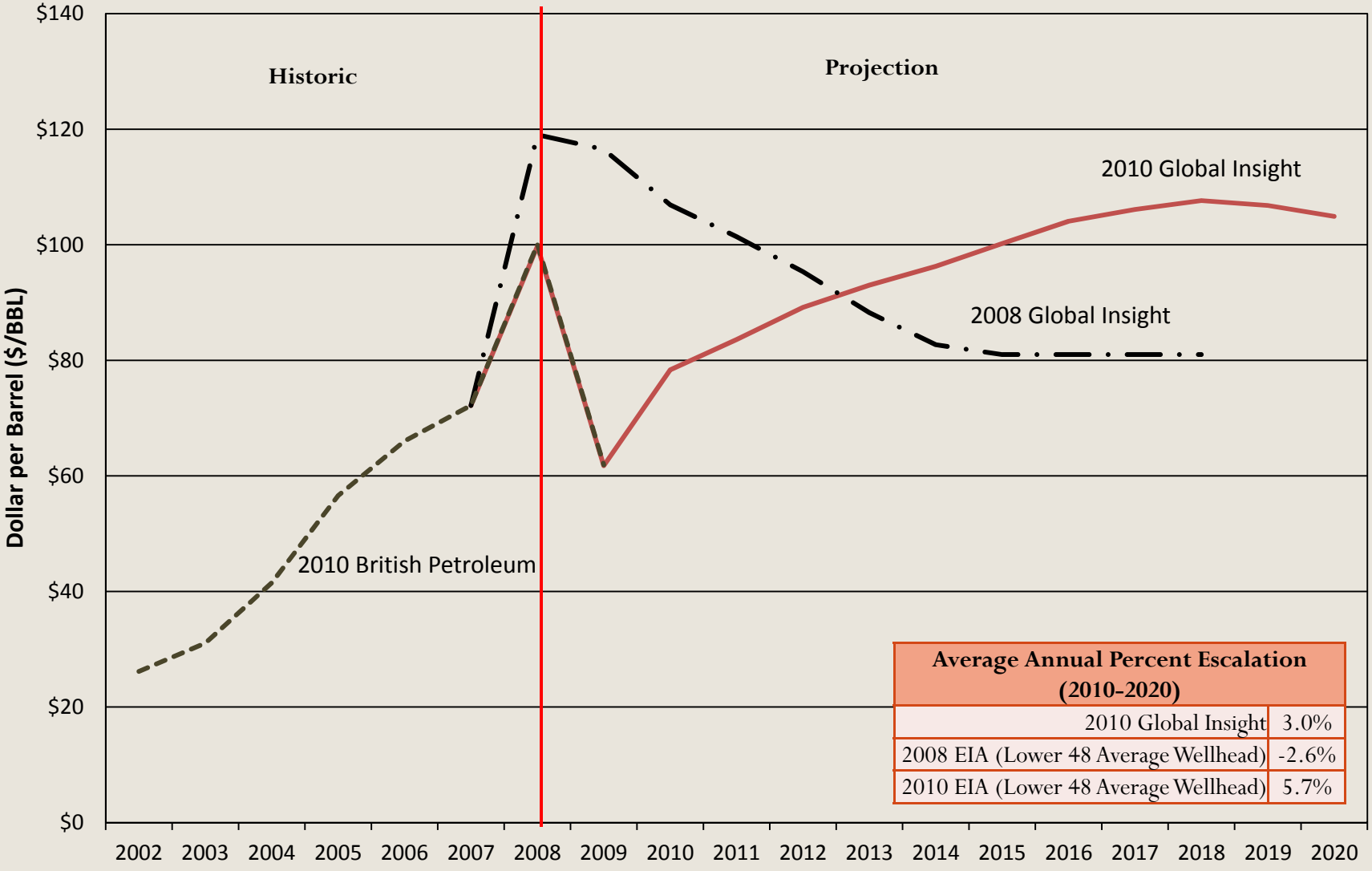
Gasoline Price through 2025



Average Annual Percent Change (2010-2025)	
2010 Baseline	2.1%
2008 EIA Middle Atlantic (NJ-NY-PA)	1.0%
2010 EIA Middle Atlantic (NJ-NY-PA)	4.2%

Reference: R/ECON™ (11/20/10).
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Crude Oil Prices: Western Texas Intermediary at Cushing, OK



Average Annual Percent Escalation (2010-2020)	
2010 Global Insight	3.0%
2008 EIA (Lower 48 Average Wellhead)	-2.6%
2010 EIA (Lower 48 Average Wellhead)	5.7%

Reference: R/ECON™ (9/30/08) and (11/20/10).
British Petroleum. Statistical Review of World Energy (June 2010). Accessed at www.bp.com/statisticalreview
Energy Information Administration (EIA). United States Department of Energy. Annual Energy Outlook.

Generation Cost Assumptions

- Levelized Cost of Electricity Comparisons
- Cost Projections and Comparisons

  Capital Costs, Input Variables (Capacity Factors, Discount Rate, Operating Life), Fuel Costs, Heat Rates, O&M Costs, and Fuel Costs for the following technologies:

  - Biomass
  - Combined Cycle
  - Combined Heat & Power
  - Gas Turbine
  - Nuclear
  - Offshore Wind
  - Onshore Wind
  - Solar

Levelized Cost of Electricity (LCOE)

- The revenue, per unit of energy, required to recoup a plant's initial investment, cover annual costs, and provide equity investors their expected rate of return.
- Limitations of LCOE include:
  - Does not account for the costs associated with emissions (except to the extent those are reflected in fuel costs).
  - Is typically presented for a specific year and as a point-estimate, thus not accounting for how costs may change over time or the uncertainty associated with various cost components.
  - Do not account for the fact that different generation technologies earn different revenue in wholesale electricity markets.
  - Do not reflect that there may capacity limits for a given technology.

Levelized Cost of Electricity in Recent Studies ($/MWh)

	CEEEP RPS Report (2004)	National Research Council (2008)	CEEEP Modeling Report (2008)	Lazard (2009)	PA-AEPS (2010)	IEA (2010)	EIA-AEO (2010)
Nuclear		$60-$130	$117	$107-$138			$136
Biomass		$80-$100	$99	$65-$113	$50-$130		$127
Combined Cycle		$40 - $70	$90	$69 - $96			$83
Onshore Wind	$82 (2010) $75 (2015)	$40-$100	$187	$107-$138	$80-$130		$170
Offshore Wind		$50-$180	$123		$150		$218
Gas Turbine			$188	$216 - $334			$140
Solar	$504 (2010) $390 (2015)	$140-$300	$806*	$187-$280	$240-$400	$360-$720 (Res) $240-$480 (Utility)	$453

RPS: Renewable Portfolio Standards

Tax credits were not included in any of the levelized cost of electricity estimates above, except for in the Lazard study. The Lazard study LCOE estimate was adjusted to no longer include the tax credits, for comparison purposes only.

* For marginal solar panel setting the SREC price.

Biomass Capital Cost (Nominal $/kW) & Input Variable Estimates

	NREL: Direct-fired (2006)	NREL: Gasification (2006)	Rutgers 25MW Solid Bio (2007)	Rutgers 1.5MW Gasifier IC (2007)	CEEEP Modeling Report (2008)	Summit Blue (2008)	Navigant Direct Combustion (2008)	Lazard (2009)*	NJCEP (2009)	EIA-AEO (2010)	PA-AEPS (2010)
2008					$2,500-$3,500	$3,232		$3,150-$4,000			
2009							$,4000		$7,252	$3,995	$1,500-$5,500
2010	$1,838	$1,999	$1,970	$4,148							
2015	$1,845	$2,040	$2,050	$4,327			$4,705			$6,133	
2020	$1,844	$2,080					$5,432				
2025										$4,296	
Capacity Factor (%)	80%	80%	85%	85%	85%	70-85%	85%	80%		83%	80-90%
Discount Rate (%)					12-15%			8%		8.5%	7.5%
Lifetime (years)			25	25	20		25	20			20
Heat Rate (Btu/kWh)	12,322	9,222	16,250	16,250	14,250			14,500			
Fuel Cost ($/MMBTu)							$9-$13	$0-$3			$0-$8

*Production Tax Credit of 1.1 cents to 2.2 cents/kWh is not included in any of the above studies except for the Lazard study.

Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.

Biomass Fixed O&M Cost (Nominal $/kW-yr)

	NREL: Direct-fired (2006)	NREL: Gasification (2006)	Rutgers 25MW Solid Bio (2007)	Rutgers 1.5MW Gasifier IC (2007)	CEEEP Modeling Report (2008)	Summit Blue (2008)	Navigant (2008)	Lazard (2009)	NJCEP (2009)	EIA-AEO (2010)	PA-AEPS (2010)
2008					$50-$60			$83		$66-$117	
2009							$125				$60-$120
2010	$83	$60									
2015	$83	$66					$131				
2020	$83	$73					$137				

Biomass Variable O&M Cost (Nominal $/MWh)

	NREL: Direct-fired (2006)	NREL: Gasification (2006)	Rutgers 25MW Solid Bio (2007)	Rutgers 1.5MW Gasifier IC (2007)	CEEEP Modeling Report (2008)	Summit Blue (2008)	Navigant (2008)	Lazard (2009)	NJCEP (2009)	EIA – AEO (2010)	PA-AEPS (2010)
2008					$2-$4			$11		$7	
2009							$2.50				$10-$15
2010	$10	$6									
2015	$9	$6					$2.80				
2020	$10	$7					$3.09				

Combined Cycle Turbine Capital Cost (Nominal $/kW) & Input Variable Estimates

	CEEEP Modeling Report (2008)	DOE (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Navigant (2008)	Lazard (2009)	EIA-AEO (2010)
2004						
2008	$900-$1,050		$1,131		$950-$1,175	$984
2009				$910		
2010		$842				
2015		$928		$1,288		
2020		$1,022		$1,543		
Capacity Factor (%)	38.3%			85%	40-85%	
Discount Rate (%)	12-5%		9.5%			
Lifetime (years)	40	30	20	25	20	
Heat Rate (Btu/kWh)	6,875	6,870	6,979	7,100	6,800-7,220	7,196
Fuel Cost	$8				$6	

*EMAAC encompasses the PS, JCP&L, AE, PECO, DPL, and RECO zones.

Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.

Combined Cycle Turbine Fixed O&M Cost (Nominal $/kW-yr)

	CEEEP Modeling Report (2008)	DOE (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Navigant (2008)	Lazard (2009)	EIA-AEO (2010)
2004						
2008	$6.50-$13.00		$18		$5.50-$6.20	$12.76
2009				$		
2010		$16				
2015		$17				
2020		$19				

Combined Cycle Turbine Variable O&M Cost (Nominal $/MWh)

	CEEEP Modeling Report (2008)	DOE (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Navigant (2008)	Lazard (2009)	EIA-AEO (2010)
2004						
2008	$2-$3		2.80		$2-$3.50	$2.11
2009				$4.20		
2010		$3.24				
2015		$3.57		$5.49		
2020		$3.93		$6.54		

* EMAAC encompasses the PS, JCP&L, AE, PECO, DPL, and RECO zones.

Combined Heat and Power (CHP) Capital Cost (Nominal $/kW) & Input Variable Estimates

	Lemar (2001)	EERE: 100 kW micro-turbine (2005)	EERE: 1 MW Gas Turbine (2005)	Onovwiona (2006)	Karki (2007)	CEEEP Modeling Report (2008)	EIA-AEO (2010)	MACEAC (2010)
2001	$270-$2,200							
2006				$800-$2,800				
2007					$1,339-$2,516			
2008						$1,000-$1,500	$1,334-$1,601	
2010		$1,356	$1,701					$1,222-$2,917
2015		$1,459	$1,923					
2020		$1,596	$2,031					
2025		$1,764	$2,203					$1,052-$1,725
Capacity Factor (%)	80-90%	80%	84%	75%		80%		75-85%
Discount Rate (%)	7%					12-15%		
Lifetime (years)	20					25		15-30
Heat Rate (Btu/kWh)	6,450-11,000					10,000	9,050-10,069	3,189-6,093 (Thermal output) 9,222-12,014 (Fuel)

Capital Costs vary by the size of the unit. Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included. In addition, the value of the steam needs to be considered.

CHP Fixed O&M Cost (Nominal $/kW-yr)

	Lemar (2001)	EERE (2005)	Onovwiona (2006)	Karki (2007)	CEEEP Modeling Report (2008)	EIA-AEO (2010)	MACEAC (2010)
2001	$4-$10						
2006			$6-$26				
2007				$10			
2008					$30-$45	$16	

CHP Variable O&M Cost (Nominal $/MWh)

	Lemar (2001)	EERE (2005)	Onovwiona (2006)	Karki (2007)	CEEEP Modeling Report (2008)	EIA-AEO (2010)	MACEAC (2010)
2008					$4-$6.50	$7	
2010		$15.90					$4-$22
2015		$15.90					
2020		$15.90					
2025		$15.90					

Gas Turbine Capital Cost (Nominal $/kW) & Input Variable Estimates

	NEA /IEA (2005)	DOE (2008)	CEEEP Modeling Report (2008)	Navigant (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Lazard (2009)	EIA-AEO (2010)
2004	$600						
2008			$600-$800		$953	$675-$1,575	$685
2009				$670			
2010		$809					
2015		$892		$952			
2020		$983		$1,160			
Capacity Factor (%)			10.7%	15%		10%	
Discount Rate (%)	5%		12-15%		9.5%		
Lifetime (years)	20-30	30	20	20		20	
Heat Rate (Btu/kWh)		8,900	10,750	10,700	10,554	10,200-10,880	10,788
Fuel Cost	$4.58-$4.96		$8			$6	

*EMAAC encompasses the PS, JCP&L, AE, PECO, DPL, and RECO zones.

Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.

Gas Turbine Fixed O&M Cost (Nominal $/kW-yr)

	NEA/IEA (2005)	DOE (2008)	CEEEP Modeling Report (2008)	Navigant (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Lazard (2009)	EIA-AEO (2010)
2004	$14-$26						
2008			$6.50-$8.50			$7-$27	$12.38
2009							
2010		$7					
2015		$8					
2020		$9					

Gas Turbine Variable O&M Cost (Nominal $/MWh)

	NEA/IEA (2005)	DOE (2008)	CEEEP Modeling Report (2008)	Navigant (2008)	PJM Cost of New Entry (EMAAC*) (2008)	Lazard (2009)	EIA-AEO (2010)
2004							
2008			$3.50-$6			$5-$28	$3.65
2009				$10.40			
2010		$3					
2015		$3.30		$13.67			
2020		$3.60		$16.17			

* EMAAC encompasses the PS, JCP&L, AE, PECO, DPL, and RECO zones.

Nuclear "Capital" Cost (Nominal $/kW)

	U of Chicago (2004)	NEA/IEA (2005)	CEEEP Modeling Report (2008)	DOE (2008)	Navigant (2008)	Lazard (2009)	MIT (2009)	NEI (2010)	EIA-AEO (2010)	FP&L (2010)	Progress Florida (2010)	RFF (2010)	Brattle Group (2010)
2003		$1,074-$2,510											
2004	$1,200-$1,800												
2007							$4,000			$3,596-$4,540	$4,200		
2008			$4,500-$7,000			$6,325-$8,375							$4,038
2009								$4,000-$4,500	$3,822				
2010				$3,420									
2015				$3,592	$8,802				$4,581				
2020				$3,853	$9,505				$4,531			$5,213	
2025									$4,460				

The capital costs do not include decommissioning costs.
Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.

Nuclear Input Variable Estimates

	U of Chicago (2004)	NEA/IEA (2005)	CEEEP Modeling Report (2008)	DOE (2008)	Navigant (2008)	Lazard (2009)	MIT (2009)	NEI (2010)	EIA-AEO (2010)	FP&L (2010)	Progress Florida (2010)	RFF (2010)	Brattle Group (2010)
Capacity Factor (%)	85%				94%	90%	85%		90%				
Discount Rate (%)			12-15%			8%	8%		8.5%			6.9%	
Lifetime (years)	40		40		40		40				60		
Heat Rate (BTU/kWh)			10,400		10,400		10,400						
Fuel Cost ($/MWh)	$4.35	$4.64	$5.20		$2.93		$6.97	$7.50				$8.67	

Nuclear Fixed O&M Cost (Nominal $/kW-yr)

	U of Chicago (2004)	NEA/ IEA (2005)	CEEEP Modeling Report (2008)	DOE (2008)	Navigant (2008)	Lazard (2009)	MIT (2009)	NEI (2010)	EIA-AEO (2010)	FP&L (2010)	Progress Florida (2010)	RFF (2010)	Brattle Group (2010)
2003								$63					
2004	$60												
2007							$56		$92				
2008			$80-$120			$12.80							
2009													
2010				$97									
2015				$107	$137								
2020				$118	$148								

Nuclear Variable O&M Cost (Nominal $/MWh)

	U of Chicago (2004)	NEA/IEA (2005)	CEEEP Modeling Report (2008)	DOE (2008)	Navigant (2008)	Lazard (2009)	MIT (2009)	NEI (2010)	EIA-AEO (2010)	FP&L (2007)	Progress Florida (2008)	RFF (2010)	Brattle Group (2008)
2003													
2004	$2.10												
2007							$0.42		$0.51				
2008			$0.65-$1.20			$11							
2009													
2010				$0.51									
2015				$0.56	$17.15								
2020				$0.62	$18.52							$15.23	

Offshore Wind Capital Cost (Nominal $/kW) & Input Variable Estimates

	PACE (2007)	CEEEP Modeling Report (2008)	DOE (2008)	NJ Bluewater (2008)	NJ GSOE (2008)	NJ Fishermen Energy (2008)	Summit Blue (2008)	Navigant (2008)	Lazard (2009)	EWEA (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NREL (2010)
2006				$3,729	$2,873	$4,147	$2,972						
2007	$5,736												
2008		$3,100-$4,100											
2009											$3,937	$4,000-$5,000	$4,254
2010			$2,337							$2,875			$4,029
2015			$2,465					$5,187		$1,844	$4,611		$4,847
2020			$2,654					$5,345		$1,593			$4,847
2025			$2,966							$1,550	$4,696		
Capacity Factor (%)	36%	34%	34-55%				34%	35%		24.1%	43-45%	35-40%	
Discount Rate (%)	9%	12-15%	7%						8%		8.5%	7.5%	
Lifetime (years)		20		25	20	24		25	20	20-25			

Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.
*Production Tax Credit of 2.2 cents/kWh and decommissioning costs are not included in the above studies.

Offshore Wind Fixed O&M Cost (Nominal $/kW-yr)

	PACE (2007)	CEEEP Modeling Report (2008)	DOE (2008)	NJ Bluewater (2008)	NJ GSOE (2008)	NJ Fishermen Energy (2008)	Summit Blue (2008)	Navigant (2008)	Lazard (2009)	EWEA (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NREL (2010)
2008		$50-$100											
2009												$140	
2010			$16								$87		
2015			$18					$26					
2020			$20					$28					
2025			$23										

Offshore Wind Variable O&M Cost (Nominal $/MWh)

	PACE (2007)	CEEEP Modeling Report (2008)	DOE (2008)	NJ Bluewater (2008)	NJ GSOE (2008)	NJ Fishermen Energy (2008)	Summit Blue (2008)	Navigant (2008)	Lazard (2009)	EWEA (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NREL (2010)
2008		$1-$2			$33.54*	$38.57*							
2009													
2010			$19								$0		
2015			$19					$29					
2020			$18					$30					
2025			$19										

* Garden State Offshore Energy and Fisherman's Energy O&M costs represent total O&M in $/MWh, not just variable O&M costs.

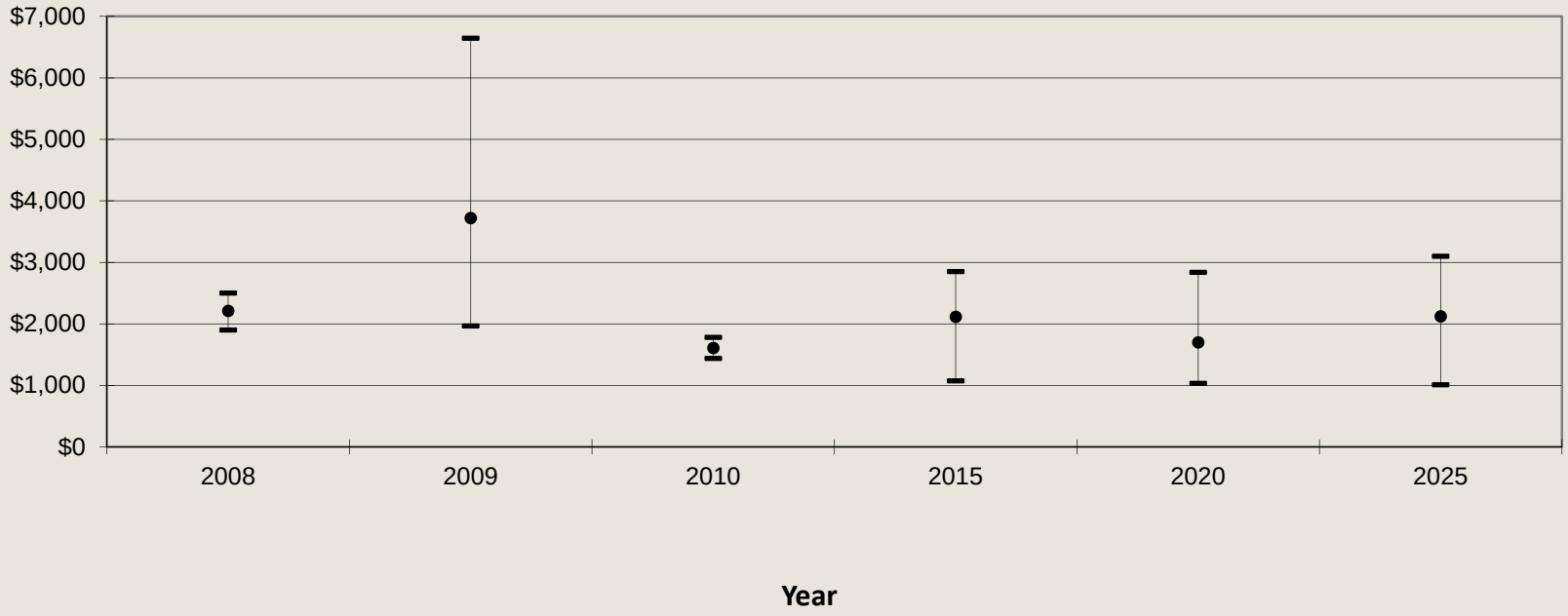
Onshore Wind Capital Cost (Nominal $/kW) & Input Variable Estimates

	Navigant (2008)	Summit Blue (2008)	CEEEP Modeling Report (2008)	DOE (2008)	EWEA (2008)	Lazard (2009)*	NJCEP (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NY ISO (2010)	DOE (2010)	IEA (2010)
2008			$2,000-$2,500			$1,900-$2,500					$1,950	
2009	$2,471						$6,645	$1,967	$2,100-$3,000		$2,120	$2,080
2010				$1,780	$1,438							
2015	$2,621			$1,915	$1,074			$2,852				
2020	$2,839			$2,058	$1,033							
2025				$2,262	$1,009			$3,099				
Capacity Factor (%)	18%	15-29%	32%	39-40%	24%	28-36%		44-46%	25-40%	26.4-34%	28%	
Discount Rate (%)			12 -15%	7%		8%		8.5%	7.5%			
Lifetime (years)	25		20		20-25	20			20			

Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included.

* Production Tax Credit of 2.2 cents/kWh is not included in any of the above studies except for the Lazard study. The PTC has a very small effect on the capital cost.

Onshore Wind Capital Cost (Nominal $/kW)



Onshore Wind Fixed O&M Cost (Nominal $/kW-yr)

	Navigant (2008)	Summit Blue (2008)	CEEEP Modeling Report (2008)	DOE (2008)	EWEA (2008)	Lazard (2009)	NJCEP (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NY ISO (2010)	DOE (2010)	IEA (2010)
2008			$30-$45			$40-$50						
2009									$60			
2010				$12				$31				
2015				$14								
2020				$25								
2025				$17								

Onshore Wind Variable O&M Cost (Nominal $/MWh)

	Navigant (2008)	Summit Blue (2008)	CEEEP Modeling Report (2008)	DOE (2008)	EWEA (2008)	Lazard (2009)	NJCEP (2009)	EIA-AEO (2010)	PA-AEPS (2010)	NY ISO (2010)	DOE (2010)	IEA (2010)
2008			$1-$2									
2009												
2010				$6								
2015				$6								
2020				$6								
2025				$7								

Solar Capital Cost (Nominal $/kW) & Input Variable Estimates

	SEIA (2004)	EERE (2005)	CEEEP Modeling Report (2008)	NREL (2008) DC	Navigant (2008) AC	Lazard (2009)*	Open PV (2009) DC	NJCEP (2009) DC	LBNL (2009) DC	IEA (2010)	EIA-AEO (2010) AC	PA-AEPS (2010) AC
2008			$5,000-$8,000			$4,643-$7,143			$7,500	$6,000 (Res) $5,000 (C&I)		
2009					$8,104 (Res) $7,303 (C&I)		$8,050	$7,195			$6,174	$4,000-$7,200
2010	$4,870	$7,669 (Res) $5,375 (C&I)		$6,320								
2015	$4,240	$6,580 (Res) $4,981 (C&I)		$5,399	$6,609 (Res) $5,937 (C&I)						$9,000	
2020	$3,760	$5,185 (Res) $4,359 (C&I)			$6,049 (Res) $5,432 (C&I)					$3,333 (Res) $2,778 (C&I)		
2025		$4,699 (Res) $4,554 (C&I)									$6,410	
Capacity Factor (%)	9-14%		13.5%	18-24%	18-20% (Res) 17-19% (C&I)	20-27%			14%	14-20%	21%	15- 19.5%
Discount Rate (%)		8%	12 -15%			8%				10%	8.5%	7.5%
Lifetime (years)	25		20		25	20						20

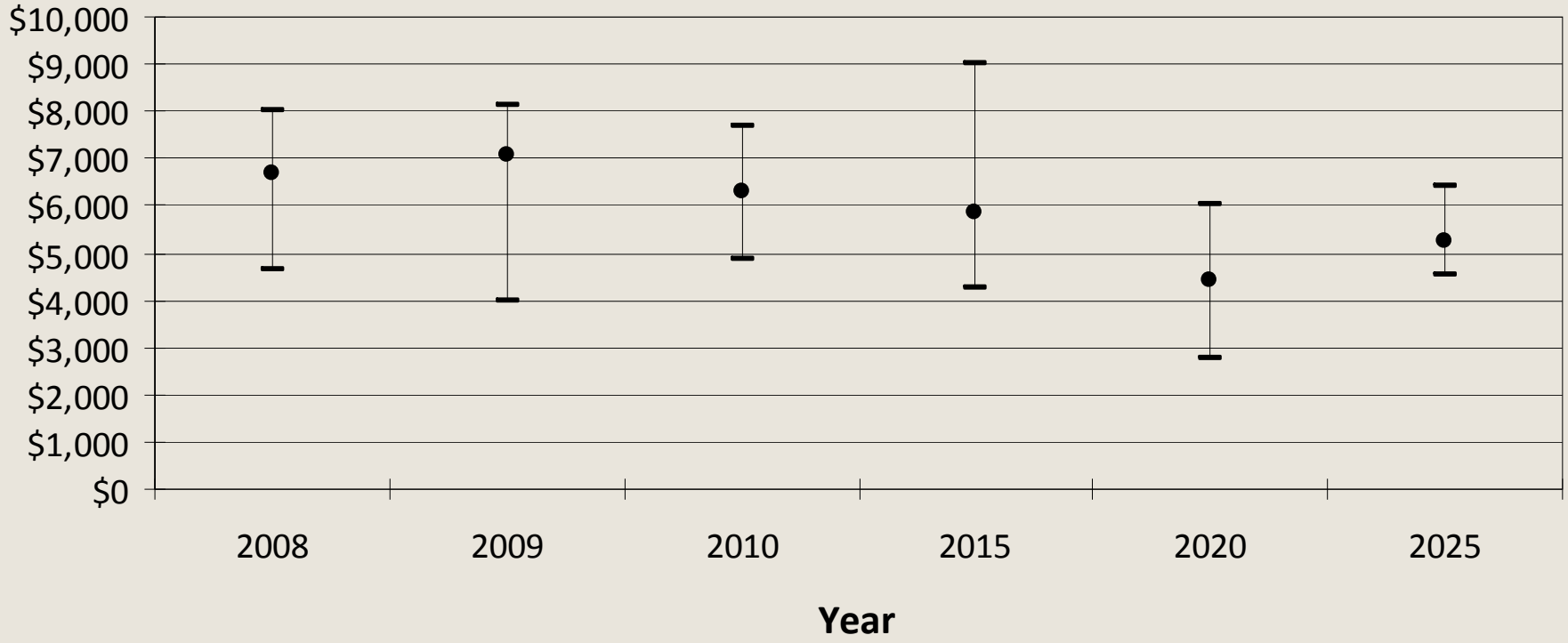
Capital cost varies in definition among different studies reported here. Some studies include development costs, interest charges, labor costs, etc, while other studies do not specify the exact costs that are included. System capital costs vary with system size.

*The Lazard study capital costs include the Investment Tax Credit of 30%. The ITC is not included in this analysis, for comparison purposes only.

The studies that reported whether the capacity was in AC or DC are noted above.

T&D savings (11%) due to solar are not accounted for.

Solar Capital Costs (Nominal $/kW)

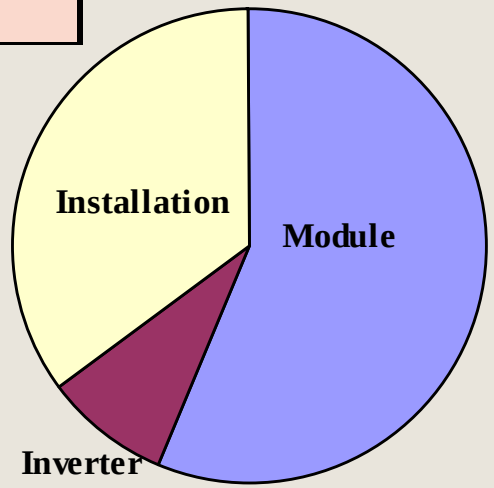


Solar Fixed O&M Cost (Nominal $/kW-yr)

	SEIA (2004)	EERE (2005)	CEEEP Modeling Report (2008)	NREL (2008)	Navigant (2008)	Lazard (2009)	Open PV (2009)	NJCEP (2009)	LBNL (2009)	IEA (2009)	EIA-AEO (2010)	PA-AEPS (2010)
2008			$11-$12			$25						
2009					$41(Res) $34 (C&I)							$40- $65
2010		$41 (Res and C&I)		$39							$58	
2015		$34 (Res and C&I)		$31	$27 (Res) $22 (C&I)							
2020		$21 (Res and C&I)			$16 (Res) $19 (C&I)							
2025		$14 (Res and C&I)										

Solar Capital Cost Breakout

	Module	Inverters	Installation
LBNL (2009)	56%-58%	6%-9%	34%-39%
SolarPower.org	60%	10%	30%
SunPower (2009 estimate)	50%-54%	8%	38%-42%
DOE Solar Technology Program	63%	7%	30%



References: Lawrence Berkeley National Laboratory (LBNL). Tracking the Sun II: The Installed Cost of Photovoltaics in the US from 1998 to 2008 (October 2009).
SolarPower.org Accessed at www.solarpower.org/Articles/solar-power-installation-breakdown.aspx
SunPower. Personal Communication.
Department of Energy (DOE). Solar Energy Industry Forecast: Perspectives on U.S. Solar Market Trajectory (May 27, 2008). Accessed at www.earthday.net/files/doe.ppt

Generation Cost Assumption References

Brattle Group: "The Cost of New Generating Capacity in Perspective," Nuclear Energy Institute, February 2010.
CEEEP Modeling Report: "Modeling Report for the New Jersey Energy Master Plan," Center for Energy, Economic, and Environmental Policy, October 2008.
CEEEP RPS Report: "Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard," Center for Energy, Economic, and Environmental Policy, December 8 2004.
DOE: "20% Wind Energy by 2030," Department of Energy, July 2008.
DOE: "2009 Wind Technologies Market Report," US Department of Energy, August 2010.
EERE: "Projected Benefits of Federal Energy Efficiency and Renewable Energy Programs - FY 2006 Budget Request," May 2005.
EIA-AEO: "Energy Information Administration Annual Energy Outlook 2010," Assumptions Document, 2010.
EWEA: "Pure Power: Wind Energy Targets for 2020 and 2030," European Wind Energy Association, November 2009.
FP&L: "The Cost of New Generating Capacity in Perspective," Nuclear Energy Institute, February 2010.
IEA: "Technology Roadmap: Solar Photovoltaic Energy," International Energy Agency, 2010.
IEA: "IEA Wind Energy 2009 Annual Report", International Energy Agency, July 2010.
Karki: Karki S., M. Kulkarni, M.D. Mann, H. Salehfar. "Efficiency Improvements through Combined Heat and Power for On-site Distributed Generation Technologies," Cogeneration and Distributed Generation Journal, V. 22, pp 19-34, 2007.
Lazard: "Levelized Cost of Energy Analysis," June 2009.
LBNL: "Tracking the Sun II: The Installed Cost of Photovoltaics in the US from 1998 to 2008," Lawrence Berkley National Laboratory, October 2009.
Lemar: Lemar, P.L. "The Potential Impact of Policies to Promote Combined Heat and Power in US Industry," Energy Policy, V 29,pp 1243-1254, 2001.
MACEAC: "New Jersey Combined Heat and Power Market Assessment", U.S. Department of Energy Mid-Atlantic Clean Energy Application Center, August 2010.
MIT: "The Future of Nuclear Power: An Interdisciplinary MIT Study, 2009 Update," MIT, 2009.
National Research Council: "America's Energy Future: Technology and Transformation," National Academies Press, 2009.

Generation Cost Assumption References (con't)

Navigant: "Florida Renewable Energy Potential Assessment," Navigant Consulting, December 2008.
NEA/IEA: "Projected Costs of Generating Electricity: 2005 Update," March 2005.
NEI: "The Cost of New Generating Capacity in Perspective," Nuclear Energy Institute, February 2010.
NJ Bluewater: Developer's Offshore Wind Proposal.
NJ Fishermen's Energy: Developer's Offshore Wind Proposal.
NJ GSOE: Developer's Offshore Wind Proposal.
NJCEP: Data for 2009. Accessed at www.njcleanenergy.com/renewable-energy/project-activity-reports/program-status-reports/program-status-reports
NREL: "Power Technologies Energy Data Book," National Renewable Energy Laboratory, August 2006.
NREL: "Rooftop Photovoltaics Market Penetration Scenarios," National Renewable Energy Laboratory, February 2008.
NREL: "Large Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers," National Renewable Energy Laboratory, September 2010.
NY ISO: "NYISO Wind Generation Study Final Draft," New York Independent System Operator, June 2010.
Onovwiona: Onovwiona, H.I., and V.I. Ugursal. "Residential Cogeneration Systems: Review of the Current Technology," Renewable and Sustainable Energy Reviews, V 10, pp 389-431, 2006.
Open PV: Data for New Jersey. Accessed at http://openpv.nrel.gov/ on June 14, 2010.
PA-AEPS: "Assessment of a 15% Pennsylvania AEPS," Black & Veatch, January 2010.
PACE: "Assessment of Offshore Wind Power Resources," Prepared for Long Island Power Authority, August 22, 2007.
Progress Florida: "The Cost of New Generating Capacity in Perspective," Nuclear Energy Institute, February 2010.
RFF: "New U.S. Nuclear Generation: 2010-2030," Resources for the Future, June 2010.
Rutgers: "Assessment of Biomass Potential in New Jersey," New Jersey Agricultural Experiment Station, July 2007.
SEIA: "Our Solar Power Future: The US Photovoltaic Industry Roadmap through 2030 and Beyond," Solar Energy Industry Association, September 2004.
Summit Blue: "Assessment of the New Jersey Renewable Energy Market," Summit Blue Consulting, LLC, March 24, 2008.
University of Chicago: "The Economic Future of Nuclear Power," funded by the US Department of Energy, August 2004.

Appendix A: Energy Master Plan Statute

52:27F-14. Energy Master Plan Committee

a. There is established an **Energy Master Plan** Committee (hereinafter "Committee") which shall be composed of the heads of the following principal departments or their designees: Commerce, Energy and Economic Development; Community Affairs; Environmental Protection; Health; Human Services; Transportation; and Treasury. The Commissioner of Commerce, Energy and Economic Development or his designee shall be the chairperson of the committee. The committee shall be responsible for the preparation, adoption and revision of master plans regarding the production, distribution, and conservation of energy in this State.

b. The committee within one year of the effective date of this act shall prepare or cause to be prepared, and, after public hearings as hereinafter provided, adopt a master plan for a period of 10 years on the production, distribution, consumption and conservation of energy in this State. Such plan shall be revised and updated at least once every three years. The plan shall include long-term objectives but shall provide for the interim implementation of measures consistent with said objectives. The committee may from time to time and after public hearings amend the master plan. In preparing the master plan or any portion thereof or amendment thereto the department shall give due consideration to the energy needs and supplies in the several geographic areas of the State, and shall consult and cooperate with any federal or State agency having an interest in the production, distribution, consumption or conservation of energy.

c. Upon preparation of such master plan, and each revision thereof, the committee shall cause copies thereof to be printed, shall transmit sufficient copies thereof to the Governor and the Legislature, for the use of the members thereof, and shall advertise, in such newspapers as the commissioner determines appropriate to reach the greatest possible number of citizens of New Jersey, the existence and availability of such draft plan from the offices of the committee for the use of such citizens as may request same. In addition, the department shall:

1. Fix dates for the commencement of a series of public hearings, at least one of which shall be held in each geographical area delineated in the master plan. Each such public hearing shall concern the overall content of the plan and those aspects thereof that have relevance to the specific geographical area in which each such public hearing is being held;
2. At least 60 days prior to each public hearing held pursuant to this section, notify each energy industry and each State department, commission, authority, council, agency, or board charged with the regulation, supervision or control of any business, industry or utility engaged in the production, processing, distribution, transmission, or storage of energy in any form of the time and place for the hearing and shall publish such notice in a newspaper of general circulation in the region where the hearing is to be held, and in such newspapers of general circulation in the State as the commissioner determines appropriate to reach the greatest possible number of citizens of New Jersey.

d. Upon the completion of the requirements of subsection c. of this section, the committee shall consider the testimony presented at all such public hearings and adopt the **energy master plan** , together with any additions, deletions, or revisions it shall deem appropriate.

EMP Statute (cont)

e. Upon the adoption of the **energy master plan** , and upon each revision thereof, the committee shall cause copies thereof to be printed and shall transmit sufficient copies thereof to the Governor and the Legislature, for the use of the members thereof, and to each State department, commission, authority, council, agency, or board charged with the regulation, supervision or control of any business, industry or utility engaged in the production, processing, distribution, transmission, or storage of energy in any form. In addition, the committee shall advertise in the manner provided in subsection c. of this section the existence and availability of the **energy master plan** from the offices of the committee for the use of such citizens of New Jersey as may request same; provided, however, that the committee may charge a fee for such copies of the **energy master plan** sufficient to cover the costs of printing and distributing same.

52:27F-15. Intervention in proceedings of state instrumentalities which regulate energy producers or distributors; notice; guidelines for energy master plan ; siting of energy facilities; jurisdiction; fees

a. The Division of Energy Planning and Conservation is empowered and directed to intervene in any proceedings before, and appeals from, any State department, division, commission, authority, council, agency or board (hereinafter referred to as "State instrumentalities") including the Board of Public Utilities charged with the regulation, supervision or control of any business, industry or utility engaged in the production, processing, distribution, transmission or storage of energy in any form, when, in the discretion of the commissioner, such intervention is necessary to insure the proper consideration by such State instrumentalities of the State **energy master plan** , or any part or aspect thereof, adopted by the department pursuant to section 12 of this act, or any rule or regulation promulgated by the department pursuant to the provisions of this act. To facilitate the intervention provisions of this section, each such State instrumentality shall consider the department a party of interest in any proceedings before such instrumentality with respect to energy and shall give the same notice to the department as is given to every other party of interest in such proceedings of any meeting, public hearing or other proceeding of such instrumentality in implementing its regulatory, supervisory or control powers, responsibilities and duties with respect to such businesses, industries or utilities.

b. It being the intention of the Legislature that the actions, decisions, determinations and rulings of the State Government with respect to energy shall to the maximum extent practicable and feasible conform with the **energy master plan** adopted by the department pursuant to section 12 of this act, the department shall prepare, periodically revise and distribute to each State instrumentality charged with the regulation, supervision or control of any business, industry or utility engaged in the production, processing, distribution, transmission or storage of energy in any form, such guidelines as the department determines to be relevant to assist each such instrumentality in conforming with said **energy master plan** in implementing its regulatory, supervisory or control powers, responsibilities and duties with respect to such businesses, industries or utilities.

EMP Statute (cont)

c. With respect to the siting of any energy facility in any part of New Jersey, the department shall, the provisions of any law to the contrary notwithstanding, have jurisdiction coextensive with that of any other State instrumentality, and to that end, no State instrumentality with the power to grant or deny any permit for the construction or location of any energy facility shall exercise its powers without referring to the Division of Energy Planning and Conservation, for its review and comments, a copy of such application and all papers, documents and materials appurtenant thereto filed by the applicant with such State instrumentality. Prior to making a final decision with respect to any such application, the State instrumentality with power of approval over such application shall solicit the views of the department thereupon. Such views shall be communicated to the State instrumentality with the power of approval over such application in the form of a report describing the findings of the department with respect to such application. Such report shall be prepared by the Director of the Division of Energy Planning and Conservation and shall be signed by said director and by the commissioner. In the event that such report is not prepared and transmitted to the State instrumentality with power of approval over such application within 90 days after the department's receipt of such application, such State instrumentality shall act upon such application pursuant to the law providing its power of approval thereof. In the event that the views of the department, as contained in its report, with respect to any such application differ from the views of the State instrumentality with the power of approval over such application, there shall be established an Energy Facility Review Board which shall consist of the Director of the Division of Energy Planning and Conservation, the director or chief executive officer of the State instrumentality with the power of approval over such application, and a designee of the Governor. The decision of the Energy Facility Review Board created with respect to a specific energy facility application shall be binding with respect to such facility and shall be implemented forthwith by the State instrumentality with the power of approval over such application.

In implementing its responsibilities pursuant to this subsection, the department shall have the power to adopt, by regulation, a fee schedule for reviewing applications for the construction or location of energy facilities; provided, however, that fees shall be charged to applicants for permits to construct or locate energy facilities only in those instances where the nature and extent of the proposed energy facility are such as to necessitate the employment of consultants or other expert personnel from without the department before the department can make its determination with respect to any such application, and that such fees shall in any event be the minimum amount necessary to permit the department to fulfill its responsibilities under this section.

The provisions of this section shall not be regarded as to be in derogation of any powers now existing and shall be regarded as supplemental and in addition to powers conferred by other laws, including municipal zoning authority.

52:27F-16. Emergency allocation plan in event of impending shortage of energy

The commissioner shall prepare and adopt an emergency allocation plan specifying actions to be taken in the event of an impending serious shortage of energy which poses grave threats to the public health, safety, or welfare. The commissioner shall direct all State Government departments and agencies, including the Board of Public Utilities, to develop, subject to his approval, contingency plans for dealing with said emergencies.

977, c. 146, s. 14, eff. July 11, 1977.

2008 EMP Goal 1 Maximize the State's energy conservation and energy efficiency to achieve reduction in energy consumption of at least 20% by 2020

Action Item 1 Redesign and transition the State's current energy efficiency programs to be implemented by the electric and natural gas utilities, and achieve the desired results while remaining cost effective.

- Identify and implement cost-effective energy efficiency measures that could achieve over 15,000 GWh of electric savings and 75 trillion Btus of total heating savings by 2020.

Action Item 2 Work with the Legislature to authorize the development of statewide building codes to result in new construction being at least 30% more energy efficient than current code by July 2009 and develop a strategy to achieve net zero carbon emitting buildings.

- The DCA, DEP and BPU will develop a statewide strategy to achieve net zero carbon emitting buildings for all new and existing building, achieving electricity savings of nearly 1,000 GWh and total heating savings of nearly 20 trillion Btus per year by 2020.

Action Item 3 Work with the Legislature to set minimum energy efficiency standards for new appliances and other types of equipment currently not covered by existing standards by 2009.

- The BPU staff working with the DCA staff will conduct an annual review of new appliance equipment and appliance energy efficiency improvements to determine whether new energy efficiency standards will be necessary.
- The legislation and other recently approved standards are estimated to achieve more than 2,500 GWh of electricity savings and total heating savings of more than 6 trillion Btus by 2020.

Action Item 4 Increase education and outreach in the public and private sectors.

- The BPU Office of Business Energy Ombudsperson will select up to ten industry sectors to create Best Practice Manuals, featuring recommendations for energy efficiency improvements.
- The BPU will create a partnership of public and private sector representatives to review existing education efforts in the public and private sectors and recommend an ongoing mix of education programs and resources to help New Jersey achieve its energy efficiency goals.

2008 EMP Goal 2 Reduce peak electricity demand by 5,700 MW by 2020

An estimated 900 MW of peak demand can be reduced through specific peak demand initiatives (discussed below) and an additional 4,800 MW of peak demand can be reduced through energy efficiency and cogeneration action items(achieved through other EMP goals)

Action Item 1 Expand incentives for participation in PJM regional demand response programs.

Action Item 2 Involve electric utilities in developing and implementing demand response programs.

Action Item 3 Target all commercial and industrial customers with a peak demand of 500 kW or greater for reduction in peak demand and continue to develop incentives that achieve significant peak demand saving.

- By 2012, the BPU Office of the Energy Ombudsperson will target commercial and industrial customers to educate and inform them about peak demand and energy consumption reduction incentives provided by PJM and the State.
- The BPU Office of the Energy Ombudsperson will develop a best practices guide and a listing of State companies that install and operate demand response equipment.

Action Item 4 Pilot different technologies and rate structures to determine the best way to achieve peak demand reductions for residential customers and all customers with peak demand below 500 kW.

Action Item 5 Monitor the results of all demand response, energy efficiency, and conservation initiatives through 2012 and implement the most effective mix of action steps to achieve a total peak demand reduction of 5,700 MW by 2020.

2008 EMP Goal 3 Strive to surpass the current RPS goals and achieve 30% of the State's electricity needs from renewable sources by 2020

Action Item 1 Change the solar energy goals from a percentage of 2.12% to a goal of 2,120 GWh by 2020.

Action Item 2 Develop New Jersey's wind energy resources, with at least 1,000 MW of offshore installed by 2012, and at least 3,000 MW of offshore wind and up to 200 MW of onshore wind by 2020.

- The Governor will establish an Offshore Wind Planning Group that will consist of the DEP, BPU, the Rate Counsel and public members to develop the necessary plan to guide the development of offshore wind.

Action Item 3 Develop 900 MW of biofuels and biomass as part of the State's 2020 RPS.

Action Item 4 Increase support of other renewable energy technologies.

- The BPU will consider an RPS 'carve out' model for new and emerging technologies of up to 50 MW a year through 2020.

Action Item 5 Increase the Renewable Portfolio Standard for the years 2021 to 2025.

- The BPU will evaluate the appropriateness of increasing the Renewable Portfolio Standard for the years 2021 to 2025 and have a final proposal by January 1, 2010.

2008 EMP Goal 4 Develop a 21st Century energy infrastructure that supports the goals and action items of the EMP, ensures reliability of the system and makes available additional tools to consumers to manage their energy consumption

Action Item 1 The State will work with the electric and gas utilities to develop individual utility territory master plans through 2020 that effectively respond to the goals and action items in the EMP, and provides consumers with additional resources to manage their energy consumption.

- The electric and gas utilities will work with the BPU, Rate Counsel and the Governor's Office to develop individual master plans within 12 months of the release of the EMP. These plans will be updated every 3 years.

Action Item 2 Foster the development of 1,500 MW of new cogeneration capacity in New Jersey by 2020.

- The EDA, BPU and DEP will work together to develop economic and regulatory incentives to spur clean generation construction, especially cogeneration, and to smooth regulatory and legal hurdles to turn waste energy into economically smart and environmentally sounder energy.
- The BPU staff will develop a list of necessary regulatory and statutory changes that are necessary to make cogeneration available to more customers.

Action Item 3 Ensure a balance between supply and demand of energy that will ensure reliability of electricity and fuel supplies, serve the State's greenhouse gas targets and provide energy at a reasonable price.

- The State will charge the stakeholder group of the State Energy Council to issue a report to the Governor by the end of 2009 about the following issues concerning nuclear energy: waste storage issues, projected growth to baseload demand, available technologies that can environmentally and economically meet baseload demand while not comprising reliability, impacts to ratepayers, and the appropriate public outreach process that should be undertaken if the State were to consider approving construction of a new nuclear plant.
- The BPU staff will work with the DEP staff and local distribution gas companies to conduct comprehensive analysis and future needs assessment of pipeline capacity and regional natural gas and liquid natural gas supply the ensure a level of stability in prices impacting New Jersey consumers.

2008 EMP Goal 5 Invest in innovative clean energy technologies and businesses to stimulate the industry's growth in New Jersey

Action Item 1 Expand efforts that encourage the development of clean energy technologies by expanding the Edison Innovation Fund to invest in innovative clean energy technologies and provide support to business incubators that support clean energy business development.

- The BPU, EDA and CST are partnering to expand the Edison Innovation Fund to include an Edison Innovation Clean Energy Technology Commercialization Fund and an Edison Innovation Clean Energy Manufacturing Fund.

Action Item 2 Develop timely and industry recognized job training programs to ensure that sufficient numbers of New Jersey workers have the skills demanded by industry to fill the jobs that are created from the action items in the EMP.

Action Item 3 Establish the Energy Institute of New Jersey to support basic and applied energy research efforts at the colleges and universities in the State.

- The Energy Institute , in its efforts to advance the State's research development and demonstrations efforts in the energy sector, will advance new technologies and channel additional funding sources, such as federal funds and private grants, in support of the goals of the EMP.

Appendix B: Acronyms

Energy Master Plan (EMP)

New Jersey Board of Public Utilities (BPU)

New Jersey Economic Development Authority (EDA)

New Jersey Commission on Science and Technology (CST)

New Jersey Department of Environmental Protection (DEP)

New Jersey Clean Energy Program (CEP)

Center for Energy, Economic and Energy Policy (CEEEP)

Board of Public Utilities Office of Business Energy Ombudsperson (OBEO)

New Jersey Department of Labor and Workforce Development (LWD)

Energy Units

- Kilowatt Hour (kWh)
- Megawatt Hour (MWh)
- Gigawatt Hour (GWh)
- Megawatt (MW)
- British Thermal Unit (Btu)

III. 1. RATE COMPONENT ANALYSIS- COMMERICIAL & INDUSTRIAL(C&I)

1. Overview

The Center for Energy, Economic and Environmental Policy (CEEEP), with the Staff of the Board of Public Utilities (BPU), has broken down the average cost drivers of New Jersey small general service customer's 2010 electric and natural gas rates. The analysis accounts only for the costs of various policies, not the benefits. The data presented below are in draft form and may be updated based upon stakeholder input.

The average small general service electric and natural gas rate cost drivers, discussed in Sections II and III respectively, are estimated based on a bottom-up analysis of New Jersey commercial customer energy components. The data were gleaned from the current New Jersey electric and natural gas utility tariffs -- Public Service Electric and Gas (PSE&G), Atlantic City Electric (ACE), Jersey Central Power and Light (JCP&L), Rockland Electric (RECO), Elizabethtown, New Jersey Natural Gas (NJNG) and South Jersey Gas (SJG).[1] PSE&G is an electric and natural gas provider while ACE, JCP&L, and RECO are electric providers and Elizabethtown, NJNG and SJG are natural gas providers. The utility tariff categories and charges differ across utilities. Therefore, the tariff charges were weighted by the number of electric general service customers or natural gas commercial customers in 2009.[2] Descriptions of the charges are provided below.

2. Average Secondary General Service Electric Rate Cost Drivers

The U.S. Energy Information Administration (EIA) estimates the average New Jersey commercial customer retail electricity rate was 14.25 cents per kilowatt-hour in 2009.[3] However, the EIA's average retail energy prices often do not include transfer payments such as the New Jersey sales and use tax and societal benefits charges. Additionally, the EIA aggregates customer classes into general customer classes, whereas the New Jersey utility tariffs contain multiple commercial customer classes.

The 2010 average secondary general service[4] electric rate cost drivers are comprised of three major categories, non-Basic Generation Service (BGS) policy components, distribution components and Basic Generation Service components. Table 1 presents the 2010 average secondary general service electric rate cost drivers and Table 2 presents the average 2007-2009 LMP ratepayer impacts. All values are in cents per kilowatt-hour.

- Non-BGS policy components include transition and other charges, societal benefits charges, utility-administered energy efficiency and renewable energy programs and sales and use tax.
- BGS components are comprised of New Jersey renewable energy credit ratepayer impacts, transmission, PJM Reliability Pricing Model, PJM ancillary costs, New Jersey secondary general service load-weighted average locational marginal price (LMP) and other BGS charges. The LMP accounts for the average ratepayer impacts of national and regional emission allowance programs.

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[1] PSE&G (Nov. 1, 2010) www.pseg.com/family/pseandg/tariffs/electric/index.jsp; ACE (Nov. 1, 2010) www.atlanticcityelectric.com/business/choice/nj/tariffs/; JCP&L (Dec. 1, 2010) www.firstenergycorp.com/Residential_and_Business/Customer_Choice/Tariff_Information/New_Jersey_Tariffs.html; RECO (Nov. 1, 2010) www.oru.com/aboutoru/tariffsandregulatorydocuments/newjersey/scheduleforelectricservice.html; Elizabethtown (Nov. 1, 2010) www.elizabethtowngas.com/Repository/Files/elizabethtown_tariff.pdf; NJNG (Nov. 1, 2010) www.njng.com/regulatory/tariff.asp; SJG (Nov. 1, 2010) www.southjerseygas.com/108/regulatory_information.html

[2] New Jersey Statewide BGS Electricity Supply Auction. Customer Counts by Rate Class / Profile Group www.bgs-auction.com/bgs.dataroom.occ.asp; United States Energy Information Administration (EIA). Annual Company Level Natural Gas Supply and Disposition (EIA-176 Data through 2009) www.eia.doe.gov/oil_gas/natural_gas/applications/eia176query.html

[3] EIA. Form EIA-826 Database www.eia.doe.gov/cneaf/electricity/page/eia826.html

[4] NOTE: secondary general service refers to PSE&G general lighting and power, ACE monthly secondary general service and JCP&L and RECO secondary general service.

Secondary general service customers with an annual peak load less than 1,000 kW are eligible for either BGS Fixed Price or Commercial and Industrial Energy Pricing (CIEP) service while those with an annual peak load of at least 1,000 kW are required to take BGS CIEP service. As of June 1, 2010, all ACE, RECO and PSE&G secondary general service customers as well as 99.99 percent of JCP&L secondary general service customers were classified as BGS Fixed Price customers.[5] Therefore, the 2010 electric rate cost drivers are based on BGS Fixed Price components.

Federal and state policies include all non-BGS policy components and a portion of BGS components -- the ratepayer impacts of state renewable energy credits and national and regional emissions markets. These policies constitute approximately 27 percent of the average New Jersey secondary general service electric bill, see Figure 1. Table 3 presents a summary of 2010 New Jersey secondary general service electric rate cost drivers (combination of Tables 1 and 2), broken down by State and Federal policies, distribution components and BGS (non-State and Federal) components.

[5] New Jersey Statewide BGS Electricity Supply Auction. Customer Counts by Rate Class / Profile Group.

TABLE 1: 2010 SECONDARY GENERAL SERVICE ELECTRICITY COST DRIVERS (CENTS PER KILOWATT-HOUR)

Non-BGS Policy Components (3.331 cents per kilowatt-hour)	
Transition & Other Charges	
Regulatory Asset Recovery Charge	0.003
Transitional Energy Facility Assessment Unit Tax	0.274
System Control Charge	0.003
Solar Pilot Recovery Charge	0.000
Infrastructure Investment Surcharge	0.003
Non-Utility Generation Charge	0.507
Securitization Charges	
Transition Bond Charge	0.595
Market Transition Charge Tax	0.278
Societal Benefits Charges	
Nuclear Decommissioning Costs	0.026
Manufactured Gas Plant Remediation Costs	0.030
Clean Energy Program (Energy Efficiency & Renewables)	0.305
Uncollectible Accounts	0.069
Universal Service Fund	0.192
Lifeline	0.062
Consumer Education Program	0.005
Utility-Administered Energy Efficiency and Renewable Energy Programs	
Demand Response Working Group	0.001
Residential Controllable Smart Thermostat Program	0.002
Integrated Distributed Energy Resource Expansion	0.002
Carbon Abatement Program	0.002
Energy Efficiency Stimulus Program	0.021
Demand Response Program	0.004
Solar Generation Investment Program	0.011
Solar Loan II Program	0.002
Sales and Use Tax	0.935
Distribution Components (1.339 cents per kilowatt-hour)	
Customer Distribution Charge	0.138
Average Weighted Distribution Charge	1.102
Average Weighted Distribution Demand Charge	0.092
Reactive Demand Charge	0.000*
Capital Adjustment Service Charge	0.001
Average Weighted Capital Adjustment Distribution Charge	0.005
Average Weighted Capital Adjustment Demand Charge	0.001
Basic Generation Service Components (9.629 cents per kilowatt-hour)	
Transmission Charges	0.218
BGS Fixed Price Supply Charge, Reconciliation Charge and Retail Margin	
New Jersey Solar Renewable Energy Credit Ratepayer Impact	0.090
New Jersey Renewable Energy Credit Ratepayer Impact	0.024
PJM Reliability Pricing Model	1.529
PJM Ancillary Costs	0.184
New Jersey Load-Weighted Average Locational Marginal Price	6.787
Other BGS Charges	0.796
TOTAL	**14.300**

Non-BGS Policy Components

Transition & Other Charges

Regulatory Asset Recovery Charge (ACE) recovers deferred expenses, including asbestos removal, post retirement benefits other than pension and other regulatory assets.

Transition Energy Facility Assessment Unit Tax

System Control Charge (ACE, JCP&L & PSE&G) recover appliance cycling load management costs.

Solar Pilot Recovery Charge (PSE&G) recover costs associated with the Solar Pilot Program, less net proceeds from the sale of Solar Renewable Energy Certificates or Alternative Compliance Payments.

Infrastructure Investment Surcharge (ACE) recover costs associated with incremental infrastructure improvement projects related to Governor Corzine's Economic Stimulus Plan.

Non-Utility Generation Charge (ACE, JCP&L & PSE&G) recover costs associated with (1) utility purchase power contracts with non-utility generators and related stranded costs; (2) the transition to a competitive electric market and restructuring of New Jersey's electric industry; and (3) utility generation facilities, net of any revenue received from the sale of energy, capacity and ancillary services associated with the units.

Securitization Charges

Transition Bond Charge (recovers bondable stranded costs, including financing and related costs.

Market Transition Charge Tax (ACE, JCP&L & PSE&G) recover income taxes and state corporate business taxes associated with the Transition Bond Charge and Market Transition Charge Tax revenues.

Societal Benefits Charges

Nuclear Decommissioning Costs (JCP&L)

Manufactured Gas Plant Remediation Costs (JCP&L & PSE&G) recover costs associated with investigations and remediation of environmental media.

Clean Energy Program

Uncollectible Accounts (ACE, JCP&L & PSE&G) recover costs associated with uncollectible accounts recorded in FERC account 904. PSE&G's social program also recovers costs other sources.

Universal Service Fund recovers costs to provide affordable electric and natural gas service to residential customers.

Lifeline recovers rate assistance costs for elderly and disabled citizens.

Consumer Education Program (ACE & JCP&L)

Utility-Administered Energy Efficiency and Renewable Energy Programs Public Law 2007, chapter 340 authorizes greenhouse gas emission reduction programs, including participation in the Regional Greenhouse Gas Initiative (RGGI) and utility-administered energy efficiency and renewable energy programs.

Demand Response Working Group (ACE, PSE&G & RECO) recover incentive payments to Curtailment Service Providers for incremental load curtailment delivered into the PJM Market.

Residential Controllable Smart Thermostat Program (ACE) residential customers with central air-conditioning/heat pumps select a programmable thermostat or outdoor cycling device.

Integrated Distributed Energy Resource Expansion (JCP&L) load management devices deployed to volunteer customers served by substations in high growth areas. Air conditioners will be controlled by managing ambient temperatures in and hot water heaters/pool pumps with an on/off switch.

Carbon Abatement Program (PSE&G) offer residential and business customers energy audits, programmable thermostats, attic insulation and high-efficiency lighting upgrades.

Energy Efficiency Stimulus Program (PSE&G & RECO) provides energy efficiency measures to residential customers, multi-family affordable housing units, municipal buildings and businesses.

Demand Response Program (PSE&G) residential and small commercial air conditioning cycling program will cycle participant air conditioners for 6 hours, up to 20 cycling times per year.

Solar Generation Investment Program (PSE&G) recover investment to finance, own and operate grid connected solar photovoltaic generation systems.

Solar Loan II Program (PSE&G) recover costs to install 51 MW of solar on homes, businesses and municipal buildings.

Sales and Use Tax sum of all components subject to the 7% New Jersey sales and use tax.

Distribution Components recover company costs to deliver/distribute electricity.

Customer Distribution Charge monthly charge divided by average New Jersey secondary general service customer's monthly electricity consumption.[6]

Average Weighted Distribution Charge average distribution charge weighted by utility-specific volumetric and seasonal values.[7]

Capital Adjustment Service Charge (PSE&G) monthly charge divided by average New Jersey secondary general service customer's monthly electricity consumption.

Average Weighted Capital Adjustment Distribution Charge (PSE&G) recover revenue related to the acceleration of electric capital expenditures to improve reliability, system operation and energy efficiency infrastructure improvements. The charge is weighted by utility-specific volumetric and seasonal values.

BGS Components includes transmission charges, a BGS reconciliation charge, retail margin charge and BGS Fixed Price supply charge.

Transmission Charges recover the company cost of transporting electricity to local distribution companies and compensates transmission owners for annual transmission revenue requirements for reliability or economic purposes approved by FERC.

Retail Margin Charge (ACE & JCP&L) applies to customers whose annual peak load share for generation is at least 750 kW.

BGS Reconciliation Charge recovers the difference between the monthly amount paid to BGS suppliers and total revenue from customers for BGS for the preceding months for the applicable BGS supply.

BGS Fixed Price Supply Charge reflects the costs for energy, generation capacity, ancillary services and administrative charges via an annual statewide BGS auction. The auction uses a rolling procurement structure, where each year 1/3 of the load is procured for a 3-year period.[8] The charge is weighted by assumed seasonal values.

New Jersey Solar Renewable Energy Credit Ratepayer Impact weighted average solar renewable energy credit allowance multiplied by the state solar requirement, divided by total state electric consumption.[9]

New Jersey Renewable Energy Credit Ratepayer Impact average Class I renewable energy credit allowance multiplied by the state Class I requirement, divided by total state electric consumption.[10]

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[6] New Jersey Statewide BGS Electricity Supply Auction. Historic Load Profiles by Rate Class/Profile Group; New Jersey Statewide BGS Electricity Supply Auction. Retail Rates: BGS-FP Pricing Factors.

[7] New Jersey Statewide BGS Electricity Supply Auction. Historic Load Profiles by Rate Class/Profile Group.

[8] PSE&G and RECO's BGS Fixed Price supply charges exclude generation charges. To adjust, PSE&G and RECO's demand charges are included in their energy charge.

[9] PJM Generation Attribute Tracking System. Solar Weighted Average Price: New Jersey. https://gats.pjm-eis.com/%5Cmymodule%5Cmypage.asp; New Jersey Renewable Portfolio Standard www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R&re=1&ee=1; EIA Form-826.

[10] New Jersey Board of Public Utilities. New Jersey's Renewable Portfolio Standard Rules: 2009 Annual Report (DRAFT) (2/8/10); New Jersey Renewable Portfolio Standard; EIA Form-826.

PJM Reliability Pricing Model (RPM) average 2007 to 2009 annual New Jersey RPM cost, assumed to be consistent across all customers. The annual New Jersey RPM cost is the product of the average annual utility final zonal capacity price, number of days in a year and annual utility PJM peak load, divided by annual utility New Jersey electric demand, then weighted by annual utility New Jersey electric demand.[11]

PJM Ancillary Services average 2007 to 2009 annual PJM ancillary service costs, assumed to be consistent across all customers.[12]

Other BGS Charges

New Jersey Load-Weighted Average Locational Marginal Price (LMP) hourly integrated market clearing marginal price for energy at the location energy is delivered/ received. Secondary general service load-weighted average LMP is the sum of the product of the hourly utility real-time secondary general service load and the hourly utility real-time LMP, divided by the sum of hourly utility real-time secondary general service load.[13]

The LMP accounts for the average 2007 to 2009 ratepayer impacts of the national sulfur dioxide and nitrogen oxide allowance programs and the regional carbon dioxide (Regional Greenhouse Gas Initiative (RGGI)) program; see Table 2.[14] The impacts are assumed to be consistent across all customers.

TABLE 2: AVERAGE 2007-2009 LMP RATEPAYER IMPACTS (CENTS PER KILOWATT-HOUR)

Sulfur Dioxide Ratepayer Impact	0.230
Nitrogen Oxide Ratepayer Impact	0.075
Regional Carbon Dioxide (RGGI) Ratepayer Impact	0.061

Federal and state policies constitute approximately 27 percent of the average New Jersey secondary general service electric bill, see Figure 1.

[11] PJM. Reliability Pricing Model User Information. Base Residual Auction Results www.pjm.com/markets-and-operations/rpm/rpm-auction-user-info.aspx#Item01; PJM. Historic Load Data www.pjm.com/markets-and-operations/compliance/nerc-standards/historical-load-data.aspx.

[12] PJM. Members Committee Meeting. Item 20A - Markets Report (Sept 23, 2010) and Item 07A - Markets Report (Nov 19, 2009) www.pjm.com/committees-and-groups/committees/mc.aspx#2.

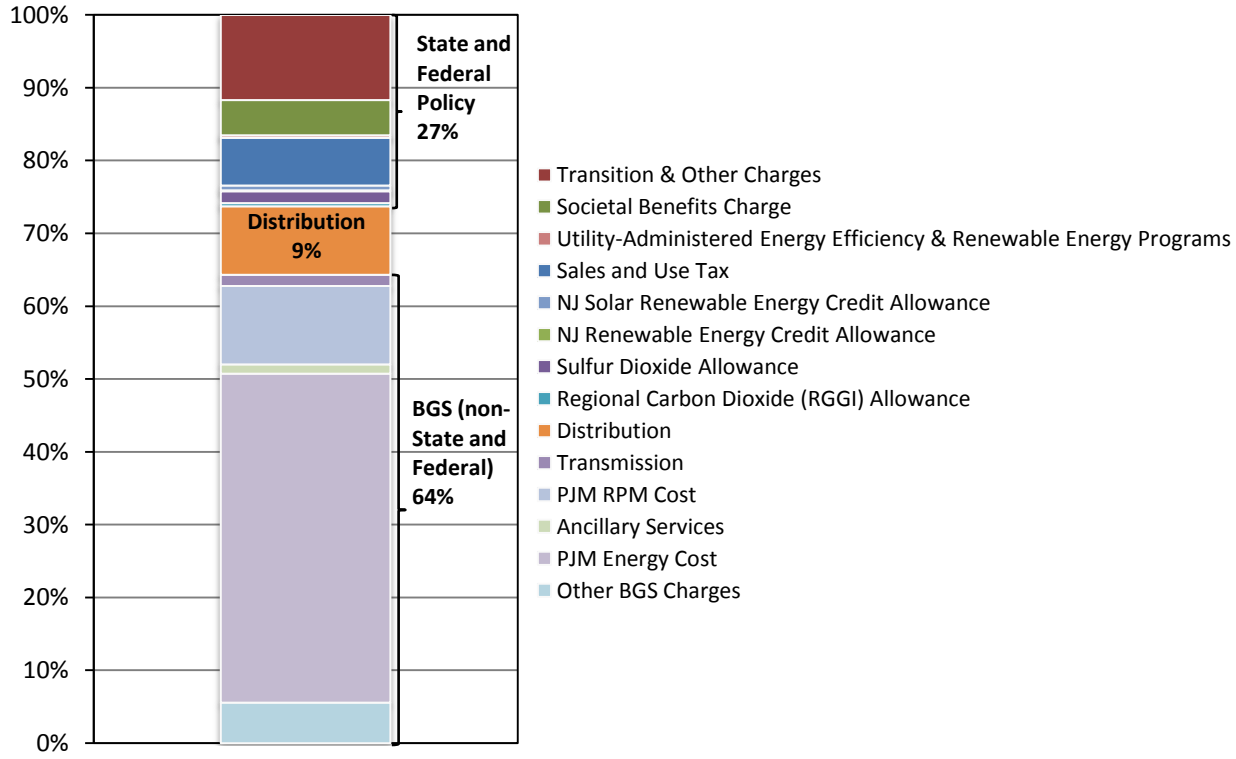
[13] PJM. Daily Day-Ahead LMP Data www.pjm.com/markets-and-operations/energy/real-time/monthlylmp.aspx; New Jersey Statewide BGS Electricity Supply Auction. Hourly Data by Customer Groupings: Historic Load Profiles by Rate Class/Profile Group.

[14] PJM. State of the Market Report. Volume II, Section 2 - Energy Market, Part I. (2007, 2008 & 2009) http://pjm.com/documents/reports/state-of-market-reports.aspx.

TABLE 3: SUMMARY OF 2010 SECONDARY GENERAL SERVICE ELECTRIC RATE COST DRIVERS (CENTS PER KILOWATT-HOUR)

State and Federal Policies	
Transition & Other Charges	1.662
Societal Benefits Charges	0.668
Utility-Administered Energy Efficiency and Renewable Energy Programs	0.046
Sales and Use Tax	0.935
New Jersey Solar Renewable Energy Credit Ratepayer Impact	0.090
New Jersey Renewable Energy Credit Ratepayer Impact	0.024
Sulfur Dioxide Ratepayer Impact	0.230
Nitrogen Oxide Ratepayer Impact	0.075
Regional Carbon Dioxide (RGGI) Ratepayer Impact	0.061
Distribution Components	1.339
BGS (non-State and Federal) Components	
Transmission	0.218
PJM RPM Cost	1.529
Ancillary Services	0.184
PJM Energy Cost	6.421
Other BGS Charges	0.796
TOTAL	**14.300**

FIGURE 1: 2010 SECONDARY GENERAL SERVICE ELECTRIC RATE COST DRIVERS, PERCENTAGE OF TOTAL BILL



3. Average Small General Service Natural Gas Rate Cost Drivers

The U.S. Energy Information Administration (EIA) estimates the average New Jersey commercial customer retail natural gas rate was $0.77 per therm in 2009.[15] However, the EIA's average retail energy prices often do not include transfer payments such as the New Jersey sales and use tax and societal benefits charges. Additionally, the EIA aggregates customer classes into general customer classes, whereas the New Jersey utility tariffs contain multiple commercial customer classes.

The 2010 small general service natural gas rate cost drivers are comprised of three major categories, non-Basic Gas Supply Service (BGSS) policy components, distribution components and Basic Gas Supply Service components. The non-BGSS policy components are broken down into other charges, societal benefits charges and sales and use tax. Table 4 presents the 2010 average small general service natural gas rate cost drivers. All values are in dollars per therm.

Comprised of primarily small commercial customers, small general service class has annual natural gas consumption limits. According to the utility tariffs, Elizabethtown, PSE&G and SJG customers must consume less than 3,000 therms per year and NJNG customers must consume less than 5,000 therms per year.

Federal and state policies, all non-BGSS policy components, constitute approximately 15 percent of the average New Jersey small general service natural gas bill, see Figure 2.

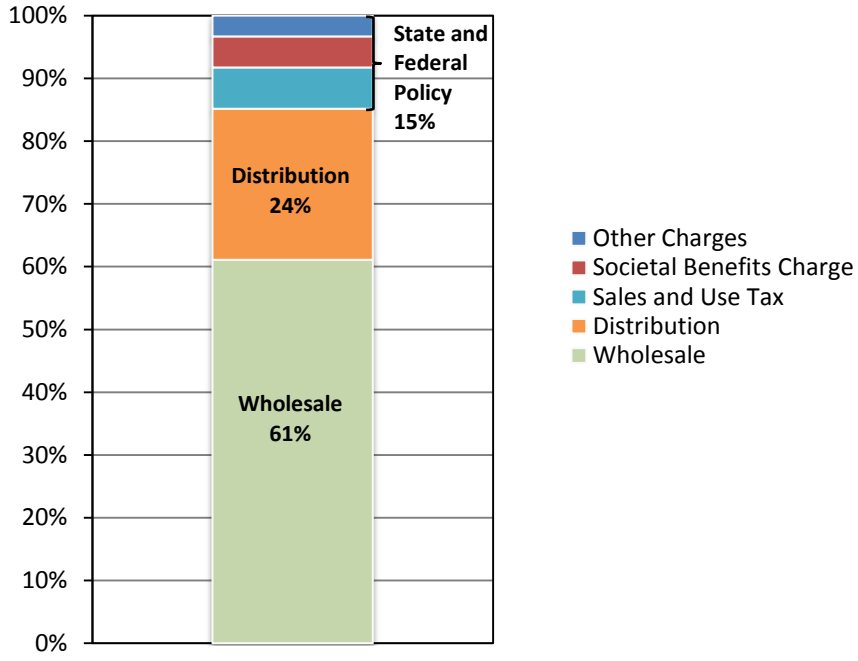
TABLE 4: 2010 SMALL GENERAL SERVICE NATURAL GAS RATE COST DRIVERS (DOLLAR PER THERM)

Non-BGSS Policy Components (0.163 dollars per therm)	
Other Charges	
Weather Normalization Clause	$ 0.001
Transitional Energy Facilities Assessment Unit Tax	$ 0.022
Conservation Incentive Program	$ 0.008
Energy Efficiency Program	$ 0.004
Carbon Abatement Program	$ 0.000*
Transportation Initiation Clause	$ 0.000*
Utility Infrastructure Charge	$ 0.001
Societal Benefits Charges	
Clean Energy Program (Energy Efficiency & Renewables)	$ 0.024
Remediation Adjustment Charge	$ 0.012
Universal Service Fund	$ 0.013
Lifeline	$ 0.005
Sales and Use Tax	$ 0.072
Distribution Components (0.264 dollars per therm)	
Monthly Customer Charge	$ 0.017
Average Distribution Charge	$ 0.247
Monthly Capital Adjustment Customer Charge	$ 0.000*
Capital Adjustment Distribution Charge	$ 0.000*
Basic Gas Supply Service Components (0.671 dollars per therm)	
BGSS Charge	$ 0.672
On-System Margin Sharing Credit	$ (0.001)
TOTAL (dollar per therm)	**$ 1.098**

* Greater than zero.

[15] EIA. New Jersey Natural Gas Summary. www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SNJ_m.htm.

FIGURE 2: 2010 SMALL GENERAL SERVICE NATURAL GAS RATE COST DRIVERS, PERCENTAGE OF TOTAL BILL



Non-BGSS Policy Components

Other Charges

Weather Normalization Clause (Elizabethtown & PSE&G) adjusts rates to offset the impact of abnormal weather on company revenue and income during the winter months.

Transition Energy Facility Assessment Unit Tax

Conservation Incentive Program (NJNG & SJG) replaces the Weather Normalization Clause and decouples utility revenue from actual sales. Customers are credited/charged when actual usage per customer differs from baseline usage per customer during a specific period, due to variations in weather, recessions and/or conservation.

Energy Efficiency Program recovers expenditures related to energy efficiency programs created in response to Governor Corzine's Economic Stimulus Plan.

Carbon Abatement Program (PSE&G) offer residential and business customers energy audits, programmable thermostats, attic insulation and high-efficiency lighting upgrades.

Transportation Initiation Clause (SJG) recovers capital expenditures and operating costs associated with Electronic Data Interchange, including consulting and transaction costs.

Utility Infrastructure Charge (Elizabethtown & SJG) recover costs associated with the replacement of connected services, meters, etc related to Governor Corzine's Economic Stimulus Plan.

Societal Benefits Charges

Clean Energy Program

Remediation Adjustment Charge recovers costs associated with investigations and remediation of environmental media related to former gas manufacturing facility sites.

Universal Service Fund recovers costs to provide affordable access for electric and natural gas service to residential customers.

Lifeline recovers rate associated costs for qualified low-income elderly and disabled citizens.

Sales and Use Tax sum of all components subject to the 7% New Jersey sales and use tax.

Distribution Components recover company costs to deliver/distribute natural gas.

Monthly Customer Charge monthly charge divided by average New Jersey small general service customer's monthly natural gas consumption.[16]

Average Distribution Charge

Capital Adjustment Service Charge (PSE&G) monthly charge divided by average New Jersey small general service customer's monthly natural gas consumption.

Capital Adjustment Distribution Charge (PSE&G) recover costs associated with the acceleration of gas capital expenditures in areas of distribution infrastructure related to improvement in reliability.

Basic Gas Supply Service Components

BGSS Charge recovers the cost of purchasing gas or a substitute fuel, including the cost of storage, transportation, financial instruments employed to stabilize gas costs and any other charges or credits that result from the operation of tariff provisions.[17] The charge includes the balancing charge, which adjusts for differences between the amount of gas delivered to a customer on a daily basis and the amount of gas consumed by the customer on a daily basis.

On-System Margin Sharing Credit (Elizabethtown) adjusts rates based on the margins received from on-system sales and transportation services which were passed on to firm sales customers and residential transport customers.

[16] EIA. Natural Gas Summary: New Jersey www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SNJ_a.htm; EIA-176 Query.
[17] See the utility tariffs.

III. 2. RATE COMPONENT ANALYSIS- RESIDENTIAL

1. Overview

The Center for Energy, Economic and Environmental Policy (CEEEP), with the Staff of the Board of Public Utilities (BPU), has broken down the average cost drivers of New Jersey residential customer's 2010 electric and natural gas rates. The analysis accounts only for the costs of various policies, not the benefits. The data presented below are in draft form and may be updated based upon stakeholder input.

The average residential electric and natural gas rate cost drivers, discussed in Sections II and III respectively, are estimated based on a bottom-up analysis of New Jersey residential customer energy components. The data were gleaned from the current New Jersey electric and natural gas utility tariffs -- Public Service Electric and Gas (PSE&G), Atlantic City Electric (ACE), Jersey Central Power and Light (JCP&L), Rockland Electric (RECO), Elizabethtown, New Jersey Natural Gas (NJNG) and South Jersey Gas (SJG).[18] PSE&G is an electric and natural gas provider while ACE, JCP&L, and RECO are electric providers and Elizabethtown, NJNG and SJG are natural gas providers. The utility tariff categories and charges differ across utilities. Therefore, the utility tariff charges were weighted by the number of residential utility customers in 2009.[19] Descriptions of the charges are provided below.

2. Average Residential Electric Rate Cost Drivers

The U.S. Energy Information Administration (EIA) estimates the average New Jersey residential customer retail electricity rate was 16.44 cents per kilowatt-hour in 2009.[20] However, the EIA's average retail energy prices often do not include transfer payments such as the New Jersey sales and use tax and societal benefits charges.

The 2010 average residential electric rate cost drivers are comprised of three major categories, non-Basic Generation Service (BGS) policy components, distribution components and Basic Generation Service components. Table 1 presents the 2010 average residential electric rate cost drivers and Table 2 presents the average 2007-2009 LMP ratepayer impacts. All values are in cents per kilowatt-hour.

- Non-BGS policy components include transition and other charges, societal benefits charges, utility-administered energy efficiency and renewable energy programs and sales and use tax.
- BGS components are comprised of New Jersey renewable energy credit ratepayer impacts, transmission, PJM Reliability Pricing Model, PJM ancillary costs, New Jersey residential load-weighted average locational marginal price (LMP) and other BGS charges. The LMP accounts for the average ratepayer impacts of national and regional emission allowance programs.

Federal and state policies include all non-BGS policy components and a portion of BGS components -- ratepayer impacts of state renewable energy credits and national and regional emissions markets. These policies constitute approximately 22 percent of the average New Jersey residential electric bill, see Figure 1. Table 3 presents a summary of 2010 New Jersey residential electric rate cost drivers (combination of Tables 1 and 2), broken down by State and Federal policies, distribution components and BGS (non-State and Federal) components.

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[18] PSE&G (Nov. 1, 2010) www.pseg.com/family/pseandg/tariffs/electric/index.jsp; ACE (Nov. 1, 2010) www.atlanticcityelectric.com/business/choice/nj/tariffs/; JCP&L (Dec. 1, 2010) www.firstenergycorp.com/Residential_and_Business/Customer_Choice/Tariff_Information/New_Jersey_Tariffs.html; RECO (Nov. 1, 2010) www.oru.com/aboutoru/tariffsandregulatorydocuments/newjersey/scheduleforelectricservice.html; Elizabethtown (Nov. 1, 2010) www.elizabethtowngas.com/Repository/Files/elizabethtown_tariff.pdf; NJNG (Nov. 1, 2010) www.njng.com/regulatory/tariff.asp; SJG (Nov. 1, 2010) www.southjerseygas.com/108/regulatory_information.html

[19] United States Energy Information Administration (EIA). Annual Company Level Natural Gas Supply and Disposition (EIA-176 Data through 2009) www.eia.doe.gov/oil_gas/natural_gas/applications/eia176query.html; EIA. Form EIA-826 Database www.eia.doe.gov/cneaf/electricity/page/eia826.html

[20] EIA. Form EIA-826 Database.

TABLE 1: 2010 AVERAGE RESIDENTIAL ELECTRIC RATE COST DRIVERS (CENTS PER KILOWATT-HOUR)

Non-BGS Policy Components (3.614 cents per kilowatt-hour)	
Transition & Other Charges	
Regulatory Asset Recovery Charge	0.004
Transitional Energy Facility Assessment Unit Tax	0.292
System Control Charge	0.003
Solar Pilot Recovery Charge	0.000
Infrastructure Investment Surcharge	0.003
Non-Utility Generation Charge	0.505
Securitization Charges	
Transition Bond Charge	0.593
Market Transition Charge Tax	0.291
Societal Benefits Charges	
Nuclear Decommissioning Costs	0.029
Manufactured Gas Plant Remediation Costs	0.025
Clean Energy Program (Energy Efficiency & Renewables)	0.292
Uncollectible Accounts	0.062
Universal Service Fund	0.192
Lifeline	0.062
Consumer Education Program	0.005
Utility-Administered Energy Efficiency and Renewable Energy Programs	
Demand Response Working Group	0.001
Residential Controllable Smart Thermostat Program	0.003
Integrated Distributed Energy Resource Expansion	0.003
Carbon Abatement Program	0.002
Energy Efficiency Stimulus Program	0.020
Demand Response Program	0.004
Solar Generation Investment Program	0.010
Solar Loan II Program	0.002
Sales and Use Tax	1.211
Distribution Components (3.638 cents per kilowatt-hour)	
Customer Distribution Charge	0.330
Average Weighted Distribution Charge	3.279
Capital Adjustment Service Charge	0.002
Average Weighted Capital Adjustment Distribution Charge	0.027
Basic Generation Service Components (11.259 cents per kilowatt-hour)	
Transmission and Transmission Enhancement Charge	0.636
BGS Fixed Price Supply Charge and Reconciliation Charge	
New Jersey Solar Renewable Energy Credit Ratepayer Impact	0.090
New Jersey Renewable Energy Credit Ratepayer Impact	0.024
PJM Reliability Pricing Model	1.529
PJM Ancillary Costs	0.184
New Jersey Residential Load-Weighted Average Locational Marginal Price	6.848
Other BGS Charges	1.948
TOTAL (cents per kilowatt-hour)	**18.512**

Non-BGS Policy Components

Transition & Other Charges

Regulatory Asset Recovery Charge (ACE) recovers deferred expenses, including asbestos removal, post retirement benefits other than pension and other regulatory assets.

Transition Energy Facility Assessment Unit Tax

System Control Charge (ACE, JCP&L & PSE&G) recover appliance cycling load management costs.

Solar Pilot Recovery Charge (PSE&G) recover costs associated with the Solar Pilot Program, less net proceeds from the sale of Solar Renewable Energy Certificates or Alternative Compliance Payments.

Infrastructure Investment Surcharge (ACE) recover costs associated with incremental infrastructure improvement projects related to Governor Corzine's Economic Stimulus Plan.

Non-Utility Generation Charge (ACE, JCP&L & PSE&G) recover costs associated with (1) utility purchase power contracts with non-utility generators and related stranded costs; (2) the transition to a competitive electric market and restructuring of New Jersey's electric industry; and (3) utility generation facilities, net of any revenue received from the sale of energy, capacity and ancillary services associated with the units.

Securitization Charges

Transition Bond Charge recovers bondable stranded costs, including financing and related costs.

Market Transition Charge Tax (ACE, JCP&L & PSE&G) recover income taxes and state corporate business taxes associated with the Transition Bond Charge and Market Transition Charge Tax revenues.

Societal Benefits Charges

Nuclear Decommissioning Costs (JCP&L)

Manufactured Gas Plant Remediation Costs (JCP&L & PSE&G) recover costs associated with investigations and remediation of environmental media.

Clean Energy Program

Uncollectible Accounts (ACE, JCP&L & PSE&G) recover costs associated with uncollectible accounts recorded in FERC account 904. PSE&G's social program also recovers costs other sources.

Universal Service Fund recovers costs to provide affordable electric and natural gas service to residential customers.

Lifeline recovers rate assistance costs for elderly and disabled citizens.

Consumer Education Program (ACE & JCP&L)

Utility-Administered Energy Efficiency and Renewable Energy Programs Public Law 2007, chapter 340 authorizes greenhouse gas emission reduction programs, including participation in the Regional Greenhouse Gas Initiative and utility-administered energy efficiency and renewable energy programs.

Demand Response Working Group (ACE, PSE&G & RECO) recover incentive payments to Curtailment Service Providers for incremental load curtailment delivered into the PJM Market.

Residential Controllable Smart Thermostat Program (ACE) residential customers with central air-conditioning/heat pumps select a programmable thermostat or outdoor cycling device.

Integrated Distributed Energy Resource Expansion (JCP&L) load management devices deployed to volunteer customers served by substations in high growth areas. Air conditioners will be controlled by managing ambient temperatures in and hot water heaters/pool pumps with an on/off switch.

Carbon Abatement Program (PSE&G) offer residential and business customers energy audits, programmable thermostats, attic insulation and high-efficiency lighting upgrades.

Energy Efficiency Stimulus Program (PSE&G & RECO) provides energy efficiency measures to residential customers, multi-family affordable housing units, municipal buildings and businesses.

Demand Response Program (PSE&G) residential and small commercial air conditioning cycling program will cycle participant air conditioners for 6 hours, up to 20 cycling times per year.

Solar Generation Investment Program (PSE&G) recover investment to finance, own and operate grid connected solar photovoltaic generation systems.

Solar Loan II Program (PSE&G) recover costs to install 51 MW of solar on homes, businesses and municipal buildings.

Sales and Use Tax sum of all components subject to the 7% New Jersey sales and use tax.

Distribution Components recover company costs to deliver/distribute electricity.

Customer Distribution Charge monthly charge divided by average New Jersey residential customer's monthly electricity consumption.[21]

Average Weighted Distribution Charge average distribution charge weighted by utility-specific volumetric and seasonal values.[22]

Capital Adjustment Service Charge (PSE&G) monthly charge divided by average New Jersey residential customer's monthly electricity consumption.

Average Weighted Capital Adjustment Distribution Charge (PSE&G) recovers revenue related to the acceleration of electric capital expenditures to improve reliability, system operation and energy efficiency infrastructure improvements. The charge is weighted by utility-specific volumetric and seasonal values.

BGS Components includes transmission charges, a BGS reconciliation charge and BGS Fixed Price supply charge.

Transmission and Transmission Enhancement Charge recovers the company cost of transporting electricity to local distribution companies and compensates transmission owners for annual transmission revenue requirements for reliability or economic purposes approved by FERC.

BGS Reconciliation Charge recovers the difference between the monthly amount paid to BGS suppliers and total revenue from customers for BGS for the preceding months for the applicable BGS supply.

BGS Fixed Price Supply Charge reflects the costs for energy, generation capacity, ancillary services and administrative charges via an annual statewide BGS auction. The auction uses a rolling procurement structure, where each year 1/3 of the load is procured for a 3-year period. The charge is weighted by assumed volumetric and seasonal values provided by the BPU, consistent across all utilities.[23]

New Jersey Solar Renewable Energy Credit Ratepayer Impact weighted average solar renewable energy credit allowance multiplied by the state solar requirement, divided by total state electric consumption.[24]

New Jersey Renewable Energy Credit Ratepayer Impact average Class I renewable energy credit allowance multiplied by the state Class I requirement, divided by total state electric consumption.[25]

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[21] EIA Form-826.

[22] New Jersey Statewide Basic Generation Service Electricity Supply Auction. Retail Rates: BGS-FP Pricing Factors. www.bgs-auction.com/bgs.dataroom.occ.asp

[23] PSE&G's BGS Fixed Price supply charge includes the cost of transmission. To adjust, PSE&G's transmission and transmission enhancement charge were removed from the charge.

[24] PJM Generation Attribute Tracking System. Solar Weighted Average Price: New Jersey. https://gats.pjm-eis.com/%5Cmymodule%5Cmypage.asp; New Jersey Renewable Portfolio Standard www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R&re=1&ee=1; EIA Form-826.

[25] New Jersey Board of Public Utilities. New Jersey's Renewable Portfolio Standard Rules: 2009 Annual Report (DRAFT) (2/8/10); New Jersey Renewable Portfolio Standard; EIA Form-826.

PJM Reliability Pricing Model (RPM) average 2007 to 2009 annual New Jersey RPM cost, assumed to be consistent across all customers. The annual New Jersey RPM cost is the product of the average annual utility final zonal capacity price, number of days in a year and annual utility PJM peak load, divided by annual utility New Jersey electric demand, then weighted by annual utility New Jersey electric demand.[26]

PJM Ancillary Services average 2007 to 2009 annual PJM ancillary service costs, assumed to be consistent across all customers.[27]

Other BGS Charges

New Jersey Residential Load-Weighted Average Locational Marginal Price (LMP) hourly integrated market clearing marginal price for energy at the location energy is delivered/received. Residential load-weighted average LMP is the sum of the product of the hourly utility real-time residential load and the hourly utility real-time LMP, divided by the sum of hourly utility real-time residential load.[28]

The LMP accounts for the average 2007 to 2009 ratepayer impacts of the national sulfur dioxide and nitrogen oxide allowance programs and the regional carbon dioxide (Regional Greenhouse Gas Initiative (RGGI)) program; see Table 2.[29] The impacts are assumed to be consistent across all customers.

TABLE 2: AVERAGE 2007-2009 LMP RATEPAYER IMPACTS (CENTS PER KILOWATT-HOUR)

Sulfur Dioxide Ratepayer Impact	0.230
Nitrogen Oxide Ratepayer Impact	0.075
Regional Carbon Dioxide (RGGI) Ratepayer Impact	0.061

Federal and state policies constitute approximately 22 percent of the average New Jersey residential electric bill, see Figure 1. Table 3 presents a summary of 2010 New Jersey residential electric rate cost drivers (combination of Tables 1 and 2).

[26] PJM. Reliability Pricing Model User Information. Base Residual Auction Results www.pjm.com/markets-and-operations/rpm/rpm-auction-user-info.aspx#Item01; PJM. Historic Load Data www.pjm.com/markets-and-operations/compliance/nerc-standards/historical-load-data.aspx.

[27] PJM. Members Committee Meeting. Item 20A - Markets Report (Sept 23, 2010) and Item 07A - Markets Report (Nov 19, 2009) www.pjm.com/committees-and-groups/committees/mc.aspx#2.

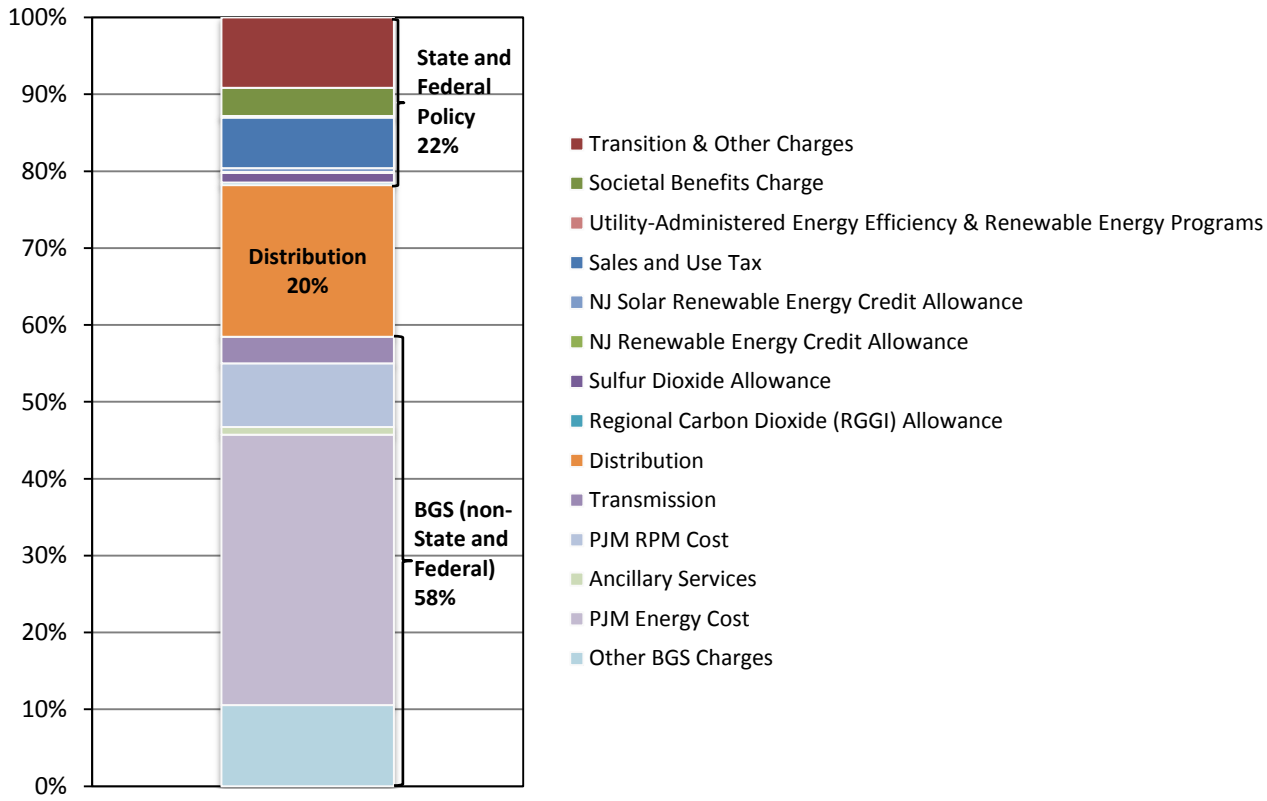
[28] PJM. Daily Day-Ahead LMP Data www.pjm.com/markets-and-operations/energy/real-time/monthlylmp.aspx; New Jersey Statewide BGS Electricity Supply Auction. Hourly Data by Customer Groupings: Historic Load Profiles by Rate Class/Profile Group. www.bgs-auction.com/bgs.dataroom.occ.asp.

[29] PJM. State of the Market Report. Volume II, Section 2 - Energy Market, Part I. (2007, 2008 & 2009) http://pjm.com/documents/reports/state-of-market-reports.aspx.

TABLE 3: SUMMARY OF 2010 RESIDENTIAL ELECTRIC RATE COST DRIVERS (CENTS PER KILOWATT-HOUR)

State and Federal Policies	
Transition & Other Charges	1.691
Societal Benefits Charges	0.668
Utility-Administered Energy Efficiency and Renewable Energy Programs	0.043
Sales and Use Tax	1.211
New Jersey Solar Renewable Energy Credit Ratepayer Impact	0.090
New Jersey Renewable Energy Credit Ratepayer Impact	0.024
Sulfur Dioxide Ratepayer Impact	0.230
Nitrogen Oxide Ratepayer Impact	0.075
Regional Carbon Dioxide (RGGI) Ratepayer Impact	0.061
Distribution Components	3.638
BGS (non-State and Federal) Components	
Transmission	0.636
PJM RPM Cost	1.529
Ancillary Services	0.184
PJM Energy Cost	6.482
Other BGS Charges	1.948
TOTAL	**18.512**

FIGURE 1: 2010 RESIDENTIAL ELECTRIC RATE COST DRIVERS, PERCENTAGE OF TOTAL BILL



3. Average Residential Natural Gas Rate Cost Drivers

The U.S. Energy Information Administration (EIA) estimates the average New Jersey residential customer retail natural gas rate was $1.24 per therm in 2009.[30] However, the EIA's average retail energy prices often do not include transfer payments such as the New Jersey sales and use tax and societal benefits charges.

The 2010 average residential natural gas rate cost drivers are comprised of three major categories, non-Basic Gas Supply Service (BGSS) policy components, distribution components and Basic Gas Supply Service components. The non-BGSS policy components are broken down into other charges, societal benefits charges and sales and use tax. Table 4 presents the 2010 average residential natural gas rate cost drivers. All values are in dollars per therm.

Federal and state policies, all non-BGSS policy components, constitute approximately 13 percent of the average New Jersey residential natural gas bill, see Figure 2.

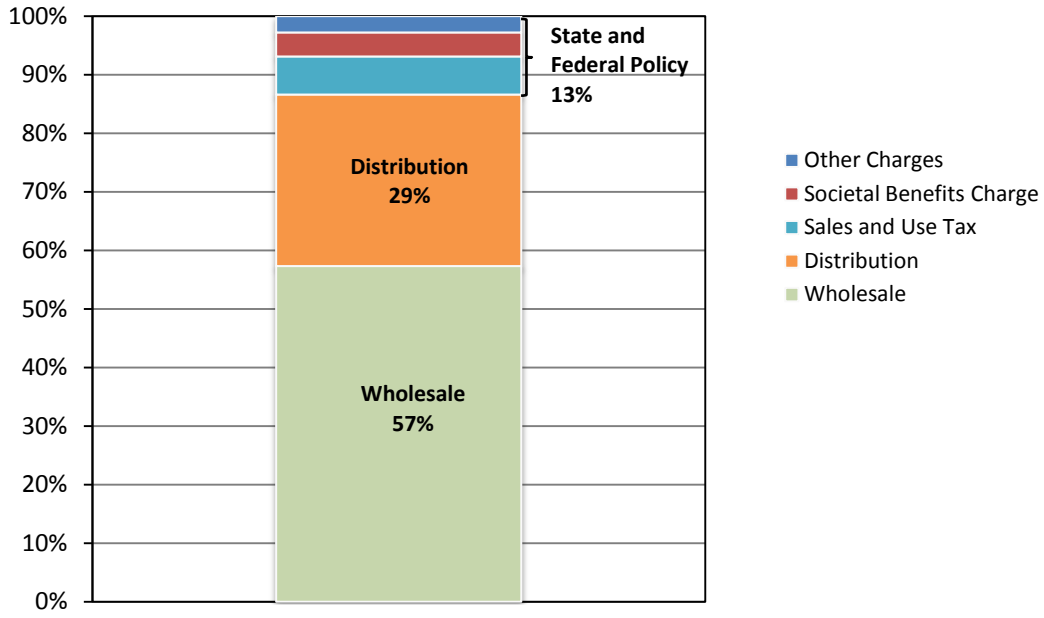
TABLE 4: 2010 RESIDENTIAL NATURAL GAS RATE COST DRIVERS (DOLLAR PER THERM)

Non-BGSS Policy Components (0.178 dollars per therm)	
Other Charges	
Weather Normalization Clause	$0.001
Transitional Energy Facilities Assessment Unit Tax	$0.022
Conservation Incentive Program	$0.008
Margin Adjustment Charge	$0.000
Energy Efficiency Program	$0.004
Carbon Abatement Program	$0.000*
Transportation Initiation Clause	$0.000*
Utility Infrastructure Charge	$0.002
Societal Benefits Charges	
Clean Energy Program (Energy Efficiency & Renewables)	$0.024
Remediation Adjustment Charge	$0.013
Universal Service Fund	$0.013
Lifeline	$0.005
Social Programs	$0.000
Sales and Use Tax	$0.087
Distribution Components (0.389 dollars per therm)	
Monthly Customer Charge	$0.084
Average Distribution Charge	$0.304
Capital Adjustment Service Charge	$0.000*
Capital Adjustment Distribution Charge	$0.000*
Basic Gas Supply Service Components (0.761 dollars per therm)	
BGSS Periodic Charge	$0.762
On-System Margin Sharing Credit	$(0.002)
TOTAL (dollars per therm)	**$1.328**

* Greater than zero.

[30] EIA. New Jersey Natural Gas Summary. www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SNJ_m.htm

FIGURE 2: 2010 RESIDENTIAL NATURAL GAS RATE COST DRIVERS, PERCENTAGE OF TOTAL BILL



Non-BGSS Policy Components

Other Charges

Weather Normalization Clause (Elizabethtown & PSE&G) adjusts rates to offset the impact of abnormal weather on company revenue and income during the winter months.

Transition Energy Facility Assessment Unit Tax

Conservation Incentive Program (NJNG & SJG) decouples utility revenue from actual sales. Customers are credited/charged when actual usage per customer differs from baseline usage per customer during a specific period, due to variations in weather, recessions and/or conservation.

Margin Adjustment Charge (PSE&G)

Energy Efficiency Program recovers expenditures related to energy efficiency programs created in response to Governor Corzine's Economic Stimulus Plan.

Carbon Abatement Program (PSE&G) offer residential and business customers energy audits, programmable thermostats, attic insulation and high-efficiency lighting upgrades.

Transportation Initiation Clause (SJG) recovers capital expenditures and operating costs associated with Electronic Data Interchange, including consulting and transaction costs.

Utility Infrastructure Charge (Elizabethtown & SJG) recover costs associated with the replacement of connected services, meters, etc related to Governor Corzine's Economic Stimulus Plan.

Societal Benefits Charges

Clean Energy Program

Remediation Adjustment Charge recovers costs associated with investigations and remediation of environmental media related to former gas manufacturing facility sites.

Universal Service Fund recovers costs to provide affordable access for electric and natural gas service to residential customers.

Lifeline recovers rate associated costs for qualified low-income elderly and disabled citizens.

Social Programs (PSE&G) recover costs associated with existing social program.

Sales and Use Tax sum of all components subject to the 7% New Jersey sales and use tax.

Distribution Components recover company costs to deliver/distribute natural gas.

Monthly Customer Charge monthly charge divided by average New Jersey residential customer's monthly natural gas consumption.[31]

Average Distribution Charge

Capital Adjustment Service Charge (PSE&G) monthly charge divided by average New Jersey residential customer's monthly natural gas consumption.

Capital Adjustment Distribution Charge (PSE&G) recover costs associated with the acceleration of gas capital expenditures in areas of distribution infrastructure related to improvement in reliability.

Basic Gas Supply Service Components

BGSS Periodic Charge recovers the cost of purchasing gas or a substitute fuel, including the cost of storage, transportation, financial instruments employed to stabilize gas costs and any other charges or credits that result from the operation of tariff provisions.[32] The charge includes the balancing charge, which adjusts for differences between the amount of gas delivered to a customer on a daily basis and the amount of gas consumed by the customer on a daily basis.

On-System Margin Sharing Credit (Elizabethtown) adjusts rates based on the margins received from on-system sales and transportation services which were passed on to firm sales customers and residential transport customers.

[31] EIA. Natural Gas Summary: New Jersey www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SNJ_a.htm; EIA-176 Query.
[32] See the utility tariffs.

IV. ENERGY EFFICIENCY RATIO ANALYSIS

As part of the 2011 New Jersey Energy Master Plan update, the Center for Energy, Economic, and Environmental Policy (CEEEP) examined the New Jersey Clean Energy Program (NJCEP) Energy Efficiency Program total dollars saved and total dollars spent. The ratio of total dollars saved versus total dollars spent gives program administrators a proxy to quickly assess the overall fiscal benefit of the programs, but does not take into account other benefits and costs of the programs, such as emission savings, tax credits, capacity benefits, participant costs and NJCEP overhead costs .

Total Dollars Saved

The Energy Efficiency Program total dollars saved was estimated by multiplying energy savings by wholesale energy prices. Electricity and natural gas savings were taken from the annual "New Jersey Clean Energy Program Data Forming Basis of Report to the New Jersey Board of Public Utilities" spreadsheet report prepared by Applied Energy Group. Energy savings from 2003 through 2009 were available through the fourth quarter. 2010 energy savings data were only available through the third quarter; it was assumed that the savings would persist through the end of the year at the same rate as the first three quarters.

The average 2006 through 2010 wholesale electricity price, Load Weighted Locational Marginal Prices (LMP),[33] was multiplied by electricity savings to calculate total electricity dollars saved. The average 2003 through 2010 wholesale natural gas price, from Henry Hub, was multiplied by natural gas savings to calculate total natural gas dollars saved.The total electricity dollars saved and total natural gas dollars saved were added together to estimate the total dollars saved as a result of the Energy Efficiency Programs.

TABLE 1: TOTAL DOLLARS SAVED FROM NJCEP ENERGY EFFICIENCY PROGRAMS

	Residential	C&I	Total
2003	$90,757,101	$196,212,464	$286,969,565
2004	$131,523,574	$305,611,633	$437,135,207
2005	$115,809,329	$181,585,852	$297,395,182
2006	$67,589,464	$114,597,654	$182,187,117
2007	$117,810,445	$134,005,892	$251,816,338
2008	$148,944,191	$107,039,350	$255,983,541
2009	$211,678,335	$109,346,851	$321,025,185
2010	$158,867,377	$155,088,411	$313,955,788
Average	**$130,372,477**	**$162,936,013**	**$293,308,490**

Total Dollars Spent

The total dollars spent on the Energy Efficiency Programs was taken from the annual "New Jersey Clean Energy Program Data Forming Basis of Report to the New Jersey Board of Public Utilities" spreadsheet report prepared by Applied Energy Group. As with the energy savings, budget data from 2003 through 2009 were available through the fourth quarter. For 2010, budget data was available through the third quarter; it was assumed that the program spending would persist through the end of the year at the same rate as the first three quarters.

[33] PJM. Monthly Locational Marginal Pricing. Daily Day-Ahead LMP Data. Accessed at www.pjm.com/markets-and-operations/energy/real-time/monthlylmp.aspx; PJM. Historical Metered Load Data. Accessed at www.pjm.com/markets-and-operations/compliance/nerc-standards/historical-load-data.aspx

TABLE 2: TOTAL NJCEP ENERGY EFFICIENCY PROGRAM BUDGET (000'S)[34]

	Residential	C&I	Total
2003	$51,549	$36,765	$88,314
2004	$60,021	$32,154	$92,753
2005	$57,923	$27,511	$85,414
2006	$58,104	$23,065	$79,640
2007	$65,972	$22,058	$90,078
2008	$62,843	$19,670	$82,452
2009	$79,254	$25,101	$120,959
2010	$144,374	$117,770	$262,144
Average	**$72,505**	**$38,012**	**$112,719**

Results

The ratio of total dollars spent per total dollars saved for the Residential programs, C&I programs, and total program is reported in Table 3.

TABLE 3: NJCEP ENERGY EFFICIENCY PROGRAM DOLLARS SAVED PER DOLLARS SPENT

	Residential	C&I	Total
2003	$1.76	$5.34	$3.25
2004	$2.19	$9.50	$4.71
2005	$2.00	$6.60	$3.48
2006	$1.16	$4.97	$2.29
2007	$1.79	$6.08	$2.80
2008	$2.37	$5.44	$3.10
2009	$2.67	$4.36	$2.65
2010	$1.10	$1.32	$1.20
Average	**$1.80**	**$4.29**	**$2.60**

Overall, the Residential program saves $1.80 for every dollar it spends, while the C&I program saves $4.29 for every dollar it spends. In 2010, the C&I programs ratio was at a low of $1.32 saved per dollar spent because of very large program spending during that year. If this year is not included, the average from 2003 through 2009 for the C&I program is $6.04.

[34] The residential program budget plus the C&I program budget may not add up to the total program budget because of additional program costs not associated with the residential or C&I programs.

V. ENERGY EFFICIENCY ECONOMIC IMPACT ANALYSIS

1. Summary

The New Jersey Board of Public Utilities (NJBPU) asked the Center for Energy, Economic and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service (R/ECON™) to analyze the economic and energy impacts of New Jersey's proposed Energy Master Plan (EMP) energy efficiency goals.

New Jersey's proposed energy efficiency goals directly impact energy prices, energy consumption and employment, which has indirect and induced economic and energy price effects. This memo presents the economic and energy impacts of direct one-time energy efficiency construction jobs and the ripple effect due to increased spending on energy efficiency. It does not account for the impact on energy prices or consumption or the expected reduction in energy utility bills due to the implementation of energy efficiency. As a result, this analysis is conservative, i.e., underreports the benefits of energy efficiency to New Jersey's economy. In addition, the analysis does not account for any environmental benefits.

2. Description of Economic and Energy Impact Analysis

The economic and energy impacts of New Jersey's proposed EMP energy efficiency goals were estimated using the R/ECON™ Model, an econometric model of New Jersey. R/ECON™ is comprised of over 300 equations, based on historical data for New Jersey and the United States, which are solved simultaneously. The heart of the model is a set of equations modeling employment, wages, and prices by industry. In general, employment in an industry depends on demand for that industry's output and the state's wages and prices relative to the nation's. Demand can be represented by a variety of variables including (but not limited to) New Jersey personal income, population, and sectoral output or U.S. employment in the sector. Other sectors in the model include population, housing, vehicle registrations, state tax revenue and energy. The U.S. data comes from IHS Global Insight, Inc., a national leader in economic forecasting.

R/ECON™ direct construction employment was adjusted by CEEEP to account for the proposed energy efficiency goals' direct construction jobs created within New Jersey. The annual direct jobs created per $1 million invested in New Jersey energy efficiency were estimated based on data gleaned from two recent studies. The direct job estimate was applied to the annual cost of the energy efficiency goal, determined based on the annual incremental proposed energy efficiency consumption goal and the average cost of energy efficiency per unit of energy reduced. The average historic New Jersey Clean Energy Program energy efficiency program costs $24.89 per MWh reduced and $3.52 per MMBtu reduced.

Table 1 presents the direct jobs per $1 million invested. Table 2 presents the 2010 to 2020 proposed energy efficiency consumption goals, the total cost of the proposed goals and the direct employment created. These costs would be in addition to current energy efficiency funding levels.

TABLE 1: AVERAGE DIRECT JOBS PER $1 MILLION INVESTED IN ENERGY EFFICIENCY[35]

	Direct Job-Years
White & Walsh	9.50
Ehrhard-Martinez & Laitner	6.32
Average	**7.91**

[35]White, S. & J. Walsh (2008). Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy. Center on Wisconsin Strategy, The Workforce Alliance and The Apollo Alliance; Ehrhardt-Martinez, K. & J. Laitner (2008). The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture. American Council for an Energy-Efficient Economy.

TABLE 2: PROPOSED ENERGY MASTER PLAN ENERGY EFFICIENCY GOAL INPUTS

	Energy Efficiency Consumption Goal		Total Additional Cost ($ thousands)			Direct Employment Created	
	Electric (GWh)	Natural Gas (BBtu)	Electric	Natural Gas	Total	Electric	Natural Gas
2010	79,656	660,885	na	na	na	na	na
2011	79,260	657,385	$9,859	$12,332	$22,191	78	98
2012	78,864	653,885	$19,718	$24,664	$44,382	156	195
2013	78,468	650,385	$29,577	$36,996	$66,572	234	293
2014	78,072	646,885	$39,436	$49,328	$88,763	312	390
2015	77,676	643,385	$49,295	$61,659	$110,954	390	488
2016	77,280	639,885	$59,154	$73,991	$133,145	468	585
2017	76,884	636,385	$69,012	$86,323	$155,336	546	683
2018	76,488	632,885	$78,871	$98,655	$177,527	624	780
2019	76,092	629,385	$88,730	$110,987	$199,717	702	878
2020	75,696	625,885	$98,589	$123,319	$221,908	780	975

3. R/ECON™ Results

New Jersey's proposed energy efficiency goals directly impact energy prices, energy consumption and employment, which has indirect and induced economic and energy price effects. The economic and energy impacts of direct one-time energy efficiency construction jobs are presented in Table 3.

TABLE 3: NEW JERSEY PROPOSED ENERGY MASTER PLAN ENERGY EFFICIENCY GOAL IMPACTS

	Baseline (No RPS)		Employment Impact		Difference (Actual and Percentage)			
	2015	*2020*	*2015*	*2020*	*2015*		*2020*	
Non-Agricultural Employment	4,040,690	4,215,920	4,041,588	4,217,768	898	0.02%	1,848	0.04%
Construction	146,052	165,271	146,920	167,033	868	0.59%	1,762	1.07%
Gross State Product ($2000 millions)	$439,697	$483,669	$439,699	$483,682	$2	0.0004%	$13	0.003%
Personal Income ($ millions)	$562,082	$714,907	$562,133	$714,979	$51	0.01%	$73	0.01%
Retail Sales ($ millions)	$186,263	$226,722	$186,290	$226,802	$26	0.01%	$80	0.04%
Consumer Price Index (1982 = 1)	2.58	2.84	2.58	2.84	0.00002	0.001%	0.0001	0.004%
Electricity								
Weighted Average Price (Cents/kWh)	14.19	15.59	14.19	15.59	0.00002	0.0001%	0.00003	0.0002%
Total Consumption (GWh)	84,497	90,952	84,498	90,953	1	0.001%	2	0.002%
Natural Gas								
Weighted Average Price ($/MMBtu)	$9.88	$10.13	$9.88	$10.13	($0.00001)	-0.0001%	($0.00003)	-0.0003%
Total Consumption (Billion Btu)	672,925	719,573	672,929	719,587	4	0.001%	14	0.002%

Overall, the additional New Jersey employment resulting from the proposed energy efficiency goals has a slightly positive economic impact. Non-agricultural employment increases by approximately 898 jobs (0.02%) in 2015 and 1,850 jobs (0.04%) in 2020. Personal income and retail sales increase by $51 million (0.01%) and $26 million (0.01%), respectively, in 2015 and $73 million (0.01%) and $80 million (0.04%), respectively, in 2020.

The impact on energy prices and consumption are negligible. In 2020, electricity prices increase 0.00003 cents per kWh (0.0002%) while consumption increases 2 GWh (0.002%). In 2020, natural gas prices decrease $0.00003 per MMBtu (-0.0003%) while consumption increases 14 billion Btu (0.002%). Since this analysis does not account for the reduction in utility energy bills due to the energy efficiency measures, these price changes only reflect the impact of the additional economic activity due to the increased energy efficiency employment.

Table 4 presents the average cost per job created from the New Jersey proposed EMP energy efficiency goal. The total cost of the energy efficiency goal (presented in Table 2) was divided by the direct, indirect

and induced employment generated. The average job cost decreases over time from a high approximately $132,000 in 2011 to $120,000 in 2020.

TABLE 4: AVERAGE COST PER JOB CREATED

	Total Jobs Generated	Average Cost per Job Generated
2011	168	$132,088
2012	370	$119,950
2013	529	$125,846
2014	716	$124,014
2015	898	$123,591
2016	1,101	$120,986
2017	1,295	$119,927
2018	1,465	$121,220
2019	1,651	$120,949
2020	1,848	$120,096

VI. SOLAR ECONOMIC IMPACT ANALYSIS

1. Summary

The New Jersey Board of Public Utilities (NJBPU) asked the Center for Energy, Economic and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service (R/ECON™) to analyze the economic and energy impacts of New Jersey's solar requirements, including the Renewable Portfolio Standard (RPS) Solar Carve-Out and the Solar Energy Advancement and Fair Competition Act (Solar Act).[36]

New Jersey's solar requirements directly impact electricity prices and employment. The electricity price and direct employment changes have indirect and induced effects on New Jersey's economy and energy prices. The electricity price and employment effects were analyzed incrementally to distinguish between the impacts resulting solely from the solar requirement and the impacts due to the increase in electricity prices. The analysis included three scenarios. Note that the analysis assumes that there is no solar manufacturing in New Jersey.[37] Further it does not account for any environmental benefits or any wholesale electricity price suppression due to the solar installations.

Baseline (No RPS) R/ECON™ output without Class I, Class II or solar RPS standards.

Solar Cost Effect R/ECON™ model determined the gross direct, indirect and induced impacts based on the additional cost of electricity due to the solar requirement.

Solar Requirement Impact R/ECON™ model determined the gross direct, indirect and induced impacts based on the additional cost of electricity due to the solar requirements and the direct one-time installation and ongoing O&M solar jobs.

2. Description of Economic and Energy Impact Analysis

The economic and energy impacts of New Jersey's solar requirements were estimated using the R/ECON™ Model, an econometric model of New Jersey. R/ECON™ is comprised of over 300 equations, based on historical data for New Jersey and the United States, which are solved simultaneously. The heart of the model is a set of equations modeling employment, wages, and prices by industry. In general, employment in an industry depends on demand for that industry's output and the state's wages and prices relative to the nation's. Demand can be represented by a variety of variables including (but not limited to) New Jersey personal income, population, and sectoral output or U.S. employment in the sector. Other sectors in the model include population, housing, vehicle registrations, state tax revenue and energy. The U.S. data comes from IHS Global Insight, Inc., a national leader in economic forecasting.

R/ECON™ variable inputs were adjusted by CEEEP to account for New Jersey's solar requirements, which increase the cost of electricity and create jobs within the state. The additional cost of electricity (the Electricity Price Adder) was determined based on the RPS Solar Carve-Out and Solar Act energy requirements, forecasted Solar Renewable Energy Credit (SREC) prices and forecasted New Jersey electric consumption. Forecasted SREC prices are assumed to be 75 percent of the Solar Alternative Compliance Payment (SACP).[38] The analysis assumes that New Jersey's solar requirement is met solely by SRECs, not SACPs.

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[36] DSIRE. New Jersey Renewables Portfolio Standard www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ05R&re=1&ee=1; State of New Jersey. Assembly No. 3520. *Solar Energy Advancement and Fair Competition Act*. 7 December 2009.

[37] Petra Solar has an assembly plant in South Plainfield, New Jersey and MX Solar USA opened a facility in Somerset, New Jersey and began production in December 2010.

[38] 2017 to 2026 values were determined via conversations with NJBPU staff.

Table 1 presents the 2010 to 2026 solar requirements (in GWh and MW), SREC prices, the total cost of the solar requirement, and the Electricity Price Adder. The values have been adjusted to reflect the calendar year.

TABLE 1: SOLAR ELECTRICITY ADDER INPUTS

	Solar Requirement (GWh)	Solar Requirement (MW)	SREC Prices ($/MWh)	Total Cost ($ thousands)	Electricity Price Adder (cent/kWh)
2010	252	205	$604.07	$152,135	0.19
2011	385	314	$498.81	$192,209	0.24
2012	532	434	$486.06	$258,504	0.32
2013	699	570	$473.75	$330,993	0.40
2014	885	721	$461.75	$408,456	0.49
2015	1,073	875	$450.19	$483,014	0.57
2016	1,271	1,036	$393.53	$500,072	0.58
2017	1,494	1,218	$351.12	$524,397	0.60
2018	1,747	1,424	$342.20	$597,739	0.68
2019	2,037	1,661	$333.51	$679,191	0.76
2020	2,371	1,933	$325.04	$770,502	0.85
2021	2,757	2,248	$316.78	$873,421	0.94
2022	3,223	2,628	$308.74	$994,926	1.06
2023	3,757	3,064	$300.89	$1,130,558	1.18
2024	4,351	3,548	$293.25	$1,276,009	1.31
2025	5,022	4,095	$285.80	$1,435,252	1.45
2026	5,316	4,335	$278.82	$1,482,181	n/a

The annual direct solar jobs created within New Jersey were estimated based on data gleaned from two comprehensive studies. Direct one-time solar installation job-years were applied to the annual incremental solar requirement. Direct solar O&M jobs occur over the life of the photovoltaic system; therefore, the annual jobs were applied to the annual solar requirement. Table 2 presents the direct installation and O&M jobs per MW. Table 3 presents the direct employment created.

TABLE 2: AVERAGE DIRECT INSTALLATION AND O&M SOLAR JOBS PER MW [39]

(Job-Years)	Installation	Annual O&M
EPRI	7.14	0.12
Navigant	5.80	0.25
Average	**6.47**	**0.19**

[39] EPRI (2001). California Renewable Technology Market and Benefits Assessment. Prepared for the California Energy Commission; Navigant (February 13, 2008). Economic Impacts of the Tax Credit Expiration. Prepared for the American Wind Energy Association and the Solar Energy Research and Education Foundation.

TABLE 3: DIRECT EMPLOYMENT CREATED

	Direct Employment	
	One-Time Installation	Cumulative O&M
2010	549	38
2011	704	58
2012	765	80
2013	888	105
2014	981	133
2015	994	162
2016	1,025	191
2017	1,193	225
2018	1,336	263
2019	1,529	307
2020	1,728	357
2021	2,074	416
2022	2,455	486
2023	2,821	567
2024	3,071	655
2025	3,600	758
2026	1,552	802

3. R/ECON™ Results

New Jersey's solar requirements directly impact electricity prices and employment. The electricity price and direct employment effects have indirect and induced effects on New Jersey's economy and energy prices. The electricity price and employment effects were analyzed incrementally to distinguish between the impacts resulting solely from the solar requirement and the impacts due to increases in electricity prices. The incremental analysis incorporated three scenarios.

Baseline (No RPS) R/ECON™ output without Class I, Class II or solar RPS standards.

Solar Cost Effect R/ECON™ model determined the gross direct, indirect and induced impacts based on the additional cost of electricity due to the solar requirement.

Solar Requirement Impact R/ECON™ model determined the gross direct, indirect and induced impacts based on the additional cost of electricity due to the solar requirements and the direct one-time installation and ongoing O&M solar jobs.

Figures 1 and 2 illustrate the incremental impacts on employment and gross state product in 2020 and 2025, respectively. The Electricity Price Effect impacts reflect the economic and energy price impacts of increasing electricity prices (the difference between the Baseline (No RPS) and the Solar Cost Effect). The Solar Employment Effect impacts reflect the economic and energy price impacts of increasing employment (the difference between the Solar Requirement Impact and the Solar Cost Effect). The Net Effect impacts of the New Jersey solar requirement are the sum of the electricity price and solar employment effects.

FIGURE 1: INCREMENTAL EMPLOYMENT IMPACT (NON-AGRICULTURAL JOBS), 2020 AND 2025

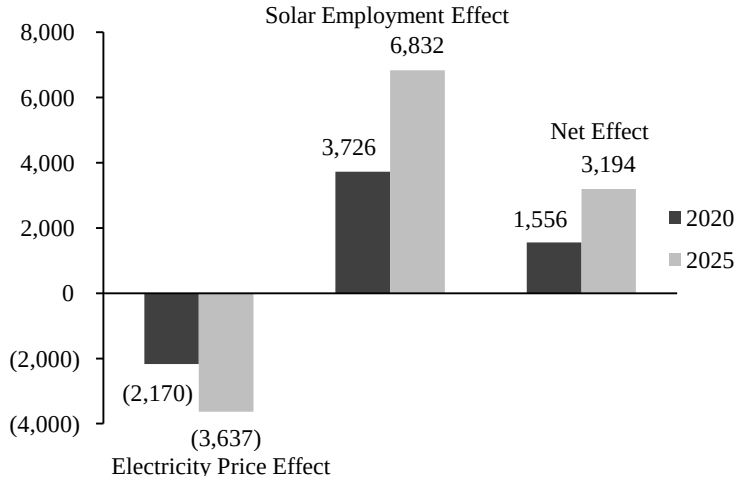

FIGURE 2: INCREMENTAL GROSS STATE PRODUCT IMPACT ($ MILLIONS, 2000 CHAINED), 2020 AND 2025

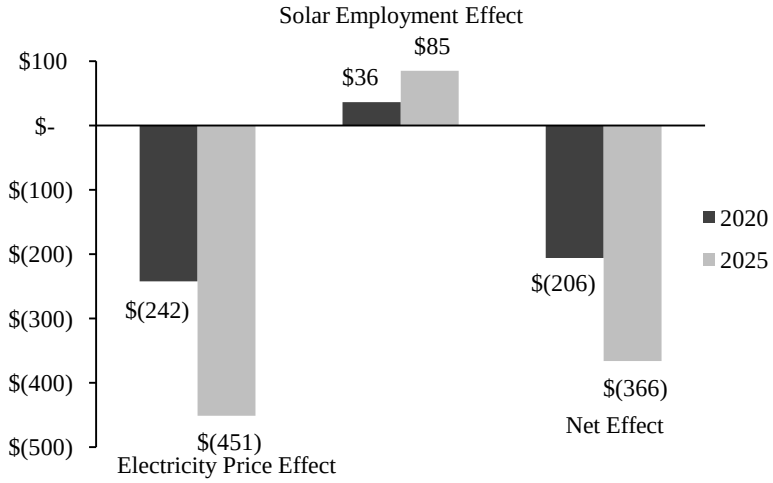

Table 4 presents an overview of the R/ECON™ economic and energy projections for each scenario. Table 5 presents an overview of the economic and energy impacts of the scenarios.

TABLE 4: NEW JERSEY ECONOMIC AND ENERGY PROJECTIONS

	Baseline (No RPS)		Solar Cost Effect		Solar Requirement Impact	
	2020	2025	2020	2025	2020	2025
Non-Agricultural Employment	4,215,920	4,402,406	4,213,750	4,398,768	4,217,476	4,405,600
Gross State Product ($2000 millions)	$483,669	$542,718	$483,427	$542,267	$483,463	$542,352
Personal Income ($ millions)	$714,907	$891,864	$714,837	$891,840	$714,951	$891,892
Retail Sales ($ millions)	$226,722	$285,014	$226,637	$284,841	$226,787	$285,140
Consumer Price Index (1982 = 1)	2.84	3.13	2.84	3.14	2.84	3.14
Electricity						
Weighted Average Price (Cents per kWh)	15.59	17.44	16.41	18.83	16.41	18.83
Total Consumption (GWh)	90,952	99,317	90,607	98,760	90,611	98,768

TABLE 5: NEW JERSEY SOLAR REQUIREMENT IMPACTS

	Electricity Price Effect				Solar Employment Effect				Net Effect			
	2020		2025		2020		2025		2020		2025	
Non-Agricultural Employment	(2,170)	-0.05%	(3,637)	-0.08%	3,726	0.09%	6,832	0.16%	1,556	0.04%	3,194	0.07%
Gross State Product ($2000 millions)	($242)	-0.05%	($451)	-0.08%	$36	0.01%	$85	0.02%	($206)	-0.04%	($366)	-0.07%
Personal Income ($ millions)	($70)	-0.01%	($25)	-0.00%	$114	0.02%	$52	0.01%	$45	0.01%	$28	0.00%
Retail Sales ($ millions)	($85)	-0.04%	($173)	-0.06%	$150	0.07%	$299	0.10%	$65	0.03%	$125	0.04%
Consumer Price Index (1982 = 1)	0.01	0.18%	0.01	0.22%	0.00	0.01%	0.00	0.02%	0.01	0.19%	0.01	0.24%
Electricity												
Weighted Average Price (Cents per kWh)	0.82	5.26%	1.40	8.01%	0.00	0.00%	(0.00)	-0.00%	0.82	5.26%	1.40	8.01%
Total Consumption (GWh)	(345)	-0.38%	(557)	-0.56%	4.31	0.00%	8.33	0.01%	(340)	-0.37%	(549)	-0.55%

Overall, the New Jersey solar requirements have a slightly positive economic impact —the employment benefits from installing and maintaining solar equipment slightly outweigh the negative economic impacts of higher electric prices.

The Solar Employment Effect has a slightly positive gross impact on New Jersey's economy but negligible impact on energy prices and consumption. Non-agricultural employment increases by approximately 3,700 jobs (0.09%) in 2020 and 6,800 jobs (0.16%) in 2025. Gross state product increases by approximately $36 million (0.01%) in 2020 and $85 million (0.02%) in 2025. Personal income and retail sales increase by $114 million (0.02%) and $150 million (0.07%), respectively, in 2020 and $52 million (0.01%) and $300 million (0.1%), respectively, in 2025.

The electricity price effect alone has a slightly negative impact on New Jersey's economy. Non-agricultural employment decreases by approximately 2,200 jobs (0.05%) in 2020 and 3,600 jobs (0.09%) in 2025. Gross state product decreases by approximately $242 million (0.05%) in 2020 and $450 million (0.08%) in 2025. Personal income and retail sales decrease slightly in 2020 and 2025.

Table 6 presents the average cost per job created from the New Jersey solar requirement. The total cost of the solar requirement (presented in Table 1 above) was divided by the solar requirement direct, indirect and induced employment generated. The average job cost decreases over time from a high approximately $390,000 in 2010 to a low of $200,000 in 2022.

TABLE 6: AVERAGE COST PER JOB CREATED FROM THE SOLAR REQUIREMENTS

	Total Jobs Generated	Average Cost per Job Generated
2010	393	$386,866
2011	850	$226,128
2012	1,024	$252,507
2013	1,321	$250,515
2014	1,600	$255,245
2015	1,838	$262,829
2016	2,090	$239,269
2017	2,497	$210,032
2018	2,845	$210,065
2019	3,282	$206,960
2020	3,726	$206,791
2021	4,340	$201,261
2022	4,986	$199,564
2023	5,576	$202,754
2024	6,115	$208,677
2025	6,832	$210,093

VII. NEW JERSEY SOLAR PAYBACK MODEL

Working with the New Jersey Board of Public Utilities (BPU), Rutgers University's Center for Energy, Economic and Environment Policy (CEEEP) developed a spreadsheet based model to compute the simple payback period and internal rate of return (IRR) for solar projects. The cash flows for a solar project are presented from a perspective of a solar plant owner. The major expenditures for solar projects include installation and operation & maintenance (O&M) costs. The major sources of income for solar projects are savings incurred due to generation of electricity and the sale of Solar Renewable Energy Credit (SREC) units. By varying the payback period and IRR for the projects, we can posit a tentative idea on the level of SREC price stream. The BPU had outlined a set of scenarios for three types of projects: residential, commercial and industrial and grid interactive plants. Building sufficient margin on the model SREC prices could aid in determining the Solar Alternative Compliance Payment (SACP) levels for the energy years 2016-2025.

The ratepayer impact model analyses the cost of dispensing the SREC program on the New Jersey ratepayers. The model computes the impact from an average ratepayer perspective based on the SREC prices used in the payback model. Metrics like rate impact and average household bill increase helps in better quantitative understanding of the ratepayer impact.

The following tables present the key results of the scenario runs. Table 1 presents the minimum SREC prices required to achieve a target payback period for the three project types. The scenario runs were computed based on the assumption that the SREC prices would decline at the 2.5% every year. Since residential projects do not qualify for MACRS depreciation, they require higher SREC price support in comparison to commercial & industrial projects. For comparable payback periods the grid interactive projects require the highest SREC price support since their project cash inflow is based on wholesale price of electricity.

Table 2 & 3 presents an overall ratepayer impact for a given set of SREC prices starting at $500 and $252 and declining at 2.5% annually. These starting SREC prices were chosen based on the results of Table 1, which posits an approximate SREC price range for a five or a ten year payback period. The detailed retail price data used in the rate payer impact calculation is presented in Table 6.

Table 4&5 presents the results of a scenario run with SREC prices at 75% of SACP schedule. Since the SREC prices are fixed first, Table 5 presents the estimated payback period and 10 year internal rate of return for various types of solar projects under this scenario.

TABLE 1: SREC PRICE RANGE FOR BPU SCENARIO 2010

BPU Scenario for 2010	Simple Payback period (years)	2011 SREC Price Range($/MWh)
[1] Residential and small commercial	10	Starting at $500
[2] Commercial net metered 10kW-50kW	5	$502
	10	$252
[3] Commercial net metered 50kW-1000kW	5	$502
	10	$252
[4] Commercial net metered more than 1000kW	5	Starting at $502
	10	Starting at $252
[5] Grid Interactive more than 2000kW	5	Starting at $568
	10	Starting at $331

Note: The solar installed cost estimates are $7550 per kW for Residential and $5640 per kW for other customer class. Cash flow estimates are computed based on the assumptions the SREC prices decrease by 2.5% every year.

TABLE 2: OVERALL RATEPAYER IMPACT: FOR SREC PRICES STARTING AT $500 IN 2011(DECLINING AT 2.5% ANNUALLY)

Year	NJ Electricity Consumption (MWh)	RPS Solar Requirement (GWh)	SREC Prices ($/MWh)	Current SACP ($/MWh)	Total SREC Cost ($)	SREC Costs as a Percentage of Total Ratepayer Cost of Retail Electricity	SREC Cost as a Percentage of Total Ratepayer Cost of Wholesale Electricity	Rate Impact (cents/kWh)	NJ Average Household Cost Increase ($)
2011	79,756,295	442	$500.0	$675	$ 221,000,000	1.83%	3.56%	0.28	$ 24.96
2012	80,348,103	596	$487.5	$658	$ 290,550,000	2.37%	4.56%	0.36	$ 32.61
2013	81,740,754	772	$475.3	$641	$ 366,941,250	2.87%	5.6%	0.45	$ 40.52
2014	83,147,521	965	$463.4	$625	$ 447,209,648	3.35%	6.54%	0.54	$ 48.60
2015	84,191,481	1150	$451.8	$609	$ 519,620,537	3.73%	7.36%	0.62	$ 55.83
2016	85,269,652	1357	$440.5	$594	$ 597,823,428	4.12%	8.21%	0.70	$ 63.48
2017	86,384,223	1591	$429.5		$ 683,388,833	4.49%	9.09%	0.79	$ 71.70
2018	87,383,152	1858	$418.8		$ 778,122,590	4.85%	10.04%	0.89	$ 80.79
2019	88,561,113	2164	$408.3		$ 883,617,252	5.17%	11.04%	1.00	$ 90.61
2020	89,930,559	2518	$398.1		$ 1,002,460,505	5.46%	12.11%	1.11	$ 101.33
2021	91,211,738	2928	$388.2		$ 1,136,546,565	5.81%	13.28%	1.25	$ 113.38
2022	92,719,752	3433	$378.5		$ 1,299,255,549	6.28%	14.66%	1.40	$ 127.64
2023	94,439,585	3989	$369.0		$ 1,471,937,701	6.76%	16.00%	1.56	$ 142.11
2024	96,022,620	4610	$359.8		$ 1,658,559,032	7.29%	17.41%	1.73	$ 157.64
2025	97,776,803	5316	$350.8		$ 1,864,745,623	7.85%	18.86%	1.90	$ 174.24

Note: The solar requirements are on an energy year basis (Jun 1- May-31). For calculation purposes, it is assumed to be on a calendar year basis.
NJ Average household consumption for 2010 is assumed as 9000kWh. It is expected to increase by 0.1% every year.
Analysis does not include the impact of solar on wholesale electricity prices.

TABLE 3: OVERALL RATEPAYER IMPACT: FOR SREC PRICES STARTING AT $252 IN 2011 (DECLINING AT 2.5% ANNUALLY)

Year	NJ Electricity Consumption (MWh)	RPS Solar Requirement (GWh)	SREC Prices ($/MWh)	Current SACP ($/MWh)	Total SREC Cost ($)	SREC Costs as a Percentage of Total Ratepayer Cost of Retail Electricity	SREC Cost as a Percentage of Total Ratepayer Cost of Wholesale Electricity	Rate Impact (cents/kWh)	NJ Average Household Cost Increase ($)
2011	79,756,295	442	$252.0	$675	$ 111,384,000	0.92%	1.80%	0.14	$ 12.58
2012	80,348,103	596	$245.7	$658	$ 146,437,200	1.19%	2.30%	0.18	$ 16.44
2013	81,740,754	772	$239.6	$641	$ 184,938,390	1.45%	2.80%	0.23	$ 20.42
2014	83,147,521	965	$233.6	$625	$ 225,393,663	1.69%	3.29%	0.27	$ 24.49
2015	84,191,481	1150	$227.7	$609	$ 261,888,751	1.88%	3.71%	0.31	$ 28.14
2016	85,269,652	1357	$222.0	$594	$ 301,303,008	2.07%	4.14%	0.35	$ 31.99
2017	86,384,223	1591	$216.5		$ 344,427,972	2.26%	4.58%	0.40	$ 36.14
2018	87,383,152	1858	$211.1		$ 392,173,786	2.44%	5.06%	0.45	$ 40.72
2019	88,561,113	2164	$205.8		$ 445,343,095	2.61%	5.56%	0.50	$ 45.67
2020	89,930,559	2518	$200.7		$ 505,240,095	2.75%	6.10%	0.56	$ 51.07
2021	91,211,738	2928	$195.6		$ 572,819,469	2.93%	6.69%	0.63	$ 57.15
2022	92,719,752	3433	$190.7		$ 654,824,797	3.17%	7.39%	0.71	$ 64.33
2023	94,439,585	3989	$186.0		$ 741,856,601	3.41%	8.07%	0.79	$ 71.62
2024	96,022,620	4610	$181.3		$ 835,913,752	3.67%	8.77%	0.87	$ 79.45
2025	97,776,803	5316	$176.8		$ 939,831,794	3.96%	9.51%	0.96	$ 87.81

Note: The solar requirements are on an energy year basis (Jun 1- May-31). For calculation purposes, it is assumed to be on a calendar year basis.
NJ Average household consumption for 2010 is assumed as 9000kWh. It is expected to increase by 0.1% every year.
Analysis does not include the impact of solar on wholesale electricity prices.

TABLE 4: OVERALL RATEPAYER IMPACT: WITH SREC PRICES @ 75% OF SACP SCHEDULE

Year	NJ Electricity Consumption (MWh)	RPS Solar Requirement (GWh)	SREC Prices ($/MWh)	SACP ($/MWh)	Total SREC Cost ($)	SREC Costs as a Percentage of Total Ratepayer Cost of Retail Electricity	SREC Cost as a Percentage of Total Ratepayer Cost of Wholesale Electricity	Rate Impact (cents/kWh)	NJ Average Household Cost Increase ($)
2011	79,756,295	442	$506.3	$675	223,762,500	1.86%	3.61%	0.28	$25.28
2012	80,348,103	596	$493.5	$658	294,126,000	2.40%	4.62%	0.37	$33.01
2013	81,740,754	772	$480.8	$641	371,139,000	2.90%	5.62%	0.45	$40.99
2014	83,147,521	965	$468.8	$625	452,343,750	3.38%	6.61%	0.54	$49.16
2015	84,191,481	1150	$456.8	$609	525,262,500	3.77%	7.44%	0.62	$56.43
2016	85,269,652	1357	$445.5	$594	604,543,500	4.16%	8.30%	0.71	$64.19
2017	86,384,223	1591	$356.3	$475	566,793,750	3.72%	7.54%	0.66	$59.47
2018	87,383,152	1858	$347.3	$463	645,190,500	4.02%	8.32%	0.74	$66.98
2019	88,561,113	2164	$338.3	$451	731,973,000	4.28%	9.15%	0.83	$75.06
2020	89,930,559	2518	$330.0	$440	830,940,000	4.53%	10.03%	0.92	$83.99
2021	91,211,738	2928	$321.8	$429	942,084,000	4.81%	11.01%	1.03	$93.98
2022	92,719,752	3433	$313.5	$418	1,076,245,500	5.20%	12.14%	1.16	$105.73
2023	94,439,585	3989	$305.3	$407	1,217,642,250	5.59%	13.24%	1.29	$117.56
2024	96,022,620	4610	$297.8	$397	1,372,627,500	6.03%	14.40%	1.43	$130.47
2025	97,776,803	5316	$290.3	$387	1,542,969,000	6.50%	15.61%	1.58	$144.17

Note: The solar requirements are on an energy year basis (Jun 1- May-31). For calculation purposes, it is assumed to be on a calendar year basis.
NJ Average household consumption for 2010 is assumed as 9000kWh. It is expected to increase by 0.1% every year.

TABLE 5: SPECIAL SCENARIO: SREC PRICES @ 75% OF SACP SCHEDULE

BPU Scenario for 2010	Simple Payback (years)	10 year Internal Rate of Return (IRR)
[1] Residential and small commercial (less than 10kW)	11	-2.2%
[2] Commercial net metered 10kW-50kW	5	10.8%
[3] Commercial net metered 50kW-1000kW	5	10.8%
[4] Commercial net metered more than 1000kW	5	10.8%
[5] Grid Interactive more than 2000kW	6	7.2%

TABLE 6: RECON RETAIL ELECTRICITY PRICE DATA (CENTS PER KWH)[40]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Retail Price of Electricity, Residential	17.27	17.04	17.24	17.70	18.25	18.84	19.43	20.16	21.09	22.25	23.61	24.89	25.93	26.84	27.64	28.36
Retail Price of Electricity, Commercial	14.40	13.83	13.95	14.26	14.62	15.02	15.43	15.92	16.55	17.33	18.26	19.16	19.89	20.52	21.08	21.58
Wholesale Price of Electricity	7.64	7.78	7.93	8.08	8.23	8.38	8.54	8.70	8.87	9.04	9.21	9.38	9.56	9.74	9.92	10.11
Average Retail Price of Electricity	15.55	15.12	15.26	15.64	16.07	16.55	17.03	17.62	18.36	19.30	20.40	21.45	22.31	23.05	23.71	24.29

Note: A 7.5% Sales & Use Tax is added (except to the wholesale estimates). The average retail price is weighted as (60% C&I + 40% Residential) of RECON retail rates.

Conclusion

The future costs to New Jersey residents of its solar requirements may be substantial. The future costs of SRECs depends on many factors that are difficult to forecast (e.g., future costs of solar, future wholesale and retail prices, solar supply availabilities, the type and cost of the marginal solar facility etc). Nevertheless, the cost to ratepayers in a scenario with SREC prices at 75% of SACP schedule would be $830 million in 2020 and over $1.5 billion in 2025. Of course, if solar parity occurs, then SREC prices would converge to zero over time.

[40] NJ Total Electricity Consumption, Retail Prices- Rutgers' RECON Model 7/20/2010- 2010 Baseline Stakeholder Presentation Data