2014-2015 Evaluation and Research Plan

New Jersey's Clean Energy Program
Energy Efficiency and Renewable Energy Programs

FINAL Report

April 30, 2014

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I. Introduction

This report is the seventh evaluation and research plan prepared by the Center for Energy, Economic and Environmental Policy ("CEEEP") since 2004. It sets out a proposed process for establishing and executing a detailed evaluation and research plan for New Jersey's Clean Energy Program ("NJCEP"). The six previous plans issued by CEEEP include:

- The 2004-2005 Evaluation and Research Plan Phase 1 Report[1] which set out general strategies to be employed in evaluating programs and identified evaluation activities with a high priority that should be initiated in 2005.
- The 2004-2005 Evaluation and Research Plan Phase 2 Report[2] which identified specific evaluation and research activities proposed for 2005 for each program and a timeline for implementing the recommended activities.
- The 2006 Evaluation and Research Plan[3] which identified specific evaluation and research activities proposed for 2006.
- The Draft 2007 Evaluation and Research Plan[4] which identified specific evaluation and research activities proposed for 2007. This report was not publicly released.
- The 2010-2011 Evaluation and Research Plan[5] which identified specific evaluation and research activities proposed for 2010 and 2011.
- The 2012 Evaluation and Research Plan Draft[6].

There have been three evaluation studies undertaken since the last Evaluation Plan in 2012, including:

- **Energy Efficiency Market Potential:** EnerNOC conducted a market assessment and energy efficiency potential study to assess the potential statewide impacts from energy efficiency resources in the time period from 2013 to 2016 (so as to help inform the corresponding CRA proceeding). Final report of this study was published in October 2012[7]. This was followed by a supplemental report from

[1] "New Jersey Clean Energy Program 2004-2005 Evaluation and Research Plan, Phase I: Activities to be Initiated 2004", Center for Energy, Economic and Environmental Policy, August 5, 2004.
[2] "New Jersey Clean Energy Program 2004-2005 Evaluation and Research Plan, Phase 2: Activities to be Initiated 2005", Center for Energy, Economic and Environmental Policy, February 4, 2005.
[3] "2006 Evaluation and Research Plan, New Jersey's Clean Energy Program, Energy Efficiency and Renewable Energy Programs", Center for Energy, Economic and Environmental Policy, February 4, 2005.
[4] "Draft 2007 Evaluation and Research Plan, New Jersey's Clean Energy Program, Energy Efficiency and Renewable Energy Programs", Center for Energy, Economic and Environmental Policy, February 9, 2007.
[5] "2010-2011 Evaluation and Research Plan", Center for Energy, Economic and Environmental Policy, January 26, 2010.
[6] "2012 Evaluation and Research Plan", Center for Energy, Economic and Environmental Policy, DRAFT Report, July 12, 2012.
[7] New Jersey Energy Efficiency Market Potential Assessment, Volume 2, Report, EnerNOC Utility Solutions Consulting, October 17, 2012

EnerNOC estimating costs of efficiency programs (participant costs and program costs) and was published in July 2013[8].

- **Renewable Energy Market Potential:** Navigant conducted an RE market potential study that was finalized in mid-August. The market potential study examined on-shore wind, marine hydrokinetic, small hydropower, energy storage technologies, and fuel cells[9].
- **Avoided Cost Assumptions:** CEEEP released Avoided Cost assumptions for electricity and natural gas (wholesale and retail), capacity, environmental externalities (CO2), and line losses in conjunction with its work on developing a cost-benefit model for combined heat and power (CHP)[10].

Table 2 and Appendix A of this report includes a full list of previous evaluation plans and reports.

During 2013-2014 Board Staff convened an Evaluations Work Group[11], which was tasked to develop a finalized schedule of evaluations that should be performed in the years 2014 through 2016. The Evaluations Work Group met several times to discuss purposes, types and priorities of evaluation and also met with the Data Work Group to identify data required as part of administration and management of clean energy programs and that should be required for various evaluation activities. Observations of the Evaluations Work Group regarding the type of data that should be collected (and is already collected under the Information Management System by the Market Managers for NJCEP) and essential data requirements against each type of evaluation study are provided in Appendix B. Overall the group members agreed to include a "report card" type analysis on what has been accomplished (by portfolio & programs) against the legislative goals. Accomplishments should consist of clear, concise summaries both in terms of energy savings and cost-effectiveness of those savings.

The Work Group agreed to undertake a Benchmarking and Metrics Study, followed by a Portfolio-level Process Evaluation and a Building Characteristics Baseline Study, on a high priority basis. Objective and scope of these studies is covered in detail in following sections.

Members also agreed that the future evaluation plans should consider having ongoing evaluation tasks which may provide almost real-time program improvement information. As a long-term objective it may be worthwhile to explore how evaluation can be made an integral part of a program design.

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[8] Program Cost Analysis – Phase 2: Program Level Results, An addendum to the New Jersey Energy Efficiency Market Potential Assessment, EnerNOC Utility Solutions Consulting, July 25, 2013.
[9] Market Assessment Services to Characterize the Opportunities for Renewable Energy – Final Report, Navigant Consulting, Inc., August 6, 2012.
[10] Draft Avoided Cost Assumptions, Center for Energy, Economic & Environmental Policy, July 2013.
[11] Per Staff's 8/29/13 memo "Evaluations Work Group"

Also shaping the planning of evaluation activities are two major policy initiatives that may impact energy efficiency and renewable energy programs. These initiatives include:

- Tracking progress towards the five goals set out in the State Energy Master Plan dated June 2011, including:
  - Drive down the cost of energy for all customers
  - Promote a diverse portfolio of new, clean, in-State generation
  - Reward energy efficiency and energy conservation and reduce peak demand
  - Capitalize on emerging technologies for transportation and power production
  - Maintain support for the renewable energy portfolio standard of 22.5% of energy from renewable sources by 2021
- Streamlining the administration of the New Jersey Clean Energy Program by transitioning from management by three separate market managers to a single program administrator.

This evaluation plan is developed taking into consideration studies that will be needed to support these policy initiatives. For example, benchmarking and metrics studies will help compare savings and cost-effectiveness of various programs and process evaluations will support the program administrator by determining the implementation, effectiveness, operational efficiency, and market actor satisfaction of the current programs.

Evaluation and research activities are intended to provide a continual feedback loop to policymakers, program administrators and program managers. It is therefore important to integrate evaluation findings along with actual tracking of results, so that corrective actions can be taken and long-term policy decisions can be framed.

This report summarizes evaluation activities recently completed or currently underway, identifies major issues facing the Board related to New Jersey's Clean Energy Program and how the evaluation activities proposed in this and past plans will support the Board's decision making process as it addresses these issues.

Several entities that are involved in the oversight, delivery, evaluation and management of New Jersey's Clean Energy program will have a role in implementing this evaluation plan including:

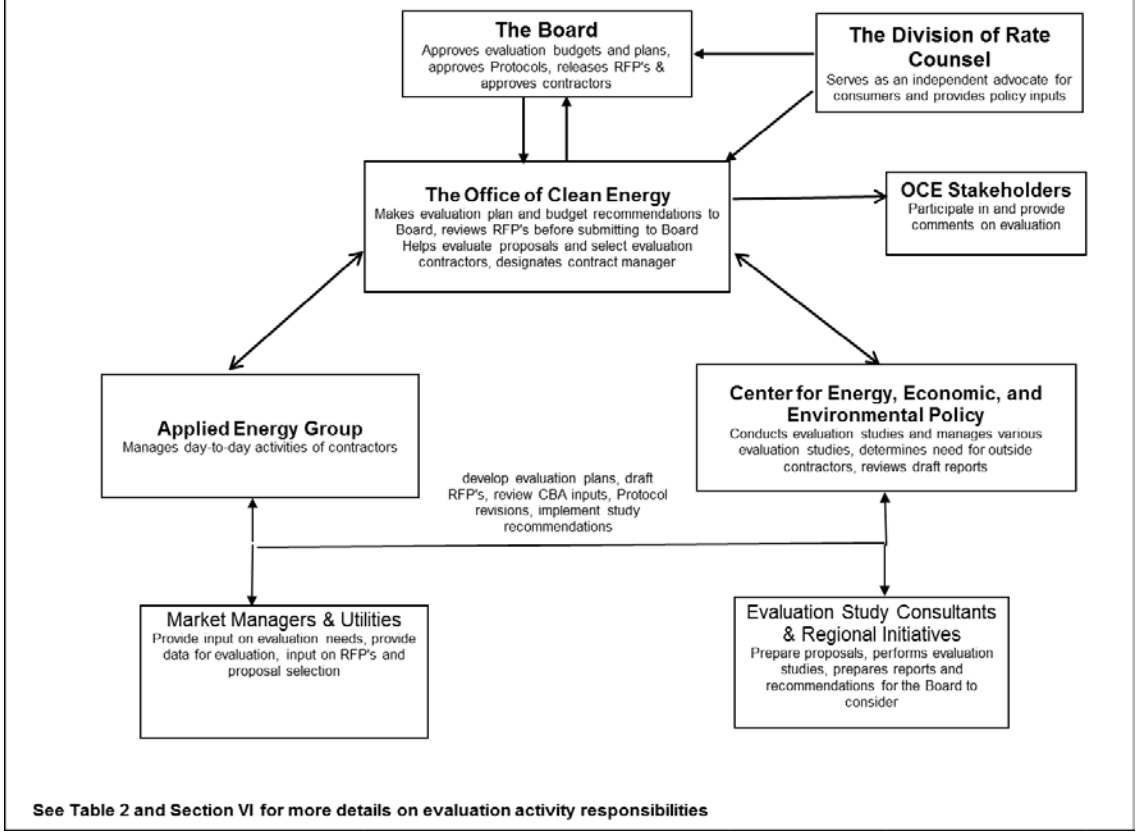
- The Board of Public Utilities (the "Board" , "BPU")
- The Office of Clean Energy ("OCE")
- Rutgers Center for Energy, Economic and Environmental Policy ("CEEEP")
- Applied Energy Group ("AEG") in its current role as Program Coordinator
- Honeywell in its current role as the residential energy efficiency and renewable energy Market Manager
- TRC in its current role as C&I energy efficiency Market Manager
- The utilities in their role as manager of the New Jersey Economic Stimulus Plan energy efficiency programs and the Comfort Partners program
- The Division of Rate Counsel ("Rate Counsel") in its role of participating in the development of the evaluation plan, reviewing and commenting on draft

evaluation plans and proposed modifications to the Protocols, and reviewing and commenting on evaluation reports

- Other stakeholders in their role of participating in and providing feedback on evaluation activities.

Please note that under the new program administration structure being developed by the BPU, the program coordinator and market manager roles will be combined into a single program administrator role. The specific current role of each of these entities in implementing the evaluation plan is described more fully in Section VI below and is shown pictorially in Figure 1.

Figure 1: New Jersey Clean Energy Program Inter-Organization Chart (Current Structure)



See Table 2 and Section VI for more details on evaluation activity responsibilities

II. Purposes of Evaluation

New Jersey's Clean Energy Program ("NJCEP"), one of the nation's most ambitious energy efficiency and renewable energy initiatives, requires a significant commitment to transparent, accurate, and timely evaluation. The need for a commitment to evaluation is based on several factors, including:

- The need for regulatory accountability given the significant and increasing level of public funds dedicated to energy efficiency and renewable energy programs
- The need to assess the effects that the presence of both NJCEP and utility-administered program have on the impacts and administration of each
- The need to provide clear and concise reporting to policymakers and the general public concerning both the energy savings and impacts of the program, and cost-effectiveness of the programs in achieving those impacts
- The need to establish objective measures of progress towars state policy and program goals including in deferring generation, transmission and distribution infrastructure upgrades and meeting green house gas goals
- The need to evaluate and improve the administration of the program, and potential for incentive payments related to the successful implementation of energy efficiency and renewable energy programs
- The potential for efficiency savings and distributed renewables to be bid into the new PJM Reliability Pricing Market
- The need to ensure that energy efficiency and renewable energy programs are designed and administered to provide benefits commensurate with their costs, and to achieve the desired goals in a cost-effective manner
- The need to assure that the measurement protocols used to measure energy savings and other program benefits are technically accurate and reflective of current market conditions
- The need to provide timely feedback to program managers, program administrators, and policy makers.

Program evaluation can have a number of different purposes and can be either backward looking or forward looking. Both of these perspectives are valuable and important. Although the goals of evaluation can be articulated in a number of different ways, they generally fall under one of the following categories:

Retrospective:

- Quantifying the historical impacts of programs – in energy, environmental and/or economic terms – to assess whether goals have been achieved
- Quantifying the costs and benefits, of the programs to assure that ratepayers are receiving adequate benefits from their investments, and are receiving the maximum possible benefits from the funds expended
- Assessing whether the performance of the organizations delivering programs were good enough to warrant payment of performance incentives (i.e. for achieving goals in a cost-effective manner)

Prospective:

- Identifying keys to program successes and/or failures so that the program elements associated with such successes are continued, emphasized even more and/or applied to other initiatives where appropriate, and elements associated with failures are changed
- Assessing whether programs can be improved to be more effective – whether in attracting participants, obtaining more system savings, increasing participant satisfaction, and/or improving the efficiency of service delivery
- Assessing which historically pursued opportunities warrant continued attention and which do not (e.g. if the market is sufficiently transformed, or if new lower estimates of savings potential cannot justify market interventions)
- Identifying new opportunities for cost-effective savings
- Estimating the economic impacts of future initiatives to determine whether they should be pursued (i.e. whether the benefits exceed the costs)
- Establishing market benchmarks (e.g. market share for a particular efficient product and degree of market transformation) and/or performance indicators against which future program progress can be measured
- Undertaking at thorough review of the protocols used to measure energy savings and other program benefits to assure that they are technically accurate and consistent with current market conditions, thereby assuring a proper foundation for future evaluations.

III. Types of Evaluation Activities

The main types of evaluation activities include:

- Overall Goals, Objectives and Outcomes Assessment;
- Economic impact and leveraging of New Jersey Clean Energy Program, including both positive impacts such as creation of clean energy industry jobs, federal funding, and private capital, and negative impacts resulting rate surcharges needed to pay for the program;
- Cost Benefit Analysis;
- Benchmarking and Metric Studies;
- Market Potential Studies;
- Market Assessments;
- Baseline Studies;
- Impact Evaluations;
- Process Evaluations;
- Tracking System Assessments; and
- Review of Protocols for Estimating Program Impacts.

Table 1 shows the studies that have been conducted in New Jersey since 1999 and some of the anticipated studies from 2010 through 2012. For more details on these studies, see Table 2, Table 3, and Appendix A. A description of the various types of evaluations, and the evaluations suggested over the next few years, follows. More details on the proposed evaluations can be found in Section V.

Table 1: New Jersey Evaluation Timeline: 1999-2016

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BPU Proceedings			CRA Funding Cycle 2001-2004				CRA Funding Cycle 2005-2008				CRA Funding Cycle 2009-2012				CRA Funding Cycle 2013-2016			
EDECA																		
CRA Proceeding																		
EMP																		
Major Evaluation Studies																		
Evaluation Plan																		
Cost-Benefit Analysis																		
Retrospective							EE			EE	EE	EE	EE		EE/RE	EE/RE	EE/RE	EE/RE
Prospective											EE				EE/RE	EE/RE	EE/RE	EE/RE
Market Potential	EE/RE					EE/RE				EE				EE/RE	EE/RE			EE/RE
Market Assessment								EE		RE								
Benchmarking Study																EE		
Baseline Study		EE	EE													EE	EE	
Impact Evaluation											EE/RE				EE/RE			EE/RE
Process Evaluation						RE										EE	EE	
Tracking System Assessment																		
Protocols						EE/RE			EE/RE		EE/RE	EE/RE	EE/RE	EE/RE	EE/RE	EE/RE	EE/RE	EE/RE
Clean Energy Economy Impact						RE					RE					EE/RE		
Goals, Objectives & Outcomes																	EE/RE	
Survey & Focus Group									EE/RE	EE/RE								

Completed Study
Proposed Study

EE = Energy Efficiency
RE = Renewable Energy

Overall Goals, Objectives and Outcomes Assessment should serve as a "report card" style evaluation and assess various programs relative to quantifiable overall legislative

goals (specifically goals as set through the NJ Energy Master Plan and other state/federal directives such as 2050 GHG reduction goal).

Economic Impact Analysis should assess the impacts of the NJCEP and utility-administered programs on the State's economy. Analysis should include both the positive impacts such as clean energy-related investment and employment, and negative impacts resulting from the utility rate surcharges needed fund the programs. Positive and negative impacts should be assessed for the New Jersey economy overall, and for different sectors of the economy.

Cost Benefit Analysis should assess the costs and benefits of individual measures, programs and the overall portfolio of programs. Costs should include both the costs of implementing the programs as well as any contributions made by participants or others. Benefits should include both resource savings and environmental, health and other savings. CEEEP uses the cost tests described in the California Standard Practice Manual.[12]

CEEEP has developed a cost-benefit model for estimating the costs and benefits of New Jersey's Clean Energy Programs[13]. This tool has been used for calculating the costs and benefits of historic programs. In previous Evaluation Plans, there were four important tasks with regards to CEEEP's cost-benefit modeling that were recommended which did not occur.

1. a process for developing OCE/BPU approval on inputs to the models such as avoided transmission and distribution costs, externalities, etc. should be developed;

2. standardized cost-benefit tests, including the participant cost test (PCT), the utility/program administrator cost test (PACT), the ratepayer impact measure test (RIM), the total resource cost test (TRC), and the societal cost test (SCT), should be adopted in coordination with the OCE and codified;

3. CEEEP should explore consideration of non-energy benefits such as increased comfort levels or increased home values that could result from measures installed under programs such as the Home Performance with Energy Star program; and

4. CEEEP will work with the market managers to improve the reporting of relevant program measure data, in particular obtain near real-time data so that cost-benefit results will also be available in near real time.

[12] California Standard Practice Manual: Economic Analysis of Demand-side Programs and Projects, California Public Utilities Commission, October 2001.
[13] CEEEP's Cost-Benefit Model Manual, Center for Energy, Economic, and Environmental Policy, 2006.

Cost-benefit analyses have been conducted in 2004, 2005, and annually since 2008, and will be conducted annually during 2014, 2015 and 2016. The analysis should include both NJCEP and utility-administered programs.

Benchmarking and Metrics Studies should compare the effectiveness of the NJCEP and utility-administered programs with those in other jurisdictions, and establish goals for the New Jersey programs. These analyses should include the establishment of objectively measurable steps toward the achievement of market transformation and other defined goals.

Market potential studies assess the technical, economic and market potential for energy efficiency and renewable energy measures. Technical potential is an estimate of the total level of energy efficiency or renewable energy resources available unrestrained by economics. Economic potential screens for available energy efficiency and renewable energy resources that are economically viable compared to other available alternatives, and, market potential estimates the realistic level of economic resources that can be developed taking into consideration other market factors. Market potential studies were conducted in 1999, 2004, 2008, and 2012. The next Market potential study should be conducted in 2016 before the next Office of Clean Energy funding cycle.

Market assessments address specified market attributes such as customer or market actor awareness and attitudes, market barriers to efficiency and/or renewable energy investments, product and service availability, common practice, prices, new products, and market share of energy efficient products and services. They should also include an assessment of other key aspects of program impacts, including estimated free rider and spillover effects. Market assessments should identify barriers to program participation and strategies to remove or reduce such barriers. In addition to NJCEP programs, the effects of utility-sponsored programs should be studied. Market assessments may also be necessary to estimate savings from programs such as the Energy Star Products program since these estimates rely on assessments of market penetration rates of different measures. Market assessments should be performed every three to five years to help gauge the success of the programs and to provide updated market information to inform changes to programs. For example, Honeywell and TRC incorporated some of the recommendations of the assessments performed in July 2006 and March 2008 into their respective 2008 and 2009 programs.

Baseline studies are market assessment studies that provide a snapshot in time of the state of a market. These studies define what the state of the market is at the beginning of a particular program as a means of comparison for future results. The last baseline studies were performed in New Jersey by the utilities in 2000. Summit Blue updated some baseline studies as part of the energy efficiency and renewable energy market assessment. The market potential study that EnerNOC recently completed provides an estimated baseline for many measures (including lighting) in the Residential, Commercial, and Industrial sectors. It is important that New Jersey specific baselines be established, though, for future market potential studies. This plan recommends undertaking detailed building characteristics baseline studies in 2014 and 2015, for both residential and

commercial buildings. The emphasis of these plans will be to describe the existing building stock in New Jersey, along with its energy and equipment characteristics, in order to better estimate efficiency opportunities by market sector, to target new efficiency initiatives, and to measure the progress of future program efforts in improving the efficiency of New Jersey's building stock. These studies will be similar in scope to those currently planned in New York and in Maryland. In addition, the BPU is looking into renewing their Consortium for Energy Efficiency ("CEE") membership, which includes the opportunity to sponsor the annual Energy Star Awareness Survey. The survey may be useful in determining appliance saturations in New Jersey and eliminate the need for the Residential Appliance Saturation Survey and C&I Equipment Saturation Survey.

Impact evaluations support the measurement of energy savings and other program goals, including the amount and distribution of savings, and the appropriateness and comprehensiveness of measures. Impact evaluations test the assumptions used to estimate the level of energy savings or renewable energy delivered by the installation of various technologies. Impact analyses should employ industry-accepted methods of analysis that rely on well-developed engineering and statistical analysis techniques including the possibility of energy-use simulation models, multivariate regression models, and/or other analytic tools. In addition to leveraging data collected through the course of program implementation, the analyses may employ billing analysis, end-use metering, site visits, customer surveys, or other data development studies as needed. KEMA conducted a comprehensive impact evaluation for several programs in 2009. This plan recommends conducting comprehensive impact evaluations in 2016, to quantify current program accomplishments. In addition, this plan recommends conducting a portfolio benchmarking and metrics study in 2014, to better understand how New Jersey programs and accomplishments compare to those in other states.

Process evaluations address implementation effectiveness, operational efficiency, and customer and market actor satisfaction, attitudes, and awareness related to specified programs. Process evaluations also seek to find ways to improve the efficiency of the delivery of programs and to identify critical road blocks and opportunities to increase the availability of efficient measures and qualified trade allies to support customer adoption. A renewable energy process evaluation was conducted in 2004. A comprehensive portfolio level process evaluation which shall assess the success of the current programs and administrative structures in addressing the needs of the New Jersey marketplace, to inform the design and structure future of energy efficiency programs, is recommended to be carried in 2014-2015. A portfolio level process evaluation would look externally to trade allies, contractors and participants to develop lessons learned and gain suggested improvements as well as learn about awareness, satisfaction and insights into the overall portfolio. As part of this study a 'Marketing Evaluation' can also be conducted, which look into the effectiveness of marketing budget of program managers and utilities.

Tracking system assessments review the tracking systems to ensure consistent tracking and reporting, and collection of all necessary data. This step is critical in determining what level of detail is available for all other analyses related to the established programs. Stakeholders should have an opportunity to provide feedback on what data is necessary

and data should be available for the public to evaluate and use taking into consideration protection of confidential customer information.

Protocols are used in New Jersey to estimate program savings. The Protocols use measured and customer data as input values into measure specific algorithms. The savings algorithms for NJCEP are a combination of results from various impact evaluations (primarily in the Northeast) and engineering estimates of savings that have been developed based on manufacturer data, program monitoring and evaluation data, and information from other programs. The data and input values for the protocol algorithms come from the program application forms and tracking systems, or from standard values. There should be a comprehensive review of the current protocols to assure that they are technically accurate and reflective of current technology and government standards. The protocols should subsequently be updated and validated frequently to ensure that the measures remain technically accurate and current. Stakeholders should have an opportunity to comment on the protocols before implementation, as well as the opportunity to comment on inputs. These Protocols are updated and approved by the Board on an annual basis.

Surveys and focus groups are conducted to determine the perceptions of, and interest in, current and new programs. These studies have several major uses including:

- Aid in program design by measuring customer receptiveness to alternative program designs/attributes and identifying roadblocks to participation.
- Aid in communication planning by measuring customer preferences for various media, methods of communication, and value propositions.
- Understand the effectiveness - strengths and weaknesses - of New Jersey's efforts to date to increase consumer awareness, interest, and participation.
- Track some of the key perceptions measured in prior surveys in order to measure changes in awareness, media/communications preferences, interest, attitudes, and behaviors relevant to energy efficiency, clean power, and the State's programs designed to promote them.
- Understand more fully consumers' multiple motivations for getting involved with energy efficiency and clean energy.

Surveys and focus groups were alternated for Residential and Business programs each year in the past, but have not been conducted since 2008.

IV. Previous and Recurring Evaluation Activities

This section of the evaluation plan highlights the evaluation studies performed since 1999 and discusses major evaluation activities that will be performed annually. Table 2 shows a timeline of evaluation studies that have been completed from 1999 through March 2014. Links to these studies can be found in Appendix A.

Table 2: Completed New Jersey Evaluation Studies

Year	Study	Conducted by	Date
1999	EE & RE Maket Potential	XENERGY	August 19, 1999
2000	O&M Baseline Study	Pacific Energy	May 25, 2000
	Chiller Baseline Study	Pacific Energy	September 26, 2000
2001	Compressed Air Baseline	Aspen	May 2001
	Residential New Construstion Baseline	XENERGY/Roper-Starch	June 2001
	Residential HVAC Baseline	XENERGY	November 16, 2001
2004	Final Evaluation of Home Energy Audit Tools	CEEEP	February 19, 2004
	LIWAP/Comfort Partners Evaluation	Apprise	June 2004
	NJCEP 2003 Program Evaluation (EE & RE)	CEEEP	July 30, 2004
	EE Maket Potential Study	KEMA	August 2004
	RE Market Potential Study	Navigant	August 2, 2004
	NJCEP 2004-2005 Evaluation and Research Plan (Phase 1)	CEEEP	August 5, 2004
	Protocols to Measure Resource Savings		September 2004
	RE Environmental Impacts Study	CEEEP	October 7, 2004
	RE Process Evaluation	Aspen	November 2004
	RPS Economic Impact Evaluation	CEEEP	December 8, 2004
2005	2004-2005 Evaluation Plan Phase 2: Activities to be Initiated in 2005	CEEEP	February 4, 2005
	2003 EE Program Cost-Benefit Analysis	CEEEP	July 28, 2005
	Appliance Cycling Evaluation	CEEEP	September 2, 2005
2006	2006 Evaluation Plan	CEEEP	February 15, 2006
	EE Market Assessment	Summit Blue	July 20, 2006
2007	Renewable Energy Market Transition	Summit Blue	March 15, 2007
	Business RE/EE Survey and Focus Group	Market Strategies/Grafica	November 6, 2007
	Protocols to Measure Resource Savings	CEEEP	December 2007
2008	2006 EE Program Cost-Benefit Analysis	CEEEP	January 9, 2008
	RE Market Assessment	Summit Blue	March 24, 2008
	Residential RE/EE Survey and Focus Group	Market Strategies/Grafica	March 24, 2008
	Review and Update of EE Market Potential	CEEEP/AEG	June 2008
	CEEEP Cost-benefit Model Manual	CEEEP	November 18, 2008
2009	CHP Impact Evaluation	KEMA	June 10, 2009
	Res HVAC Impact Evaluation	KEMA	June 11, 2009
	Res New Construction Impact Evaluation	KEMA	June 17, 2009
	Energy Star CFL Impact Evaluation	KEMA	July 9, 2009
	SmartStart Protocol Review	KEMA	July 10, 2009
	Customer On-Site Renewable Energy Impact Evaluation	KEMA	July 13, 2009
	SmartStart Impact Evaluation	KEMA	July 29, 2009
2010	2010-2011 Evaluation and Research Plan	CEEEP	January 27, 2010
	2007 EE Program Cost-Benefit Analysis	CEEEP	March 2010
	2008 EE Program Cost-Benefit Analysis	CEEEP	March 2010
	2009 EE Utility Stimulus Program Cost-Benefit Analysis	CEEEP	March 2010
2012	Avoided Cost Assumptions	CEEEP	Draft Assumptions June 2012
	Energy Efficiency Market Potential	EnerNOC	October 17, 2012
	Renewable Energy Market Potential	Navigant	August 6, 2012
2013	Avoided Cost Assumptions	CEEEP	Draft Assumptions July 2013
	Energy Efficiency Market Potential - Phase 2 Program Cost Analysis	EnerNOC	July 25, 2013

In addition to the major evaluation studies that are undertaken every few years or as they are needed, there are several types of studies that occur on an annual basis. These studies include:

Update Evaluation Plan

This evaluation plan should be updated annually as part of the program and budget planning process. The current process results in the Program Managers and the OCE submitting a compliance filing by October 1 each year that includes program descriptions and budgets for the proposed programs to be implemented in the following calendar year. An updated evaluation plan that identifies the major evaluation activities proposed for the following year and budgets necessary to perform those activities should be submitted coincident with the compliance filings.

CEEEP will coordinate with the OCE and Program Administrators to develop the annual evaluation plan. Draft plans should be presented to the Clean Energy Council and its committees for comment prior to submitting a final plan to the OCE. The evaluation plan will describe major evaluation activities proposed for the following year, identify the entity responsible for implementing each component of the plan and proposed budgets for performing the evaluation activities.

Review and Continuing Update of Protocols

The current New Jersey Clean Energy Protocols to Measure Resource Savings (the Protocols) were established by the Board in September 2004 and have been updated several times, most recently in August 2012[14]. A new set of modifications to the Protocols were issued on January 30, 2014 and are currently under consideration[15]. The Protocols were developed to measure resource savings, including energy, capacity, and other resource savings. The Protocols are also used in determining energy and cost savings associated with the Energy Savings Improvement Program.

A thorough, comprehensive review of the protocols is warranted to assure that they provide a technically accurate and current foundation for the new program administrator's assessment of the effectiveness, and cost-effectiveness, of existing programs. The Protocols should be updated annually or as new programs or measures are added, coincident with the Board's approval of annual program plans and budgets. Compliance filings submitted by any program manager should include proposed protocols for any new programs or program components. The annual updates should incorporate improved data to be collected as a result of implementing recommendations of the Data Work Group.

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[14] NJ Clean Energy Program Protocols to measure resource savings – revisions to July 2011 Protocols, August 2012

[15] Draft Revisions to NJCEP Protocols, issued Jan 30, 2014 http://www.njcleanenergy.com/files/file/public_comments/NJ%20Protocols%20Revisions%202013%20Draft%20Update%201-27-14.pdf

The Program Administrator shall include any proposed modifications to the Protocols as part of their annual compliance filings. Currently, AEG compiles the proposed changes to the Protocols and prepares a redlined version that includes all of the proposed changes. AEG circulates the proposed changes for comment, review and assess the comments, and prepare a final draft for submittal to the OCE for consideration by the Board.

AEG will coordinate with the OCE to prepare documents required for consideration by the Board of any proposed changes to the Protocols and will submit proposed changes to the Protocols to the OCE for consideration by the Board each year.

Cost Benefit Analysis

Cost benefit analysis should assess the costs and benefits of individual programs and measures as well as the overall portfolio of programs. Costs should include both the costs of implementing the programs as well as any contributions made by participants or others. Benefits should include both resource savings and environmental, health and other savings as deemed appropriate and documented with supporting justification. In addition, rate and bill impact analyses should be performed. The cost benefit analysis should take a multi-year view of the programs taking into consideration that new programs may have high startup costs.

CEEEP believes that the Board should formally approve the methodologies to be used to assess the costs and benefits of the programs, including the PCT, the PACT the RIM test, the TRC test and the SCT. Such approval should follow a thorough review of these methodologies and the proper role of each in evaluation of the NJCEP and utility-administered programs. CEEEP will work with the Office of Clean Energy and the Clean Energy Council to facilitate a coordinated review of proposed cost benefit analysis methodologies and develop recommendations for consideration by the Board, with opportunity for input from stakeholders.

CEEEP's approach to cost-benefit analysis is quantitative and, in general, does not take into account qualitative characteristics of the various programs and measures. The model simply measures how a program or measure's costs relate to its benefits. The model depends on quality information from the program implementers who propose various programs and measures. Program implementers will be asked to complete a small spreadsheet of requested information that will become input for the model.

CEEEP's cost-benefit model is a fairly simple and a portion of the inputs come from program administrators (electricity savings estimates, tax credits, etc), a portion of inputs come from data sources such as PJM or EIA (electricity or natural gas prices), and a portion of the inputs come from CEEEP (discount rate, transmission and distribution costs, etc.). The model takes these inputs and produces specific outputs such as emission savings, program participant benefits, participant costs, etc.

CEEEP will perform cost-benefit analyses on both completed and proposed energy efficiency programs. The purpose of performing the analysis on *completed* programs is to determine how cost-effective the programs were to determine if the programs should be

continued in the future. The purpose of performing the analyses on *proposed* programs is to project how cost-effective the proposed programs are and to have a common point of comparison to compare the various programs and measures.

V. Proposed Evaluation Activities

The proposed evaluation activities for 2014 through 2016 (including the ones which have been initiated in 2013) are described below and are summarized in Table 3.

Table 3: Proposed New Jersey Evaluation Studies (2014-2016) need to include every program

Table 3: Proposed New Jersey Evaluation Studies		
Fiscal Year	Study	To be conducted by
FY 2014 (1 July 2013 to 30 June 2014)	Clean Energy Economic Impact Stduy	CEEEP + Survey Contractors
	Solar Procurement Volatility Analysis	Third-party Contractors
	Small-Scale Wind, Biopower and Fuel Cell Impact Evaluation	Third-party Contractors
	Evaluation Plan Update	CEEEP
	Cost-Benefit Analysis	CEEEP
	Protocols Update	AEG
	Tracking System Assessment (NJCEP Information Management System) as part of Data Work Group	AEG
	Portfolio Benchmarking Study	Third-party Contractors
FY 2015 (1 July 2014 to 30 June 2015)	Portfolio level Process Evaluation	Third-party Contractors
	Building Characteristics Baseline Studies	Third-party Contractors
	Evaluation Plan Update	CEEEP
	Cost-Benefit Analysis	CEEEP
	Protocols Update	AEG
	Overall Goals, Objectives and Outcomes Assessment	Third-party Contractors
FY 2016 (1 July 2015 to 30 June 2016)	Impact Evaluations	Third-party Contractors
	Market Potential Study	Third-party Contractors
	CRA Proceeding for 2017-2020	BPU
	Evaluation Plan Update	CEEEP
	Cost-Benefit Analysis	CEEEP
	Protocols Update	AEG

a. 2013/2014 Evaluation Activities

Clean Energy Economic Impact Study:

The New Jersey Clean Energy Economy Study has been initiated with an objective to establish a baseline in terms of employment; federal, state, local and private money spent and leveraged; and other economic measures of the positive and negative economic impacts of the New Jersey Clean Energy Economy. The study is expected to collect needed data required for future forecasts related to the clean economy in New Jersey.

Solar Procurement Volatility Analysis:

On October 4, 2012, the Board directed Staff to investigate solar development volatility, and on November 9, 2012, a public meeting was held to begin discussions and review solar market related data. Discussions have continued with stakeholders at the monthly Renewable Energy Committee meetings. Staff has received written comments on the definition of and possible solutions to solar development volatility. In addition a study was initiated to investigate approaches to mitigate solar development volatility.

Small-Scale Wind, Biopower and Fuel Cell Impact Evaluations:

A study has been proposed to evaluate applications of participants in the small-scale wind program, biopower and fuel cell program and assess their actual performance and provide recommendations for future program design.

Tracking System Assessment:

A Tracking System Assessment of the NJCEP Information Management System ("IMS") is necessary to assess the collection of data and ensure consistent tracking and reporting of program data. The study will determine if the proper data is being collected through IMS. In addition, a potential second phase of the study will investigate any potential challenges to using IMS for a financing-based program.

Benchmarking and Metrics Study:

A New Jersey portfolio and program benchmarking analysis was performed by AEG in September 2012[16]. A follow-on analysis is necessary to determine the reasons for New Jersey's programs performance, in comparison with other states' and utilities' programs and to determine appropriate energy efficiency benchmarks for use in future comparisons. The study would also propose standards with metric definitions for each

[16] Evaluation of New Jersey's Clean Energy Programs, June 11, 2012. Applied Energy Group

benchmark that the New Jersey programs should strive to achieve with appropriate reasoning and basis for the use of proposed standards.

b. 2014/2015 Evaluation Activities

Portfolio level Process Evaluations:

No process evaluations have been performed on the Energy Efficiency programs since the program inception in 1999. A process evaluation of all the energy efficiency programs is needed to determine the implementation, effectiveness, operational efficiency, and market actor satisfaction and to develop recommendations for improving their processes going forward. However, as the current programs will be phasing out, it is late to be doing program-by-program process evaluations. Rather, the Evaluation Work Group has recommended a portfolio level process evaluation for the current program cycle, in order to inform the development of the new portfolio regime in the next cycle. A portfolio level process evaluation would look externally to trade allies, contractors and participants to develop lessons learned and gain suggested improvements as well as learn about awareness, satisfaction and insights into the overall portfolio.

Building Characteristics Baseline Studies:

There are several baseline studies that should be considered before the next CRA proceeding to inform the next market potential study. The market potential study that EnerNOC conducted provided an estimated baseline for many measures (including lighting) in the Residential, Commercial, and Industrial sectors. It is important that New Jersey specific baselines be established, though, for future market potential studies. There are several baseline studies that were recommended in the 2010 Evaluation plan and by Rate Counsel, that should be considered in 2014/2015:

- Residential Appliance Saturation Survey
- Residential HVAC
- Residential New Construction
- C&I Equipment Saturation Survey
- C&I New Construction
- Lighting Measures (both Residential and C&I)

These could usefully be combined into complete building characteristics baseline studies, for the residential and for the C&I sectors, similar to the baseline study being initiated in New York (and in Maryland). This approach would have the advantage of capturing a comprehensive description of the building stock, rather than focusing only on subsets of those characteristics (as in the list above). There could even be some useful synergies between the state studies, if it were possible to coordinate the studies.

In addition, the BPU is looking into renewing their Consortium for Energy Efficiency ("CEE") membership which includes the opportunity to sponsor the annual Energy Star

Awareness Survey. The survey may be useful in determining appliance saturations in New Jersey and eliminate the need for the Residential Appliance Saturation Survey and C&I Equipment Saturation Survey.

c. 2015/16 Evaluation Activities

Market Potential:
This study should provide an updated assessment of cost-effective, achievable energy efficiency and renewable energy potential. It should look not just at existing measures, but at emerging technologies as well. As in the past, this study would be a key input to a 2016 BPU decision on the next 4-year funding cycle for the clean energy initiative.

Impact Evaluations:

The following impact evaluations are recommended:

- Home Performance with Energy Star;
- Local Government Energy Audit;
- Pay for Performance;
- Direct Install;
- EE Products (Washers, Appliance Recycling);
- Combined Heat and Power;
- Economic Development Authority CEP Programs;
- Sustainable Jersey;
- Renewable Energy Incentive Program;
- SREC Registration Program;
- Grid Supply Program; and
- Other utility-administered Programs.

These impact evaluations would assess program energy savings impacts in order to assess the effectiveness on the programs and would calibrate savings assumptions associated with the various incentive programs. The evaluations should include analysis of the effect the presence of both NJCEP and utility-administered program have on the impacts of each. In the case of the Home Performance with Energy Star study, actual energy bill savings from program participants would be evaluated.

VI. Responsibilities for Performing Evaluation Activities

Several entities that are involved in the oversight, delivery, evaluation and management of New Jersey's Clean Energy program will have a role in implementing this evaluation plan including:

- The Board of Public Utilities (the "Board" , "BPU");
- The Office of Clean Energy ("OCE");
- Rutgers Center for Energy, Economic and Environmental Policy ("CEEEP");
- Applied Energy Group ("AEG") in its role as Program Coordinator;
- Program Managers (currently Honeywell, TRC, and the utilities);
- The Division of Rate Counsel ("Rate Counsel"); and
- Other Stakeholders.

This section will discuss the respective roles of each of these entities in developing, approving and implementing this evaluation plan. Table 4 provides an overview of the responsibilities of each party involved in evaluation. Please note that all roles in this section assume the current program structure, not the proposed structure, which would establish a single program administrator.

Table 4: Evaluation Activity Responsibilities (Under Current Program Structure)

	Overall Responsibility	Evaluation Plans	Evaluation Contracting	Measurement & Analysis	Regional Initiatives
Board	Sets overall program goals	Approves budgets and plans annually	Releases RFP's and approves contractors	Approves Protocols	
OCE	Oversees all evaluation activities	Make evaluation plan and budget recommendations to Board	Reviews and approves RFP's before submitting to Board, Helps evaluate proposals and select contractors, designates contract manager	Makes recommendations on Protcols	Makes recommendations on activities to participate in
CEEEP	Provides overall program evaluation services	Prepare & manage plans, determine evaluation study need and budget	Prepare RFP, evaluate proposals, manage contractors, track results	Perform CBA's, update avoided cost estimates	Participates and periodically updates OCE on activities. ID's initiatives that support NJ's efforts
AEG	Supports evaluation activities	Assist in development of plans and budgets	Prepare RFP's and manage day-to day activities of contractors	Review and provide CBA input, update Protocols	
Program Managers (Honeywell, TRC, Utilities)	Provide input on program goals, customers of evaluation studies	provide input on priorities & budgets, review evaluation plans	Assist in scope of works and contractor selection, provide input on data collection instruments, provide needed program data	Make recommendations on policy issues related to evaluation activities, Utilities provide supporting data and usage data	
Rate Counsel	Review and comment on evaluation documents	Assist in development of plan, Provide feedback	Review and comment on evaluation papers	Review and comment on Protocols	
Evaluation Study Consultants	Perform major evaluation studies			Carry out measurement and analysis as necessary for studies	Perform studies on a regional or national level

The Board
The Board approves program budgets and plans on an annual basis. As part of the annual program and budget approval process the OCE will submit proposed evaluation budgets and activities to the Board for consideration. The Board authorizes the release of RFPs for evaluation services and approves the selection of contractors to provide evaluation services. The Board approves the protocols used for estimating energy savings.

The OCE
The OCE oversees all evaluation activities including:

- Development of evaluation plans and budgets and preparing recommendations for consideration by the Board
- Review and approval of RFPs for evaluation services prior to submitting to the Board for approval
- Participate as a member of any team put together to evaluate proposals submitted and to select evaluation contractors
- The OCE designates a Contract Manager for each evaluation contractor that has responsibility for reviewing and approving all invoices and any final reports
- Making recommendations on Protocols

Rate Counsel
Rate Counsel provides input on behalf of New Jersey ratepayers, including monitoring, reviewing and providing input on the following:

- Evaluation plans and budgets
- Evaluation protocols, benchmarks and metrics
- RFPs for performance of evaluation work
- Evaluation activities and reports

CEEEP
CEEEP has entered into a multi-year Memorandum of Understanding (MOU) with the Board to provide program evaluation services. As set out in the MOU, CEEEP is responsible for formal evaluation of the effectiveness of the programs. CEEEP has overall responsibility for managing evaluation activities including:

- Preparation of annual and multi-year evaluation plans;
- Managing the implementation of the plans;
- Performing cost benefit analyses and updating avoided cost estimates used to perform cost benefit analysis; and
- Managing Market Potential Studies, Baseline Studies, Market Assessments (except R&D activities as note below), Process Evaluations, and Impact Evaluations. For each of these types of evaluations CEEEP will:
    - Develop sections of the annual evaluation plan indicating when these types of evaluations should be performed and any specific issues the evaluation will assess;

    - Coordinate with the Program Coordinator to ensure that the annual budgets approved by the Board include funding for any recommended evaluation activities;
    - Determine whether the evaluations can be performed in-house at Rutgers or if an RFP will be issued for an outside contractor;
    - Assist with the preparation of RFPs;
    - Either issue the RFP or coordinate with AEG if the RFP is to be issued by Treasury;
    - Participate on the team that evaluates any proposals received in response to RFPs;
    - Review any draft reports issued by evaluation contractors; and
    - Track implementation of recommendations included in evaluation reports.
- Monitor national and regional evaluation activities including NEEP, CESA and CEE
    - Participate as a member of evaluation committees;
    - Provide OCE with periodic reports concerning activities;
    - Provide recommendations regarding benefits of continuing support for these activities; and
    - Identify national and regional evaluation activities that can support NJ's evaluation efforts. Such activities should be specifically identified in the annual evaluation plan.

Program Coordinator (AEG)

In its role as Program Coordinator, AEG will support evaluation activities as follows:

- Assist in the development of annual and multi-year evaluation plans;
- Assist in drafting the scope of work for evaluation RFPs;
- Coordinate the development of annual evaluation plans with the development of annual programs and budgets for consideration by the Board;
- Manage day-to-day activities of selected outside evaluation contractors including:
    - Assist with the collection of data needed to perform evaluations;
    - Review of draft and final reports;
    - Ensuring work is performed in accordance with work plans and on schedule;
    - Provide recommendations regarding payment of invoices;
    - Provide OCE with updates regarding status of evaluation projects; and
    - Coordinate approval of work plans, invoices, final reports and other documents with the designated BPU Contract Manager.
- Coordinate with CEEEP and program managers regarding implementation of recommendations;
- Maintaining and updating the Protocols for Measuring Resource Savings
- Review and provide input into cost benefit analyses; and
- Coordinate with CEEEP and the program managers to develop proposed revisions to protocols, coordinate soliciting comments on proposed changes and coordinate with OCE to develop draft Board Orders and present proposed changes to the protocols to the Board for consideration.

Program Managers (Honeywell, TRC, Utilities)
The Program Managers are responsible for supporting formal evaluation activities in the following ways:

- Providing input to OCE, the Program Coordinator, and CEEEP on evaluation plans, priorities and budgets, based both on their experience and needs delivering programs in New Jersey and their awareness of leading evaluation efforts in other jurisdictions across the continent;
- Providing input on the scopes of work for prioritized studies that will be undertaken;
- Providing input on the selection of evaluation contractors when appropriate (e.g. more so for market assessments, not for impact evaluations);
- Reviewing and providing input on draft evaluation surveys or other data collection instruments;
- Supporting evaluation contractors, CEEEP and/or AEG in accessing program data necessary for evaluation studies;
- Reviewing and providing input on draft evaluation reports; and
- Making recommendations to OCE, AEG, and CEEEP on policies issues related to evaluation activities (e.g. how cost-effectiveness tests should be applied to measure or program screening).

Though not a formal evaluation activity, Program Managers have an on-going responsibility to continually re-assess their operations and programs based on informal market feedback. They also may lead research and development activities (once approved by the OCE), including the hiring of contractors to carry out such work. Finally, they are also obvious "customers" for the more formal evaluation work to be managed by CEEEP. All of that information – from informal market feedback, R&D work and formal evaluation studies – should inform the Program Managers in carrying out of their program design responsibilities.

VII. Appendix A: Previous Evaluation Plans and Studies

Evaluation Plans

1. "New Jersey Clean Energy Program, 2004-2005 Evaluation and Research Plan Phase 1: Activities to be Initiated 2004", Center for Energy, Economic, and Environmental Policy, August 5, 2004.

2. "2004 – 2005 Evaluation and Research Plan Phase 2: Activities to be Initiated 2005", Center for Energy, Economic, and Environmental Policy, February 4, 2005.

3. "2006 Evaluation and Research Plan", Center for Energy, Economic, and Environmental Policy, February 15, 2006.

4. "2007 Evaluation and Research Plan", Center for Energy, Economic, and Environmental Policy, February 19, 2007.

5. "2010-2011 Evaluation and Research Plan", Center for Energy, Economic, and Environmental Policy, January 27, 2010.

6. "2012 Evaluation and Research Plan", Center for Energy, Economic, and Environmental Policy, July 31, 2012.

Evaluation Studies

7. "New Jersey Comprehensive Resources Analysis Market Assessment", XENERGY, Inc., August 19, 1999.

8. "The Market for Operations and Maintenance Training in New Jersey", Pacific Energy Associates, May 25, 2000.

9. "Commercial/Industrial Chiller Market Database Report", Pacific Energy Associates, September 26, 2000.

10. "Residential New Construction Attitude and Awareness Baseline Study", Roper Starch Worldwide, June 2001.

11. "Compressed Air Systems Market Assessment In the Public Service Electric and Gas Service Territory", Aspen Systems Corporation, May 2001.

12. "New Jersey Residential HVAC Baseline Study", XENERGY, Inc., November, 16, 2001.

13. "Evaluation of Home Energy Audit Tools", Center for Energy, Economic, and Environmental Policy, February 19, 2004.

14. "New Jersey LIWAP and NJ Comfort Partners Comparison of Programs and Evaluation Findings", Apprise, June 2004.

15. "New Jersey Clean Energy Program, 2003 Program Evaluation - Energy Efficiency and Renewable Energy Programs", Center for Energy, Economic, and Environmental Policy, July 30, 2004.

16. "New Jersey Energy Efficiency and Distributed Generation Market Assessment", KEMA Inc., August 2004.

17. "New Jersey Renewable Energy Market Assessment", Navigant Consulting Inc., August 2, 2004.

18. "Protocols to Measure Resource Savings ",Center for Energy, Economic, and Environmental Policy, September 2004

19. "Impacts of Environmental Externalities Upon Relative Costs of Renewable Technology & Impact of The Deployment of Renewable Generation On The market Price of Electricity", Center for Energy, Economic, and Environmental Policy, October 7, 2004.

20. "Process Evaluation of the Renewable Energy Programs Administered and Managed by the New Jersey Board of Public Utilities, Office of Clean Energy", Aspen Systems Corporation, November 2004.

21. "Economic Impact Analysis of a 20% New Jersey Renewable Portfolio Standard", Center for Energy, Economic, and Environmental Policy, December 8, 2004.

22. "Program Cost-benefit Analysis of 2003 New Jersey Clean Energy Council Energy Efficiency Programs", Center for Energy, Economic, and Environmental Policy, July 28, 2005.

23. "Appliance Cycling Evaluation", Center for Energy, Economic, and Environmental Policy, September 2, 2005.

24. "Energy Efficiency Market Assessment of New Jersey Clean Energy Programs", Summit Blue Consulting, LLC., July 20, 2006.

25. "Preliminary Review of Alternatives for Transitioning the New Jersey Solar Market from Rebates to Market-Based Incentives", Summit Blue Consulting and Rocky Mountain Institute, March 15, 2007.

26. "NJCEP 2007 Business Survey Report", Market Strategies, November 6, 2007.

27. "Protocols to Measure Resource Savings ",Center for Energy, Economic, and Environmental Policy, December 2007.

28. "Cost-benefit Analysis of the New Jersey Clean Energy Program Energy Efficiency Programs", Center for Energy, Economic, and Environmental Policy, January 9, 2008.

29. "Assessment of the New Jersey Renewable Energy Market", Summit Blue Consulting, March 24, 2008.

30. "Review and Update of Energy Efficiency Market Assessment For the State of New Jersey", Center for Energy, Economic, and Environmental Policy, June 2008.

31. "NJCEP 2008 Residential Survey Report", Market Strategies, August 22, 2008.

32. "CEEEP's Cost-Benefit Model Manual", Center for Energy, Economic, and Environmental Policy, November 18, 2008.

33. "Combined Heat & Power (CHP) Program Impact Evaluation", KEMA, Inc., June 10, 2009.

34. "New Jersey's Clean Energy Program Residential HVAC Impact Evaluation and Protocol Review", KEMA, Inc., June 11, 2009.

35. "Residential New Construction Program Impact Evaluation", KEMA, Inc., June 17, 2009.

36. "New Jersey's Clean Energy Program Residential CFL Impact Evaluation and Protocol Review", KEMA, Inc., July 9, 2009.

37. "New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review: SmartStart Program Protocol Review", KEMA, Inc., July 10, 2009.

38. "New Jersey's Clean Energy Program Energy Impact Evaluation: Customer On-site Renewable Energy Program (CORE)", KEMA, Inc., July 13, 2009.

39. "New Jersey's Clean Energy Program Energy Impact Evaluation: SmartStart Program Impact Evaluation", KEMA, Inc., July 29, 2009.

40. "Cost-Benefit Analysis of the 2007 New Jersey Clean Energy Program Energy Efficiency Programs", Center for Energy, Economic, and Environmental Policy, March 2010.

41. "Cost-Benefit Analysis of the 2008 New Jersey Clean Energy Program Energy Efficiency Programs", Center for Energy, Economic, and Environmental Policy, March 2010.

42. "Cost-Benefit Analysis of the Proposed 2009 Energy Efficiency Utility Programs Associated with the New Jersey Economic Stimulus Plan - Summary Report", Center for Energy, Economic, and Environmental Policy, March 2010.

43. Market Assessment Services to Characterize the Opportunities for Renewable Energy – Final Report, Navigant Consulting, Inc., August 6, 2012.

44. New Jersey Energy Efficiency Market Potential Assessment, Volume 2, Report, EnerNOC Utility Solutions Consulting, October 17, 2012

45. Program Cost Analysis – Phase 2: Program Level Results, An addendum to the New Jersey Energy Efficiency Market Potential Assessment, EnerNOC Utility Solutions Consulting, July 25, 2013.

VIII. Appendix B: Observations of the Evaluations Work Group on Data Needs for Evaluation

Objective: To identify data required already collected or needs to be collected as part of the administration and management of clean energy programs in order to perform the various types of energy evaluation studies.

Approach: The table below (Table 5) lists primary data required against each type of evaluation study. It then compares the needed data with data that would be collected by a Program Administrator – in the current set up that would be the Program Administrator in its Information Management System (IMS) and the Market Managers for NJCEP – and data that falls outside program administration functions. Program administration functions include the data needed for invoicing, budgeting, quality control, reporting, etc.

Table 6, below, matches data needed for evaluation with what is presently being collected in IMS. Together these two documents provide an overall idea of how IMS and its progeny can be used while conducting evaluation studies.

Table 5: Desired Data to be Collected and Inputted into IMS as Part of Its Functions (Invoicing, Reporting, Program Administration) for All New Jersey Energy Efficiency Programs (whether NJCEP, Utilities, or Others)

	Type of Energy Evaluation Study	Data Already Collected or Needs to be Collected by the Program Administrator and Supporting Contractors	Data outside Program Administrator's Scope
A	**Baseline** – a type of market assessment studies that provide a snapshot in time of the state of a market. These studies define what the state of the market is at the beginning of a particular program as a means of comparison for future results. Most recent baseline study was performed by EnerNoc in 2013.	1. Existing energy efficiency measure data i. List of all major appliances, number, their age or year of installation, energy efficiency rating, manufacturer, manufacturer product identification codes (model number, model name), location (EDC area), building type 2. Replacement measures i. List of replacement appliances, number, their age or year of installation, energy efficiency rating,	1. Load reduction as a result of ongoing Demand Response programs 2. Population/ Demographics (e.g., size of family, income level) 3. Nielsen-type data (e.g., age, income, …) 4. Utility bills

	Type of Energy Evaluation Study	Data Already Collected or Needs to be Collected by the Program Administrator and Supporting Contractors	Data outside Program Administrator's Scope
		manufacturer, manufacturer product identification codes (model number, model name), location (EDC area), building type 3. Energy audits 4. Program participation 5. Contact information 6. Utility account number	
B	**Technical, Economic and Market Potential** – Technical potential is an estimate of the total level of EE/RE resources available unrestrained by economics. Economic potential screens for available EE/RE resources that are economically viable compared to other available alternatives. Market potential estimates the realistic level of economic resources that can be developed taking into consideration other market factors. Most recent technical and market potential study was performed by EnerNoc in 2013 based upon rebate levels and TRC threshold	1. See baseline study 2. Existing measure cost, electricity and natural gas usage by month, and measure life 3. Replacement measures cost, electricity and natural gas usage by month, and measure life 4. Utility and utility rate class 5. SIC/NAICS codes 6. Incremental costs and savings	1. Ownership type – rented/ self-usage (residential); C&I building type 2. New construction 3. Information about existing and future measures, building codes, building inventory, custom measures etc. 4. New technologies, especially for renewable resources 5. % of population participating
C	**Market Assessment** - address specified market attributes such as customer awareness, market barriers (and strategies to remove/reduce them), product and service availability, prices, new products, and market share	1. Marketing budgets of program managers and utilities 2. Reason for each measure replacement (equipment failure, economics, program incentives, etc.)	1. Understanding the customer's decision-making process: when and why the decision was made 2. State goals & policy 3. Financing options and availability

	Type of Energy Evaluation Study	Data Already Collected or Needs to be Collected by the Program Administrator and Supporting Contractors	Data outside Program Administrator's Scope
	of energy efficient products and services.	3. Who is the decision-maker? 4. Incentives for each measure	
D	**Code compliance study** Most recent studies performed in 2006 and 2008.	1. See above	1. New code adoption and compliance
E	**Impact Evaluations** - support the measurement of energy savings, the amount and distribution of savings, and the appropriateness and comprehensiveness of measures. They can also provide insight into key aspects of program impacts, including estimated free rider and spillover effects. Most recent studies performed by KEMA in 2009.	2. Monthly electric and natural gas bills for 12 months before and after, date of bills	1. Verification of measure installed 2. Net-to-gross study at or near time of installation
F	**Benchmarking –** compares savings and cost-effectiveness of programs run by different managers Benchmarking study planned for in 2014.	1. See impact evaluation	1. Savings and costs of similar programs in other states
G	**Process Evaluations** - address implementation effectiveness, operational efficiency, and customer satisfaction, attitudes, and awareness related to specified programs.	1. Time to complete each major milestone from initial program contact to final payment of incentives 2. Scrub rates, partial projects 3. QA/QC data	1. Program Administrator and Program Manager organizational structure

	Type of Energy Evaluation Study	Data Already Collected or Needs to be Collected by the Program Administrator and Supporting Contractors	Data outside Program Administrator's Scope
	Most recent process evaluation conducted in 2004.		
H	**Cost-benefit analysis** (prospective and retrospective) - should assess the costs and benefits of individual measures, programs and the overall portfolio of programs. Cost-benefit analyses have been conducted in 2004, 2005, and annually since 2008.	1. See baseline and technical market potential 2. Program administrative budgets 3. See above	1. Other non-IMS data includes price forecasts, discount rate, emissions, costs of emissions, and electrical and natural gas losses, avoided T&D, non-energy benefits and costs, PJM prices including congestion and load pockets, etc. (see CEEEP CBA assumptions memo posted on CEEEP website for further information)
I	**Tracking System Assessments**		
J	**Technical Resource Manual** (**Protocols**)	Should IMS independently produce the calculations in the protocol? Note: Calculations from the Protocols provide values that end up in IMS but IMS itself does not affect the Protocols	
K	**Clean Energy Economic Impact** – assessing the size and economic impact of the NJ Clean Energy Economy	1. Name and complete contact information of vendors/contractors 2. NAICS code for vendors/contractors 3. Company revenue and employment in New Jersey 4. Number of employees in clean energy jobs (or	1. Induced impact of clean energy economy

	Type of Energy Evaluation Study	Data Already Collected or Needs to be Collected by the Program Administrator and Supporting Contractors	Data outside Program Administrator's Scope
		percent of time spent on clean energy jobs) 5. Total wages (or percent) in clean energy jobs 6. Occupations of employees in clean energy jobs 7. Specific information for each project (hours, wages, benefits, types of employees, cost of materials, cost of wages)	
L	**Marketing Evaluation** - effectiveness of marketing efforts	1. How did program participant hear about the program?	1. Broader public awareness of Clean Energy Programs
M	**Overall New Jersey State Goals (Legislative goals, Energy Master Plan, etc.)**	1. Maintenance of historical data	1. Establishment of quantifiable long-term Clean Energy Program Goals 2. Comparison of historical and current programs to long-term goals 3. Tracking of State goals (EMP) and relate to Baseline Analysis and Market Assessment

Table 6: Matching Data Requirement for Evaluation Studies with the IMS Data Table[17]

	Study	Data needed	Reference – IMS Data Table
A	Baseline	7. Existing energy efficiency measure data i. List of all major appliances, number,	Row 107 – 117 (no of units installed, installation location, efficiency-seer, efficiency-eer, measure install/approve/purchase date, measure

[17] ARRA related information is not included in this analysis.

	Study	Data needed	Reference – IMS Data Table
		their age or year of installation, energy efficiency rating, manufacturer, manufacturer product identification codes (model number, model name), location (EDC area), building type	id_installed (Codes Provided), manufacture_installed, model_installed, serial number_installed, capacity_installed, capacity units_installed)
		8. Replacement measures i. List of replacement appliances, number, their age or year of installation, energy efficiency rating, manufacturer, manufacturer product identification codes (model number, model name), location (EDC area), building type	Row 143 – 154 (measure id - removed or replaced, no of units - removed or replaced removal date, manufacturer - of removed or replaced, model - of removed or replaced, serial number - of removed or replaced, capacity - of removed or replaced, capacity units - of removed or replaced, efficiency-seer - of removed or replaced, efficiency-eer - of removed or replaced, efficiency - other - of removed or replaced, efficiency - other – type - of removed or replaced)
		9. Building type information	Row 4 -10 (building_num_id, building_address1, building_address2, building_city, building_state, building_zip, hers_rating) Row 46 – 51 (buildbusiness_type, building/unit square footage, rnc tier, no_of_members_household, household_income, no_of_buildings)
		10. EDC (servicing utility information)	Row 11 – 13 (utility company id, utility a/c num, service types)
B	Technical and Market Potential	7. Existing measure cost, electricity and natural gas usage by month, and measure life	Row 118 – 125 (install_ann_savings_kwh, install_lifetime_savings_kwh, install_peakdemand_savings_kw, install_therm_per_year, install_therm_lifetime, install_ann_gen_kwh, install_lifetime_gen_kwh, install_peakdemand_gen_kw)
		8. Replacement measures cost, electricity and natural gas	Row 156 – 157 (usage - of removed or replaced, usage units - of removed or

	Study	Data needed	Reference – IMS Data Table
		usage by month, and measure life	replaced)
		9. Measure life	
C	Market Assessment	4. Marketing budgets of program managers and utilities	
		5. Reason for each measure replacement (equipment failure, economics, program incentives, etc.)	
		6. Incentives for each measure	Row 126 – 130 (committed_incentive, to_be_paid_incentive, paid_incentive, month, year)
D	Impact Evaluations	3. Monthly electric and natural gas bills for 12 months, date of bills	Row 58 – 71 (install_ann_savings_kwh, install_lifetime_savings_kwh, install_therm_per_year, install_therm_lifetime, install_ann_generation_kwh, install_lifetime_generation_kwh, install_savings_peak_demand_kw, install_gen_peak_demand_kw, file_names (of attached documents), install_ann_savings_oil_mmbtu, install_lifetime_savings_oil_mmbtu, install_ann_savings_propane_mmbtu, install_lifetime_savings_propane_mmbtu, savings_gen_NOT_expected_ind) Row 72 – 84 (comm_ann_savings_kwh, comm_lifetime_savings_kwh, comm_therm_per_year, comm_therm_lifetime, comm_ann_generation_kwh, comm_lifetime_generation_kwh, comm_savings_peak_demand_kw, comm_gen_peak_demand_kw, comm_ann_savings_oil_mmbtu, comm_lifetime_savings_oil_mmbtu, comm_ann_savings_propane_mmbtu, comm_lifetime_savings_propane_mmbtu, committed_incentive)

	Study	Data needed	Reference – IMS Data Table
			Row 85 – 96 (verif_ann_savings_kwh, verif_lifetime_savings_kwh, verif_therm_per_year verif_therm_lifetime, verif_ann_generation_kwh, verif_lifetime_generation_kwh, verif_savings_peak_demand_kw, verif_gen_peak_demand_kw, verif_ann_savings_oil_mmbtu, verif_lifetime_savings_oil_mmbtu, verif_ann_savings_propane_mmbtu, verif_lifetime_savings_propane_mmbtu)
E	Benchmarking	2. See impact evaluation	
F	Process Evaluations	4. Time to complete each major milestone from initial program contact to final payment of incentives 5. Note: many important processes are not part of IMS	Row 53 – 56 (application_received, application_approved, app_completed_dt, application_rejected) Row 187 – 193 (invoice_id (PM unique ID), amount, inv_type ("CR", "PE", "UT"), market_manager_id (Codes Provided), invoice_start_dt, invoice_end_dt) Row 102 – 106 (paid_incentive / amount cashed, payment_authorized_date, paid date / check cut date, check cashed date)
G	Cost-benefit analysis	4. See baseline and technical market potential 5. Program administrative budgets	Row 43 – 44 (estimated project cost, actual project cost)
H	Tracking System Assessments		
I	Technical Resource	Should IMS independently produce the calculations in the	

	Study	Data needed	Reference – IMS Data Table
	Manual (Protocols)	protocol? Note: Calculations from the Protocols provide values that end up in IMS but IMS itself does not affect the Protocols	
J	Clean Energy Economic Impact	2. Name and complete contact information of vendors/contractors 3. NAICS code for vendors/contractors 4. Company revenue and employment in New Jersey 5. Number of employees in clean energy jobs (or percent of time spent on clean energy jobs) 6. Total wages (or percent) in clean energy jobs 7. Occupations of employees in clean energy jobs 8. Specific information for each project (hours, wages, benefits, types of employees, cost of materials, cost of wages)	Row 14 – 27 (companyperson_id, company_name, first_name, middle_name, last_name, address1, address2, city, state, zip, phone_number, fax_number, e_mail, fed tax id / ssn) Row 196 -210 (contract_line_id, contract_num (If none - "Undefined Contract"), units, amount, file_names (of attached documents), job_code, notes, media_type_code, amount, amount_desc_ind, job_type_code, hours, material cost, administration_labor cost, total cost of project)

IX. Appendix C: Evaluation Activity Definitions

The following definitions of evaluation activities are included in the Glossary of Terms and Acronyms prepared for the Regional Evaluation, Measurement and Verification Forum[18] that are applicable to the evaluation activities described in this report:

Achievable Potential - The amount of energy or demand savings within a defined geographical area or population that can be achieved in response to specific energy efficiency program designs, delivery approaches, program funding, and measure incentive levels. Achievable potential studies are sometimes referred to as Market Potential studies.

Avoided Costs - In the context of energy efficiency, these are the costs that are avoided by the implementation of an energy efficiency measure, program, or practice. Such costs are used in benefit cost analyses of energy efficiency measures and programs. Because efficiency activity reduces the need for electric generation, these costs include those associated with the cost of electric generation, transmission, distribution, and reliability. Typically, costs associated with avoided energy and capacity are calculated. Other costs avoided by the efficiency activity can also be included, among them the value of avoided emissions not already embedded in the generation cost, impact of the demand reduction on the overall market price for electricity, avoided fuel or water, etc. For natural gas efficiency programs, avoided costs include components of the production, transportation, storage, and service that are variable to the amount of natural gas delivered to customers.

Baseline - Conditions, including energy consumption and related emissions that would have occurred without implementation of the subject measure or project. Baseline conditions are sometimes referred to as "business-as-usual" conditions and are used to calculate program related efficiency or emissions savings. Baselines can be defined as either project-specific baselines or performance standard baselines (e.g. building codes).

Baseline Data - The baseline conditions of the facilities, market segment, generating equipment, or other area of focus of the subject project or program.

Benchmarking - A process that compares the energy, emissions, and other resource-related conditions of a facility against industry best practices.

Benefit-Cost Ratio - The mathematical relationship between the benefits and costs associated with the implementation of energy efficiency measures, programs, practices, or emissions reductions. The benefits and costs are typically expressed in dollars. Also see Benefit Cost Test and Avoided Cost.

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[18] Glossary of Terms and Acronyms, Version 1.0, Prepared for the Regional Evaluation, Measurement and Verification Forum by Paul A. Horowitz, PAH Associates, March 2009

Benefit Cost Test - Also called Cost-Effectiveness Test. The methodology used to compare the benefits of an investment with the costs. Five key benefit-cost tests have, with minor updates, been used for over 20 years as the principal approaches for energy efficiency program evaluation. These five cost-effectiveness tests are the participant cost test (PCT), the utility/program administrator cost test (PACT), the ratepayer impact measure test (RIM), the total resource cost test (TRC), and the societal cost test (SCT).

Cost-Benefit and Cost-Effectiveness Analysis - Analysis that compares the benefits associated with a program or measure's outputs or outcomes with the costs (resources expended) to produce them. Cost-benefit analysis is typically conducted to determine the relationship of the program's benefits and costs, as a ratio, once the decision has been made to implement or design the program; programs with benefit-cost ratios greater than 1.0 provide overall ratepayer benefits. Cost-effectiveness analysis is generally undertaken to compare one program or program approach to other approaches, or options for the use of funds, to determine the relationship among the options. The terms are often interchanged in evaluation discussions.

Cost-Effectiveness - An indicator of the relative performance or economic attractiveness of any energy efficiency investment or practice. In the energy efficiency field, the present value of the estimated benefits produced by an energy efficiency program is compared to the estimated total costs to determine if the proposed investment or measure is desirable from a variety of perspectives (e.g. whether the estimated benefits exceed the estimated costs from a societal perspective).

Economic Potential - The amount of savings opportunities that can be acquired cost-effectively.

Evaluation - The conduct of any of a wide range of assessment studies and other activities aimed at determining the effects of a program, understanding or documenting program performance, program or program-related markets and market operations, program-induced changes in energy efficiency markets, levels of demand or energy savings, or program cost effectiveness. Market assessment, monitoring and evaluation (M&E), and measurement and verification (M&V) are aspects of evaluation.

Impact Evaluation - An evaluation of the program-specific directly induced quantitative changes (e.g. kWh, kW, and therms) attributable to an energy efficiency program.

Market Assessment - An analysis that provides an assessment of how and how well a specific market or market segment is functioning with respect to the definition of well-functioning markets or with respect to other specific policy objectives. Generally includes a characterization or description of the specific market or market segments, including a description of the types and number of buyers and sellers in the market, the key actors that influence the market, the type and number of transactions that occur on an annual basis, and the extent to which market participants consider energy efficiency as an important part of these transactions. This analysis may also include an assessment of whether a market has been sufficiently transformed to justify a reduction or elimination

of specific program interventions. Market assessment can be blended with strategic planning analysis to produce recommended program designs or budgets. One particular kind of market assessment effort is a baseline study, or the characterization of a market before the commencement of a specific intervention in the market, for the purpose of guiding the intervention and/or assessing its effectiveness later.

Net-to-Gross Ratio (NTGR) - A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts. The factor itself may be made up of a variety of factors that create differences between gross and net savings, commonly including estimated free riders and spillover. Other adjustments may include a correction factor to account for errors within the project tracking data, breakage, and other factors that may be estimated which relate the gross savings to the net effect of the program. Can be applied separately to either energy or demand savings.

Potential Studies - Studies conducted to assess market baselines and future savings that may be expected for different technologies and customer markets over a specified time horizon. Potential is typically defined in terms of 1) technical potential - savings estimate based solely on currently and anticipated available technology; 2) achievable potential - savings estimate based on market forces, codes and standards, equipment efficiency, and energy efficiency programs; and 3) economic potential - estimate of savings limited by only those found to be cost-effective.

Process Evaluation - A systematic assessment of an energy efficiency program for the purposes of documenting program operations at the time of the examination and identifying and recommending improvements to increase the program's efficiency or effectiveness for acquiring energy resources, while maintaining high levels of participant satisfaction.

Technical Potential - An estimate of energy savings based on the assumption that all existing equipment or measures will be replaced with the most efficient equipment or measure that is technically feasible over a defined time horizon, without regard to cost or market acceptance.