Duquesne Light
Our Energy...Your Power

411 Seventh Avenue
16th Floor
Pittsburgh, PA 15219

Tel 412-393-1541
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Gary A. Jack
Assistant General Counsel

December 14, 2010

Via Overnight Mail

CONTAINS CONFIDENTIAL INFORMATION

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

Re: Petition of Duquesne Light Company for Approval of its Energy Efficiency and Conservation and Demand Response Plan
Docket No. M-2009-2093217

Dear Secretary Chiavetta:

Enclosed for filing and the Commission's approval are an original and three copies of Duquesne Light Company's proposed Conservation Service Provider ("CSP") Agreement for its Evaluation, Measurement and Verification of its Energy Efficiency and Conservation and Demand Response Plan in the above-referenced proceeding. **Please note that page 3 of Exhibit D to the CSP Agreement contains confidential information and should be accorded confidential treatment by the Commission. It has been placed in a separate confidential envelope and should not be placed as part of the public record.**

Act 129 requires the Commission to establish procedures to review all proposed energy efficiency contracts with conservation service providers prior to execution of the contract. 66 Pa. C.S. § 2806.1(a)(8). In selecting this CSP, Duquesne considered all of the factors the Commission deemed important in its Implementation Order at Docket No. M-2008-2069887, including quality of prior performance, timeliness of performance, quality of the proposed work plan or approach, knowledge, background and experience of the personnel to be utilized and other factors deemed relevant. The selected CSP is a PUC approved and registered CSP under Docket No. A-2009-2092203.

Sincerely yours,

Gary A. Jack

Enclosures
cc: Bohdan Pankiw – Law Bureau
Robert Wilson – Fixed Utility Services
Wayne Williams – Bureau of Conservation, Economics & Energy Planning

CSP SERVICES AGREEMENT

This CSP Services Agreement, dated _____, is made by and between Duquesne Light Company ("DLC" or "Company") and Navigant Consulting, Inc. ("NCI" or "CSP").

WHEREAS, NCI is in the business of providing evaluation measurement and verification of utility energy efficiency programs; and

WHEREAS, DLC is an electric distribution company ("EDC") in Pennsylvania; and

WHEREAS, Act 129 of House Bill 2200 was signed into law by Governor Rendell on October 15, 2008, requiring each EDC to create and submit an energy efficiency and conservation plan by July 1, 2009; and

WHEREAS, DLC submitted an energy efficiency and conservation plan to the Pennsylvania Public Utility Commission ("PA PUC") on June 30, 2009; and

WHEREAS, DLC was granted approval of its energy efficiency and conservation plan under PA PUC Docket No. M-2009-2093217 on October 27, 2009 to be effective December 1, 2009; and

WHEREAS, the PA PUC contracted with GDS Associates, Inc. ("GDS") as the Act 129 Statewide Evaluator ("SWE") for the Energy Efficiency and Conservation Programs of the large Pennsylvania Electric Distribution Companies ("EDCs"); and

WHEREAS, GDS created, and the PA PUC approved, an Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs, December 1, 2009 ("Audit Plan"); and

WHEREAS, DLC has prepared an Evaluation Measurement and Verification Plan for its 2010-2012 Energy Efficiency and Conservation Programs, a copy of which is attached hereto as Exhibit E (the "EM&V Plan"); and

WHEREAS, the SWE reviewed and approved the EM&V Plan on August 31, 2010 and finds it to be compliant with the Audit Plan; and

WHEREAS, NCI certifies that it was approved by and is a member of the PA PUC's Registry of Conservation Service Providers and will maintain such registration with the PA PUC for the term of the contract; and

WHEREAS, DLC is relying upon the skill and expertise of NCI to implement DLC's EM&V Plan by performing evaluation measurement and verification of savings and processes of DLC's Act 129 Energy Efficiency and Conservation and Demand Response Programs.

NOW, THEREFORE, in consideration of the premises and of the mutual benefits and covenants contained herein, the parties hereto, intending to be legally bound hereby, agree as follows:

1. DEFINITIONS

"Applicable Law" means any applicable constitution, charter, act, statute, law, ordinance, code, rule regulation, judgment, decree, writ, order, permit, approval or the like of any Governmental Authority.

"Company" shall mean Duquesne Light Company.

"**Company's Site**" shall mean 411 Seventh Avenue, Pittsburgh, PA 15219.

"**Price**" shall mean the purchase price or prices stated in Exhibit D of the CSP Agreement.

"**CSP Agreement**" shall mean this Agreement, along with Exhibits dated November __, 2010.

"**Services**" shall mean CSP services, Work Product and any other work performed by CSP necessary to fulfill CSP's obligations under the CSP Agreement.

"**Subcontractor**" shall mean vendors, suppliers and subcontractors of any tier and any other persons or entities contracting directly or indirectly with CSP for or in regard to the CSP Agreement.

"**Work**" shall mean CSP services. Work Product and other work performed by Contractor as necessary to fulfill CSP's obligations under the CSP Agreement.

"**Work Product**" shall mean studies, reports, evaluations, designs, drawings, procedures, specifications, plans and all other documentation and deliverables which are prepared, produced or acquired by CSP for the Work or at the request or direction of Company in connection with the Plan's requirements for reduction in demand and consumption.

2. ENGAGEMENT OF CSP; CSP'S WORK

Subject to the terms and conditions of this CSP Agreement, DLC hereby engages NCI to properly and completely perform evaluation, measurement and verification of its Act 129 energy efficiency and conservation programs. CSP shall perform the Work in a professional and workmanlike manner and with accuracy and reasonable care and skill. Specifically, the Services to be provided are shown on Exhibit C.

3. CSP'S ACKNOWLEDGMENT

CSP, by performing the Work and/or delivering the Work Product, by any performance under this CSP Agreement and/or by written acknowledgement, accepts the offer contained in this Agreement and such acceptance of the offer is expressly limited to the terms and conditions as set forth herein. Any term or condition proposed by CSP, in the Proposals or otherwise, which is different from, conflicts with or adds to any of the provisions of this CSP Agreement, shall be deemed to materially alter the provisions of this CSP Agreement and is hereby objected to and rejected by DLC. Except as expressly provided herein, under no circumstances shall any term and/or condition of the Proposal or CSP's sales documents or otherwise become part of this CSP Agreement.

4. PROJECT SCHEDULE

(a) CSP shall design, submit and assist with the implementation of an energy efficiency and conservation plan to meet all the needs and requirements of DLC, applicable laws and applicable standards, to achieve all the requirements identified in the Proposals and to allow DLC to properly and efficiently implement a Plan as defined in the Scope and Exhibit C. Company shall be entitled to implement adequate provisions and procedures for monitoring performance quality and rate of progress. Such is set forth in more detail in Exhibit C.

(b) (i) Except as expressly set forth herein, CSP is authorized to commence the Work and shall perform the Work in accordance with and within the time schedule contained in the project schedule attached hereto as Exhibit B (the "Project Schedule").

(ii) If at any time CSP determines that it is behind schedule or is unable to meet any milestone set forth in the Project Schedule, CSP shall, within five (5) days of its knowledge of such delay, promptly notify DLC, in writing, of any anticipated material departure from the Project Schedule and if CSP has reason to believe that a milestone or the Completion Date will not be met and shall specify in said notice corrective action planned by CSP to timely complete the Work or any portion thereof; provided, however, that such notice shall not relieve Vendor of any of its obligations under the CSP Agreement or its obligations to take all actions necessary to achieve the timely and proper completion of the Work. At all times, CSP shall take such actions as may be necessary to facilitate the timely and proper completion of the Work on or prior to any applicable milestones set forth in the Project Schedule or by the Completion Date.

(iii) CSP understands and agrees that time is of the essence with respect to the dates and times set forth in the Project Schedule, including, but not limited to, the Completion Date, and for performance of the Work.

5. PRICE AND PAYMENT

The price or compensation to be paid to CSP shall be as was bid by CSP Provider and accepted herein by Company upon acceptable performance of the Services. Those payment arrangements

are shown in Exhibit D. Compensation shall be based on time and materials, not to exceed the agreed upon price, explained further in Exhibits C and D.

Unless otherwise agreed upon, statements must be submitted monthly, within 30 days after the end of a billing month. Itemized statements for services and expenses should be submitted directly to Dave Defide, Duquesne Light Company, 411 Seventh Avenue, Mail Drop 8-6, Pittsburgh, PA 15219. If any (portion) of the Work does not conform to the requirements of the CSP Agreement upon inspection by Company, a corresponding portion of the Price may be withheld by Company until the nonconformity is corrected. Invoices shall be paid within 45 days.

6. WARRANTIES

CSP represents, warrants and guarantees that the Work provided under the CSP Agreement shall be: (a) provided in accordance with, and conform to, the requirements of the CSP Agreement; (b) provided in accordance with the standard of care consistent with generally accepted industry practices and procedures in CSP's particular area of expertise; and (c) suitable for the specified purposes.

CSP represents, warrants and guarantees that it is not an affiliate of Duquesne or any other Pennsylvania EDC. If CSP should merge with a Pennsylvania EDC during the term of the CSP Agreement, then the CSP shall immediately notify Duquesne and provide for automatic termination of the CSP Agreement.

CSP represents, warrants and guarantees that it will conduct criminal background checks for all employees of the CSP that will enter a customer's premises or otherwise have personal contact with an EDC customer.

If, during the sixty-day period following completion of the Work, it is shown there is an error in the Work caused solely by CSP's failure to meet such standards and Company has notified CSP in writing of such error within that period, CSP shall re-perform, at no additional cost to Company, such Work as may be necessary to remedy such error.

Company shall have no liability for defects in the Work attributable to CSP's reliance upon or use of data, design criteria, drawings, specifications or other information furnished by Company.

7. OWNERSHIP RIGHTS

CSP warrants that the Work shall not infringe or misappropriate the intellectual property rights of any third parties. Company shall have exclusive use of and own title, rights and interests in and to all Work. All Work shall be considered "work made for hire."

At all times, each party shall retain all of its rights in its drawings details, designs, specifications, databases, computer software, copyrights, trade and service marks, patents, trade secrets, and any other proprietary property.

8. FACILITIES, SUPPLIES AND EQUIMENT

To the extent that CSP's Work must be performed at Company's Site, Company shall furnish the facilities, supplies and equipment which Company determines are reasonably required for CSP to perform Work under the CSP Agreement.

9. TERMINATION

Company may terminate all or part of the CSP Agreement if CSP: performs below acceptable standards, abandons the work; becomes bankrupt or insolvent; is unable to obtain a bond, if required; assigns the CSP Agreement or subcontracts any portion thereof without Company's written consent; or otherwise breaches or fails to comply with the CSP Agreement; provided, however, that prior to such termination, Company must have notified CSP in writing of its intent to terminate the CSP Agreement and the reasons therefore, and CSP must have failed to cure such non-compliance within ten (10) days after receipt of such notice. If Company so terminates the CSP Agreement, Company may complete or contract with a third party to complete all or part of the Work, and CSP shall be liable to Company for the excess costs to complete all or such part of the Work and any other damage resulting from CSP's non-compliance or breach. Company may suspend all payments to CSP in order to protect ratepayer funds pursuant to Commission order.

Company may, at any time, also terminate by written notice all or part of the CSP Agreement due to modification of its Energy Efficiency/Conservation plan. Upon receipt of such notice, CSP shall bring the work to a prompt conclusion. Company shall pay CSP a proportionate amount of the price due to CSP for the portion of the Work completed up to the effective date of the termination plus costs necessarily incurred directly as a result of the termination, subject to Company's right to audit CSP's books and records. Such payment by Company, however, shall not exceed the total price for the Work set forth in the CSP Agreement.

In all cases, Company may require CSP to transfer title and deliver to Company any contracts, rights, goods, equipment or Work Product produced, received or acquired by CSP for the performance of the CSP Agreement.

10. INDEMNIFICATION

CSP shall defend, indemnify and hold harmless Company, its directors, officers, employees, agents, successors and assigns and customers and users of the goods, equipment and services, from and against, and shall pay, all losses, damages (including consequential, indirect and punitive), costs, liabilities, suits, claims and actions, and all related expenses (including attorneys' fees and expenses and the actual costs of litigation) by reason of injury or death to any person or damage to any property or any accident or event arising or relating to the performance of the CSP Agreement or arising from or relating to the goods, equipment or services or from any other cause to the extent not attributable to the negligence or willful misconduct of Company.

11. INTELLECTUAL PROPERTY INDEMNIFICATION

CSP represents and warrants that all goods, equipment and services shall not and do not infringe any United States or foreign patent, trademark, copyright or other intellectual property right of any third party. CSP shall defend, indemnify and hold harmless Company and its directors, officers, employees, agents, successors and assigns from and against, and shall pay, all losses, damages (including consequential, indirect and punitive), costs, liabilities, suits, claims and actions, and all related expenses (including attorneys' fees and expenses and the actual costs of litigation) based on or arising from an allegation or claim that any goods, equipment or services or parts thereof furnished by CSP infringe or misappropriate the rights of others; and/or if their use by Company is enjoined, CSP shall at Company's option and CSP 's expense either: (a) procure for Company the right to continue using the goods, equipment and services or parts thereof; (b) replace the same with substantially equivalent goods, equipment or services or parts thereof that do not infringe or misappropriate the rights of others; (c) modify the same so they no longer infringe or misappropriate the rights of others; or (iv) refund the price and the transportation and installation costs to Company.

CSP shall obtain from all Subcontractors similar indemnity protection for Company.

12. LIMITATION OF LIABILITY

Company shall not be liable to CSP for any indirect, incidental, special, liquidated, punitive or consequential damages or damages for delay in performance and/or failure to perform, irrespective of whether claims or actions for such damages are based upon contract, tort, negligence, strict liability, warranty or otherwise. CSP's liability for performance shall be limited as set forth in the compensation section except for acts of negligence, misconduct, or intentional acts.

13. CHANGES

Company may, at any time by a written change order, make changes to the scope of the CSP Agreement ("Change Order"). If any change results in an increase or decrease in the quantity or cost of the goods, equipment or services or otherwise materially affects the CSP Agreement, the Change Order will include an equitable adjustment in the price, the schedule and/or any other affected provisions. Any objection by CSP to the equitable adjustment set forth in a Change Order must be asserted within seven (7) business days after receipt of the Change Order by CSP. Notwithstanding such objection, if directed by Company, CSP shall proceed with the change and performance of the Work.

14. SUSPENSION OR INTERRUPTION OF WORK

Company may direct CSP, in writing, to suspend or interrupt all or any part of the Work for such period of time as Company may determine to be appropriate. CSP shall mitigate the costs of

such suspension or interruption. Company agrees to reimburse CSP for those expenses necessarily and directly incurred as a result of such suspension or interruption, subject to Company's right to audit CSP's books and records.

15. CONFLICTS, ERRORS AND OMISSIONS

In the event CSP becomes aware of any conflict, error or omission in the documents comprising the CSP Agreement, CSP shall promptly bring the discrepancy to the attention of Company. Such discrepancy shall be resolved by Company in its sole discretion.

16. INSPECTIONS; MONITORING PERFORMANCE QUALITY AND RATE OF PROGRESS

Company may inspect, at all reasonable times, the progress of the Work, including work performed at CSP's or Subcontractor's facilities. Also, if the CSP Agreement, laws, ordinances, rules, regulations or orders of any governmental authority require any portion of the Work to be inspected, tested or approved, CSP shall give Company reasonable notice to permit Company to observe such inspection, testing or approval. CSP shall provide Company with periodic status reports during the course of the Work.

17. COST ACCOUNTS AND INFORMATION/AUDITS

CSP shall maintain detailed separate cost data for each CSP Agreement in accordance with generally accepted accounting principles. CSP's records pertaining to the cost of the Work (other than fixed prices agreed to prior to performance of the Work) and CSP's tax records shall be open at all reasonable times for inspection or audit by Company or its representative(s). Company or its representative(s) shall, at all reasonable times, have access to the premises, materials, instructions, working papers, plans, drawings, specifications, memoranda and other information of CSP pertaining to the Work. All CSP's purchase orders or contracts with Subcontractors shall provide that Company or its representative(s) shall have the right to audit Subcontractors' charges to CSP. Company's rights under this Article shall terminate five (5) years after expiration of the warranty periods.

18. INSURANCE

Prior to commencing any portion of the Work, CSP shall properly maintain the following coverage: Statutory Workers' Compensation Insurance in full compliance with the Workers' Compensation and Occupational Disease Acts of each and every state in which Work is to be performed and U.S. Longshoremen's and Harbor Workers' Compensation Acts, if applicable; Employer's Liability Insurance with a limit of not less than $500,000; Comprehensive General Liability Insurance including Premises-Operation Independent Contractor's Protective, Products, Completed Operation, and Blanket Contractual Liability coverages with a combined single limit of not less than $1,000,000 per occurrence and $2,000,000 aggregate; Excess Umbrella Liability Insurance with a single limit of not less than $2,000,000; and Automobile Liability Insurance covering all owned, hired and non-owned vehicles with a combined single limit of not less than $1,000,000 per occurrence. CSP shall provide Company with a certificate of insurance

specifically evidencing the coverages required above, naming the Company as an additional insured, except under the Workers' Compensation Policy, and stating the policy numbers and the inception and expiration dates of all policies. The certificate of insurance shall also provide for thirty (30) days' prior written notice to Company in the event of cancellation or any material alteration of any policy. The certificate of insurance shall be furnished to Company prior to commencement of any portion of the Work. The Property Damage Liability Insurance shall include the Broad Form Comprehensive General Liability coverage.

19. TAXES

The price set forth in the CSP Agreement shall include, unless otherwise expressly set forth in the CSP Agreement, all federal state and local sales and use taxes applicable to the manufacture and/or sale of the goods and equipment and/or the performance of the services.

Company will provide to CSP, upon CSP 's request, a tax exemption certificate for taxes for the Work that are exempt under Pennsylvania's Sales and Use Tax laws.

Upon Company's request, CSP shall provide evidence satisfactory to Company of the payment of any taxes which CSP is required to pay. CSP shall also provide to Company such additional information as Company may request to facilitate the determination of taxes for which Company is responsible, if any.

20. CONFIDENTIAL/PROPRIETARY INFORMATION

CSP agrees to treat as confidential and proprietary any of Company's information which is not generally known to the public and to exercise the same care to prevent the disclosure of such information as CSP exercises to prevent disclosure of its own proprietary and confidential information; however, CSP may disclose such information as required by law or court order. Furthermore, Company's information shall be utilized by CSP only in connection with performance of CSP's obligations under the CSP Agreement.

21. PUBLICITY

CSP shall not use Company's name nor issue any publicity releases, including but not limited to, news releases and advertising, relating to the CSP Agreement and Services without the prior written consent of Company.

22. FORCE MAJEURE

Neither party shall be liable for any failure or delay in performing its obligations under the CSP Agreement, or for any loss or damage resulting therefrom, due to causes beyond its reasonable control, including but not limited to, acts of God, public enemy or government, riots, fires, natural catastrophe, strikes or epidemics. In the event of such failure or delay, the date of delivery or performance shall be extended for a period not to exceed the time lost by reason of

the failure or delay; provided that Company may terminate the CSP Agreement if the period of failure or delay exceeds fifteen (15) days. Company shall have no obligation to make any payments to CSP during the period of failure or delay. Each party shall notify the other promptly of any failure or delay in, and the effect on, its performance.

23. ASSIGNMENT

CSP shall not assign the CSP Agreement, in whole or in part, nor contract with any Subcontractor for the performance of the same or any of its parts, without first obtaining Company's written consent. Company's consent shall not be construed as discharging or releasing, nor shall it discharge or release, CSP in any way from the performance of the Work or the fulfillment of any obligation under the CSP Agreement.

24. NOTICES

Any notice required under the CSP Agreement shall be in writing and sent to the CSP and Company at their respective addresses identified below:

If to DLC: c/o David Defide
Duquesne Light Company
411 Seventh Avenue
Pittsburgh, PA 15219
Via e-mail: ddefide@duqlight.com

If to NCI: Steve Hastie
Navigant Consulting, Inc.
1717 Arch Street, Suite 4800
Philadelphia, PA 19103
Phone 215.832.4435
Via e-mail: shastie@navigantconsulting.com

25. INDEPENDENT CONTRACTOR

CSP shall operate as an independent contractor in the performance of the CSP Agreement and not as an agent or employee of Company. CSP shall ensure that neither it nor its agents or employees shall act or hold themselves out as agents or employees of Company. CSP shall have complete control of its agents and employees engaged in the performance of the Work.

26. PRIORITY OF DOCUMENTS

In the event of conflict among the various documents comprising the CSP Agreement, the conflict shall be resolved according to the priority given to the documents in the Purchase Order.

If no priority is indicated in the Purchase Order, the conflict shall be resolved according to Article 15, Conflicts, Errors and Omissions.

27. SEVERABILITY

If any provision(s) of the CSP Agreement is prohibited by law or held to be invalid, illegal or unenforceable, the remaining provisions thereof shall not be affected, and the CSP Agreement shall continue in full force and effect as if such prohibited, illegal or invalid provisions had never constituted a part thereof, with the remaining provisions of the CSP Agreement being enforced to the fullest extent possible.

28. SURVIVAL

The obligations and rights of the parties pursuant to the Warranties, Liens, Indemnification, Intellectual Property Indemnification, Limitation of Liability, Cost Accountants and Information/Audits and Confidential/Proprietary Information shall survive the expiration or early termination of the CSP Agreement.

29. MBE/WBE

It is the policy of Company to stimulate the growth of Certified Minority, Women and Disabled Business Enterprises (MBEs, WBEs and DBEs) by encouraging their participation in Company's procurement activities and by affording them an equal opportunity to compete for Company's procurements. CSP agrees to carry out this policy to the fullest extent consistent with the requirements of the CSP Agreement (a) through the award of subcontracts to MBEs, WBEs and DBEs or (b) if CSP is a MBE, WBE or DBE, through the use of its own forces. CSP shall include this policy as a provision in all subcontracts.

30. LAWS, CODES, RULES, REGULATIONS

CSP and its Subcontractors, at their own expense, shall obtain all necessary licenses and permits and shall comply with all applicable federal, state and local laws, statutes, ordinances, codes, rules and regulations relating to performance of the Work and the CSP Agreement, including but not limited to, safety, products liability, environment, labor standards and workers' compensation laws.

CSP and its Subcontractors shall also comply with Company's policies, rules and procedures.

31. HAZARDOUS AND DANGEROUS GOODS

For any goods or equipment provide by CSP pursuant to the CSP Agreement which are defined as hazardous or dangerous under any applicable law, rule or regulation, CSP shall provide Company with hazardous warning and safety handling information, including Material Safety Data Sheets, and appropriate labeling for all such goods and equipment.

32. ELECTRIC COMMERCE

At Company's request, Company and CSP may facilitate business transactions for the CSP Agreement by electronically transmitting data. Any data digitally signed pursuant to this Article and electronically transmitted shall be as legally sufficient as a written and signed paper document exchanged between the parties, notwithstanding any legal requirement that the document be in writing or signed.

33. GOVERNING LAW/JURISDICTION

The CSP Agreement shall be governed by and interpreted in accordance with the laws of the Commonwealth of Pennsylvania, excluding the choice of law and conflicts of law provisions. Any litigation arising from or relating to the CSP Agreement shall only be filed in state or federal court in and for Allegheny County, Pennsylvania and CSP hereby consents and submits to the exclusive jurisdiction of such courts.

34. ENTIRE AGREEMENT

The CSP Agreement contains the entire understanding and agreement of Company and CSP with respect to the subject matter hereof and supersedes and replaces all prior agreements and commitments with respect thereto. There are no oral understandings, terms or conditions and neither Company nor CSP has relied upon any representation, express or implied, not contained in the CSP Agreement.

35. AMENDMENT

Except as expressly set forth herein, no provision of the CSP Agreement may be changed, modified, waived, terminated or amended except by written instrument executed as appropriate by Company and/or CSP.

36. WAIVER

Any failure of Company to enforce any of the provisions of the CSP Agreement or to require compliance with any of its terms at any time during the term of the CSP Agreement shall in no way affect the validity of the CSP Agreement, or any part thereof, and shall not be deemed a waiver of the right of Company thereafter to enforce any and each such provision.

37. CAPTIONS

The captions contained in the CSP Agreement are for convenience and reference only and in no way define, describe, extend or limit the scope or intent of the CSP Agreement or the intent of any provision contained therein.

IN WITNESS WHEREOF, the parties have executed this Agreement on the respective dates entered below.

DUQUESNE LIGHT COMPANY	NAVIGANT CONSULTING, INC.
By:_____	By:_____
Name: _____	Name:_____
Title:_____	Title:_____
Date:_____	Date:_____

Exhibit A

Bid Materials

NAVIGANT

Proposal to Perform Evaluation, Measurement, and Verification of Duquesne Light's Act 129 Energy Efficiency and Conservation Plan Programs

Presented to

Duquesne Light

Duquesne Light

September 30, 2010

Presented by

Steve Hastie
Associate Director

Navigant Consulting
1717 Arch Street, Suite 4800
Philadelphia, PA 19103

phone 215.832.4435
fax 215.832.4401

www.navigantconsulting.com

NAVIGANT
CONSULTING

Craig McDonald
1375 Walnut Street, Suite 200
Boulder, CO 80302
303.728.2461 office
484.437.2487 mobile
303.728.2501 fax

September 30. 2010

Duquesne Light Company
Patricia Jordan
2515 Preble Ave MD: NM-MS
Pittsburgh, PA 15233
Email: pjordan@duqlight.com
Phone: 412-393-8909
Fax: 412-393-8644

Subject: **Proposal for Duquesne Light Company Evaluation, Measurement, and Verification of Act 129 Energy Efficiency and Conservation Plan Programs**

Dear Ms. Jordan:

Navigant Consulting Inc. (NCI), in conjunction with Itron and Skumatz Economic Research Associates (SERA) proposes to provide portfolio impact and process evaluations of Duquesne Lighting Company's energy efficiency programs. We understand the unique issues and challenges of rapidly scaling up tprograms to meet ambitious goals. Our team is ***uniquely qualified to provide timely, rigorous, and credible evaluations.*** We are confident that no other consultant team can match our depth and breadth of resources, our practical program implementation perspectives, and our credibility with other stakeholders. Our team provides multiple advantages to Duquesne, including the following:

- **Depth and Breadth of Resources** - Our team includes over 100 energy efficiency consultants dedicated to program evaluation and many of the industry's thought leaders. ***No other team can match our depth of resources, expertise, and recent related evaluation expertise.***
- We have completed, (or are in the process of completing) **more than 70 evaluations within the past two years** throughout North America (including California, New York, Wisconsin, New Jersey, Ontario, British Columbia, Massachusetts, Pennsylvania) spanning all customer segments, program approaches and business models.
- We are actively engaged in the Pennsylvania Act 129 process. Our team is managing the evaluations for PECO and actively participate in the working groups and work with the State Wide Evaluator (SWE). We have no learning curve, survey instruments and on-site protocols that have already been approved by the SWE.
- Our project manager is located in PA and is nationally recognized for his expertise in evaluation.

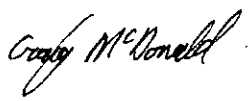
- Many of our staff have ***practical experience in program implementation***. Our analysis of interviews, survey data, and program data incorporates our understanding of the realities of getting customers to act and contractors to perform.
- We have ***established evaluation approaches, survey instruments, on-site data collection protocols*** consistent with the "PA Audit Plan and Evaluation Framework," and best practices in other jurisdictions. In fact, NCI, Itron and SERA staff have been major contributors to the development of many of the established Evaluation Measurement and Verification (EM&V) protocols and guidelines referenced.
- We have a track record of providing high quality results ***within schedule and budget***.

The bottom-line, we:

(1) Are the industry leaders in EE evaluations;
(2) Have the resources to complete multiple, simultaneous process evaluations led by staff with specific, related program and market segment expertise; and
(3) Can deliver on schedule and support Duquesne's standards of excellence.

We are very excited about the opportunity to work with the Duquesne. Please feel free to contact me if you have any questions about our proposal.

Sincerely yours,



Craig McDonald
Managing Director

NAVIGANT

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NAVIGANT

Section 1. Executive Summary

Navigant Consulting, Inc. (NCI or Navigant), in conjunction with Itron and Skumatz Economic Research Associates (SERA) propose to complete process and impact evaluations for Duquesne Lighting Company's (DLCo) Act 129 energy efficiency programs. These evaluations will be performed according to DLCo's comprehensive and rigorous *"Evaluation Measurement and Verification Plan (July 15, 2020)."*

Navigant, Itron and SERA are recognized leaders in DSM Program evaluation. This effort will be led out of our Pennsylvania office. Navigant and Itron are currently performing the evaluations for PECO's Act 129 programs. Some of the lessons learned that we have reflected in our proposal include the following:

- The SWE has taken substantially longer to approve protocols, and the process for approval is opaque. **It is important the keep good written records of communications and to communicate regularly with the other EDCs.**
- **The evaluation plan is an important document.** This is not a document that the SWE **has** actively encouraged, however, it is a critical element of interpretation of the Audit Plan and of the TRM. We've seen the SWE question our sampling plan long after the evaluation plan was approved. It was helpful to be able to refer them to the relevant passages in the approved plan.
- **The SWE seems inherently opposed to billing analysis.** While this is normally part of the evaluator's tool box, limited reliance on billing analysis appears best in PA.
- **It is important that contingency resource be maintained.** The EM&V process has been evolving. While it is much clearer now than it was 12 months ago, it is not possible to completely plan the next three years.
- **Communications with customers must be managed well.** We've worked with PECO to make sure customer account reps are apprised of all of our survey contacts.
- **It is important to maintain detailed notes from meetings with the SWE.** The SWE has referred to undocumented discussion at meetings as the basis for required action.
- **Quarterly sampling is more costly.** The quarterly sampling called for by the SWE requires significantly more mobilizing, demobilizing, sample design, and analysis than annual sampling.
- **Regular, scheduled communications are essential.**
    - **Meetings with the SWE.** We've held bi-weekly meetings. These are helpful in maintaining a good working relationship.
    - **Meetings with PECO.** We've had weekly meetings to report on status, upcoming activity, and discuss issues.

The Navigant proposed approach includes the following elements designed to provide DLCo with timely and rigorous impact and process evaluations:

- Our approach includes on-site inspections and measurements for the enhanced EM&V site visits that leverage our instrumentation, our *FACT* system including (tracking, data collection and validation protocols), and our ability to use calibrated simulations/engineering analyses to meet statistical precision requirements most cost-effectively.
- We have budgeted to complete on-site measurements for all of the non-residential enhanced site surveys.
- Our surveys will cover both process and impact issues and ***build upon instruments that have been reviewed and approved by PA SWE.***
- We have added non-participant surveys in both 2011 and 2012 to address process and net-to-gross issues.
- We will leverage our current work with managing the Act 129 evaluations for PECO. This includes use of the battery of process and impact questions that have already been approved by the SWE to minimize survey development costs and minimize possible delays from SWE review.
- We will complete quarterly surveys (both basic and enhanced). The survey results will be used to update the realization factors for the quarterly reports.

Annual reports will include complete process and impact evaluation results.

Section 2. Work Scope and Schedule

NCI has studied the Duquesne Light Company (DLCo) *"Evaluation Measurement and Verification (EM&V) Plan,"* (PLAN) dated July 15 2010. We find the plan to be very comprehensive and rigorous. We propose to implement the plan as specified with possible modifications and considerations:

- Like any plan, it is based on assumptions and forecasts regarding market conditions, participation rates, measure mix, and baselines. There is considerable uncertainty about all of these factors. NCI is dedicated to working ***pro-actively and flexibly with DLC to adjust the plan and approaches to rigorously*** address the greatest sources of uncertainty within the budget constraints.
- In some cases, the plan may outline more resource intensive evaluations than justified by the program budgets. We have recommended approaches consistent with each program budget. We will work flexibly with DLCo to adjust approaches to fit within budgets, as required.
- Our approach includes on-site inspections and measurements for the enhanced EM&V site visits that leverage our instrumentation, our *FACT* system including (tracking, data collection and validation protocols), and our ability to use calibrated simulations/engineering analyses to meet statistical precision requirements most cost-effectively.
- Our surveys will cover both process and impact issues and ***build upon instruments that have been reviewed and approved by PA SWE.***
- We have added non-participant surveys in both 2011 and 2012 to address process and net-to-gross issues.
- We will leverage our current work with managing the Act 129 evaluations for PECO. This includes use of the battery of process and impact questions that have already been approved by the SWE to minimize survey development costs and minimize possible delays from SWE review.

Below, we provide a high level summary of the work that we will perform consistent with the plan. As described in Task 4: Management and Reporting. We will tune the plan, as appropriate to best utilize the evaluation budgets.

2.1 Task 1: Impact Evaluation

NCI's impact evaluation approach includes the following elements:

1) NCI will use its **FACT** system that includes standard data collection protocols, instrumentation plans, real-time tracking of all field activities to ensure the rigor, integrity and timeliness of field data (enhanced survey) collection activities.

2) Use of **stratified and ratio sample designs and estimation** to minimize the sample sizes required to achieve the targeted precision levels
3) The surveys will *support both the process and impact evaluations*, providing economies to DLCo
4) We will use our library of survey instruments that have been reviewed and approved by the PA SWE as starting points -- providing cost savings, reducing potential delays, and consistency across the state.
5) Our engineers are experts at calibrated simulations and engineering analyses to rigorously determine the energy savings for EE measures, *especially customized measures* which comprise a large portion DLCo's forecasted savings.
6) Our engineers have strong expertise in evaluation and measurement of customized projects for large industrial process energy efficiency projects including the chemicals and metals industries.

The table below presents the number of telephone survey completions we plan to complete for each program group, which is based on the Evaluation Plan provided by DLCo.

Program Group	Telephone Surveys (Annually)	Total Surveys (2011-2013)
Commercial	33	99
Industrial	7	21
Residential: EE Rebate	33	99
Residential: EE Low-income Energy	33	99
Residential: Refrigerator Recycling	33	99
Residential: School Energy Pledge	33	99

2.1.1 Site M&V

NCI plans to implement the following site M&V by program group within the first 6 months of 2011, 2011, and 2013 as summarized below:

Program Group	On-Sites Surveys (Annually)	Total Surveys (2011-2013)
Commercial	31	93
Industrial	13	39
Residential	32	96

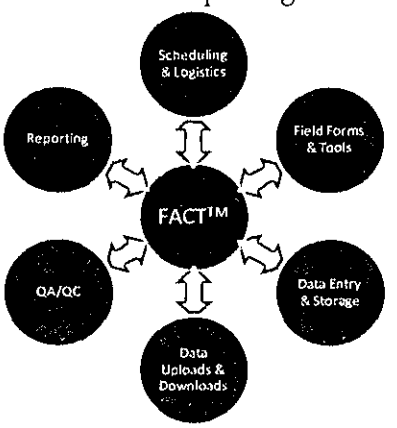
We plan on four levels of field data collection as follows:

1) Verification inspections
2) Inspections with spot measurements
3) Runtime hour data logging studies
4) End-use metering data collection

Approximately ¼ of the annual surveys will be completed each quarter. Within the first 4 months of 2011, we will complete the targeted number of annual surveys for 2010 in order to support results reporting by mid-year 2011.

1) Samples will be developed for each program by end use, measure or technology group, guided by Evaluation Framework protocols.
2) We will systematically apply the International Performance Measurement and Verification Protocols (IPMVP) for both data collection and analysis methods

NCI has developed the FACT system that includes standard on-site measurement and data collection protocols, real-time activity and data reporting, and data quality verification. This system allows us to ensure efficient and rigorous on-site data collection as well as near real-time data analysis and results reporting.



We are assuming that approximately 1/3 of the on-site verifications will include each of the following levels of measurement:

- Verify installation including equipment specifications of the installed and replaced equipment
- Spot measurements of key parameters used for calculating the energy savings
- Logger (including run-time or interval power measurement) data

Inspections will be conducted quarterly. Results will be used to update the realization rates for both the quarterly and annual reports.

2.1.2 Analysis

NCI will complete quarterly surveys that will be used to develop realization rates for each program area (differentiated by market segment and measure type, where the data support). For the quarterly updates, realization rates will be updated based upon the rolling averages.

For the annual reports, the results will include updates based upon the on-site measurements conducted during for the installations completed for the previous calendar year.

We recognize that the SWE does not favor billing analysis. Thus, the realization rates will be based on the survey date efforts including both the telephone interviews (basic) and on-site (enhanced) data collection.

2.1.3 Net-to-Gross

As an option, the NCI will develop net-to-gross estimates. We favor the enhanced self report approach which we have successfully used in regulatory settings throughout North America including New York, Ontario, and California). The survey instruments that we are currently using for the PECO evaluations (and approved by the SWE) include this approach.

2.2 *Task 2: Process Evaluation*

The process evaluation research and reporting will center on the four primary areas of investigation:

- Program design
- Program administration
- Program implementation
- Market response

NCI is using a very similar approach in its process evaluation of all of Con Edison's Energy Efficiency Portfolio Standards (EEPS) programs. Each research instrument, interview, document review, and so on – and especially the evaluation reporting – is addressed in terms of the central research areas identified prior to initiating the process evaluations. The NCI Team will execute the process evaluation strategy to address each of these areas as specified in the DLCo Evaluation Plan and in a manner consistent with the protocols outlined in that plan. Below, we comment on the DLCo description of each of these areas to the extent that we propose modifying it or wish to raise questions about it.

2.2.1 Program Design

The NCI Team will review/analyze any models and theories that exist and modify or create models/theories as needed. It is important to understand how savings goals were developed, and to make some assessment regarding how realistic those goals are for DLCo in particular. We also note that, in addition to the information sources listed in the DLCo RFP, information gleaned from trade allies and customers can provide important feedback regarding program design elements such as timing of program components/requirements, marketing approach, etc. While desirable, the program design timeline may or may not have permitted sufficient time to obtain feedback from trade allies on programs relying on their active involvement.

2.2.2 Program Administration

Important in this area is the utility's decision for each program whether to implement in-house or via an implementation contractor (CSP) The NCI Team has found it very helpful in its program administration assessments to review CSP contracts, in addition to the various program brochures, reports, tracking system, etc. These make clear where the self-interest of the CSP lies, the extent to which the utility can determine marketing level of effort, changes in marketing approach, aspects of the CSP's relationship with its subcontractors, etc. This has been very important in some recent process evaluations. NCI also has recently conducted a benchmarking study of DSM staffing and organization, which can be brought to bear in our analysis of these areas for the DLCo program effort.

2.2.3 Program Implementation and Delivery

This investigation area is viewed from multiple perspectives, including utility/implementation contractor staff, trade allies and customers. NCI has an office in Pittsburgh, staff from which can be used in conducting any mystery shopper or unannounced participation research that is needed. On-site observation of work quality, while in some respects a process task, is most cost effectively done when on-site verifications are specified for impact evaluation. A key aspect of this part of the evaluation is to document the extent to which the program is being implemented in accordance with the program design and, if not, why. This is in addition to key research into the extent to which there are bottlenecks or participation flow/process issues that are affecting cost effectiveness, satisfaction or participation.

2.2.4 Market Response

The NCI Team will perform an assessment of the marketing approach being used by each program, in part with respect to a listing of best marketing practices we have developed over time based on our own experience and best practice documents produced from time to time. This allows the marketing assessment to be structured more formally and, while programs can

certainly deviate from best practices, can point to certain key deficiencies in market plans and implementation. Third-party market trend data may be obtained, on an as-needed basis, to the extent that such data are available and can assist in the process assessment.

2.2.5 Sample Design

The DLCo RFP indicated a specific sampling regime on which to base program evaluation costs, which also must meet reporting precision requirements. As such, we plan to include process evaluation-related survey question modules in all impact evaluation surveys being conducted of program participants. For non-participants, we propose to conduct two annual sets of surveys, with segments as indicated below.

Non-participant Survey in 2nd Quarter of 2011 and 2012	Annual Completions
Commercial	75
Industrial	20
Residential: EE Rebate	75
Residential: Refrigerator Recycling	
Residential: School Energy Pledge	
Residential: Low-income	75
Total	245

Trade ally research will be conducted as needed, depending on the program designs, the extent to which trade allies form a key component of program delivery, and the extent to which the program's overall process evaluation budget allocation permits it. It is likely that this research will be qualitative in nature rather than targeting a specific statistical precision. We will discuss the desirability of conducting such interviews via internet, as stipulated in the Evaluation Plan, versus some other medium on a program-by-program basis.

2.2.6 Design Feedback

Early evaluation findings memoranda can be a valuable tool for correcting program deficiencies in a timely manner, uncovering differences in understanding between CSPs and utility program managers, spurring changes already under consideration, and identifying and helping to resolve key administrative and marketing deficiencies. The timing of these memoranda should be determined in coordination with the DLCo project manager, but we suggest that such early findings memos should typically wait until the following have been completed: utility and CSP staff interviews, review of program materials, CSP contract(s), and (at least preliminarily) program tracking system. Additional early findings (not merely included in scheduled

quarterly, semi-annual or annual reporting) memos could result from unexpected findings regarding trade ally interviews, or from quarterly customer surveys.

2.2.7 Spot Evaluations

Spot evaluations will be conducted on an as-needed basis, based on the guidelines (evaluation triggers) presented in the DLCo RFP. We will work with the DLCo to refine these triggers, as needed, on a program-by-program basis. Where appropriate, the NCI Team may suggest additional or modified triggers.

2.3 *Task 3: Cost Effectiveness*

NCI will develop a system that reports TRC results incorporating ex-ante estimates along with quarterly updates of realization rates by program and market segment. NCI has a unique depth and breadth in developing PJM and MISO wholesale market prices forecasts as well a local cost considering transmission. We will incorporate our work in developing incremental costs for EE measures based upon survey results. NCI has developed TRC B/C analyses that have been accepted in many different jurisdictions in North America including New York, New Jersey, Ontario, British Columbia, Maryland, California, Washington, Illinois, Pennsylvania and others.

2.4 *Task 4: Management and Reporting*

In meeting its responsibility to ensure that reporting to the SWE is accomplished accurately and in a timely manner, it will be important for the NCI Team to develop a seamless interface with the DLCo PMRS tracking system. That interface may be electronic or merely a carefully considered set of protocols developed for NCI and DLCo interactions regarding program-related data. NCI will develop a systematic reporting process, to ensure that all quarterly and semi-annual reports are done as required. This will be one of the first activities the Team addresses in this project.

As noted in the DLCo RFP, it will be important to manage subcontractors, including the time keeping, invoicing, and information-sharing that will be required. NCI has selected subcontractors we have worked with before, and with whom we have strong relationships, to minimize the amount of time these efforts entail.

Annual reports will demonstrate the extent to which the utility is achieving its Act 129 mandates. The three annual, and one final, impact evaluation reports will address all issues required by the SWE. Impact evaluation activities will be timed so that these reports can benefit from the most recent analyses.

It is our expectation that a significant amount of time will need to be spent communicating with and at times meeting with not only DLCo but also the SWE, the program CSPs and possibly specialized M&V contractors. Our experience in evaluating the PECO Act 129 programs is that a strong relationship with the SWE, developed through regular contacts with the SWE, is very valuable in minimizing risk, and in enhancing understanding (and obtaining SWE acceptance of) the evaluation activities that are being implemented and the rationale for them.

The DLCo RFP lays out the required contents of each type of report required throughout the project period, including quarterly and annual impact reports (including any M&V reporting), process evaluation reports (including spot evaluation reports, quarterly reports during 2011, semi-annual reports during 2012, as-needed reports during 2013, and final), and annual cost effectiveness reports. The NCI Team will address each required area of interest and work with DLCo and the SWE, to the extent that either organization's review of these reports indicates needed modifications. In cooperation with DLCO we will revise our overall evaluation approach as needed to the end of the management and Reporting section.

2.5 Schedule

The table presents the high-level project schedule, indicating the due dates provided in the DLCo RFP, as well as timing of other deliverables. This schedule will be refined as the Team gains a better understanding of the implementation status of each program and the appropriateness of initiating various aspects of the evaluations.

Deliverable/Activity	Quarter 1	Quarter 2	Quarter 3	First Annual Report	Quarter 5	Quarter 6	Quarter 7	Second Annual Report	Quarter 9	Quarter 10	Quarter 11	Final Report
Due Date:	11/30/2010	2/28/2011	5/31/2011	7/15/2011	11/30/2011	2/29/2012	5/31/2012	7/15/2012	11/30/2012	2/28/2013	5/31/2013	10/31/2013
Impact Results	X	X	X	X	X	X	X	X	X	X	X	X
Process Results	X	X	X	X		X		X				X
Cost Effectiveness Results				X				X				X
Early Findings Reports*		X										
Participant Surveys (Process and Impact)**		X	X	X	X	X	X	X	X	X	X	
Process Non-participant Surveys			X				X					
*Assumes all programs are being implemented by project initiation												
**After second annual report, impact only (unless specific need for process)												

Section 3. Staffing and Subcontracting Plan

The Navigant Team includes highly experienced experts in evaluation and other disciplines associated with conducting energy efficiency program evaluations. The Team organization includes a project director and a project manager, who will direct three customer sector evaluation leads as well as subcontractors responsible for customer survey and market actor qualitative research. Four functional area leads (impact evaluation, process evaluation/market research, engineering/on-site analyses, and sampling) will ensure that the firm's highest level of expertise is brought to bear on each evaluation in a consistent manner and that study methods, analysis techniques and interpretation of results are both rigorous and defensible.

Figure 1 below presents our project organization, followed by a table showing the role and qualifications of key project staff, with more detail appearing in the 2-page resumes in Section 6. The level of involvement of key staff member will rise and fall according to work schedule. Their overall availability and the percentage of that availability representing their expected average level of commitment (LOC) is shown in column one in the table below.

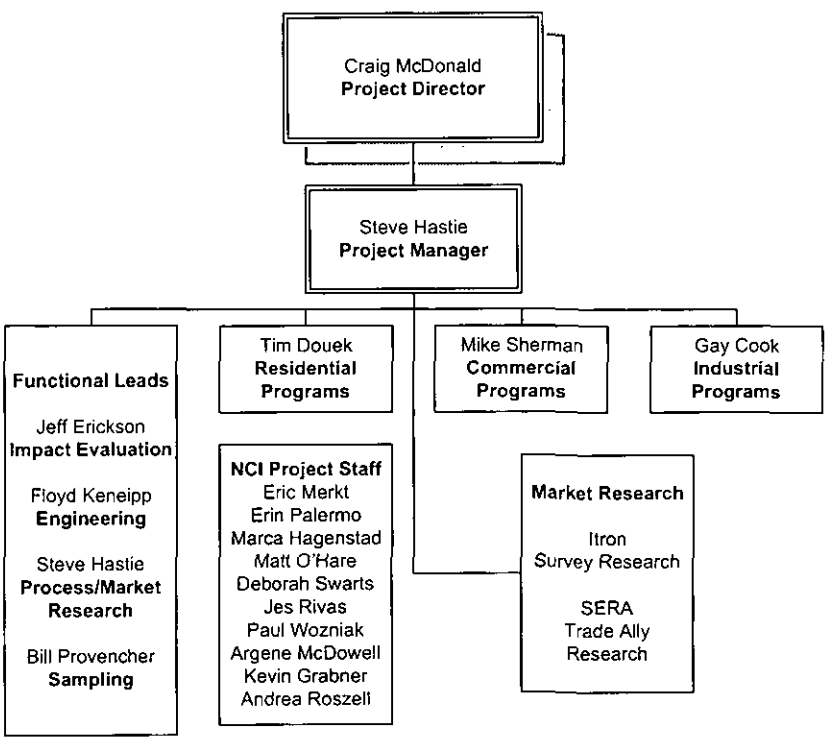


Figure 1. Project Organization Chart

Key Project Staff, Their Role, Experience and Level of Commitment (LOC)

Person/Title/LOC	Project Role	Experience/Expertise
Craig McDonald, Managing Director, Boulder, CO LOC: 30-50% of 20-25% availability = 6-13%	Project Director –responsible for overall technical direction, quality assurance and allocation of corporate resources	• More than 20 years of experience with utilities and governmental agencies on developing, implementing, and evaluating DSM programs. • Worked with more than 30 different utilities. Directed energy efficiency evaluations used to determine shareholder incentives for more than 6 utilities. • Testified on DSM program evaluation, utility planning, rates, energy efficiency and load management programs in more than 10 states and provinces.
Steve Hastie, Associate Director, Philadelphia, PA LOC: 70-80% of 70-80% availability = 49-64%	Project Manager/Process Evaluation Lead—responsible for day-to-day project management and serving as Process Evaluation and Market Research Lead	• More than 20 years utility EE program evaluation experience, managing > 35 evaluations, and overseeing impact, process and market evaluation components • Special expertise in SRA net-to-gross assessment, process evaluation and market research
Tim Douck, Associate Dir., Philadelphia, PA LOC: 30-50% of 50-70% availability= 15-35%	Residential Program Lead—responsible for directing residential program evaluations	• Has managed multiple residential efficiency program evaluations recently, including those addressing a wide range of measures • 6 Sigma, significant process evaluation expertise
Mike Sherman, Managing Consultant, Burlington, MA LOC: 30-50% of 50-70% availability= 15-35%	Commercial Program Lead—responsible for directing commercial program evaluations	• Has led more than 20 impact and process evaluations, including C/I sector program evaluations • Led 3-year multi-utility working group effort in MA to define reporting protocols and bill impact methods
Gay Cook, Managing Consultant, Toronto LOC: 30-50% of 50-70% availability= 15-35%	Industrial Program Lead—responsible for directing industrial program evaluations	• Has conducted industrial program evaluations since the beginning of her career • Has conducted specialized study C/I program attribution and sample design
Jeff Erickson, Associate Director, Verona, WI LOC: 30-50% of 20-25% availability= 6-13%	Impact Evaluation Lead—responsible for directing impact evaluation efforts	• Expertise in impact data analysis, modeling, sample and tracking system design, and process analysis • Led WI statewide C/I program theory development, and impact/process/market evaluations for 5 years
Floyd Keneipp, Dir., Walnut Creek, CA LOC: 30-50% of 20-25% availability= 6-13%	Engineering Lead—responsible for directing engineering and on-site survey efforts	• PE with > 23 years experience developing requirements for complex engineering projects • Extensive experience in impact and process evaluation, and in identifying, developing, and managing energy projects for commercial/public institutional customers
Bill Provencher, Associate Director, Verona, WI LOC: 30-50% of 20-25% availability= 6-13%	Sample Design Lead—responsible for directing sampling strategies, under direction of Mr. Erickson	• PhD in environmental and resource economics, with numerous technical journal publications and experience in econometric modeling of energy savings from traditional & behavioral-based EE programs • NCI resource for addressing difficult sample design issues

NAVIGANT

Section 4. Firm Qualifications and Experience

Navigant Consulting's team includes Itron and Skumatz Economic Research Associates. Our firms are widely recognized as leaders in DSM program evaluation. Our qualifications and expertise are briefly summarized and references are provided below.

4.1 Navigant Consulting

NCI is the leading consultancy for the evaluation of energy efficiency and demand response programs in North America. Our staff have led and/or contributed to the development of most of the major protocols for evaluation of energy efficiency and demand response programs including the International Protocols for Measurement and Verification of Performance and the protocols used in Ontario, California, New York, and New England. In addition, we perform more than 30 energy efficiency and demand response program evaluations annually. NCI (including Summit Blue) has unique depth and breadth of experience in performing evaluations, testifying to support the evaluation findings, defining the approaches and rigor for evaluations, and documenting best practices. NCI also has extensive utility process improvement experience (in all aspects of utility operation) and we understand how utilities develop and implement processes and can apply these insights to this project.

No other firm can match our depth and breadth of expertise in EE and DR program evaluation. We bring significant insights, knowledge of best practices, and lessons of experience. The following table highlights some of our most directly related experience and expertise.

Client	Short Description of Work	Areas Covered
Ontario Power Authority	Multiple program evaluations including impact, net-to-gross adjustments, establishment of M&V protocols, and development of the savings references.	• Best Practices • Gross and net savings • Measure characterization • Program QA/QC and process improvement • Project / program M&V
California Public Utilities Commission	• Contributor to the development of the M&V protocols. • Lead evaluation contractor for evaluation of local government partnerships, codes and standards, and emerging technologies	• Best practices • Gross and net savings • M&V methodologies • Program improvements • QA/QC

Client	Short Description of Work	Areas Covered
Hydro One	Evaluation of rate-induced savings among medium and large industrial customers	• Gross and net savings • Billing analysis • Program and process Improvements
ISO-New England	Development of M&V standards for determination of energy efficiency and *demand response savings*	• M&V methodologies • Measure characterization • Stakeholder collaboration / consultation
Wisconsin Public Power Inc.	Multiple program evaluations covering all sectors and including net-to-gross adjustments and establishment of M&V protocols	• Gross and net savings • Project / program M&V • Comparative analysis
Arizona Public Service	Multi-year evaluation covering impact and process evaluation of entire program portfolio	• Gross and net savings • Market transformation effects • Program and process improvements • On-site visits
PECO	Conducting all evaluations for this major, multiple year program including regulatory compliance and goals attainment filings.	• M&V methodologies • Measure characterization • Stakeholder collaboration and consultation
Consolidated Edison	Completed evaluation of 150 MW targeted DSM program including both residential and non-residential programs. Results accepted by NY PSC.	• Best Practices • Gross impact verification • Net-to-gross adjustments • Process design improvements

NCI provides staff with industry leading expertise, drawing upon a deep experience base including the following:

- ***NCI is the industry leader in EE and DR M&V – NCI has developed M&V programs for a range of clients including State of California, New York Energy Research and Development Authority, New Jersey Bureau of Public Utilities, Ontario Power Authority as well as work for more than 20 other utilities and state agencies.***
- *Ability to provide Rigorous Impact and Net-to-Gross (NTG) Evaluations* – NCI brings exceptional qualifications in impact evaluation. This includes work on sampling and survey development, weather normalization, billing analysis, detailed statistical analysis, building modelling / verification, and other tasks associated with conducting reliable impact evaluations. Our team has conducted impact evaluations that conform to state-specific protocols, and we bring cutting-edge / best practices expertise for impact evaluations.

- *NCI has developed the DSM deemed savings for many clients* – NCI has significant experience in reviewing DSM program assumptions, calculations, and estimates. NCI's experience spans the life-cycle of DSM projects from program design and conception to verification and refinement of DSM savings assumptions and estimates. Relevant experiences includes development of the DEER database for California, and the deemed savings data bases and calculations for Ontario and Connecticut.
- *NCI understands the drivers of program performance* – Based on our project experience, NCI is very familiar with which programs have strong (and/or consistent) evaluation results. This includes examining past performance of time of use and peak load programs to identify expected savings, factors influencing performance, key design / outreach characteristics for best practices, and other assessments covering residential and commercial programs. Relevant experience is as follows:
- *NCI has extensive knowledge of DSM program best practices* – NCI has conducted numerous process evaluations of residential, commercial, and industrial programs for utilities from New England to California – including many of the leading energy efficiency states and provinces in North America.

Selected examples of NCI experience are provided below.

- *California Public Utilities Commission (CPUC) Evaluation, Measurement, and Verification of the California Investor Owned Utilities' Emerging Technologies Program.* Summit Blue is performing evaluation, measurement and verification activities with respect to the emerging technology programs implemented by the California IOUs. Such activities include, but are not limited to: (1) management and coordination of evaluation work activities, including on-going contract management, project meetings and project reporting; (2) development and continuing updating of an evaluation plan to be approved by the CPUC; (3) implementation of the evaluation in accordance of the approved plan; (4) and any additional support and assistance required for the CPUC's program evaluation efforts.
- *Commonwealth Edison (ComEd) Energy Efficiency and Demand Response Program Evaluation.* Summit Blue is the prime contractor to evaluate the new energy efficiency and demand response programs being offered by ComEd and the Illinois Department of Commerce and Economic Opportunity (DCEO). Summit Blue is leading a team of contractors to evaluate the portfolio of programs that cover a wide range of market approaches in both the residential and non-residential markets and both energy efficiency and demand response. The evaluation contract covers work from 2008

through 2011. The evaluation will primarily focus on impact evaluation and will include extensive field data collection. The evaluation will also focus on process issues to provide timely feedback to program managers to help them improve program implementation procedures.

- ***Establishing Emission Baselines for Energy Efficiency Programs, International Energy Agency.*** Summit Blue consultants principally authored a report for the International Energy Agency on the establishment of baselines for determining additionality from energy efficiency projects as part of the Joint Implementation and Clean Development Mechanism protocols for reducing greenhouse gases.

- ***California Public Utilities Commission (CPUC) Evaluation, Measurement, and Verification of the California Investor Owned Utilities' Local Government Partnerships Program.*** NCI completed the multi-year evaluation, including measurement and verification activities on the local government partnerships program implemented by California IOUs. The statewide program includes partnerships between California's investor owned utilities and 56 local government entities. The evaluation includes monitoring and verification of reported direct impacts associated with the energy efficiency partnership programs that have direct delivery mechanisms and incentives for measure installations. It also includes assessment of indirect impacts associated with marketing, outreach and education program components being delivered through the partnerships. The programs include direct install efforts, retro-commissioning, incentive and buy-down programs, codes and standards promulgation, and design assistance among other elements, comprising 256 program elements across all 56 partnerships. Summit Blue is managing a 6 firm team that is responsible for all data analysis, sampling, field measurements, engineering analyses, surveys, a process evaluation, and reporting of kW and kWh savings attributable to the programs to the CPUC.

- ***California Public Utilities Commission (CPUC) Evaluation, Measurement, and Verification of the California Investor Owned Utilities' New Construction and Codes and Standards Programs.*** Summit Blue is assisting with evaluation, measurement and verification activities related to new construction and codes and standards programs implemented by the California IOUs. The project includes evaluation planning, field investigations, inspections, metering activities and impact analysis. The Project entails both residential and non-residential applications.

- ***Ontario Power Authority*** - Directed the evaluation of the Every Kilowatt Counts Program for 2008, 2009, and 2010. Efforts including the development, execution and analysis of participant and non-participant surveys enabling attribution of various

partial drivers to customer's decision to perform energy saving actions, analysis of psychographic responses for customer segmentation, and sophisticated billing analysis linking survey response with actual consumption data.

- ***Impact and Process Evaluation of Hydro One Network's Double Return Demand Response Program.*** Summit Blue Canada conducted an evaluation of a Hydro One program targeted to medium to large industrial customers, including a customer survey and interviews with program staff and partners. Hydro One is the largest electric utility in Ontario with over one million customers. The program offered workshops, customized online information, technical audits as well as financial incentives. The project goal was to assess the energy and demand savings and program cost-effectiveness, and determine the process efficiency and recommend changes to enhance the effectiveness of program design and delivery.

- ***Long-Term Project Monitoring and Tracking, Northwest Energy Efficiency Alliance.*** Summit Blue is currently conducting a project to analyze the ongoing energy impacts of market transformation initiatives that are in their post-funding period. Due to the delayed effect of many market transformation impacts, as new technologies and services diffuse into the marketplace, it is important to track program effects after their active phase. This project is focused on identifying the critical parameters to measure, and the frequency of data collection required to adequately assess long- term impacts. Summit Blue reviewed the sensitivity of impact estimates to each parameter, confidence in data accuracy, and availability and cost of collecting data – then conducted data collection activities and reporting. Six projects are being assessed during the first phase of this effort, and the Alliance will use Summit Blue recommendations to make appropriate adjustments to previous estimates of post-funding impacts for these programs.

- ***Impact Evaluation of Energy Efficiency Programs, Wisconsin Public Power, Inc.*** Summit Blue prepared an impact evaluation for the portfolio of energy efficiency programs offered by WPPI to their municipal utility members. Program savings for 2007 were verified at both the gross and net level. The program portfolio included prescriptive and custom incentives for commercial and industrial customers and air-conditioner tune-up rebates for residential customers. Gross savings were verified with engineering reviews, including a nested sample of on-site visits. Free ridership was estimated for each group using a sample-based direct survey approach. The surveys used a state-of-the-art method for estimating free ridership that compared answers from several lines of questioning to make sure the results were internally consistent for each customer. In-depth analysis was done to validate the free ridership scores, using both sensitivity analysis of key internal assumptions and a rigorous comparison of results

developed using both the Summit Blue method and the Wisconsin Focus On Energy method.

- *California Public Utilities Commission* – Key project staff were responsible for development of the current California state-wide M&V framework and protocols – including all M&V work for the range of programs in place. One of NCI's staff was active in the development of the CPUC M&V framework when he was at the CPUC.
- *Arizona Public Service Demand-side Management Program Evaluation.* Summit Blue is currently leading a multi-year evaluation of APS' 2005 – 2007 portfolio of demand-side management programs. The effort involves multiple primary data collection efforts including telephone surveys, site visits, focus groups, and Delphi panels, to gather market data regarding the net impacts of APS' program interventions as well as to develop recommendations to strengthen APS' program offerings. The process evaluation component of the project will also assess temporal changes in the market for energy efficiency products and services through the development and use of market and program progress indicators.
- *Long Island Power Authority (LIPA)* – Navigant Consulting developed the M&V protocols for, and monitored compliance with, the 75 MW Commercial Retrofit DSM bidding program for LIPA.
- *Consolidated Edison* – Navigant Consulting completed a comprehensive impact and process evaluation of a targeted DSM program (150 MW) including field data collections, program records review, statistical analysis, and benefit-cost analysis.
- *NYSERDA Energy $mart℠ Program Evaluation.* Summit Blue is currently performing multi-year, comprehensive market characterization, market assessment, and causality evaluations of NYSERDA's New York Energy $martSM portfolio of residential, commercial, and industrial energy efficiency, demand response, and renewable energy programs. Primary work areas include characterizing energy markets and providing the background information required to define programs, delivery concepts, target markets, and potential for different types of programs; tracking changes in markets with a specific focus on market indicators that might be impacted by program offers; and identifying the impacts of the program interventions beyond what would have happened without the program. The project was initiated in 2003 and is planned to continue through June 2007.
- *Residential New Construction EnergyStar® Program* – Comprehensive impact and process evaluation of the Energy Star program for 2007. The program currently has over

2,500 participants. NCI reviewed data collection processes and procedures and undertook a full review of program technical reporting and the calculations underlying the reports. Our impact evaluation identified areas where we believed reported savings needed to be adjusted. The evaluation included development of independent net-to-gross estimates and the provision of recommendations for program performance enhancements.

- ***Statewide Measurement and Verification Evaluation, Public Utility Commission of Texas.*** Summit Blue served as the Independent Measurement and Verification Expert to the Public Utility Commission of Texas (PUCT) for verifying the estimates of energy and peak demand reductions for calendar years 2003 and 2004 as reported by six Texas utilities. Summit Blue confirmed the legitimacy of the reported savings in most cases and recommended adjustments where appropriate. This effort required detailed review of program databases and a sample of original program records to confirm data and ensure appropriate use of deemed savings estimates approved by the Commission. As part of a process evaluation, Summit Blue also conducted in-person interviews with program staff and a variety of participating contractors/project sponsors. Recommendations on program design and implementation were cited in a third-party petition to the Commission to expand funding for energy efficiency programs, and it the state legislature took up the issues raised in the report in the 2007 legislative session.

- ***US Department of Energy*** - Audited the conservation programs of US DOE's, Office of Energy Efficiency and Renewable Energy (EERE) in accordance with the Government Performance Results Act (GPRA). Reviewed technology cost and performance projections, market penetration estimates, energy saving estimates and modelling approaches for building technologies.

- ***Evaluation of Performance Contracting Program, Alliant Energy/Interstate Power and Light.*** Summit Blue conducted a complete process and market evaluation of Interstate Power and Light's performance contracting program. The study assessed customer and project developer satisfaction with the program, and assessed methods to increase customer and developer participation in the program.

- ***Natural Gas DSM Program Attribution Evaluation, Enbridge Gas Distribution.*** Summit Blue performed a study of attribution (free riders and spill over) in a business market custom efficiency project program. The research involved the design and field implementation of a qualitative research method to assess program influences. The method developed evidence on multiple decision levels and from multiple market actors

through personal interviews and program records review, supported by a literature review of attribution research. The results of the research were used to support Enbridge's DSM financial incentive rate filings with the Ontario Energy Board.

- *Xcel Energy, Process and Impact Evaluation of Colorado DSM Programs,* Summit Blue completed cost-effectiveness, impact, and process evaluations of Xcel Energy's portfolio of residential, commercial, and industrial energy efficiency and demand response programs operating in Colorado. Program cost-effectiveness was computed using the four standard benefit-cost tests including the Total Resource Cost test; the impact analysis employed calibrated engineering methods based upon tracking system data, individual project files, and M&V data; and process and satisfaction issues were addressed with integrated, cross-program survey instruments and samples.

4.2 *Itron*

Itron's Consulting and Analysis (C&A) Group is made up of two of the most successful and innovative consulting companies in the history of the energy efficiency industry: Quantum Consulting, Inc. (QC) and Regional Economic Research, Inc. (RER). Itron staff developed and refined some of the industry's most important evaluation, planning, and forecasting tools and approaches, including conditional demand (CDA) and statistically-adjusted engineering (SAE) models, discrete choice and net-to-gross methodologies, the duty-cycle approach to load control impacts, the COMMEND and REEPS end-use forecasting models, the ASSET energy efficiency potential model, and end-use metering data cleaning and analysis techniques, among others. Itron C&A staff have authored some of the industry's most influential projects and reports, including the 2001 Framework for Assessing Publicly Funded Energy Efficiency Programs, the national Energy Efficiency Program Best Practices Project, the California Secret Surplus Study and 2006 California Statewide Potential Study, the recent California End Use Survey (CEUS), and the CDA and related analysis for the recent California Residential Appliance Saturation Survey (RASS).

In addition, for the past 15 years, C&A staff led the most comprehensive and useful evaluations of the California IOU's energy efficiency programs, including CADMAC-protocol compliant evaluations of PG&E's Express Efficiency and Custom Incentive Programs, evaluation of the statewide Express Efficiency Program from 1998 – 2005, evaluation of the California Statewide SPC program from 1998-2005, evaluation of the statewide Single-Family Rebate Program (2002-2005), evaluation of the statewide large nonresidential demand response programs (2004-2005), and the statewide nonresidential audit program evaluation (2002-2005), among others. As a result, C&A team members have unparalleled knowledge of California programs, markets, segments, demographics, firmographics, climate, and end use patterns.

Itron's C&A group includes over 60 professional staff with expertise in economics, engineering,statistics, energy and the environment, business management, and related fields. Three-quarters of these staff are located in Itron's Oakland and San Diego offices. Itron's C&A group is managed by some of the industry's most respected leaders, including Mr. John Cavalli, Mr. Michael Rufo, and Mr.Kris Bradley. Itron's Consulting and Analysis Group has provided evaluation, monitoring and verification, and market assessment consulting services to the energy industry since the early 1980s, primarily to electric and gas utilities and related public and private sector institutions.

4.3 *SERA*

SERA, one of the NCI team's subcontractors, has conducted hundreds of the types of interviews required for this engagement as part of process evaluations for both residential and non-residential DSM programs as well as having expertise in evaluating non-energy benefits and attribution for utility energy efficiency programs. Some examples of recent, related work are summarized below.

Client	Type of Evaluation(s)	Program Area(s)
Southern California Edison	Process	Non-residential Standard Performance Contracting program
Energy Center of Wisconsin	Process	High-performance office and school design
Seattle City Light	Process & impact	C/I Operations and Resource Assessment program, and Air Compressor Efficiency program
Puget Power	Process	Commercial lighting

4.4 *References*

References for recently completed and related project are provided below along with client references for these projects.

- ***Evaluation, Measurement, and Verification of the Statewide Local Government Partnerships Program for the California Public Utilities Commission (2007-2010).***

  Jeorge Tagnipes
  California Public Utilities Commission
  San Francisco, CA

Phone: 415-703-2451
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- *150 MW Targeted DSM Program Evaluation, Consolidated Edison (2009)*

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  William Saxonis
  New York Public Service Commission Staff
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- *Arizona Public Service Demand-side Management Program Evaluation (2006-present).*

  Roger Krouse
  Arizona Public Service Company
  Phoenix, AZ
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Ontario Power Authority's (OPA) Programs (2007-2010) – NCI has completed multiple evaluations for the Ontario Power Authority over the past 4 years.

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Section 5. Budget and Billing Rates

Navigant proposes to complete the process and impact evaluations for the Act 129 energy efficiency programs for $2.698.919, as detailed in the following tables.

Evaluation Groups	Impact Evaluation				Process Evaluation	C/B Analysis	Mgm't & Reporting	Total EM&V
	Site M&V	Analysis	NTG	Total				
Low Income Energy Efficiency	$0	$91,593	$9,159	$100,752	$27,478	$9,159	$45,796	$183,186
Res. Energy Efficiency Rebate	$67,200	$182,065	$24,926	$274,191	$74,779	$24,926	$124,632	$498,530
Res. School Energy Pledge	$0	$37,212	$3,721	$40,934	$11,164	$3,721	$18,606	$74,425
Res. Refrigerator Recycling	$0	$34,996	$3,500	$38,496	$10,499	$3,500	$17,498	$69,992
Upstream Lighting Program	$0	$40,000	$4,000	$44,000	$16,000	$4,000	$16,000	$80,000
Industrial Sector	$105,300	$168,209	$27,351	$300,860	$82,053	$27,351	$136,754	$547,017
Commercial Sector	$139,500	$483,385	$62,288	$685,173	$186,865	$62,288	$311,442	$1,245,769
Total	***$312,000***	***$1,037,459***	***$134,946***	***$1,484,405***	***$408,838***	***$134,946***	***$670,730***	***$2,698,919***

Task	Assigned Personnel	Hours	Labor Costs	Other Costs	Per Task Total Cost
Impact Evaluation					
Site M&V	Multiple	1,768	265,200	46,800	312,000
Analysis	Multiple	5,023	954,462	82,997	1,037,459.00
NTG	Multiple	955	124,150	10,796	134,946.00
Process Evaluation	Multiple	2,090	376,131	32,707	408,838.00
Cost Effectiveness	Multiple	671	124,150	10,796	134,946.00
Management & Reporting	Multiple	3,225	590,242	80,488	670,730.00
Total		***13,733***	***2,434,336***	***264,583***	***2,698,919***

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Confidential Billing Rates

Evaluation Groups	Program Budget	Impact Evaluation					Process Evaluation			C/B Analysis	Mgm't & Reportin	Total
		Site M&V	Analysis	NTG	Surveys	Total	Surveys	Analysis	Total			
Low Income Energy Efficiency	$4,924,347	$0	$62,782	$9,159	$28,811	$100,752	$9,508	$17,970	$27,478	$9,159	$45,796	$183,186
Res. Energy Efficiency Rebate	$13,401,339	$67,200	$166,953	$24,926	$15,112	$274,191	$4,987	$69,793	$74,779	$24,926	$124,632	$498,530
Res. School Energy Pledge	$2,000,667	$0	$22,101	$3,721	$15,112	$40,934	$4,987	$6,177	$11,164	$3,721	$18,606	$74,425
Res. Refrigerator Recycling	$1,881,503	$0	$19,884	$3,500	$15,112	$38,496	$4,987	$5,512	$10,499	$3,500	$17,498	$69,992
Upstream Lighting Program		$0	$40,000	$4,000	$0	$44,000	$0	$16,000	$16,000	$4,000	$16,000	$80,000
Industrial Sector	$14,704,767	$105,300	$136,844	$27,351	$31,365	$300,860	$10,350	$71,702	$82,053	$27,351	$136,754	$547,017
Commercial Sector	$33,488,422	$139,500	$427,121	$62,288	$56,264	$685,173	$18,567	$168,298	$186,865	$62,288	$311,442	$1,245,769
Total	*$70,401,045*	*$312,000*	*$875,684*	*$134,946*	*$161,775*	*$1,484,405*	*$53,386*	*$355,452*	*$408,838*	*$134,946*	*$670,730*	*$2,698,919*

Section 6. Exceptions

NCI requests that paragraph 17 be modified. NCI will endeavor to provide 30 day notice of cancelation of insurance. Our carrier will not commit to providing 30 day advance notice in the certificate.

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Section 7. Resumes

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Craig McDonald

Craig McDonald
Managing Director

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Professional History

- Managing Director, Navigant Consulting
- Senior Vice President, Resource Management International
- Senior Vice President, Synergic Resources Corporation
- Chief Operating Officer, SRC Systems
- Manager, Energy Consulting, Mathematical Sciences Northwest
- Staff Scientist, Battelle, Pacific Northwest Laboratories

Education

- M.S., Industrial Engineering / Operations Research, Cornell University
- B.S., Industrial Engineering / Operations Research, Cornell University

Professional Expertise

- Investment quality business plans
- Market assessment and competitive assessment
- Market /introduction entry strategy
- Emerging energy technologies (renewable, energy efficiency and conventional generation)
- Partnering and strategic alliance strategy and formation
- Business model innovation
- Energy resource planning and policy
- Marketing strategy and planning
- Marketing/business development

Craig McDonald, Managing Director, Navigant Consulting, Philadelphia -- has more than 20 years of experience with utilities and governmental agencies on developing, implementing, and evaluating Clean Energy policies and programs. He has worked with more than 30 different utilities (both publicly and investor owned) on developing their energy efficiency and marketing programs. He has also directed the marketing and implementation of Clean Energy initiatives.

He has directed DSM evaluations, which have been used to determine shareholder incentives, for Pacific Gas & Electric, Southern California Edison, Wisconsin Public Service, Duke Power, Southern Indiana Gas & Electric, Florida Power Corporation and Georgia Power. Mr. McDonald directed the development of the Market Transformation Guidebook for the National Association of Regulatory Utility Commissioners.

Mr. McDonald has testified on DSM program evaluation, utility planning, rates, energy efficiency and load management programs and market issues in British Columbia, Ontario, Washington, California, Ohio, Wisconsin, Washington, D.C., Florida, Michigan, Connecticut, North Carolina, Virginia, and Indiana.

Some examples of Mr. McDonald's experience follows.

» *Comprehensive Evaluation of Entire Portfolio of DSM Programs* - Duke outsourced all of its DSM program evaluation activities. Served as the overall project manager for the impact and process evaluation all of Duke's DSM programs, including defining the evaluation issues to be addressed, the evaluation methodology, supervising data collection, conducting the impact and market evaluations, completing benefits-cost analyses, and developing reports to the regulatory commission. This included completing more than 12 different evaluation studies each year.

- *Consolidated Edison* – Managed the evaluation of the 150 MW targeted DSM program. Con Ed had contracted to reduce loads within 25 network areas to defer T&D expenditures. This evaluation determined the actual load reductions and investment savings. The program included both residential and commercial programs delivered within constrained timeframes and geographies. The evaluation recommendations have been incorporated into the program design and implementation.
- *Portfolio of the Future* -- Director for multi-year effort to identify, evaluate, and accelerate the commercialization of emerging energy efficient technologies for Southern California Gas and San Diego Gas and Electric. The effort includes maintaining a scan on emerging energy efficiency technologies, completing pilots and marketing studies, and assisting developers with commercialization. The current portfolio pilots involving more than 10 emerging technologies. Designed and led the evaluation of pilot programs and installations for these technologies.
- *Ontario Power Authority* – developed the evaluation approach and supervised the analysis of the metering and survey data in support of several programs for the Ontario Power Authority including their non-residential demand response, the residential TOU pilot program, residential Coupon, residential HVAC Rebate, and residential Reward programs.
- *Long Island Power Authority*—developed the M&V protocols and manual for the 75 MW commercial sector retrofit DSM program. These M&V protocol were used to determine the actual payments that the 6 implementing ESCOs were paid for providing the DSM savings.
- *Class III Portfolio Standards, Connecticut Department of Public Utilities* - Provided research, policy analysis, facilitated stakeholder workshops, and analytical support for the decision that established the rules and processes for implementing a Class III portfolio standard in Connecticut covering energy efficiency, demand response, and distributed generation. This included developing the protocols for measuring savings from energy efficiency and distributed generation facility for the issuing certificates that can be used for compliance with the Class III standards.
- *Integrated Energy Policy Report, California Energy Commission*- Provided analytic and policy support to the development of the Integrated Energy Policy Report including: resource adequacy; procurement processes and rules, utility energy efficiency goals, analyzing energy efficiency embedded in the forecast, and developing energy efficiency and demand response scenarios for achieving greenhouse gas reductions goals.
- For the *City of Tallahassee,* Mr. McDonald directed the development of their DSM plan. As a result, the City committed to implement 150 MW DSM program, making it one of the most ambitious utility DSM programs. NCI's effort included resource identification, market analysis, business case development, benchmarks and program planning. NCI developed the M&V protocols for contractor payments. NCI is now managing the performance monitoring of the implementation contractors.

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Professional History

- Associate Director, Navigant Consulting
- Executive Consultant, Resource Management International
- Manager of Evaluation, Synergic Resources Corporation
- Project Manager, RCG / Hagler, Bailly, Inc.
- *Project Manager, TechPlan Associates,* Inc.
- *Project Coordinator, Portfolio* Associates, Inc.
- Senior Editor, Synergic Resources Corporation
- Technical Writer, Franklin Research Center

Education

- B.A., Sociology, University of Pennsylvania, 1974

Stephen Hastie, Associate Director, has been involved in energy-related research and communications for the past 30 years. He has extensive experience in demand-side management program design and evaluation, with respect to both resource acquisition and market transformation programs. He has directed more than 30 evaluation studies. Mr. Hastie has a special expertise in process evaluation, market research and SRA net-to-gross adjustment. His work has given him a firm understanding of what motivates program participation, how to predict program penetration, determining the effects of programs on the market, profiling specific market segments and trade allies, and understanding customer motivations and decision-making with regard to their use of electric and gas energy resources. This experience has also been useful in understanding both how customers are likely to respond to various offers and how to approach customers to gain insights into their decisions. Mr. Hastie also has extensive experience in the development of new products and services, utility industry restructuring, and market assessment. He is an excellent writer.

Professional Experience

Mr. Hastie's project experience includes efforts to:

- Design, implement and evaluate utility and governmental energy efficiency programs
- Identify best practices in utility DSM programs
- Estimate net-to-gross factors for specific DSM programs
- Develop and refine program or product features, and determine program cost effectiveness
- Estimate marketing program impacts
- Identify and characterize DSM measures for specific areas
- Estimate DSM resource potential in specific regions
- Conduct roundtables and focus groups to investigate customer decision-making practices and satisfaction related to energy efficiency products and services
- Forecast likely penetration of products and services
- Determine pricing points and incentive levels

For four years Mr. Hastie edited an industry-wide newsletter on energy program evaluation, *Evaluation Exchange.* He was lead author of *Market Transformation in a Changing Utility Environment,* a guidebook for regulators commissioned by NARUC, which included a section on evaluation issues. He also served as lead author on an evaluation guidebook for the European Union, *A European Evaluation Guidebook for DSM and EE Services Programmes.*

Sample Project Experience

The following is a sampling of Mr. Hastie's considerable relevant project experience.

» **Consolidated Edison Company of New York** – Currently managing the process evaluation of the utility's entire Energy Efficiency Portfolio Standard (EEPS) program portfolio (16 programs), and overseeing all market research for this effort. Previously responsible for process evaluation and survey-based net-to-gross estimates in an evaluation of the utility's Targeted DSM program.

» **Ontario Power Authority** — Currently directing the impact evaluation of, and overseeing market research for, a program promoting multiple efficient technologies through retailers. Previously, directed market research for a similar program involving 13 different technologies, including net-to-gross adjustment factor estimation approach (using a rigorous SRA decision-tree logic).

» **E.ON US** – Assisting in the oversight of the impact and process evaluation of this utilities DSM portfolio over a multi-year period. Due limited total program expenditures being made, given the utility's size, cost-effective alternatives to full-scale evaluation activities are being developed.

» **Long Island Power Authority** – Served as technical advisor to the Authority with respect to a wide range of Clean Energy issues for six years, including evaluation. Trained LIPA evaluation staff in evaluation strategies and in market transformation program theory. Played a key role in specification of evaluation RFPs, review of proposals and selection of contractors, specification of key issues to be addressed and analysis/reporting approaches.

» **Duke Power Company** -- Developed detailed evaluation plans and provided overall management of process/market and impact evaluations for all DSM programs for Duke Power for four consecutive years (approximately 14 programs per year). Programs evaluated included a wide range of residential, commercial and industrial initiatives. Played the lead role in free rider estimation and in sample design in the last two years of this effort.

» **Central Hudson Gas & Electric** – Overall management, as well as customer and trade ally research oversight, for a process evaluation of the utility's major commercial/industrial energy efficiency rebate program offerings (including free ridership).

» **COM/Electric** — Conducted baseline study for six energy-efficiency technologies and practices among consumers, businesses and trade allies. This involved the development of fourteen separate survey questionnaires, analysis of the survey results, and summarization of the research findings.

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Timothy Douek

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Professional History

- Associate Director, Navigant Consulting, Inc.
- *Founding Partner, Utilis Energy, LLC*
- Consultant, Datamonitor, Inc.

Education & Qualifications

- B.Sc., Economics, University of Wales, College of Cardiff
- Six Sigma – Certified Green Belt

Mr. Douek is an Associate Director in the Energy practice of Navigant Consulting, Inc. He has extensive experience in managing impact and process evaluations in the residential sector. With 13 years of market analysis and consulting experience in the energy and utilities industry, he has served numerous client organizations across the regulated and deregulated sectors of the industry and is a respected advisor to the management teams of many leading utilities in the North America and Europe. His primary focus is working with clients in the collection and analysis of information that will assist in the development and implementation of corporate and business unit strategies. Mr. Douek has participated in numerous projects that have helped regulated utilities assess their organizational efficiencies and interact with regulatory bodies.

Professional Experience

- **Consolidated Edison of New York Appliance Bounty and Residential Room AC Program Evaluations** – Leading the process evaluation of two of Con Edison's 2009-2011 electric energy efficiency programs focused on encouraging the recycling of less efficient appliances and the purchase of higher efficiency room AC units. Project involves the preparation of an evaluation plan and development of research instruments (participant and non-participant surveys, retailer and program delivery agent interviews, etc.) and preparation of detailed weekly, monthly, and final process evaluation reports.

- **Ontario Power Authority (OPA) Appliance Recycling Program Evaluation** - *Managed/coordinated the impact* and process evaluation (including net-to-gross analysis) of an appliance recycling program designed to retire 30,000 inefficient in-home devices. Project involved the preparation of an evaluation plan and development of research instruments (survey, on-site audit checklists, vendor performance evaluations, etc.) and preparation of a detailed program evaluation report.

- **Multiple OPA Efficiency and Demand Response Program Evaluations -** Managed/coordinated the impact and process evaluations of several multi-million dollar government-funded residential incentive programs. The programs have included:
  - A broad, multiple-measure residential efficient equipment rebate program, including lighting, air conditioning and other energy-using equipment.
  - A large residential summer peak demand response program.
  - A residential new construction program, including trade ally performance and partnership assessments.

  These efforts involved the evaluation of each program's processes and individual stakeholder activities as well as development/review/updating of savings algorithms, and assessment of energy-related costs and impacts of each program. The clients received a thorough analysis of each program's effectiveness and a series of clear and specific recommendations on program improvements.

- **National Grid, Evaluation/Audit of DSM Programs** – Managing an evaluation/audit of the utility's 2008 natural gas DSM program effort. Included is a review of program processes and control points, critique of impact assumptions and results, Benefit/Cost model review, review of vendor agreements, and vendor performance evaluation.

- **Customer Care Research Consortium, DSM Program Evaluation -** Coordinated an initiative by 11 major US utilities with combined annual revenues of US$300bn which explored tactical and strategic growth opportunities via energy efficiency / "green" programs. Included evaluation of conservation and DSM program designs and "Voice of the Customer" research to determine the optimal mix of programs from utility, regulator and customer perspectives.

- **First Energy, Business Unit Optimization -** Participated in the operational/organizational evaluation and redesign of the Energy Delivery group of a major US utility. Project involved mapping the current state processes of the firm's seven operating companies and streamlining the linkages between the various stakeholders to develop efficiencies between the engineering, accounting, work management team and Executive Leadership teams.

- **Utility Standards Board, Standards Development -** Worked with 7 major US utilities to begin the process of developing and codifying standards around Meter Data Management (MDM) enterprise software interfaces. Project involved aligning industry thinking, developing group consensus, outreach to other stakeholder groups and work with international standards agencies.

- **Customer Care Research Consortium, Video** Production - Defined a "Day in the Life of the Future Utility Customer" with 8 large US utilities. Project involved developing a defensible vision for how end users will interact with their utility companies over the coming 8-10 years. The project outputs were subsequently transformed into a video production which will be used by utilities, regulators and other stakeholders to align their thinking, products and services in the years to come.

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Michael Sherman

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Managing Consultant

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Professional History

- Managing Consultant, Navigant Consulting, Inc.
- Director, Energy Efficiency Programs, Massachusetts Department of Energy Resources
- Senior Consultant, Peregrine Energy Group
- Principal, Sherman Energy Associates
- Senior Consultant Xenergy, Inc. (now Kema)
- Assistant Director, MA Office of Energy Conservation

Education

- B.A., History, Brooklyn College
- M.A., Community Organizing and Planning, Boston College

Honors and Fellowships

- National Institute of Mental Health Fellowship

Mr. Sherman is a Managing Consultant with Navigant Consulting, Inc. He has more than 20 years' experience in a broad variety of energy efficiency roles in the public and private sectors, including policy and legislation development, regulation, program planning, and evaluation. Mr. Sherman has led many multi-party and multi-disciplinary stakeholder groups, using his facilitation and technical skills to bring diverse stakeholder groups to optimal, efficient solutions. He has led impact and process evaluations of commercial and industrial energy efficiency programs, as well as residential and low income efforts. Mr. Sherman has particular expertise in process evaluation. He led a year-long planning process in Massachusetts, resulting in the design and implementation of a $2.1 billion three-year plan for utility energy efficiency programs, including a substantial focus on energy efficiency upgrades in more than 1 million square feet of space owned or leased by the Commonwealth. Massachusetts was recently ranked number two nationally in energy efficiency by the American Council for an Energy Efficient Economy. Mr. Sherman holds a Bachelor's Degree in History from Brooklyn College and a Master's in Community Organizing and Planning from Boston College.

Professional Experience

Recent project assignments include:

» Updating energy efficiency program plans for Consumers Energy for the second year of a five year Energy Optimization Plan for all customer sectors. Project includes re-examination and rescreening of measures and programs, incorporation of net-to-gross impacts from Year 1 evaluations, optimization of efficiency investment, and electric and gas savings for 2011.

» Commonwealth of Massachusetts Three Year Energy Efficiency Investment Plan development and implementation. Under a state mandate to "acquire all cost-effective energy efficiency less than the cost of supply," Mr. Sherman led the year-long planning efforts involving investor-owned utilities and

a municipal aggregator as Program Administrators, an 11-member Energy Efficiency Advisory Council. Mr. Sherman managed more than 25 Advisory Council meetings and numerous working groups on specific issues ranging from plan and reporting templates, to a methodology for determining rate and bill impacts of the expanded programs on participants and non-participants, to the development of Massachusetts' first Technical Reference Manual. He supervised the complete restructuring of the existing residential Mass SAVE home assessment and comprehensive statewide energy efficiency program. The process also addressed issues such as working more effectively with independent residential contractors, increasing services to the large rental population in the state, design of performance incentives, and other equity issues. Mr. Sherman also supervised a team of consultants assisting the process.

» Commonwealth of Massachusetts. Mr. Sherman led a state team advocating "30% solution" for increasing energy code standards for the 2009 International Energy Code. The team developed an optional state "stretch code" for commercial and residential buildings, increasing standards in new construction and rehabilitation by approximately 15% over the 2009 code and has so been adopted by more than 50 Massachusetts communities.

» Commonwealth of Massachusetts. Mr. Sherman led the energy efficiency analysis of a first in the nation approach to reducing greenhouse gas emissions in new large commercial facilities such as "big box" stores and commercial office buildings through the state's environmental protection permitting authority, working with environmental regulators, developers and consultants to find viable, cost-effective energy efficiency improvements early in the development and design process. Mr. Sherman also participated in the state's Leading by Example program improving more than 1 million square feet of state-owned and leased facilities.

» Xenergy, Inc. (now Kema). Mr. Sherman led more than 20 impact and process evaluations of energy efficiency programs across the country ranging from residential low income programs to large Commercial/Industrial programs. He also did program planning and strategy development.

» Rebuild Boston. For Peregrine Energy Group, Mr. Sherman was the project manager for a three-year $750,000 effort funded by the U.S. Department of Energy (DOE) to organize and revitalize municipalities through energy efficiency. He facilitated and coordinated a variety of working groups involved with the city, including the development of Energy Services projects serving more than 15,000 public housing residents with energy and water efficiency improvements. He was honored by the DOE as National Partner of the Year in 2002.

» Massachusetts Office of Energy Efficiency. Mr. Sherman took a leading role, working with low income advocates, Community Action Agencies, the state's Congressional delegation in the improvement of the basic operating rules of the DOE Weatherization Assistance Program for Low Income Persons and in maintaining adequate levels of funding nationally through 13 years of early program development. In partnership with the in-state Low Income Energy Assistance Network, Mr. Sherman developed some of the first "piggyback" utility low income efficiency programs.

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Gaynoll Cook

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Managing Consultant

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Professional History

- Managing Consultant, Navigant Consulting, Inc.
- *Senior Consultant, Summit Blue* Consulting
- Senior Analyst, Ontario Hydro

Education

- Master of Science (Biostatistics), Faculty of Medicine, University of Toronto
- Bachelor of Arts (First Class Honours), Charleton University, Ottawa,, Ontario

Professional Associations

- Assocation of Energy Services Professionals

Gaynoll (Gay) Cook is a Managing Consultant with Navigant Consulting, formerly a Senior Consultant with Summit Blue Canada since 2004. She has worked for over twenty-five years in the energy industry with extensive experience in the evaluation of demand-side resources, particularly with industrial customers. Ms. Cook began her career in energy at Ontario Hydro and was responsible for the evaluation of the company's province-wide industrial programs. Recent work for Navigant includes managing impact and process evaluations of natural gas and electricity DSM programs in various states and *provinces; developing engineering algorithms for DSM* measures; researching regulatory and legislative requirements, designing sampling approaches to assess custom project results; and conducting research on free riders and spillover.

Professional Experience

Ms. Cook has played a key role in evaluation of energy efficiency and demand response programs, regulatory research, and statistics. As the key contact for Canada with Summit Blue, she has managed a series of projects across the country for both gas and electricity programs, including attribution research, impact and process evaluations, audits of energy program results, assessment of savings estimates, cost-effectiveness analyses, reviews of DSM, and sampling methods. She has also worked on *project teams for several US utilities and agencies. Ms Cook is* highly skilled in impact evaluation and customer research and, with the ability to see both the big picture and intricate details, can turn quantitative results into meaningful observations and recommendations.

The following is a list of recent projects.

- **Impact and Process Evaluation of the Ontario Power Authority's Cross-Cutting Commercial and Institutional Retrofit Incentive Programs.** Managed the evaluation of four programs funded by OPA and implemented by program delivery agents across the province.

- **Impact and Process Evaluation of the Ontario Power Authority's Double Return Demand Response Program.** *Managed the evaluation of Double Return, implemented by Hydro One* Networks to its interval-metered Commercial and Industrial interval-metered accounts.

- **Impact and Process Evaluation of Hydro One's Double Return Demand Response Program.** Managed the evaluation of a Hydro One program targeted to medium to large industrial customers, including a customer survey and interviews with program staff and partners.

- **Sample Design to Verify Savings for Large Commercial & Industrial Projects.** Managing a project to develop and apply a sample design for the Ontario natural gas utilities to use for the annual verification of results from large commercial and industrial custom projects.

- **Union Gas/Enbridge Gas Distribution Attribution Research for Custom Business Projects.** Project determined attribution for custom projects with large industrial and commercial customers (history and critique of free rider methods, customer interviews, analysis of results).

- **Attribution Study for Commercial and Industrial Participants in Natural Resources Canada Programs (sub to Marbek Resources).** Conducted research for NRCan's Office of Energy Efficiency to determine the attribution of energy savings and GHG to both financial and behavioural programs.

- **Impact and Process Evaluation of PECO's Low Income Energy Efficiency Program.** Currently conducting the evaluation of PECO's low-income program as part of Navigant's multi-year evaluation of PECO's portfolio of DSM programs.

- **Impact and Process Evaluation of AEP Ohio's Low Income Energy Efficiency Program.** *Currently conducting the evaluation of AEP Ohio's low-income program as part of Navigant's* multi-year evaluation of AEP Ohios's portfolio of DSM programs.

- **Billing Analysis of Missouri Gas Energy Water Heating Program.** Completed a billing impact analysis of a natural gas DSM program providing incentives for more efficient water heating systems (storage tanks with Energy Ratings greater than 0.62 and tankless water heaters).

- **Union Gas/Enbridge Gas Distribution Determining Savings for Selected Residential Measures.** Managed a project to determine resource savings values for low-flow showerheads, faucet aerators, and programmable thermostats to be used in utility DSM program design.

- **Union Gas/Enbridge Gas Distribution Attribution Research for Selected Residential Measures.** Participated in a project to determine free riders and spillover for residential measures - literature reviews, interviewing retailers and contractors, and analysis of survey results.

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Professional History

- *Associate Director, Navigant Consulting*
- Senior Consultant, Summit Blue Consulting
- Principal Consultant, PA Consulting Group (Hagler Bailly Consulting)
- Research Analyst, Analysis, Review and Critique, division of R&C Enterprises
- Research Analyst, Solar Energy Industries Association
- *Foreign Affairs Analyst, Congressional* Research Service, Foreign Affairs and National Defense Division
- Social Science Analyst, Congressional Research Service, Life Sciences : Science Policy Research Division

Education

- MA, International Affairs, George Washington University, School of Public and International Affairs, 1983
- BA, Psychology and Religion, St. Olaf College, 1978

Jeff Erickson is an Associate Director with Navigant Consulting and formerly a Senior Consultant with Summit Blue. Mr. Erickson has over 15 years of experience managing large scale energy efficiency and demand response evaluation efforts in the C&I and residential sectors. Mr. Erickson's areas of expertise include program impact data analysis, modeling, data analysis, survey and sample design, market assessment, load control and innovative pricing, process analysis, and performance measurement. He also specializes in integrated data collection and reviewing and redesigning data collection methods and program tracking databases. Mr. Erickson led program theory development and the impact, process, and market evaluation of nonresidential statewide programs in Wisconsin from 1999 to 2004. Mr. Erickson earned a MA in International Affairs from George Washington University and a BA in psychology and religion from St. Olaf College.

Professional Experience

» **Commonwealth Edison (ComEd) Energy Efficiency and Demand Response Program Evaluation.** Summit Blue was the prime contractor to evaluate the portfolio of new energy efficiency and demand response programs being offered by ComEd and the Illinois Department of Commerce and Economic Opportunity (DCEO). Is managing the project that will evaluate the portfolio of programs that cover a wide range of market approaches in both the residential and nonresidential markets and both energy efficiency and demand response. Jeff manages the Summit Blue staff and a team of three subcontractors. The evaluation contract covers work from 2008 through 2011. The evaluation will primarily focus on impact evaluation and will include extensive field data collection. The evaluation will also focus on process issues to provide timely feedback to program managers to help them improve program implementation procedures.

» **Impact and Process Evaluations of LG&E/KU's DSM Programs.** Managed a multi-year impact and process evaluation study of LG&E/KU's residential, commercial, and industrial

DSM programs from 2005 to 2009. The evaluation strategy focused on the integrated evaluation approach, and Summit Blue professionals worked closely with the utility and implementation contractors on integrated data collection and management strategies to support the evaluation process. The impact analysis relied on calibrated engineering methodologies and relied on quality datasets developed during the course of implementation. The process evaluation approach was designed to give LG&E/KU program management staff ongoing feedback to identify program design and implementation refinements needed to improve program effectiveness.

» **Integrated Data Collection and Evaluation of Innovative Power Pricing Programs.** Managed an integrated data collection effort with PSE&G in New Jersey to support the design and evaluation of several innovative power pricing pilot programs. The programs were designed to test customer response to various methods of presenting real, hourly prices to residential and small commercial customers and offering them various means to respond to those prices. The evaluation examined customer response and calculated program impacts. The integrated data collection involved integrating evaluation-specific data collection into the implementation process as opposed to the traditional approach of retrospective post-implementation evaluation. Jeff reviewed program forms and surveys, designed sampling strategies, and assisted program design staff as they developed procedures for implementing the pilots. Jeff also managed the flow of data, directed and reviewed the impact analyses, edited the reports and authored summary documents.

» **Impact analysis of Statewide Industrial and Commercial Programs in Wisconsin.** While with PA Consulting, Jeff designed the impact evaluation methods and then supervised subcontractors as they evaluated the energy and environmental impacts of the statewide industrial and commercial programs in Wisconsin between 2001 and 2004. The core approach was an engineering estimate of program impacts starting with program estimates of energy savings and applying adjustment factors. The adjustment factors include:

  - Verification of installation
  - Free ridership
  - Persistence
  - Some operating parameters such as hours of operation
  - Engineering review adjustment to the technical potential

Data from on-site measurement and metering were used for adjusting engineering parameters. Through participant surveys, the evaluation team verified measure installation and estimated free ridership and persistence. For a sample of measures and projects, evaluation engineers performed a detailed review of the engineering calculations used to estimate savings and developed a realization rate on the engineering estimate of the technical potential. For a smaller sample of measures and projects, evaluation engineers went on-site to meter equipment and measure operating data to further fine-tune the engineering estimate of savings.

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Professional History

- Director, Navigant Consulting, Inc.
- Principal, Summit Blue Consulting
- President, The Industrial Lighting Company
- Senior Project Developer, Enron Energy Services
- Project Developer, Sempra Energy
- Senior Industrial Engineer, Unisys Corporation
- Industrial Engineer, General Dynamics Corporation

Education

- MBA, Finance and Marketing, University of San Diego, 1994
- BS, Industrial and Management Engineering, Montana State University, 1983

Professional Associations

- Professional Engineers License, Industrial, California
- Certified Energy Managers Certificate (AAEE CEM)
- Co-chair, California Chapter of the Association of Energy Service Professionals (AESP)

Floyd Keneipp is a Director with Navigant Consulting, formerly of Summit Blue Consulting. He is a registered professional engineer with over 23 years of experience in developing technical and business requirements for complex engineering projects. He has been responsible for developing strategic energy plans for government, non-profit, and private clients throughout California. He has an extensive background in developing specific energy efficiency projects for clients, and has been involved in structuring and supporting project finance by identifying and acquiring incentive funds from State and Municipal agencies and private utilities.

He has extensive experience in program impact and process evaluation, and in identifying, developing, and managing energy projects for commercial enterprises and public institutions. His evaluation experience includes commercial and residential markets (all measures) involving both retrofit and new construction applications. In addition, Mr. Keneipp has a broad range of experience in energy related issues including program design, measure cost analysis, benefit-cost analysis, and strategic energy planning for public and private institutions.

He has a Bachelors degree in Industrial Engineering from Montana State University and a Masters degree in Finance and Marketing from the University of San Diego.

Professional Experience

The following provides a description of his project engagements in the energy efficiency industry, beginning in 1997, and his previous experience as an Industrial Engineer beginning in 1985.

» *Evaluation of the California Portfolio of Local Government Partnership Programs, California Public Utilities Commission.* Project manager for the evaluation of 56 local government partnership programs operating throughout California and administered by 4 investor owned utilities. These programs operate in most residential and commercial markets, and install a full range of HVAC and lighting technologies

through various downstream, mid-market, and upstream delivery mechanisms. This project employs an evaluation approach intended to reduce portfolio reporting risk by allocating resources to evaluate key performance parameters on high impact measures using various pre/post metering approaches and IPMVP options. The project also involves recommending to the public utilities commission various changes in program designs and partnership structures that will improve the viability of the partnership model as an effective greenhouse gas reduction and energy efficiency delivery mechanism.

» ***Residential and C&I Program Impact Evaluation, Arizona Public Services.*** Project manager for an impact evaluation of a portfolio of newly implemented residential and C&I energy efficiency programs offered throughout Arizona by Arizona Public Services. This project includes an integrated data collection approach that collects impact and attribution data at key points throughout each programs delivery process. The approach also involves extensive use on uncertainty analysis to refine adjusted gross impact estimates on several key programs.

» ***Program Design, UniSource Energy Services.*** Project manager responsible for developing a new portfolio of residential & non-residential DSM programs for UniSource Energy Services in Arizona. After an initial screening of a broad range of program concepts, plans for the most promising ideas were developed, along with a detailed benefit-cost analysis of each program and each energy efficiency measure to be offered.

» ***Evaluation of Commercial / Industrial Programs, New York State Energy Research and Development Authority (NYSERDA).*** This is an ongoing market characterization, market assessment, and attribution evaluation for the New York State Energy Research and Development Authority (NYSERDA). This project includes developing sample frames, program indicators, and research instruments to evaluate the impact of seven commercial / industrial programs on various upstream, midstream, and downstream market actors. Research topics include defining and quantifying inside, outside, and non-participant spillover (including the impact that NYSERDA has had on New York State energy code update and implementation efforts), free-ridership (and associated net factor), and resulting net to gross calculations on installation and education programs.

» ***Enron Energy Services, University of California and California State University Strategic Energy Plan.*** Headed a team to develop Strategic Energy Plans for 17 (UC/CSU) campuses in Northern California. Project functional requirements involved directing the technical audits of staff mechanical / electrical engineers, reviewing campus construction, development, and budgeting policies and establishing both baseline and enhanced case energy usage profiles. Worked with and led presentations to senior campus and UC/CSU system executives regarding energy usage and management issues. Project identified over $200 million in viable energy related projects, system wide. Partial implementation of recommendations has begun on a campus by campus basis.

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Professional History

- Associate Director, Navigant Consulting
- Senior Consultant, Summit Blue
- Professor, Dept. Of Agriculture & Applied Economics, University of Wisconsin, 1991 to 2010
- Instructor, Dept. Of Agriculture & Applied Economics, University of Wisconsin, 1990-91

Education

- Ph.D., Agricultural Economics, Univeristy of California
- MS, Evironmental Studies, School of Forestry and Environmental Studies, Duke University
- BS, Natural Resources, Cornell University

Professional Associations

- Board of Directors, Association of Environmental and Resource Economics, 2001-04
- Co-Editor, Journal of Environmental Economics and Management, 2002-05
- Editorial Board, Land Economics, 1997-present
- Editorial Council, Journal of Environmental Economics and Management, 2997-2002, 2005-2009

Bill Provencher is an Associate Director with Navigant Consulting. He has a Ph.D. in environmental and resource economics, and specializes in the econometric modeling of household choice and decision-making, the dynamic allocation of resources, and the valuation of environmental goods and services. Since joining Navigant Consulting in September 2009, Dr. Provencher has been involved in the econometric modeling of energy savings from traditional rebate programs as well as new behavioral-based energy efficiency programs, including a residential real time pricing program and several applications of the OPOWER behavioral program. Dr. Provencher divides his time between Navigant Consulting and the University of Wisconsin, where he is a tenured professor and continues to teach and conduct research. He has authored and presented numerous publications and presentations in environmental and resource economics. He has a Ph.D. from the University of California, an M.S. from Duke University, and a B.S. from Cornell University.

Recent Related Project Work

» **Con Edison Company of New York, Evaluation of Energy Efficiency Portfolio Standard Programs** – Currently providing sample design support for this portfolio program process evaluation effort. Role has included defining viable and *defensible alternatives to large sample size commission* requirements, developing strategies to address survey needs with customers of multiple programs cost effectively, assisting in the development of strategies to minimize error through proper design and implementation of specific research techniques, and reviewing sample design strategies for specific evaluations with respect to statistical precision and efficiency.

» **Impact Evaluation of Comparative Neighbor Energy Use Reports, OPOWER.** OPOWER is a private company offering a new energy efficiency service to utilities involving reports mailed to residential customers showing how their energy use compares to their past energy use and to the current energy use of their neighbors. Dr. Provencher has been involved in, and is currently leading, several evaluations of OPOWER programs, including a current evaluation of Year 2 of the program in the Sacramento Metropolitan Utility District. Recent innovations in the evaluation methods concern the econometric modeling of persistence effects (Do savings from the reports persist over time?), and the econometric modeling of heterogeneity in household savings due to the program (What proportion of households are not engaged in the program? What factors—behavioral, informational, attitudinal—explain the lack of engagement?). The report from the first year evaluation of the SMUD program is available at

http://www.opower.com/LinkClick.aspx?fileticket=naU7NN5-430%3d&tabid=72

» **Power Smart Pricing Impact Evaluation, Ameren – Illinois Utilities.** Navigant is under contract to provide independent third-party evaluation of the utility's residential real-time pricing rate program (10,000 current participants) for three years, with annual reports to the Illinois Commerce Commission. The focus of the evaluation is to estimate the impacts of the rates and then assess the net benefits of the program. Current innovative work involves the development of a system of hourly residential electricity demands to determine both own-price and cross-price demand elasticities, thereby allowing the opportunity to distinguish the effect of peak and off-peak electricity prices on energy consumption and energy shifting.

» **Residential Gas Weatherization Program Impact Evaluation, National Grid**. This work included a billing analysis to measure savings impacts from the program. Navigant Consulting developed a control group using an algorithm that matched each participant to their nearest non-participant neighbor that had a similar level and pattern of therm use in the period before the program started. Three different econometric approaches were used to develop robust estimates of savings compared to the control group, all based on pre-and post- billing data.

Selected Professional Service & Publications

» Board of Directors, Association of Environmental and Resource Economics, 2001-2004
» Co-Editor, Journal of Environmental Economics and Management, 2002-2005
» Editorial Board, Land Economics, 1997-present
» Editorial Council, Journal of Environmental Economics and Management, 1997-2002, 2005-present

Dr. Provencher has published numerous articles in technical journals. A list is available upon request.

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Professional History

- Navigant Consulting, Inc. – Managing Consultant
- Summit Blue Consulting - Consultant
- Hill AFB, Aircraft Sustainment Wing – Mechanical Systems Engineer, Project Manager
- GSCC-AF System Program Office – Program Manager

Education

- MS, Mechanical Engineering, Energy & Environmental track (with distinction), University of Colorado
- BS, Systems Engineering (with distinction), University of Virginia

Professional Associations

- Association of Energy Services Professionals (AESP), Member
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Member

Eric Merkt is a Managing Consultant with Navigant Consulting. Mr. Merkt's work focuses on energy efficiency and renewable energy engineering. He has experience designing renewable energy systems, performing commercial energy audits, evaluating energy efficiency programs, developing cost-effective energy incentives for energy efficiency, developing cost estimates for peak impacts, and developing estimated annual energy and demand impacts of various renewable energy technologies. Eric has also led extensive utility data projects, processing large amounts of utility DSM program data for analysis and evaluation.

Recent Projects

» **2006-2008 EE Portfolio Evaluation, Standardized Program Tracking Database lead and Evaluation Reporting Tools support, California Public Utilities Commission.** Led the development and implementation of the first cross-IOU Standardized Program Tracking database (SPTdb) capturing comprehensive DSM program tracking data from the four CPUC Investor-Owned Utilities (IOUs). This database, which interfaces with the Database for Energy Efficient Resources (DEER) for purposes of enhanced flexibility in program evaluation and reporting, is the first of its kind in the state of California and was integrated with the Evaluation Reporting Tool for the 2006-2008 CPUC EM&V evaluation cycle.

» **Energy Efficiency Program Design, Arizona Public Service.** Led the research and developed reasonable and cost-effective incentives for various energy efficiency improvements in non-residential facilities throughout the utility's service territory. Such EE improvements included industrial pumps and motors, cool roofs, and various other commercial and industrial measure analyses. Primary project tasks included the recommendation of prescribed energy efficiency upgrades; pricing and research of the

incremental costs associated with the improvements; calculation of energy savings and peak demand reduction from the various measures; and benefit-cost analyses to determine appropriate incentive levels for each measure.

» **Development of Cost-Effective Measure Incentives (JEA).** Research and development of reasonable and cost-effective incentives for various energy efficiency improvements in residential facilities throughout the utility's service territory. Primary project tasks included the recommendation of prescribed energy efficiency upgrades; pricing and research of the incremental costs associated with the improvements; calculation of energy savings and peak demand reduction from the various measures; and benefit-cost analyses to determine appropriate incentive levels for each measure.

» **DSM Potential Study Field Work and Training, General Electricity Company of Libya (GECOL).** As a subcontractor to Cadmus, performed self-directed field work and training in-country, assisting GECOL staff in and around Tripoli, Libya. Metered a large range of facilities, including small commercial, large commercial and industrial facilities, with the intent of producing 24-hour load curves for working days and holidays, and heating/cooling seasons for each sector. End uses investigated included water heating, HVAC, refrigeration, lighting, and motors.

» **Energy Efficiency Program Tracking Database Development, AEP-Ohio.** Currently leading the development of an online data system designed to track energy efficiency programs being implemented by AEP-Ohio. The system will interface with internal proprietary AEP data systems, such as the customer information system, and will allow program implementers to submit program tracking data through a web interface. Additionally, the system will have dynamic querying and reporting services, giving the client comprehensive views into their energy efficiency program data. The system uses an open source platform, which reduces client software licensing costs while maintaining high data integrity and security.

» **Pre/Post Commercial Lighting Metering Study, California Public Utilities Commission.** Led the development of field work protocols and robust, interactive field data collection forms to meet study objectives, trained subcontractor field workers, designed field instrumentation, created a database of nameplate wattages for each ballast/lamp combination represented in the field data to be used for quality control, and designed the data specification for the online open-source data collection/scheduling/QC system for the 06-08 CPUC pre- and post-retrofit commercial linear fluorescent lighting study.

Computer Skills

» Software: eQUEST, VisualDOE, AutoCAD, MS Project, MATLAB, MathCAD, WT_Perf, Arc GIS

» Languages: C, C++, HTML, SQL, Basic, Visual Basic, PASCAL, SAS

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Professional History

- Navigant Consulting, Inc.(July 2008 – Present)
- Intern, Lockheed Martin – Knolls Atomic Power Lab

Education

- B.S. Industrial Engineering and Operations Research, University of California, Berkeley, 2008

Erin Palermo is a Consultant in the Emerging Technologies and Energy Efficiency group in San Francisco, CA. Her professional experience is focused on management and evaluation of utility energy efficiency programs and policies. Her skills include statistics, mathematical modeling, and policy analysis. She holds a B.S. in Industrial Engineering and Operations Research from the University of California, Berkeley.

Professional Experience

» **Ontario Power Authority Every Kilowatt Counts Program Evaluation.** Impact evaluation of the 2009 and 2010 Every Kilowatt Counts residential energy efficiency campaigns. Developed participant and non-participant surveys to estimate net program effects of purchasing and using 13 different energy efficiency technologies. Calculated program savings, net-to-gross, and spillover effects, as well as estimating program influence on non-participants and resultant energy savings.

» **Consolidated Edison Company of New York Residential HVAC Program.** Assisted in the process evaluation of the utility's residential HVAC program. Designed surveys of participants and non-participants to understand their experiences with the contractor, the effectiveness of the marketing and outreach, and their satisfaction with the program.

» ***Consolidated Edison Company of New York Targeted* DSM Program**. Assisted in the impact and process evaluation of the utility's Targeted DSM program. This program sought to achieve permanent load reductions to avoid specific near-term transmission and distribution investments. She performed a risk analysis of the success of the targeted DSM program using Monte Carlo simulation, as well as a billing analysis to verify program effects.

- **California Solar Initiative (CSI) Low-Income Programs.** Impact and process evaluation of the CSI's Low Income solar programs for the California Public Utilities Commission (CPUC). Conducted in-depth interviews and surveys of program participant, non-participants, and market actors, focusing on work force development and the identification of gaps in the populations served.

- **Santee Cooper DSM Program Design.** Designed and developed an energy efficiency program portfolio for Santee Cooper. Modeled and projected 10 year energy savings of the program portfolio, estimated program budgets, market penetration rates, and performed cost/benefit analyses of program measures.

- **E.ON US.** Energy Efficiency Program Portfolio Evaluation. Developed market assessments for several residential and commercial energy efficiency programs in Kentucky. This multi-year evaluation involves impact evaluations, process evaluations and technical potential studies.

- **Southern California Gas Company Portfolio of the Future.** Assisted in the analysis of promoting coldwater detergent as an energy efficiency measure (reduction in water heating energy). Analyzed survey test data from users of coldwater detergent to determine net natural energy savings potential as a result of its inclusion in an energy efficiency program.

- **Benchmarking Utility "Green" Programs, Georgia Power.** Benchmarked a large IOU's sustainability program (including energy efficiency programs) and performed a gap analysis. As part of this effort, developed a utility energy efficiency program benchmark database to compare utility spending on energy efficiency programs, savings, staffing, messaging, and organization.

- **Advanced Generation Research Roadmap.** For the CEC PIER Advanced Generation Program Area, Ms. Palermo assisted in preparing a research roadmap to guide RD&D efforts of the PIER AGen Program to meet California policy goals and directives for electricity generation. She assessed market characteristics and RD&D opportunities regarding advanced, non-renewable electricity generation technologies and helped evaluate and prioritize existing RD&D effort in the industry. Through this effort, PIER AGen Program was able to effectively prioritize actions it could take to achieve its policy goals for advanced generation technologies.

- **California Sustainability Alliance.** Evaluation of "best practices" in California municipal utility energy efficiency programs for the City of Riverside.

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Professional History

- Managing Consultant, Navigant Consulting
- Senior Consultant, Summit Blue Consulting
- Project Manager, J.F. Sato and Assoc.
- Senior Associate, Stratus Consulting

Education

- MS, Economics, Specialization in Economics of Natural Resources, Utah State University
- BA, Economics, University of North Carolina

Professional Associations

- Association of Energy Services Professionals

Honors and Training

- 1999 Partners in Science Winner, US Bureau of Land Management
- SAS Training, Levels I and II
- Facilitator Training, World Resources Institute
- *Project Management Training, Microsoft* Project

Marca Hagenstad is a Managing Consultant with Navigant Consulting and formerly a Senior Consultant with Summit Blue. Ms. Hagenstad has over 16 years experience in economic and energy analysis. Ms. Hagenstad focuses on energy efficiency program evaluation and the integration of demand response within resource planning. Ms. Hagenstad led the Sampling, Net-to-Gross, and Non-Resource Evaluation efforts in the evaluation of 56 energy efficiency programs in the Local Government Partnerships (LGP) program (2006-2008 program cycle), for the California Public Utilities Commission. She is currently estimating Demand Response potential at the state-level for the American Council for an Energy-Efficient Economy. She has conducted market assessments on various measures for demand-side management and conducted surveys with vendors, participants and non-participants. She develops methodologies and economic models usable for valuation, and policy and regulatory analysis.

Professional Experience

» **Evaluation, Measurement, and Verification of the California Investor-Owned Utilities' Residential and Nonresidential Retrofit Energy Efficiency Programs -** Served as the analytical/management lead for Net-to-Gross estimations and "Non-Resource" program evaluations of the Local Government Partnership energy efficiency programs for the California Public Utility Commission (CPUC). This effort involved supervising development of telephone surveys for each program evaluation, including survey batteries for net-to-gross, spillover, and verification questions; determining survey development and implementation scheduling; overseeing execution and analysis of telephone surveys for all programs, and analysis and reporting.

» **ACEEE State Energy Efficiency and Demand Response Studies -** Assisting the American Council for an Energy Efficient Environment (ACEEE) in its series of state energy efficiency (EE) and demand response (DR) studies. This consists of a high-level

analysis and assessment for each state, and policy recommendations. Three states are included in the first phase: Virginia, Ohio, and Pennsylvania. Developed a study plan for each state that will allow for assessment of current DR activities, policies in the state that impact DR, and use of benchmark information to quantitatively assess DR potential. Reporting information includes high-level DR policy recommendations and identification of barriers in that state that might keep DR contributing appropriately to the resource mix that can be used to meet electricity needs.

» **Production Efficiency Program Evaluation for Energy Trust of Oregon (2007-2008)** - The Energy Trust of Oregon's (Energy Trust) Production Efficiency (PE) program offers energy efficiency services for industrial processes of all kinds – including manufacturing, agricultural, and water/wastewater treatment. This assessment developed reliable estimates of program- and measure-specific electric savings for the years 2007 and 2008, and obtained feedback on program design and implementation that can be used to improve the implementation of the current program. Ms. Hagenstad led the Data Tracking Assessment and Market Assessment efforts.

» **Evaluation of the New York State Renewable Portfolio Standard Program** - Providing technical and analytical support to the New York State Energy Research and Development Authority in the evaluation of the New York State Renewable Portfolio Standard with regard to assessments of market conditions. Examined the effect the increase in renewable energy supply has on natural gas prices in New York. Natural gas price suppression would be due to the reduction in natural gas demand resulting from reduced use of the fuel for electricity generation. Analysis concluded that impacts to natural gas prices in New York are likely modest (<0.03%).

» **EPA Economic Benefits Analysis** - Economic analysis in support of EPA's regulatory development under § 316(b) of the Clean Water Act, regulating cooling water intake structures. Calculated the anticipated economic benefits of reducing impingement and entrainment of aquatic organisms under the proposed rule. Developed socio-economic benefits index to help determine regional differences in expected benefits, which helped guide case study site selection and calculation of national benefits estimates. Produced publicly available reports of case study results assigning dollar values to the measured ecological benefits, to be used to facilitate federal policy.

» **OECD Vulnerability Assessment** - Using information from international and national assessments, conducted case studies in three countries: Fiji; Uruguay; and Egypt. Identified the principal impacts and vulnerabilities to climate change and provided guidance to OECD on responses to long-term climate change.

» **World Bank Economic Assessment of Climate Change on Pacific Island Nations** - Estimated potential economic impacts of climate change to coastal areas of two Pacific Island nations and analyzed options for adaptation.

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Professional History

- Consultant, Navigant Consulting
- Analyst, Summit Blue Consulting
- Intern, Enviro-Management and Research, Inc.
- Co-Op, Northrop Grumman Newport News Shipyard

Education

- BS, Mechanical Engineering, Virginia Polytechnic Institute and State University, 2007

Professional Associations

- Association of Energy Services Professionals

Awards/Achievements

- Engineer-in-Training (2007)

Matthew O'Hare is a Consultant with Navigant Consulting and formerly an Analyst with Summit Blue. Mr. O'Hare has provided program design and analytical support for many state and utility energy efficiency programs. He has evaluated energy impacts for utility programs involving HVAC, lighting, and residential appliances. He has also conducted market assessments and cost research to support portfolio level activities. Mr. O'Hare has consulted for the Department of Energy's appliance standards rulemaking analyses for several residential and commercial equipment including water heaters. He has a BS in Mechanical Engineering from Virginia Polytechnic Institute and State University.

Professional Experience

» ***As an Analyst for Summit Blue Consulting:***

– Provided program design and analytical support for several state and utility energy efficiency programs

– Conducted onsite measurement and verification of lighting retrofit projects and conduct analyses to determine energy savings as a result of these retrofit projects

– Developed and analyzed energy usage patterns for various building configurations to develop saving impacts for application to future energy efficiency incentive programs

– Analysis and quantification of energy savings for various HVAC and lighting improvements completed by utility end-use customers

– Commercial building equipment cost research to support energy efficiency incentive program development

» **As an Energy Consultant:**

- Consulted for the Department of Energy's Appliance and Commercial Equipment Standards Program in support of their energy efficiency and appliance standards rulemaking objectives
- Provided engineering and economic analyses for amending Federal energy conservation standards for residential and commercial equipment, including standards for residential water heaters, commercial boilers, and packaged terminal air conditioners
- Interfaced with manufacturers to assess the economic, employment, and production impacts resulting from government imposed regulations
- Conducted market and technology assessments, manufacturing cost modeling, and reverse engineering in a lab setting for application of Federal regulations to the rulemaking process
- Interpreted and applied Federal regulations to support the rulemaking process
- Documented rulemaking analyses for publication in the Federal Register
- Conducted public meetings to obtain feedback from manufacturers and efficiency advocates

» **As an Intern with Enviro-Management and Research Incorporated:**

- Engaged in mechanical engineering and project management with a consulting and contracting company that provides solutions to improve energy consumption, operations, maintenance plans, and overall energy efficiency of public building HVAC and electrical systems
- Onsite project management for commissioning of building HVAC and electrical systems
- Developed and implemented technical testing procedures for HVAC and electrical systems commissioning
- Performed construction inspections and consultations, contract estimations, and energy audits

» **With Northrop Grumman Newport News Shipyard:**

- Served as a facilities engineer for a shipyard that builds and overhauls naval nuclear aircraft carriers and submarines
- Redesigned and managed the repair of cryogenic storage and waste treatment systems
- Provided engineering support for steam generation facilities, shipboard nuclear systems, and mechanical piping, electrical, and sanitary distribution systems
- Provided project and construction coordination, system testing and validation, operating procedure improvements

NAVIGANT
CONSULTING

Deborah Swarts

Deborah Swarts
Managing Consultant

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Professional History

- Navigant Consulting, Inc. – Managing Consultant
- Summit Blue Consulting – Senior Consultant
- Lockheed Martin Corp. – Senior Field Engineer
- Energy and Resource Solutions – Project Engineer
- Applied Materials - Electrical Engineer

Education

- MS, Electrical Engineering, Cornell University, 1997
- BS, Physics, Harvey Mudd College, 1993

Professional Licenses

- Professional Engineer (Electrical): California, Massachusetts, Oregon, and Washington

Deborah Swarts is a Managing Consultant for Navigant Consulting and formerly a Senior Consultant for Summit Blue in the Vancouver, Washington office. Before Summit Blue, she worked at the Lockheed Martin Corporation in San Francisco, California where she has worked as an energy efficiency consultant. She performed energy audits of heavy industrial sites in conjunction with internal and external consultants. She analyzed savings and payback for proposed measures.

Before Lockheed Martin, Ms. Swarts was a Project Engineer for Energy and Resource Solutions (ERS), performing technical analyses and producing reports for potential energy and water conservation improvements in the commercial and industrial sectors. She designed and implemented lighting layouts, created building models, and assessed LEAN manufacturing improvements for energy efficiency impacts.

Ms. Swarts also brings ten years of electrical engineering experience, ranging from electrical design to analyzing power consumption of industrial equipment. She has a Bachelor of Science in Physics from Harvey Mudd College in Claremont, California, and a Master of Science in Electrical Engineering from Cornell University in Ithaca, New York.

Areas of Expertise

» Commercial and industrial sector technology assessments
» Impact analysis/ evaluation of energy efficiency programs
» Energy efficiency audits of commercial/industrial facilities
» On-site measure verification/performance measurements

Professional Experience

» **Impact Evaluation of Energy Trust of Oregon (ETO) Production Efficiency Program.** Served as lead evaluator on Energy Trust of Oregon's Production Efficiency Program. This program provides incentives for electrical savings to industrial businesses throughout Oregon. Site projects included

compressed air, lighting, refrigeration, production improvements, variable frequency drives in various applications, and custom projects. Responsibilities included Measurement & Verification (M&V), engineering analyses, and reporting.

» **Evaluation of Local Government Partnership Programs, California Public Utilities Commission (CPUC).** Served as an evaluator for the University of California / California State University (UC/CSU) Investor Owned Utility (IOU) Energy Partnership Program Evaluation. This program has helped promote, develop, and implement energy efficiency initiatives at the 33 UC and CSU campuses across the state. Site projects involved electrical and gas efficiency retrofits. Key responsibilities included Measurement & Verification (M&V), engineering analyses, and project level reporting.

» **Impact Evaluation of City of Palo Alto Utilities.** Performed impact evaluation of City of Palo Alto Utilities' Right Lights and Commercial Advantage energy efficiency programs. Site projects included lighting, refrigeration, and variable frequency drives on ventilation fans. Key responsibilities included Measurement & Verification (M&V), engineering analyses, and reporting.

» **Impact Evaluation of Silicon Valley Power.** Served as lead on impact evaluation of Silicon Valley Power's non-residential efficiency program. Site projects included lighting, HVAC systems, variable frequency drives, refrigeration, and compressed air improvements. Key responsibilities included Measurement & Verification (M&V), engineering analyses, and reporting.

» **Evaluation of Bonneville Power Administration (BPA) GrocerSmart Program.** Served as an evaluator for BPA's GrocerSmart Program. Measures assessed included refrigeration controls, electrically commutated motors, and efficient refrigerated case doors. Responsibilities included onsite Measurement & Verification work, engineering analyses, and reporting, both written and presenting for the Regional Technical Forum (RTF).

» **Long Term Monitoring and Tracking of Northwest Energy Efficiency Alliance (NEEA) MagnaDrive Support.** Performed long term tracking study of MagnaDrive sales in the Northwest following NEEA's initial support of the new technology. Responsibilities included determining status of MagnaDrive sales in the Northwest region, evaluation of sales data, and estimates of savings.

» **Impact Evaluation of City of Lodi Electric Utility.** Served as lead engineer on impact evaluation of City of Lodi's non-residential efficiency program. Site projects included lighting, compressed air, and process equipment improvements. Key responsibilities included Measurement & Verification (M&V), engineering analyses, and reporting.

Proficiency in Simulation Modeling (AGI32, AirMaster+, eQUEST) and Design Software (AutoCAD, SPICE)

NAVIGANT
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Jessica (Jes) Rivas

Jessica (Jes) Rivas
Senior Consultant

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Jes.rivas@navigantconsulting.com

Professional History

- Navigant Consulting, Inc. – Senior Consultant
- Summit Blue Consulting, LLC - Analyst
- E-Source – Research Associate

Education

- MS, Civil Engineering, Building Systems Program, University of Colorado
- BA, Physics, Colorado College

Professional Associations

- ASHRAE
- Illuminating Engineering Society (IES)

Honors and Fellowships

- n/a

Jessica (Jes) Rivas is a Senior Consultant with Navigant, previously an Analyst with Summit Blue. Her skills include impact evaluation including onsite measurement and verification of commercial and residential end use technologies, building energy-use simulation modeling and engineering analysis. She also has experience in energy efficiency and demand response technology evaluation, distributed generation/renewable energy technology evaluation and market research, and analysis tool evaluation and development. Prior to joining Summit Blue, Ms. Rivas was a research associate at E Source, where she researched and reported on energy-efficient building technologies for North American utility companies and large corporate energy consumers. She has a MS in Civil Engineering from the University of Colorado at Boulder and a BA in Physics from Colorado College.

Professional Experience

» **As a Senior Consultant at Navigant,** lead a multi-approach impact evaluation across five utilities' C&I prescriptive programs in Maryland. The evaluation approaches included on-site metering, verification and data collection as well as phone verification.

» **As an Analyst at Summit Blue,** coordinated multiple measurement and verification efforts for lighting and motor efficiency programs in Arizona. This work involved facilitating field measurements and data collection and the corollary energy, demand, and cost savings analysis.

» **As a Research Associate at E Source,** researched and reported on energy-efficient building technologies for North American utility companies and large corporate energy consumers, and presented research at various conferences including the 2008 AESP Technology Symposium.

- **Twenty Percent by 2020, Co-Author (Aug.-Dec. 2006),** composed an economic and environmental analysis of wind energy in Colorado using the JEDI software developed by the National Wind Technology Center.

- **While participating in the CU - Solar Decathlon (Jan. 2006-Aug. 2006),** helped perform natural ventilation simulations and collect information for the university's solar house design entered in the 2007 national competition

- **Ms. Rivas volunteered for Engineers Without Borders – Peru (June 2006-Dec. 2006),** where she spearheaded the education team and helped with the planning, construction and installation of a solar powered water pump in the small village of San Leon, Peru

Publications

- Estimating Energy Consumption of Variable Refrigerant Flow Systems: Developing and Validating the VRF-dat, Master Project, May 2008-May 2009 - Developed a design and analysis tool for VRF air-conditioning systems which can be used at the earliest stages of the design process.

- Comparative Energy Analysis of VRF and VAV Systems under Cooling Mode, Jaeyoon Koh, LG Electronics. John Z. Zhai, University of. Colorado at Boulder. Jessica A Rivas, University of. Colorado at Boulder, 2009 ASME Energy Sustainability Conference - Co-authored a conference paper accepted in the 2009 American Society of Mechanical Engineers 3rd International Conference on Energy Sustainability.

Technical Skills

- eQUEST
- EnergyPro
- VBA
- Phoenics (Computational Fluid Dynamics)
- EnergyPlus
- VisualDOE
- AGI32

NAVIGANT
CONSULTING

Paul Wozniak

Name
Senior Consultant-Energy Practice

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230 Horizon Drive, Ste 101B
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Professional History

- Integrys Energy Group, Customer Research Analyst
- Wisconsin Public Service Corporation, Process Evaluation Analyst
- Wisconsin Public Service Corporation, Public Communications Supervisor
- Green Bay News-Chronicle, Environmental Journalist

Education and Certifications

- M.S.- Epidemiological Statistics (meta-analysis), University of Wisconsin at Green Bay
- B.S. – Science & Environmental Change, University of Wisconsin at Green Bay

Professional Associations

- American Statistical Association
- Association of Energy Service Professionals
- Society on Consumer Psychology

Mr. Wozniak is a Senior Consultant with Navigant Consulting. He is an evaluation and research professional with extensive experience in the electric and gas utility sector. His interests include the evaluation and measurement of organizational advertising and communications and the psychology of consumer choice. His 29 years of work at a major gas & electric utility helped the company reach #185 among the Fortune 500 and attain "most admired" status among energy companies.

Extensive portfolio of work deliverables shows excellence in:

- analyzing data using advanced statistical techniques
- evaluating customer communications and education programs
- interpreting and presenting technical data and concepts for lay audiences
- designing survey questionnaires for complex, multi-client studies
- evaluating and improving programs (examples: customer acceptance of new technologies, workforce diversity and inclusion)
- identifying communication barriers and solutions using interviews and focus groups
- *exceptional focus group moderation skills*
- writing narratives summarizing research

1992-2008

Customer Research Analyst in 10-member Research & Evaluation work group.

- Worked with internal clients to identify needs
- Proposed multiple options to meet client needs within budget
- Designed data collection (mail, web & phone questionnaires)
- Examples of projects:
  - Finding out how customers make tradeoffs among features, price, quality, delivery options
  - Probing customers for below-surface feelings and evaluations of service experience
  - Identifying messages that click with customers

- *Testing language options for diverse customer segments*
- Evaluating usability of website strategies and logic-paths
- Measuring customer comprehension of safety messages for demonstration to regulatory agencies and possible courtroom use
- Segmenting customers into groups to allow targeted marketing messages and delivery methods

Other work:

- *Project manager and report writer for a quasi-experiment testing the effectiveness of energy* improvements in 50 treatment/50 control homes.
- Leader of a 5-member team launching ComfortWise, a service for making Wisconsin homes more comfortable and more energy efficient.
- Project manager and analyst for measurement of awareness, knowledge and behavior among gas utility customers, local government officials, and the construction industry (in compliance with federal law, aka "RP 1162").
- Facilitator and statistician for a cross-departmental team that created and tested metrics for "corporate inclusion and diversity" in a holding company seeking alignment for 11 subsidiaries, merged from unique corporate histories and workforces.

STATISTICAL ANALYSIS COMPETENCIES

Paul is proficient in advanced statistical techniques and specialized software including but not limited to:

- SPSS (range of advanced modules, 10y experience)
- SAS (2y experience, primarily logistic regression)
- planned experimental design and analysis
- process statistics (Deming TQM-inspired)
- regression (OLS, logistic)
- cluster analysis
- factor analysis (for survey design and interpretation)
- conjoint tradeoff analysis
- meta-analysis (extracting meaning from multiple studies with similar foci)

OTHER RELEVANT EXPERIENCES:

- Presenter at American Marketing Association Market Research Conference on the use of conjoint analysis to measure value placed by customers on "green efforts" by utilities, 1999.

- Authored or co-authored articles on energy topics in Wisconsin Natural Resources(1991), Health Physics Journal(1996), National Science Teachers Association quarterly; on Wisconsin environmental history in Transactions of the Wisconsin Academy of Arts, Letters and Sciences(1996), Wisconsin Environmental Education News (2003), Forest World(1989).

- Served on Sustainability Committee of Wisconsin's New North regional economic development organization and on the boards of several state and regional non-profits; profiled as one of top ten eco-citizens by Wisconsin Trails magazine, 2007.

NAVIGANT

Argene McDowell

Argene McDowell, MA
Senior Consultant

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Professional History

- Summit Blue Consulting
- Wisconsin Public Service Corporation
- Wisconsin Electric Power Company
- McDowell Market Research

Education

- BA, MA Sociology, Northern Illinois Universtiy, DeKalb, IL

A Senior Consultant with Navigant in the Madison, WI Office, Ms. McDowell, BA, MA, has a background in both quantitative and qualitative research methods and over 20 years of experience in the utility industry in the areas of market research, program process evaluation, product research, segmentation research and end-use forecasting. Ms. McDowell's skills include executive interviewing, and SPSS data analysis. She specializes in process evaluation research and qualitative and quantitative data analysis. Ms McDowell has experience with many market actor groups including utility program managers and implementers, residential, agricultural, commercial and industrial customers, trade allies, residential builders, motor manufacturers, veterinarians and multi-family property owners and property management firms. Ms. McDowell managed many on-line surveys of employees to support the Wisconsin Public Service/Peoples Gas merger and instituted usability Web site testing during her tenure at Wisconsin Public Service.

Professional Experience

» ***2010 Puget Sound Energy C&I Demand Response Pilot Evaluation.*** Ms. McDowell was responsible for conducting the process evaluation of this pilot of 25 demand response program participants. The process evaluation was conducted in two phases. During the first phase following the winter control period, in-depth interviews were conducted with program managers, program implementers, and five customers. During Phase 2, an additional 10 customers were interviewed. These findings will be used by Puget Sound to improve the program for the potential of scaling the pilot up to a broad based Demand Response Program.

» ***2009-2010 Unisource MER Impact and Process Evaluation.*** Ms. McDowell served on the Free Ridership and Process Teams for the 2009-2010 Unisource MER Evaluation consisting of a mix of large and small residential and business programs including both rebate and direct install delivery methods. She is developing the Free Ridership, Net-to-Gross, and Spillover estimates for all 2009 programs.

- *Energy Trust of Oregon Production Efficiency Program Evaluation.* Ms McDowell provided quantitative and qualitative support for the 2008 process evaluation of the Energy Trust of Oregon's Production Efficiency Program. She participated in the study by developing a program history, providing input to the work plan, and developing the appropriate interview guides and surveys for market actors, program participants and non participants. She provided quantitative data analysis of the participant and non-participant survey data, implemented a modified Free Ridership analysis for 2007 and 2008 program participants and a conducted a qualitative analysis of interview data with program delivery actors. This process evaluation will be used by ETO to improve implementation of the current program.

- *Energy Trust of Oregon Production Efficiency Program Evaluation.* Ms McDowell provided quantitative and qualitative support for the 2008 process evaluation of the Energy Trust of Oregon's Production Efficiency Program. She participated in the study by developing a program history, providing input to the work plan, and developing the appropriate interview guides and surveys for market actors, program participants and non participants. She provided quantitative data analysis of the participant and non-participant survey data, implemented a modified Free Ridership analysis for 2007 and 2008 program participants and a conducted a qualitative analysis of interview data with program delivery actors. This process evaluation will be used by ETO to improve implementation of the current program.

- *Impact and Process Evaluation of the Hydro One Double Return Program.* Ms. McDowell contributed to the process evaluation of the innovative Hydro One Return Program, which was designed to provide a cash incentive to industrial customers for actions they took to reduce their peak energy usage by 5% to 10%. She provided support for the comprehensive process assessment which included: a review of program marketing materials; a review of the web site to understand how it was used and contributed to the overall program objectives: a review of program tracking data, program database structure, procedures used to gather and record data, and procedures to calculate and distribute incentives; interviews with Hydro One staff and vendors involved with program implementation; and analyses of the customer survey data and findings to evaluate program design and delivery effectiveness. The evaluation validated the demand savings for the program and provided insight into the reasons for the success of this innovative industrial program.

She specializes in process evaluation research and qualitative and quantitative data analysis. Ms McDowell has experience with many market actor groups including utility program managers and implementers, residential, agricultural, commercial and industrial customers, trade allies, residential builders, motor manufacturers, veterinarians and multi-family property owners and property management firms. Ms. McDowell managed many on-line surveys of employees to support the Wisconsin Public Service/Peoples Gas merger and instituted usability Web site testing during her tenure at Wisconsin Public Service.

NAVIGANT
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Kevin Grabner, P.E.

Kevin Grabner, P.E.
Managing Consultant

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Professional History

- Managing Consultant, Navigant Consulting
- Senior Consultant, Summit Blue Consulting
- Research and Planning Director ; Principal Project Manager; Senior Project Manager ; Energy Center of Wisconsin
- Principal and Owner, KG Energy Consulting
- Associate and Senior Associate, Barakat & Chamberlain

Education

- MS, Mechanical Engineering, University of Wisconsin, 1985
- BS, Mechanical Engineering, University of Wisconsin, 1983

Professional Associations

- Registered Professional Engineer (Mechanical), Wisconsin (1991 to present)
- American Society of Heating, Refrigeration and Air Conditioning Engineers (1992 to present)
- Association of Energy Services Professionals (2003 to present)

Kevin Grabner is a Managing Consultant with Navigant Consulting and formerly with Summit Blue Consulting. Mr. Grabner has 23 years of experience in program planning, evaluation, design, implementation, and portfolio strategy for comprehensive gas and electric energy efficiency and demand reduction efforts. He evaluates programs and portfolios and develops new approaches and strategies to respond to higher goals and delivery challenges. Kevin also conducts assessments of the technical and achievable savings potential of gas and electric technologies. Mr. Grabner is a Registered Professional Engineer (Mechanical) in the state of Wisconsin and a member of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers and the Association of Energy Services Professionals. He holds a BS and MS in Mechanical Engineering from the University of Wisconsin-Madison.

Professional Experience

» **Commonwealth Edison (ComEd) Energy Efficiency and Demand Response Program Evaluation.** Navigant Consulting is the prime contractor to evaluate the portfolio of new energy efficiency and demand response programs being offered by ComEd and the Illinois Department of Commerce and Economic Opportunity (DCEO). Kevin program lead for the evaluation of the C&I prescriptive, multi-family direct install, and CFL fundraiser programs. The evaluation contract covers work from 2008 through 2011. The evaluation primarily focuses on impact evaluation and includes phone surveys, engineering review, and field data collection. The evaluation also covers process issues to provide timely feedback to program managers to help them improve program implementation procedures.

» **AEP Ohio Energy Efficiency and Demand Response Program Evaluation.** Navigant Consulting is the prime contractor for process and impact evaluations of the portfolio of new energy efficiency and demand response programs being offered by AEP Ohio. Kevin is program lead for the evaluation of the C&I prescriptive and large customer Self-Directed programs.

» **PECO Energy Efficiency and Demand Response Program Evaluation.** Navigant Consulting is the prime contractor to evaluate the portfolio of new energy efficiency and demand response programs being offered by PECO. Kevin is program lead for the evaluation of the C&I prescriptive and Government and Non-Profit programs. The scope of work covers impact and process evaluation.

While at Summit Blue, Mr. Grabner **provided commercial and industrial (C&I) program planning and design assistance to electric and gas utilities in Michigan, Ohio, Indiana, Virginia, Colorado, and Arizona.** Kevin is program lead for the three-year evaluation of C&I prescriptive, multi-family direct install, and CFL fundraiser programs in Illinois, a contract that continues under Navigant Consulting.

While working at **the Energy Center of Wisconsin**, managed the Center's energy efficiency program research, planning, evaluation, design, and implementation initiatives. He supervised seven professional project managers at the Energy Center, assisting them through project oversight, client relations, business development, mentoring, and problem solving.

» **Industries of the Future Program – statewide Wisconsin Focus on Energy program.** Kevin was the pilot phase program manager for this effort to create a sustainable new technology development program targeting key industries in Wisconsin (forest products, food processing, plastics, metal casting, printing, glass, and biotechnology). The program was designed to speed the adoption of new technologies and innovative solutions to improve industry competitiveness by reducing electric and gas energy intensity, increasing renewable energy usage, and preventing pollution. The program conducted industry roundtables and new technology demonstration projects, and created an independent nonprofit organization (CleanTech Partners) to carry the initiative forward after the third year. The Web site is http://www.cleantechpartners.org.

» **Forest Products – Industry of the Future.** Led a collaborative of the Wisconsin paper and forest products industry to determine their needs for pre-competitive research and development. From this, action teams and outside funding have been secured to pursue specific needs of the papermaking industry that have energy efficiency, environmental, and productivity benefits.

As a principal and owner of **KG Energy Consulting**, Kevin provided services in planning, design, and evaluation of commercial and industrial (C&I) conservation and load management (C&LM) activities.

As a senior associate at **Barakat & Chamberlin**, Kevin provided consulting services for clients in the gas and electric utility business. Specialized in demand-side management planning, evaluation, program design, strategy development efforts, and assessing technologies and markets.

NAVIGANT
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Andrea Roszell

Andrea Roszell
Consultant

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Professional History

- Consultant, Navigant Consulting, Inc.
- Pyrometallurgy Engineer, Hatch Ltd.

Education

- University of Waterloo - Bachelor of Applied Science, Honours Chemical Engineering
- Queen's University – Master's of Applied Science

Foreign Language

Written and oral fluency in French.

Andrea Roszell is a Consultant with the Navigant Consulting Energy Practice in the Toronto Office. Prior to joining Navigant Consulting, Mrs. Roszell worked at Hatch Ltd. as an engineer in the pyrometallurgy group. She has been involved in development and evaluation of survey instruments for the OPA's Power Savings Event. Recently Mrs. Roszell has been involved in developing savings estimates for DSM measures in both the residential and commercial fields for Tucson Electric Power. She has also been in been involved in interviewing retail and manufacturing participants for a consumer DSM program. She has completed her Master's degree in Chemical Engineering with a focus on fuel cell catalysts.

Professional Experience

» **Evaluation of Ontario Power Authority's Power Savings Event.** Contributed to survey design and evaluation. Utilized survey results to model program savings. Completed interviews with retail and manufacturer staff to determine program effects. Updated Prescriptive Input Assumptions for various measures based on survey results.

» **Savings Estimates for Tucson Electric Power.** Estimated savings potential for various DSM measures for both residential and commercial consumers.

» **Streamlining Regulation.** *Researched options for* streamlining regulation in Ontario for the Electrical Distribution Association in order to address new and expanded roles for Local Distribution Companies resulting from introduction of the Green Energy and Economy Act.

» **Modeled various industrial plants processes.** Completed mass and energy balances on overall process and individual process units in pyrometallurgy industry.

» **Completed Master's degree with a focus on Polymer Electrolyte Membrane Fuel Cell catalysts.** Strong research skills employed to determine most successful catalyst fabrication methods previously available. Statistical analysis employed to analyze quality of data obtained.

LISA A. SKUMATZ, Ph.D., Principal, SERA, Inc.

Skumatz Economic Research Associates, (SERA)
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EDUCATION

Ph.D., M.A.	Economics, The Johns Hopkins University, Baltimore, Maryland, 1978, 1987.
B.A.	Economics, The University of Wisconsin, Madison, Wisconsin, 1975.

EXPERIENCE

1994-	Principal, Skumatz Economic Research Associates
1998-	President, The Econservation Institute (non-profit)
1990-94	*Vice President, Pacific Northwest Division, Synergic* Resources Corporation.
1987-90	Rates Economist, City of Seattle.
1985-87	Energy Research Analyst, PG&E.
1980-85	Research Economist, Battelle Pacific Northwest
1978-80	*Research Economist, U.S. Bureau of Labor Statistics.*
1977-78	Economist, U.S. Department of Health, Education, and Welfare.

Dr. Skumatz is Principal of SERA, Inc. and manages the firm's practice in energy-related research. She is an experienced economist with more than 25 years of experience in non-energy benefits, program evaluation and attribution, market research, and utility economics. Dr. Skumatz holds a Ph.D. in econometric modeling. Her interests include both quantitative and policy analysis for utilities, and she is most known for using innovative approaches to measure hard-to-measure effects. Dr. Skumatz's emphasis for the last few years has been in several key areas. She has extensive experience in designing and conducting evaluation projects, from questionnaire design, conducting detailed commercial and residential program stakeholder interviews (she has conducted many hundreds), and developing evaluation results and reports.

Non-energy benefits (NEB): Dr. Skumatz is the leading researcher in the nation in the area of Non-Energy Benefits, or monetizing the omitted positive and negative effects attributable to program interventions. She has conducted state-of-the-art work in NEB of DSM programs, developing quantitative estimates of over 3 dozen categories of direct and indirect benefits from the customer, utility, and societal perspectives (each valued using appropriate methodologies). She has more than 40 widely-cited publications in the area, and has pioneered much of the measurement work being conducted in participant-side NEBs. She has analyzed NEBs for more than 50 programs across the US and internationally. SERA completed an exhaustive study for the California Utilities to estimate the array of NEBs for low-income weatherization programs, and reviewed more than 350 articles and publications to develop estimation methods, review secondary and default values, and develop an integrated model of NEBs. She used NEB and input-output models to demonstrate differences in societal economic multipliers depending on program type and region, and has conducted extensive work on emissions-related and health-related NEBs. She has conducted work measuring NEBs for statewide portfolios of energy efficiency programs, and the wide range of residential, commercial, commissioning, real-time pricing, renewables, and other programs. These projects were conducted for PG&E, the group of the four California Utilities, New York State, Seattle City Light, Northeast Utilities, Energy Center of Wisconsin, BCHydro, NGRID, NU, and many others in the US and internationally, including work in Canada and New Zealand. Her work has been used in regulatory proceedings and in refining program cost-effectiveness tests.

Process Evaluation and Market Transformation Tracking: Dr. Skumatz has extensive experience conducting process evaluations for programs across the country. Her process evaluation work goes beyond the standard, incorporating innovative practices for examining program barriers and remedies using techniques that provides specific, implementable recommendations for program staff – including tailored strategies for getting potential participants past barriers to indifference or preference for energy efficient equipment. She developed and published innovative methods for tracking market progress indicators – including and beyond hard-to-measure market share estimates – for energy efficiency equipment. This includes work in market characterization, and measuring market progress and tracking indicators (for residential, commercial, and renewables programs). Clients include BPA, PG&E, SCE, NYSERDA's portfolio, and others.

Attribution / Net to Gross, Tracking, Measurement and Evaluation Methods: Dr. Skumatz has conducted state-of-the-art work in attribution and net-to-gross assessments for utilities including work on the wide range of residential, low income, and commercial/ industrial and renewable energy efficiency programs including market transformation, direct install, rebate, and other designs. She has conducted cutting-edge work in free ridership, spillover, and net-to-gross (NTG).

She has used specialized techniques to achieve consistency and "bounded" results for NTG and its components (free ridership, spillover), and employs interviews with multiple decision-makers along the chain to program entry to more fully assess attributable program effects. She has "written the manual" (co-author) of the California "Framework..." report on methods for evaluating market transformation and other energy efficiency programs. She conducted a review of techniques for attributing causality in energy conservation / DSM / MT programs, and applied enhanced methods to more than a dozen residential, commercial, and renewable programs. She was responsible for co-writing the impact / baseline, and tracking evaluation sections of the California's Framework study. Clients include PG&E, NYSERDA, CPUC, CIEE, and many others.

Retention / Measure Lifetime Analyses. Dr. Skumatz has conducted a number of residential and commercial measure retention studies, and recently conducted a detailed evaluation of "best practices" for retention work for the CPUC. She conducted the major early EUL studies for Bonneville (BPA), developing the analysis method that has become industry standard. She has conducted measure life studies for BPA, PG&E, PSE, CCIG, NU, and other clients across the nation. She conducted cutting edge work in measure lifetimes, developing the methods currently considered state of the art in the field, and conducting the most recent and comprehensive study of more than 100 measure life studies to update the measure lifetimes used in the State of California for planning and regulatory purposes, and for the DEER database.

Market Research, Survey Design, Sampling, and Statistical Modeling / Analysis: Dr. Skumatz has extensive experience in all phases of detailed survey design and analysis for research and program evaluation purposes, including impact / behavioral / demographic / retention surveys and detailed non-energy benefits surveys, appliance saturation and characteristics surveys for residential and commercial customers; NEB research, measure lifetime work, "wants and needs" surveys; attitudinal surveys; self-efficacy, contingent valuation and WTP surveys, ordered logit (for market share analyses); and in-depth interview work. For both the residential and commercial sectors, she has conducted and analyzed validation surveys, determining the accuracy and consistency of phone, on-site, and mail surveys for particular types of questions. Dr. Skumatz has extensive experience in sampling work for energy efficiency evaluation assignments, including process and impact evaluation, load research, net-to-gross studies, residential and commercial saturation surveys, and other evaluation work. She has taught survey sampling and analysis in numerous workshops, and has published on bias reduction techniques for surveys. Dr. Skumatz has used sophisticated methods to identify bias and to impute missing data in surveys. She has conducted statistical and modeling work for energy efficiency projects, including conditional demand analyses, multiple regression analysis, principal components, logit, hazard analyses / measure lifetime analyses, and many other statistical modeling assignments. She integrated ordered logit methods and card rankings into surveys to assess the impact of alternative program interventions on market shares for new technologies. For program evaluation projects, she used surveys to collect data on behaviors, decision-making, and attribution of changes to programs and educational efforts. She used surveys and adaptations of conditional demand techniques to measure the impact of education on behavior changes and program impacts. Clients include PG&E, WWP, SCL, Puget Sound Energy, BPA, SCE, and many others.

HONORS, MEMBERSHIPS, PRESENTATIONS, AND PUBLICATIONS

Lectures and Honors: Dr. Skumatz has been an invited guest lecturer at Brown University, Yale University, Keio University (Tokyo), University of Wisconsin, University of Washington, and elsewhere. She has been presented with two awards for lifetime achievement at the national level from sustainability organizations.

Professional Memberships: Dr. Skumatz served as a member of the Technical Advisory Committee (TAC) for the CBEE, and is a member of the Association of Energy Service Professionals (and its Program Evaluation subcommittee), AEA, WEA, Association of Environmental and Resource Economists, and other professional associations. She serves on the Board of three non-profit organizations.

Presentations: She has been a regular speaker (usually with more than one paper presented) at the ACEEE Summer Study (each session since 1986), the Evaluation Conference (IEPEC), AESP, Affordable Comfort, international conferences (EEDAL, ECEEE), and other energy and environmental conferences. She has been keynote speaker at a number of conferences in the US and internationally.

Publications: Dr. Skumatz has more than 75 articles and papers (beyond reports) in trade journals, conference proceedings, refereed journals and other publications on her work in NEBs, evaluation techniques, measure lifetimes, surveys and bias reduction, program evaluation results, evaluation methods for education programs, self-efficacy, advanced baseline / impact evaluation methods, conditional demand, and other topics. These are listed in SERA's qualifications document. She has another 75 publications (not including reports) in resource economics / recycling / sustainability.

DANA D'SOUZA, Project Analyst, SERA

Skumatz Economic Research Associates, (SERA)
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EDUCATION

1991 B.S. International Business, San Diego State

WORK EXPERIENCE

2008-present SERA, Environmental Analyst
1998-1999 Accounting, Roche Pharmaceuticals, Boulder, CO

RELEVANT PROJECTS

Ms. D'Souza is a research analyst with SERA, Inc. On dozens of projects, she has conducted detailed surveys or interviews with participants, non-participants, stakeholders, trade allies, program staff and others to identify program impacts, successful designs, costs, and "best practices". She has conducted both quantitative surveys and detailed case study research for energy utility, regulator, city / county, and other clients. She is a skilled interviewer, with excellent capabilities obtaining cooperation with participants and non-participants alike for a wide range of program evaluation projects. She has successfully interviewed an array of stakeholders – households, commercial businesses, cities and state contacts, and others -- for residential and commercial programs in California, Minnesota, Colorado, and across the nation. Her strengths include an understanding of how the information will be used, which helps make sure she conducts appropriate follow-up on complex analytical issues. A summary of project efforts is provided below.

Energy and Resource Conservation Program Evaluation and Hard to Measure Impacts

Ms. D'Souza, a research analyst for SERA, has conducted process evaluations, market progress research, NEB analysis, and detailed interview work for energy clients across the nation and internationally. In support of these assignments, she has conducted detailed telephone interviews with participants and non-participant homeowners, builders, and other stakeholders for projects in California, Colorado, and elsewhere. She conducted detailed literature review work on NTG, NEB, lifetime, and impact evaluation methods and results in work for the CPUC, and additional NEB literature review work for Xcel Energy and the four California IOUs. She recently conducted nearly 100 NEB interviews for an evaluation of a set of low-income weatherization and EE assistance programs in Colorado. She also conducted detailed NEB and NTG interviews with participating and non-participating builders and households for an evaluation of the California Statewide Energy Star® Single Family Homes Program and Home Performance with Energy Star®, as well as the California Statewide Energy Star® Multifamily Homes Program. She conducted similar interview work for evaluations for clients including the Green Campus program, San Francisco Environment, City of Oakland, Building Research of New Zealand, and other clients.

- *Evaluation, Process and Attribution Interviews and Analysis – ENERGY STAR® Homes in California*: Ms. D'Souza conducted interviews with multiple program participants and stakeholder groups to identify the share of conservation behavior and actions that are attributable to program interventions. She conducted detailed interviews with builders / contractors, and homeowners about a variety of process, NEB, and impact issues including questions about awareness and understanding of the program, decision-making, program preferences, program impacts, standard practices / baseline issues, free ridership, three kinds of spillover, and other topics. The work was used for a process evaluation, analysis of barriers and market progress, as well as computation of net-to-gross figures to "check" or validate the results of a difference of differences impact analysis for the program.

- *Market Progress Tracking / Price Decomposition.* Ms. D'Souza conducted "mystery shopper" work, gathering extensive data on prices and features for an array of Energy Star® and non-Energy Star® appliances for a project for on-going tracking of the market progress of an Energy Star® outreach / appliance incentive program. The work involved in-store and other research to gather information on sales price, promotions, and an array of features for lighting and household appliances. Analyses of these data were used to quantify the price differential, or the

"premium" associated with the Energy Star® feature to examine reflected market share progress, "exit" timing, and develop estimates of any needed rebates.

- *PACE Programs – Property Tax Energy Efficiency & Renewables Programs:* Ms. D'Souza conducted detailed interviews with four of the major jurisdictions with APCE programs in place, including Berkeley, Boulder County, and two others. She gathered information on the source of funds, measures included, eligibility and administration, participants, and impacts. She compared and contrasted the programs, describing strengths and weaknesses, and cost of impacts across the four designs. She presented this work at ACEEE and AESP conferences.

- *Turnover of Mercury Thermostats:* Ms. D'Souza conducted scores of interviews with businesses and households across the State of California to gather data on the number, types, age, and removal of thermostats in their businesses or homes. These data were married with data on the percent of thermostats of different types that contain mercury and used to compute the flow of thermostats available for recycling for each of the next 20 years. The data were used by the thermostat industry and California State's DTSC to respond to product stewardship legislative requirement to establish goals for recycling of mercury thermostats.

- *Sustainability Research and Impact Analysis.* Ms. D'Souza conducted interviews on the hard-to-measure impacts from sustainability initiatives for two municipal clients in California. She gathered data on a variety of sustainability initiatives on energy, waste, water, air/emissions, economic development, and health. This work is being used to construct a model that can be used to more readily measure / compute the broad array of sustainability impacts of municipal sustainability programs, and measure progress toward sustainability goals.

Education / Outreach Related Projects

Ms. D'Souza has conducted data collection and analysis work on a number of outreach and educational initiatives, including process evaluation, "best practices", case studies, and benchmarking assignments related to sustainability, energy efficiency, renewables, recycling, waste diversion, and other programs.

- *Evaluation of College "Green" Education-Based Program.* For this student / intern-based multi-campus education-based program, Ms. D'Souza conducted detailed interviews of interns, campus staff, program staff regarding program objectives, strengths and weaknesses, as well as design / cost / impact information on specific elements implemented by the interns ("energy efficiency 101" curricula, residence hall and other efficiency "challenges", "stairs not elevator" days, fairs, / events, posters, and other initiatives). The work was combined with survey data collected in a series of baseline and end-of-year surveys from 12 college campuses around California to evaluate the success of the "Green Campus" energy-efficiency programs.

- *Curb Your Carbon/Cool the Earth.* The Cool the Earth program is a ready-to-run program for K-8 students to educate students and their families about climate change and actions they can take to reduce their impacts. Ms. D'Souza was responsible for collecting information about environmental "equivalencies" to allow translation of survey results to GHG reductions and progress toward program goals. The report included details on program impacts and recommendations for program delivery and evaluation in subsequent years.

- *The Broadlands Project: Measuring the Impacts of Social Marketing.* The Broadlands Project, designed and implemented by SERA under a grant, used an experimental design to measure the impacts and cost effectiveness of community based social marketing on recycling and energy efficiency behaviors. The project included a detailed evaluation of the participation and actions taken, impacts per dollar spent, the GHG avoidance, and job creation estimates.

PUBLICATIONS, PRESENTATIONS, AND WORKSHOPS - US AND INTERNATIONAL

Ms. D'Souza has given presentations and poster sessions on her energy, recycling, and sustainability work at conferences including the Behavioral Energy (BECC) conference, Colorado Association for Recycling, and National AESP, and ACEEE conferences.

DAVID JURI FREEMAN, Senior Project Analyst / Environmental Analyst, SERA

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EDUCATION

B.S. 1998 Environmental Science; Minor Economics, Bucknell University, Lewisburg, PA

EXPERIENCE

2006-present	SERA, Environmental Analyst
2000-2006	President, Shanti Groove Enterprises, Boulder Colorado
1999-1999	Cobe Cardiovascular, Researcher
1997-1998	Environmental Intern, Union County Conservation District, Lewisburg, PA

RELEVANT PROJECTS

Mr. Freeman is a senior energy analyst with SERA, and has conducted process evaluations, market progress research, NEB analysis, and detailed interview work for energy clients across the nation and internationally. He has conducted detailed process / NTG / NEB telephone interviews with participants and non-participant homeowners, builders, and other stakeholders for several projects in California. He has conducted survey research across the United States and has conducted analyses for clients in California, Colorado, Washington DC, and elsewhere. He is a skilled interviewer, with excellent capabilities obtaining cooperation with participants and non-participants alike for a wide range of program evaluation projects. He has successfully interviewed an array of stakeholders – households, commercial businesses, builders, developers, architects and engineers, manufacturers, service technicians, trade allies, cities and state contacts, and many others – for residential and commercial programs in California, Minnesota, Colorado, and across the nation. His strengths include an understanding of how the information will be used, which helps make sure he conducts appropriate follow-up on complex analytical issues.

On the commercial side, he has conducted extensive interviews with manufacturers, dealers, businesses, service providers, and many other stakeholders to evaluate the market potential for energy efficient ware washing and on-premise laundry equipment. He conducted NEB interviews and analysis of low-income weatherization and EE assistance in Colorado. He has collected and used data to measure market progress, identify key barriers and opportunities, and estimate the gross and net savings attributable to various energy related programs. He has detailed work experience in non-energy benefits work, assessing the "hard to measure" program impacts beyond energy savings that accrue due to program efforts. His non-energy benefits and net to gross work includes assisting Dr. Skumatz in her work for CIEE/CPUC on measuring behavioral impacts, analysis of the NEBs for the California Statewide Energy Star® Single Family Homes Program and Home Performance with Energy Star®, as well as the California Statewide Energy Star® Multifamily Homes Program, Green Campus program, San Francisco Environment, City of Oakland, Building Research of New Zealand, and other clients.

He has examined the role of attitudes on conservation behaviors and program participation. Mr. Freeman has conducted work in DSM program tracking and evaluation, and conducted field and phone research on energy decision-making / program options / preferences. He has analyzed the pros and cons of alternative policies and programs, identified the attributable effects, conducted and analyzed large-scale surveys, and researched non-energy benefit impacts from programs. He has conducted large scale as well as detailed interviews with a wide variety of stakeholders, and has analyzed topics including attitudes, adoption of new practices, barriers, investment decisions, customer satisfaction, preferences and behavior. He has presented his findings at multiple national conferences including AESP, BECC, IEPEC, and ACEEE.

- *Market Assessment and Evaluation of On-Premise Laundry Efficiency Program:* Mr. Freeman conducted research and detailed interviews to support a California Utility sponsored market research initiative. He conducted interviews with engineering directors, program managers, and stakeholders to ascertain the efficiency of recycled wastewater technologies. The interviews included information on decision making, characterization, capital improvement projects, performance, and efficiency. The results of these interviews were used to identify technologies impacting a multi-year DSM incentive program.

- *Stakeholder Interviews for Multi-family and Single Family Program Evaluation*: Mr. Freeman conducted detailed interviews with developers and owners about a variety of process and impact issues for a Statewide Energy Star® Homes program in California. The topics include awareness and understanding of the program, decision-making, program preferences, program impacts, standard practices / baseline issues, free ridership, three kinds of spillover, and other topics. The work was used for a process evaluation, analysis of barriers and market progress, as well as a detailed computation of net-to-gross and non-energy benefits associated with the program. The work was ultimately used to identify program performance and associate shareholder benefits for utility investments in the program.

- *Market Assessment and Evaluation of Advanced Dish (or Ware) washing Equipment:* Mr. Freeman conducted research and detailed interviews to support a California Utility sponsored market research initiative. He conducted interviews with engineering directors, program managers, and stakeholders to ascertain the efficiency of efficient warewashing technologies. The interviews included information on decision making, characterization, capital improvement projects, performance, and efficiency. The results of these interviews were used to identify technologies impacting a multi-year DSM incentive program.

- *Evaluation, Process and Attribution Interviews and Analysis*: Mr. Freeman conducted interviews with multiple program participants and stakeholder groups to identify the share of conservation behavior and actions that are attributable to program interventions. He conducted detailed interviews with builders / contractors, and homeowners about a variety of process and impact issues for a home construction programs in California. The topics include awareness and understanding of the program, decision-making, program preferences, program impacts, standard practices / baseline issues, free ridership, three kinds of spillover, and other topics. The work is being used for a process evaluation, analysis of barriers and market progress, as well as computation of net-to-gross figures to "check" or validate the results of a difference of differences impact analysis for the program.

- *Non-Energy Benefit Analysis of Low Income Weatherization and Non-Profit Retrofits*- Mr. Freeman conducted interviews and data analysis for an energy service provider in Colorado to compute the non-energy benefits of a low income weatherization program, a low income retro-fit/energy saver kit program, and a capital intensive non-profit retrofit program. He completed a statistically relevant analysis of the collected data to assist the utility in determining the benefits (and costs) associated with the program implementation including the impacts on arrearages, comfort levels, levels of environmental "satisfaction". Changes in maintenance, and productivity among others.

- *Market Progress Tracking / Price Decomposition*. Mr. Freeman gathered extensive data on prices and features for an array of Energy Star® and non-Energy Star® appliances for a project for on-going tracking of the market progress of an Energy Star® outreach / appliance incentive program. The work involved in-store and other research to gather information on sales price, promotions, and an array of features for lighting and household appliances. Statistical analysis was then performed on the data to analyze the level of the Energy Star® "premium", above and beyond price impacts due to the array of other important appliance features. The results were analyzed to determine whether the price differential, or the "premium", associated with the Energy Star® feature continued to decrease, representing an indirect reflection of increased sales and market share of Energy Star® appliances in the service territory. These results were compared with market share information gathered from sales data to assess market progress attributable to the program.

- *Three Projects Evaluating Education / Behavioral / Outreach Programs:* Mr. Freeman conducted extensive stakeholder and analysis to evaluate the College "Green" Education-Based Program, Curb Your Carbon / Cool the Earth, and Broadlands Social Marketing Programs.

PUBLICATIONS, PRESENTATIONS, AND WORKSHOPS - US AND INTERNATIONAL

He has presented his work at numerous national and state conferences in energy and solid waste. This includes the Behavioral (BECC) conference, ACEEE, Solid Waste Association of North America (state and National level), IEPEC, National Recycling Coalition, and several state recycling conferences. He has also authored papers for AESP, ECEEE, and EEDAL. He has given more than a dozen workshops / webinars (including Colorado) on energy and solid waste program and policy work (with attendees from South America, UK, EU, Australia/New Zealand, Middle East, Japan, Korea). His work has been published in trade journals (*Resource Recycling*), and he has more than half a dozen publications in trade journals.

DAWN BEMENT, Project Analyst, SERA

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EDUCATION

B.S. Cellular Molecular Biology, University of Michigan, Ann Arbor, MI
B.S. Plant Science, Howard Community College, Columbia, MD

EXPERIENCE

2005-Present SERA, Environmental Analyst
1987-1990 Diabetes and Cancer Research, University of MI and University of MD

RELEVANT PROJECTS

Ms. Bement is a research analyst with SERA, Inc. She has conducted primary and secondary data collection work – including extensive literature review assignments and hundreds of surveys and detailed interviews – to support SERA research and evaluation projects across the nation. She has conducted detailed surveys or interviews with participants, non-participants, stakeholders, program staff and others to identify program impacts, successful designs, costs, and "best practices" on dozens of projects. The work includes both quantitative surveys and detailed case study research for clients including state agencies, energy utilities, regulators, cities / counties, and other clients. She has excellent interview skills, and outstanding abilities to obtain cooperation from participants and non-participants, including difficult *business interviewees (haulers, builders, contractors, etc.), She has successfully interviewed an array of stakeholders* – households, commercial businesses, cities and state contacts, and others -- for residential and commercial programs in California, Minnesota, Colorado, and across the nation. Her understanding of how the work will be used helps make sure she probes and follows-up with the interviewee to gain high quality information on the data of interest.
A summary of project efforts is provided below.

Energy and Resource Conservation Program Evaluation and Hard to Measure Impacts

Ms. BeMent, a research analyst for SERA, has conducted process evaluations, market progress research, NEB analysis, and detailed interview work for energy clients across the nation and internationally. In support of these assignments, she has conducted detailed telephone interviews with participants and non-participant homeowners, builders, and other stakeholders for projects in California, Colorado, and elsewhere. She conducted detailed literature review work on NTG, NEB, lifetime, and impact evaluation methods and results in work for the CPUC, and additional NEB literature review work for Xcel Energy and the four California IOUs. She recently conducted nearly 100 NEB interviews for an evaluation of a set of low-income weatherization and EE assistance programs in Colorado. She also conducted detailed NEB and NTG interviews with participating and non-participating builders and households for an evaluation of the California Statewide Energy Star® Single Family Homes Program and Home Performance with Energy Star®, as well as the California Statewide Energy Star® Multifamily Homes Program. She conducted similar interview work for evaluations for clients including the Green Campus program, San Francisco Environment, City of Oakland, Building Research of New Zealand, and other clients.

- *Measure Lifetimes / Turnover of Mercury Thermostats:* Ms. BeMent conducted scores of interviews with businesses and households across the State of California to gather data on the number, types, age, and removal of thermostats in their businesses or homes. These data were married with data on the percent of thermostats of different types that contain mercury and used to compute the flow of thermostats available for recycling for each of the next 20 years. The data were used by the thermostat industry and California State's DTSC to respond to product stewardship legislative requirement to establish goals for recycling of mercury thermostats.

- *Evaluation, Process and Attribution Interviews and Analysis – ENERGY STAR® Homes in California*: Ms. BeMent conducted interviews with multiple program participants and stakeholder groups to identify the share of conservation behavior and actions that are attributable to program interventions. She conducted detailed interviews with builders / contractors, and homeowners about a variety of process, NEB, and impact issues including questions about awareness and understanding of the program, decision-making, program preferences, program impacts, standard practices / baseline issues, free ridership, three kinds of spillover, and other topics. The work was used for a process evaluation, analysis of barriers and market progress, as well as computation of net-to-gross figures to "check" or validate the results of a difference of differences impact analysis for the program.

- *PACE Programs – Property Tax Energy Efficiency & Renewables Programs:* Ms. BeMent conducted detailed interviews with four of the major jurisdictions with APCE programs in place, including Berkeley, Boulder County, and two others. She gathered information on the source of funds, measures included, eligibility and administration, participants, and impacts. She compared and contrasted the programs, describing strengths and weaknesses, and cost of impacts across the four designs. She presented this work at ACEEE and AESP conferences.

- *Market Progress Tracking / Price Decomposition.* Ms. BeMent conducted "mystery shopper" work, gathering extensive data on prices and features for an array of Energy Star® and non-Energy Star® appliances for a project for on-going tracking of the market progress of an Energy Star® outreach / appliance incentive program. The work involved in-store and other research to gather information on sales price, promotions, and an array of features for lighting and household appliances. Analyses of these data were used to quantify the price differential, or the "premium" associated with the Energy Star® feature to examine reflected market share progress, "exit" timing, and develop estimates of any needed rebates.

- *Sustainability Research and Impact Analysis.* Ms. BeMent conducted interviews on the hard-to-measure impacts from sustainability initiatives for two municipal clients in California. She gathered data on a variety of sustainability initiatives on energy, waste, water, air/emissions, economic development, and health. This work is being used to construct a model that can be used to more readily measure / compute the broad array of sustainability impacts of municipal sustainability programs, and measure progress toward sustainability goals.

Education / Behavioral Projects

Ms. BeMent has conducted data collection and analysis work on a number of outreach and educational initiatives, including process evaluation, "best practices", case studies, and benchmarking assignments related to sustainability, energy efficiency, renewables, recycling, waste diversion, and other programs.

- *Evaluation of College "Green" Education-Based Program.* For this student / intern-based multi-campus education-based program, Ms. BeMent conducted detailed interviews of interns, campus staff, and program staff regarding program objectives, strengths and weaknesses, as well as design / cost / impact information on specific elements implemented by the interns ("energy efficiency 101" curricula, residence hall and other efficiency "challenges", "stairs not elevator" days, fairs, / events, posters, and other initiatives). The work was combined with survey data collected in a series of baseline and end-of-year surveys from 12 college campuses around California to evaluate the success of the "Green Campus" energy-efficiency programs.

- *Curb Your Carbon/Cool the Earth.* The Cool the Earth program is a ready-to-run program for K-8 students to educate students and their families about climate change and actions they can take to reduce their impacts. Ms. BeMent was responsible for collecting information about environmental "equivalencies" to allow translation of survey results to GHG reductions and progress toward program goals. The report included details on program impacts and recommendations for program delivery and evaluation in subsequent years.

- *The Broadlands Project: Measuring the Impacts of Social Marketing.* The Broadlands Project, designed and implemented by SERA under a grant, used an experimental design to measure the impacts and cost effectiveness of community based social marketing on recycling and energy efficiency behaviors. The project involved a detailed evaluation of the participation and actions taken, impacts per dollar spent, the GHG avoidance, and job creation estimates.

Appendix: Optional Task to Estimate Net-To-Gross Factors

As an option, the NCI will develop net-to-gross estimates. We favor the enhanced self report approach which we have successfully used in regulatory settings throughout North America including New York, Ontario, and California). The surveys instruments that we are currently use for the PECO evaluations (and approved by the SWE) include this approach.

However, we will review the free ridership and net-to-gross approaches identified in the RFP and consider them for use, as well. As well, we will consider the theory-driven approach identified in the RFP. However, our concerns with this approach are:

- Achieving a defensible level of rigor may involve a much more extensive evaluation expenditure than is proposed for the current effort.
- This approach may be more appropriate when applied at the measure or technology level rather than at the program and program group level.
- This approach may be more appropriate for building the case for longer term market transformation than for identifying free ridership and spillover in any specific year, or for several years that represent the initial years of a program..

The additional cost to implement the SRA free ridership approach that the NCI Team has used in its PECO work would be largely driven by the cost of the analyses rather than the cost of instrument design and development. Our costs shown in the Budget and Billing Rates section of this proposal reflects this approach.

Duquesne Light Company
Bid Form Spreadsheet
Appendix D

Request For Proposals
For CSP Service

Bid Due Date: September 30, 2010, by 11:00 a.m. Eastern Prevailing Time

All "Required Fields" (*) must be completed.

Applicant Information

Applicant Name	Navigant	* Required Field
Contact Name	Craig McDonald	* Required Field
Phone Number	484-437-2487	* Required Field
Fax Number	215.832.4401	* Required Field
Email	cmcdonald@navigantcosnulting.com	* Required Field
	[redacted]	* Required Field

Offered Bid (Binding if accepted by Duquesne and contract approved by Pa PUC)

Fixed Price For EM&V Services	***$ 2,698,919***	* Required Field

Contract Period: on or about November 22, 2010 – end of program in 2013

Exhibit B

Project Schedule for Deliverables

Deliverable/ Activity	Q3 PY2	Q4 PY2	Annual Report PY2	Q1 PY3	Q2 PY3	Q3 PY3	Q4 PY3	Annual Report PY3	Q1 PY4	Q2 PY4	Q3 PY4	Q4 PY4	Final Report
Due Date	2/28/ 2011	5/31/ 2011	7/15/2011	8/31/ 2011	11/30/ 2011	2/29/ 2012	5/31/ 2012	7/15/2012	8/31/ 2012	11/30/ 2012	2/28/ 2013	5/31/ 2013	10/31/ 2013
Impact Evaluation	X	X	X	X	X	X	X	X	X	X	X	X	X
Process Evaluation	X	X	X	X		X		X					X
C/B Analysis			X					X					X
Impact and Process Evaluation Surveys For Participants	X	X	X	X	X	X	X	X	X	X	X	X	
Impact and Process Evaluation Surveys for Non-Participants		X					X						

PY = Program Year
Program Year 2: June 1, 2010-May 31, 2011
Program Year 3: June 1, 2011-May 31, 2012
Program Year 4: June 1, 2012-May 31, 2013

Q = Quarter
Quarter 1: June 1-August 31
Quarter 2: September 1-November 30
Quarter 3: December 1-February 28
Quarter 4: March 1-May 31

C/B = Cost Benefit

Exhibit C
Statement of Work

Pursuant to Duquesne Light Company's (DLCo) "***Evaluation Measurement and Verification EM&V Plan,***" ("EM&V Plan") dated July 15 2010, NCI will implement the EM&V Plan as specified therein, with NCI possible modifications and considerations listed below:

- Like any plan, it is based on assumptions and forecasts regarding market conditions, participation rates, measure mix, and baselines. There is considerable uncertainty about all of these factors. NCI is dedicated to working ***pro-actively and flexibly with DLC to adjust the EM&V Plan and approaches to rigorously*** address the greatest sources of uncertainty within the budget constraints.
- In some cases, the EM&V Plan may outline more resource intensive evaluations than justified by the program budgets. NCI recommended approaches consistent with each program budget. NCI will work flexibly with DLCo to adjust approaches to fit within budgets, as required.
- NCI's approach includes on-site inspections and measurements for the enhanced EM&V site visits that leverage NCI's instrumentation, NCI's ***FACT*** system including (tracking, data collection and validation protocols), and NCI's ability to use calibrated simulations/engineering analyses to meet statistical precision requirements most cost-effectively.
- NCI's surveys will cover both process and impact issues and ***build upon instruments that have been reviewed and approved by PA Statewide Evaluator ("SWE").***
- NCI added non-participant surveys in both 2011 and 2012 to address process and net-to-gross issues.
- NCI will leverage NCI's current work with managing the Act 129 evaluations for PECO. This includes use of the battery of process and impact questions that have already been approved by the SWE to minimize survey development costs and minimize possible delays from SWE review.

Below, is a summary of the work that NCI will perform consistent with the EM&V Plan. As described in Task 4: Management and Reporting, NCI will tune the EM&V Plan, as appropriate to best utilize the evaluation budgets.

1.1 Task 1: Impact Evaluation

NCI's impact evaluation approach includes the following elements:

1) NCI will use its **FACT** system that includes standard data collection protocols, instrumentation plans, real-time tracking of all field activities to ensure the rigor, integrity and timeliness of field data (enhanced survey) collection activities.
2) Use of **stratified and ratio sample designs and estimation** to minimize the sample sizes required to achieve the targeted precision levels

3) The surveys will ***support both the process and impact evaluations***, providing economies to DLCo
4) NCI will use NCI's library of survey instruments that have been reviewed and approved by the PA SWE as starting points -- providing cost savings, reducing potential delays, and consistency across the state.
5) NCI's engineers are experts at calibrated simulations and engineering analyses to rigorously determine the energy savings for EE measures, ***especially customized measures*** which comprise a large portion DLCo's forecasted savings.
6) NCI's engineers have strong expertise in evaluation and measurement of customized projects for large industrial process energy efficiency projects including the chemicals and metals industries.

The table below presents the number of telephone survey completions NCI will complete for each program group, which is based on the EM&V Plan provided by DLCo. Annual sample sizes are estimates. Final sample sizes will be based on observed program variance and adjusted as necessary to achieve the targeted 90-percent level of confidence and 10 percent relative precision or less at the Evaluation Group level (Evaluation Groups are defined in the EM&V Plan Table 1-7, page 13). If greater sample sizes are required to meet the targeted level of confidence and precision, Navigant and DLCo will negotiate either a reallocation of funds within the approved budget or an increase in the approved budget.

Program Group	Telephone Surveys (Annually)	Total Surveys (2011-2013)
Commercial	33	99
Industrial	9	27
Residential: EE Rebate	33	99
Residential: EE Low-income Energy	55	165
Residential: Refrigerator Recycling	55	165
Residential: School Energy Pledge	553	165
Total	240	720

1.1.1 Site M&V

NCI plans to implement the following site M&V by program group within the first 6 months of 2011, 2012, and 2013 as summarized below (Annual sample sizes are estimates. Final sample sizes will be based on observed program variance and adjusted as necessary to achieve the targeted 90-percent level of confidence and 10 percent relative precision or less at the Evaluation Group level (Evaluation Groups are defined in EM&V Plan Table 1-7, page 13). If greater sample sizes are required to meet the targeted level of confidence and precision, Navigant and DLCo will negotiate either a reallocation of funds within the approved budget or an increase in the approved budget.):

Program Group	On-Sites Surveys (Annually)	Total Surveys (2011-2013)
Commercial	31	93
Industrial	17	51
Residential	32	96
Total	80	240

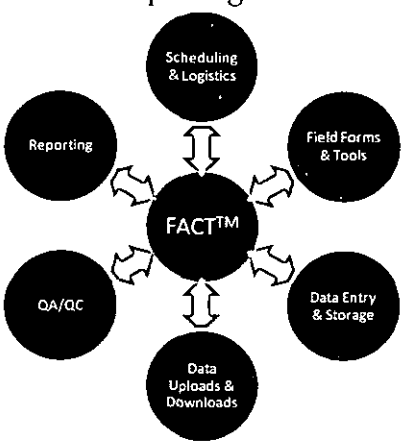
NCI plans on four levels of field data collection as follows:

1) Verification inspections
2) Inspections with spot measurements
3) Runtime hour data logging studies
4) End-use metering data collection

Approximately ¼ of the annual surveys will be completed each quarter. Within the first 4 months of 2011, NCI will complete the targeted number of annual surveys for 2010 in order to support results reporting by mid-year 2011.

1) Samples will be developed for each program by end use, measure or technology group, guided by Evaluation Framework protocols.
2) NCI will systematically apply the International Performance Measurement and Verification Protocols (IPMVP) for both data collection and analysis methods

NCI has developed the FACT system that includes standard on-site measurement and data collection protocols, real-time activity and data reporting, and data quality verification. This system allows us to ensure efficient and rigorous on-site data collection as well as near real-time data analysis and results reporting.



NCI is assuming that approximately 1/3 of the on-site verifications will include each of the following levels of measurement:

- Verify installation including equipment specifications of the installed and replaced equipment

- Spot measurements of key parameters used for calculating the energy savings
- Logger (including run-time or interval power measurement) data

Inspections will be conducted quarterly. Results will be used to update the realization rates for both the quarterly and annual reports.

1.1.2 Analysis

NCI will complete quarterly surveys that will be used to develop realization rates for each program area (differentiated by market segment and measure type, where the data support). For the quarterly updates, realization rates will be updated based upon the rolling averages.

For the annual reports, the results will include updates based upon the on-site measurements conducted during the installations completed for the previous calendar year.

NCI recognizes that the SWE does not favor billing analysis. Thus, the realization rates will be based on the survey date efforts including both the telephone interviews (basic) and on-site (enhanced) data collection.

1.1.3 Net-to-Gross

As an option, the NCI will develop net-to-gross estimates. NCI favors the enhanced self report approach which NCI has successfully used in regulatory settings throughout North America including New York, Ontario, and California). The survey instruments that NCI is currently using for the PECO evaluations (and approved by the SWE) include this approach.

1.2 Task 2: Process Evaluation

The process evaluation research and reporting will center on the four primary areas of investigation:

- Program design
- Program administration
- Program implementation
- Market response

NCI is using a very similar approach in its process evaluation of all of Con Edison's Energy Efficiency Portfolio Standards (EEPS) programs. Each research instrument, interview, document review, and so on – and especially the evaluation reporting – is addressed in terms of the central research areas identified prior to initiating the process evaluations. The NCI Team will execute the process evaluation strategy to address each of these areas as specified in the DLCo EM&V Plan and in a manner consistent with the protocols outlined in that plan. Below, NCI comment on the DLCo description of each of these areas to the extent that NCI will modify it or wish to raise questions about it.

1.2.1 Program Design

The NCI Team will review/analyze any models and theories that exist and modify or create models/theories as needed. It is important to understand how savings goals were developed, and to make some assessment regarding how realistic those goals are for DLCo in particular. NCI also note that, in addition to the information sources listed in the DLCo RFP, information gleaned from trade allies and customers can provide important feedback regarding program design elements such as timing of program components/requirements, marketing approach, etc. While desirable, the program design timeline may or may not have permitted sufficient time to obtain feedback from trade allies on programs relying on their active involvement.

1.2.2 Program Administration

Important in this area is the utility's decision for each program whether to implement in-house or via an implementation contractor (CSP) The NCI Team has found it very helpful in its program administration assessments to review CSP contracts, in addition to the various program brochures, reports, tracking system, etc. These make clear where the self-interest of the CSP lies, the extent to which the utility can determine marketing level of effort, changes in marketing approach, aspects of the CSP's relationship with its subcontractors, etc. This has been very important in some recent process evaluations. NCI also has recently conducted a benchmarking study of DSM staffing and organization, which can be brought to bear in NCI's analysis of these areas for the DLCo program effort.

1.2.3 Program Implementation and Delivery

This investigation area is viewed from multiple perspectives, including utility/implementation contractor staff, trade allies and customers. NCI has an office in Pittsburgh, staff from which can be used in conducting any mystery shopper or unannounced participation research that is needed. On-site observation of work quality, while in some respects a process task, is most cost effectively done when on-site verifications are specified for impact evaluation. A key aspect of this part of the evaluation is to document the extent to which the program is being implemented in accordance with the program design and, if not, why. This is in addition to key research into the extent to which there are bottlenecks or participation flow/process issues that are affecting cost effectiveness, satisfaction or participation.

1.2.4 Market Response

The NCI Team will perform an assessment of the marketing approach being used by each program, in part with respect to a listing of best marketing practices NCI have developed over time based on NCI's own experience and best practice documents produced from time to time. This allows the marketing assessment to be structured more formally and, while programs can certainly deviate from best practices, can point to certain key deficiencies in market plans and implementation. Third-party market trend data may be obtained, on an as-needed basis, to the extent that such data are available and can assist in the process assessment.

1.2.5 Sample Design

The DLCo RFP indicated a specific sampling regime on which to base program evaluation costs, which also must meet reporting precision requirements. As such, NCI will include process evaluation-related survey question modules in all impact evaluation surveys being conducted of program participants. For non-participants, NCI will conduct two annual sets of surveys, with segments as indicated below.

Non-participant Survey in 2nd Quarter of 2011 and 2012	Annual Completions
Commercial	50
Industrial	20
Residential: EE Rebate	60
Residential: Refrigerator Recycling	
Residential: School Energy Pledge	
Residential: Low-income	50
Total	180

Trade ally research will be conducted with up to 30 trade-allies allocated across the 3 customer segments in each of years 2011 and 2012, depending on the program designs, the extent to which trade allies form a key component of program delivery, and the extent to which the program's overall process evaluation budget allocation permits it. This research will be qualitative in nature rather than targeting a specific statistical precision. NCI will discuss the desirability of conducting such interviews via internet, as stipulated in the EM&V Plan, versus some other medium on a program-by-program basis.

1.2.6 Design Feedback

Early evaluation findings memoranda can be a valuable tool for correcting program deficiencies in a timely manner, uncovering differences in understanding between CSPs and utility program managers, spurring changes already under consideration, and identifying and helping to resolve key administrative and marketing deficiencies. The timing of these memoranda should be determined in coordination with the DLCo project manager, but NCI suggest that such early findings memos should typically wait until the following have been completed: utility and CSP staff interviews, review of program materials, CSP contract(s), and (at least preliminarily) program tracking system. Additional early findings (not merely included in scheduled quarterly, semi-annual or annual reporting) memos could result from unexpected findings regarding trade ally interviews, or from quarterly customer surveys.

1.2.7 Spot Evaluations

Spot evaluations will be conducted on an as-needed basis, based on the guidelines (evaluation triggers) presented in the DLCo RFP. NCI will work with the DLCo to refine these triggers, as needed, on a program-by-program basis. Where appropriate, the NCI Team may suggest additional or modified triggers.

1.3 Task 3: Cost Effectiveness

NCI will develop a system that reports TRC results incorporating ex-ante estimates along with quarterly updates of realization rates by program and market segment. NCI has a unique depth and breadth in developing PJM and MISO wholesale market prices forecasts as well a local cost considering transmission. NCI will incorporate NCI's work in developing incremental costs for EE measures based upon survey results. NCI has developed TRC B/C analyses that have been accepted in many different jurisdictions in North America including New York, New Jersey, Ontario, British Columbia, Maryland, California, Washington, Illinois, Pennsylvania and others.

1.4 Task 4: Management and Reporting

In meeting its responsibility to ensure that reporting to the SWE is accomplished accurately and in a timely manner, it will be important for the NCI Team to develop a seamless interface with the DLCo PMRS tracking system. That interface may be electronic or merely a carefully considered set of protocols developed for NCI and DLCo interactions regarding program-related data. NCI will develop a systematic reporting process, to ensure that all quarterly and semi-annual reports are done as required. This will be one of the first activities the Team addresses in this project.

As noted in the DLCo RFP, it will be important to manage subcontractors, including the time keeping, invoicing, and information-sharing that will be required. NCI has selected subcontractors NCI have worked with before, and with whom NCI have strong relationships, to minimize the amount of time these efforts entail.

Annual reports will demonstrate the extent to which the utility is achieving its Act 129 mandates. The three annual, and one final, impact evaluation reports will address all issues required by the SWE. Impact evaluation activities will be timed so that these reports can benefit from the most recent analyses.

It is NCI's expectation that a significant amount of time will need to be spent communicating with and at times meeting with not only DLCo but also the SWE, the program CSPs and possibly specialized M&V contractors. NCI's experience in evaluating the PECO Act 129 programs is that a strong relationship with the SWE, developed through regular contacts with the SWE, is very valuable in minimizing risk, and in enhancing understanding (and obtaining SWE acceptance of) the evaluation activities that are being implemented and the rationale for them.

The DLCo RFP lays out the required contents of each type of report required throughout the project period, including quarterly and annual impact reports (including any M&V reporting), process evaluation reports (including spot evaluation reports, quarterly reports during 2011, semi-annual reports during 2012, as-needed reports during 2013, and final), and annual cost effectiveness reports. The NCI Team will address each required area of interest and work with DLCo and the SWE, to the extent that either organization's review of these reports indicates

needed modifications. In cooperation with DLCO NCI will revise NCI's overall evaluation approach as needed to the end of the management and Reporting section.

Exhibit D
Compensation

A. **Payment Terms**: The NCI Budget will utilize a time and materials payment structure comprised of payments tied to specific tasks for each evaluation group, as identified in Table 1 below.

B. **Compensation**: Payment under the contract shall be based on time and materials, not to exceed the total cost of $2,698,919, as explained Table 1. The costs assigned to each task are estimates, and may change, as long as the total cost does not exceed $2,698,919.

C. **Billing Schedule**: Payment will be based on satisfactory completion of each task described in Table 1. NCI shall invoice Duquesne Light monthly for the work performed based on Table 1. Payments will be made thirty (30) days from the date of the invoice.

Agreed Tasks and Estimated Payments

Table 1

	(Task 1)				(Task 2)	(Task 3)	(Task 4)	
Evaluation Groups	Impact Evaluation				Process Evaluation	C/B Analysis	Mgm't & Reporting	Total EM&V
	Site M&V	Analysis	NTG	Total				
Low Income Energy Efficiency	$0	$94,909	$9,159	$104,068	$27,706	$9,159	$45,796	$186,730
Res. Energy Efficiency Rebate	$67,200	$184,725	$24,926	$276,851	$71,936	$24,926	$124,632	$498,346
Res. School Energy Pledge	$0	$49,714	$3,721	$53,435	$15,047	$3,721	$18,606	$90,809
Res. Refrigerator Recycling	$0	$47,497	$3,500	$50,997	$14,418	$3,500	$17,498	$86,412
Upstream Lighting Program	$0	$40,000	$4,000	$44,000	$15,133	$4,000	$16,000	$79,133
Industrial Sector	$105,300	$169,194	$27,351	$301,845	$78,601	$27,351	$136,754	$544,551
Commercial Sector	$139,500	$465,459	$62,288	$667,247	$171,960	$62,288	$311,442	$1,212,938
Total	***$312,000***	***$1,051,497***	***$134,946***	***$1,498,443***	***$394,800***	***$134,946***	***$670,730***	***$2,698,919***

D. **Task Budget:** Each task is paid in accordance with the assigned personnel, actual hours, labor costs, and other incurred costs (travel and lodging) designated in Table 2. In no event will Duquesne Light pay more than the total budget agreed to in Table 2 below.

Estimated Costs per Task

Table 2

Task	Assigned Personnel	Anticipated Hours	Labor Costs	Other Costs	Per Task Total Cost
Impact Evaluation					
Site M&V	Multiple	1,768	265,200	46,800	312,000
Analysis	Multiple	5,091	967,377	84,120	1,051,497
NTG	Multiple	955	124,150	10,796	134,946
Process Evaluation	Multiple	2,018	363,216	31,584	394,800
Cost Effectiveness	Multiple	671	124,150	10,796	134,946
Management & Reporting	Multiple	3,225	590,242	80,488	670,730
Total		*13,729*	*2,434,336*	*264,583*	*2,698,919*

Exhibit E

Evaluation Measurement and Verification Plan
Duquesne Light Company
2010-2012 Energy Efficiency & Conservation Programs

July 15, 2010

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Appendices

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1. Evaluation Overview

1.1. Introduction to Evaluation Plan

This Evaluation Measurement and Verification Plan (EM&V Plan or Plan) is intended to describe the scope of services supporting a request for proposals (RFP) to evaluate the 2010-2012 energy efficiency & conservation (EE&C) programs implemented by Duquesne Light Company (DLCo). It comprises a preliminary evaluation plan that includes an impact evaluation, a process evaluation, and a cost-effectiveness evaluation.[1] Bidders are expected to propose a budget to implement this plan. However, in an appendix, they may also propose any modifications to this plan that they feel are necessary and a modified budget.

DLCo is undertaking implementation of a broad suite of EE&C programs under direction of the Pennsylvania Public Utility Commission (PA PUC), who has directed the Pennsylvania Electric Distribution Companies (EDC) to provide EE&C programming. Because these programs are designed to support ratepayers, and are being funded by ratepayers, DLCo will make every effort to deliver the intended benefits, and where they are not delivered, determine how to redirect the implementation process to improve delivery of benefits over time.

There are inherent risks associated with any EE&C program implementation, and these risks bring with them the possibility that expected program outcomes will not be achieved. Evaluations are a critical part of managing the risks involved with any program and ensuring that program goals are realized. The evaluation plan provides a roadmap to conducting evaluations that can yield key information for managing these risks. DLCo expects that this plan will be further developed in consultation with the PA PUC and the PA Statewide Evaluator's (SWE).

1.1.1. Managing Program Evaluation

The information provided in this EM&V Plan represents the common evaluation approaches, protocols and procedures that DLCo and the selected Team (the Team) will undertake to evaluate DLCo EE&C programs. This EM&V Plan is responsive to the SWE Audit Plan (Audit Plan) as approved by the PA PUC. As such, this EM&V plan adheres to evaluation procedures and elements that are specified by the SWE, while also calling out elements unique to specific programs or where select programs may differ from the common EM&V approach that is presented. In developing this EM&V Plan, DLCo established a few key assumptions and understanding of critical terms that hold constant throughout this document.

This EM&V Plan was developed adopting the following key assumptions:

- The level of effort and associated resources directed to evaluating program activities will be based on a review of program implementation data that takes into account number of key variables. These variables comprise: the magnitude of reported savings by project; the level of uncertainty surrounding the accuracy of the reported savings; the complexity of project measures and program process; the presence or absence of standardized protocols supporting claimed savings and associated pre-determined evaluation levels of rigor for select measures and measure groups. Please see Section 2.4 for detail on how level of rigor assignments will be handled.

[1] This plan provides a comprehensive list of Acronyms in Appendix A.

- A general EM&V approach has been developed for various programs and program groups and combinations of deemed and custom measures. Once measure data by program becomes available, the Team will develop EM&V work plans and field-level M&V manuals based on appropriate standardized or project-specific protocols.

This EM&V Plan was developed adopting the following key definitions:

- **EM&V:** Evaluation, measurement and verification (EM&V) refers to a broad range of engineering and statistical techniques that are designed to measure gross energy and demand impacts at the program level. Evaluations should be conducted according to the EM&V Protocol in the Audit Plan. In some jurisdictions, EM&V include the estimation of net impacts.

- **M&V:** Measurement & verification (M&V) refers data collection, monitoring and analysis activities associated with the calculation of gross energy and peak demand savings from individual customer sites or projects. Gross and net impacts at the program level will be guided by the EM&V Protocol in the Audit Plan, where results from M&V studies conducted on a sample of sites/measures will be combined with other information to develop an overall estimate of savings by program or program component.

- **Gross Impacts**: The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an energy efficiency program, regardless of why they participated.

- **Net Impacts**: The total change in load that is attributable to the utility energy efficiency program. This change in load may include, spillover, implicitly or explicitly, the effects of free-drivers, free-riders, state or federal energy efficiency standards, changes in the level of energy service and natural change effects.

- **Net-To-Gross Ratio (NTGR)**: The NTGR (i.e., 1 – free-ridership + Spillover) is a measure of program attribution (ranging from 0 to 1) that is used to convert the gross impacts into net impacts. This factor is also sometimes used to convert gross measure costs into net measure costs. The NTGR can be estimated using a variety of techniques, including the self-report approach (SRA).

- **Baselines:** In order to calculate gross impacts, one must calculate the difference between the annual energy use of the energy efficient equipment installed through the program and the energy use of equipment that represents the baseline. The baselines will vary depending on a number of factors such as whether the installation situation was *early* replacement or *normal* replacement (replacement on burnout), and whether there is an applicable efficiency code. Identifying the correct baseline is critical in estimating gross impacts.

It is important to note that EM&V activities and procedures will vary depending upon individual program objectives and content. DLCo's programs include "downstream" incentive variety and "upstream" distribution variety. Per DLCo's Filed Program Plans, ". . . downstream means programmatic offerings, energy audits, recommendations and incentives, provided to end-use consumers." "Upstream" and "midstream" programs provide financial incentives to manufacturers and retail distribution outlets as a strategy for penetrating a particular niche or mass market. Evaluation activities will accommodate different requirements of downstream and upstream programs.

1.1.2. Alignment with PA Act 129 Activities

DLCo's EM&V plan aligns with PA Act 129 of 2008 goals. Pursuant to PA ACT 129, the Pennsylvania General Assembly charged the Pennsylvania Public Utility Commission (PA PUC) with establishing an energy efficiency and conservation (EE&C) program. The energy efficiency and conservation program requires each EDC with at least 100,000 customers to adopt a plan to reduce energy demand and consumption within its service territory. In compliance with the requirements of Act 129, DLCo used the energy consumption and peak demand reductions established by the PA PUC to develop its EE&C plan. This plan provides the guidance and details to conduct a full evaluation for DLCo's portfolio of programs implemented during the 2010-13 period.

PA Act 129 requires the achievement of 1% and 3% reductions in electricity consumption in DLCo's service territory by May 31, 2011 and May 31, 2013 respectively, as measured against the June 2009 to May 2010 kWh sales forecast. The energy savings goals are:

- 140,885,117 kWh by 2011
- 422,565,351 kWh by 2013
- PA Act 129 requires the achievement of a 4.5% reduction by May 31, 2013 in peak demand in the service territory as measured against the 2007 June to September average of the 100 hours of peak demand. The demand reduction goal is:
- 113 MW in the summer of 2012

Of these targets, 10% of the reductions must come from government, municipal, educational and non-profit accounts. There are also low income requirements such that the number of measures offered shall be proportionate to those household's share of the total energy usage in the service territory.[2]

The filed program plans provide details on EE&C and DR Programs planned for delivering annual energy efficiency program impacts by May 31, 2011 to exceed the mandated energy use reduction of 1% of 2009-2010 (base year) delivered energy or 140.9 GWh and cumulative impacts exceeding 3% base year delivered energy and 113 MW of demand reduction in the summer of 2012.

The Team is charged with documenting the extent to which DLCo achieved these objectives. To realize this goal, the Team will conduct the appropriate evaluations in accordance with Act 129 directives. Reflecting this integration, this plan incorporates and aligns with the following Act 129 defined protocols:

- Pennsylvania's Technical Reference Manual for Pennsylvania Act 129 Energy Efficiency and Conservation Program and Act 213 Alternative Energy Portfolio Standards (TRM)[3]
- Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs (Audit Plan)[4]

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[2] Per Report of the Act 129 Low-Income Working Group (3/19/2010) Table 1, the percent kWh usage of low-income households is 7.88% of total consumption for Duquesne Light.

[3] Pennsylvania Public Utility Commission, *Technical Reference Manual for Pennsylvania Act 129 Energy Efficiency and Conservation Program and Act 213 Alternative Energy Portfolio Standards*. May 2009

It is important to note that the Audit Plan incorporates industry standard evaluation protocols, and as such this plan draws indirectly and directly from the following documents

- International Performance Measurement and Verification Protocol (IPMVP)[5]
- The California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals (California Protocols)[6]
- The California Evaluation Framework (California Framework)[7]

Finally, the Team will draw on DLCo's program procedural guidelines specifying the application of algorithms for calculating measure level savings as well as DLCo program management plans.

1.1.3. Integration of DLCo's Program Plans

DLCo EE&C program plans support key EM&V elements to ensure implemented programs produce verifiable savings in the following ways[8]:

- **EM&V Program Theories, Logic Models and Performance Indicators**: Provides the program level framework for evaluation
- **Program Management and Reporting System (PMRS)**: Provides the measure specific data required for conducting an evaluation.
- **Program Specific Procedural Guidelines**: Provide the specific process structure required for the Process Evaluation.
- **Internal Audits**: Provide critical program performance information that can supplement the evaluation

The Team will work closely with DLCo program managers and contracted CSPs during the conduct of program evaluations. Per DLCo's EE&C Plan, they will provide the Team the following information:

- Full program descriptions, including operational and/or procedures manuals and activities descriptions and description of program service territory
- Detailed descriptions of tracking system and tracking system operations, including data dictionaries

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[4] GDS Associates, Inc., Nextant, & Mondre Energy, *Audit Plan and Evaluation Framework for Pennsylvania Act 129 Energy Efficiency and Conservation Programs*. December 1, 2009

[5] Efficiency Valuation Organization, *International Performance Measurement and Verification Protocol. Concepts and Options for Determining Energy and Water Savings*. Volume 1. April 2007.

[6] TecMarket Works, *The California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. April 2006. http://www.calmac.org/events/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf

[7] TecMarket Works, *The California Evaluation Framework*. June 2004. http://www.cee1.org/eval/CEF.pdf

[8] See DLCo's Filed Program Plans for more details on these elements.

- A detailed description or map of how data in the tracking system rolls up to the quarterly PA PUC report
- Program management and staff names, titles, work locations, phone numbers, fax numbers, and e-mail addresses
- Program savings objectives
- Key market factors, trade allies, and other stakeholders used to deliver or support the program in order to reach the energy saving or outreach goals
- Name of firms participating in the delivery of the program or program component(s) (e.g., vendors, installers, retailers, etc.)

1.1.4. Evaluation Protocols Outline

The evaluation protocols contained in this evaluation plan provide direction for the specific evaluation of DLCo's portfolio of EE&C programs. The protocols are based on direction provided in the same documents listed in Section 1.1.1 Managing Program Evaluation. This plan includes a separate protocol for each of the categories below:

- **Impact Evaluation Methods**: The Impact Evaluation section discusses the minimum allowable methods to meet a specified level of rigor that will be used to measure and document the program or program component impacts achieved as a result of implementing DLCo's portfolio of EE&C, which includes sampling and uncertainty protocols. This section also includes the measurement and verification (M&V) methods detailing how the Team will conduct field measurements and data collection to support impact evaluations and updates to ex-ante measure savings estimates.
- **Process Evaluation Protocol**: The Process Evaluation Protocol details specific procedures that the Team will undertake to assess program implementation and provide the basis for improving the operations of DLCo's programs.
- **Cost-effectiveness Protocol**: The Cost-effectiveness Protocol discusses specific procedures that the Team will be undertaking to evaluate and document program expenditures vis-à-vis benefits and provide the basis for improving the cost-effectiveness of the programs offered within DLCo's portfolio.
- **Reporting Protocols**: The Reporting Protocol discusses the process and schedule by which DLCo and the Team will deliver evaluation reports and the way information will be presented in those reports.

1.1.5. Evaluation Schedule

Because the quarters are based on the program year and not the calendar year, we provide in Table 1-1 the time periods associated with each quarter.

Table 1-1. Definition of Evaluation Quarters

Quarter	Dates
Quarter_1	6/1/2010 - 8/31/2010
Quarter_2	9/1/2010 - 11/30/2010
Quarter_3	12/1/2010 - 2/28/2011
Quarter_4	3/1/2011 - 5/31/2011
Quarter_5	6/1/2011 - 8/31/2011
Quarter_6	9/1/2011 - 11/30/2011
Quarter_7	12/1/2011 - 2/29/2012
Quarter_8	3/1/2012 - 5/31/2012
Quarter_9	6/1/2012 - 8/31/2012
Quarter_10	9/1/2012 - 11/30/2012
Quarter_11	12/1/2012 - 2/28/2013
Quarter_12	3/1/2013 - 5/31/2013

EDCs are required :

- The report for a given quarter must be submitted by the conclusion of the following quarter.
- The annual reports for the first program year must be submitted by the end of the July 15, 2011.
- The annual report for the second program year must be submitted July 15 of 2012.
- The final report across all three program years must be submitted by July 15, 2013 (Note that a third-year annual report is not required).

The contents of each report will vary somewhat.

- Impact results must be presented in every quarterly and annual report and as well as the final report.
- It is anticipated that the Team will be more engaged during the early development efforts and for conducting the early feedback based on process evaluations. Thus, during the *first year*, all programs must undergo a process evaluation with results reported for each quarterly report and the first annual report. During the *second year*, process evaluation results will be reported in the second quarterly (Quarter_6) report and in the second annual report. During the third year, process evaluation data will only be collected on an as-needed basis (e.g., to investigate the implementation of a new program component or a high number of customer complaints).
- After one full program year, the Team will conduct a preliminary cost-effectiveness analysis. Results will be used to modify the design and/or delivery of the program. At the close of the program, a final cost-effectiveness analysis will be conducted and presented into the final report.

Table 1-2 summarizes these requirements for each component of this evaluation and the date each is due.

Table 1-2. Data Reporting Requirements, by Quarter

Quarter	Quarter_1	Quarter_2	Quarter_3	First Annual Report	Quarter_5	Quarter_6	Quarter_7	Second Annual Report	Quarter_9	Quarter_10	Quarter_11	Final Report
Due Date	11/30/2010	2/28/2011	5/31/2011	7/15/2011	11/30/2011	2/29/2012	5/31/2012	7/15/2012	11/30/2012	2/28/2013	5/31/2013	10/31/2013
Impact Results	X	X	X	X	X	X	X	X	X	X	X	X
Process Results	X	X	X	X		X		X				X
Cost-Effectiveness Results				X				X				X

The SWE will issue feedback to DLCo in the quarterly and annual progress reports submitted to them by the Team (as described in Section 2.3 Uncertainty). In response to SWE feedback, all impact evaluation activities described in Section 2 Impact Evaluation Methods will be open to modification in order to adequately address process or protocol modifications that the SWE deems appropriate or necessary. This third party evaluation of DLCo's impact evaluation activities by SWE will serve as a quality control mechanism for all evaluation activities. Note that currently the Commission does not require that net-to-gross ratios (NTGRs) be estimated. However, the Team is expected to estimate NTGRs and report the results to the DLCo program managers on a quarterly, annual and overall basis.

1.2. Program Descriptions

The portfolio of DLCo EE&C programs are structured under three broad sectors: residential, commercial and industrial. Specific programs in these sectors were chosen based on the program's ability to reach key market segments and reliably achieve mandated energy reductions. DLCo EE&C Programs provide incentives for a full range of measures to assist residential, commercial and industrial energy customers of all sizes and in all key market segments to overcome barriers to adopting energy efficiency measures.

The umbrella programs put in place a baseline program design, with set incentive levels and measure content. The umbrella programs are designed as an overarching programmatic structure, with calculated incentives for customized projects or itemized incentives for standard measures.

1.2.1. The Commercial and Industrial (C&I) Sector Umbrella Program (CISUP)

The CISUP puts in place a baseline program design, with set incentive levels and measure content. The CISUP is designed as an overarching programmatic structure, with calculated incentives for customized projects and itemized incentives for standard prescriptive measures. Please see Appendix B for a description of the prescriptive and custom measure incentives offered by all C&I programs. C&I subsector programs are planned according to a customer market segmentation approach designed to be implemented by specialized implementation contractors with the capacity to assist customers to overcome market segment specific barriers to program participation. The market segment programs and specialized contractors serve as delivery mechanisms for standardized CISUP incentive offerings.

1.2.2. Industrial Overview

The Industrial Sector includes an overall umbrella program structure and three specialized sub-programs that address the following market segments: primary metals, chemical products and mixed industrials. Under the

overarching umbrella program, specialized sub-programs are allowed to promote specific technologies or target specific market segments while incorporating the umbrella program savings impacts and incentive levels. In this manner, sub-programs are intended to present a consistent and common offering. The Industrial Sector Umbrella Program comprises the operational structure for the implementing each of the industrial sub-programs. The following provides a brief description of each Industrial Sector Sub-Program. Detailed program descriptions for the Industrial Sector Umbrella Program and Sub-Programs can be found in Appendix B.

The industrial sub-programs are intended to provide a comprehensive approach to energy savings and permanent demand reduction, and address a full range of efficiency opportunities from low cost improvements to entire system upgrades -- with DLCo customers within the energy intensive primary metals, chemical products and mixed industrials market segments. Each sub-program is charged with providing the following services:

- Targeted and comprehensive on-site walk-through assessments and professional grade audits to identify energy savings opportunities.
- Efficiency studies/reports that detail process and equipment upgrades that present the greatest potential for energy/cost savings.
- Support to access rebates and incentives available across electric measures designed to help defray upfront costs of installing the equipment.
- Coordination with local chapters of key industry associations to promote energy efficiency improvements through trusted sources and encourage market-transforming practices among equipment vendors and purchasers

DLCo has chosen the following Conservation Service Providers (CSPs) to implement industrial sector programs:

- Primary Metals Program: Roth Bros, Inc. and Enerlogics Networks, Inc.
- Chemical Products: Global Energy Partners, LLC
- Mixed Industrial: Global Energy Partners, LLC

Table 1-3, Industrial Sector Impacts and Budgets, below provides the forecasted impacts and budgets for the Chemical Products, Primary Metals and Mixed Industrial programs. Each program contains a mix of deemed and custom measures (see Sampling plan).

Table 1-3: Industrial Sector Impacts and Budgets.

Program Type	Total Incentives	Total Admin	Total On - Peak Demand Reduction (kW)	Total Energy Savings (kWh)
Industrial Umbrella Program	557,051	619,330	1,360	8,803,277
Chemical Products	1,379,476	1,533,703	3,367	21,800,349
Primary Metals	3,795,853	4,220,235	9,265	59,987,224
Mixed Industrial Segments	1,230,759	1,368,360	3,004	19,450,130

1.2.3. Commercial Overview

The Commercial Sector includes an overall umbrella program structure and four specialized sub-programs that address the following market segments: Small Office, Large Office, Public Agency, Retail, and Healthcare. Under the overarching umbrella program, specialized sub-programs are allowed to promote specific technologies or target specific market segments while incorporating the umbrella program savings impacts and incentive levels. In this manner, sub-programs are intended to present a consistent and common offering. The Commercial Sector Umbrella Program comprises the operational structure for the implementation of each commercial sub-program. Detailed program descriptions for the Commercial Sector Umbrella Program and Sub-Programs can be found in Appendix B.

The commercial sub-programs are designed to help commercial customers assess the potential for energy-efficiency project implementation, cost and energy savings, and, for appropriate customers, provide follow-through by installing measures and verifying savings. The following program services will be provided in each sub-program:

- Auditing of building energy use
- Provision of targeted financing and incentives
- Project management and installation of retrofit measures
- Training, and technical assistance

DLCo has chosen the following Conservation Service Providers to implement commercial sector programs:

- Large Office: Roth Bros, Inc. and Enerlogics Networks, Inc.
- Small Office: AllFacilities Energy Group
- Retail: AllFacilities Energy Group
- Healthcare: TBD
- Public Agency Partnerships: TBD

Table 1-4 below provides forecast impacts and budgets for the Commercial Programs. Each program contains a mix of deemed and custom measures.

Table 1-4. Commercial Sector Impacts and Budgets

Program Type	Total Incentives	Total Admin	Total On -Peak Demand Reduction (kW)	Total Energy Savings (kWh)
Commercial Umbrella Program	1,603,457	458,131	4,027	18,768,885
Office Buildings	9,219,880	2,634,251	22,189	108,521,087
Retail Stores	3,707,995	1,059,427	9,312	43,403,046
Health Care Energy Efficiency Program	3,407,347	973,528	8,557	39,883,880
Public Agency Partnerships	8,107,871	2,316,535	20,187	62,813,778

1.2.4. Residential Overview

The Residential Sector is comprised of five specialized programs that either address specific technologies or address specific market segments. However, each residential sector program differs in its approach and the type of services it provides. A brief description of each residential sector program is included below.

While Table 1-5, provides brief program descriptions, detailed program descriptions for Residential Sector Programs can be found in Appendix B.

Table 1-5: Residential Sector Program Descriptions

Program	Description
Low Income Energy Efficiency Program	The Low-Income Energy Efficiency Program (LIEEP) is designed as an income-qualified program providing services to assist low-income households to conserve energy and reduce electricity costs. The objective of this program is to increase qualifying customers' comfort while reducing their energy consumption, costs, and economic burden.
Residential Energy Efficiency Rebate Program	The Residential Energy Efficiency Rebate Programs (REEP) is designed to encourage customers to make an energy efficient choice when purchasing and installing household appliance and equipment measures by offering customers educational materials on energy efficiency options and rebate incentive offerings. Program educational materials and rebates will be provided in conjunction with an on-line survey.
Refrigerator Recycling Program	The Refrigerator Recycling Program is designed to encourage residential customers in Duquesne Light Co's service territory to turn in their older operating refrigerators to be recycled. Removing an older, operating refrigerator can result in energy savings of more than 950 kWh per year. To encourage participation in this program, this program provides a $35 check for the removal of the old refrigerator
School Energy Pledge Program	The School Energy Pledge (SEP) program is designed to teach students about energy efficiency, have them participate in a school fundraising drive, and help their families to implement energy-saving measures at home. Energy efficiency impacts take place in student homes when families adopt energy efficiency measures that students learn about at school.
Upstream Lighting Program	DLCo's Upstream Lighting Program provides incentives to manufactures or retailers to reduce the price of pre-approved ENERGY STAR qualified CFLs to residential and small commercial customers at the point of sale, without the consumer having to submit a rebate application. DLCo's Upstream Lighting Program focuses on increasing consumer awareness of energy-efficient lighting products, making it easier to buy them and giving people more reasons to stay loyal to them. Using financial incentives, market research and promotional materials, the Upstream Lighting team will boost the availability and appeal of ENERGY STAR qualified CFLs.

Table 1-6 provides forecast impacts and budgets for the Residential Programs. Each program is expected to contain a mix of deemed and custom measures.

Table 1-6: Residential Sector Program Impacts and Budgets

Program Type	*Total* Incentives	*Total* Admin	Total On -Peak Demand *Reduction* (kW)	*Total Energy* Savings (kWh)
Low Income Energy Efficiency Program	3,830,048	1,094,299	12,254	30,055,105
Energy Efficiency Rebate Program (REEP)	10,423,264	2,978,075	54,916	118,121,083
School Energy Pledge Program (SEP)	630,000	1,370,667	4,253	4,725,000
Refrigerator Recycling Program	1,463,391	418,112	2,908	11,667,840
Upstream Lighting Program	TBD	TBD	TBD	TBD

1.2.5. Program Theories, Logic Models & Performance Indicators

Each DLCo program as well as its evaluation is guided by a certain logic and underlying program theory. A program theory is a presentation of the goals of a program, incorporated with a detailed presentation of the activities that the program will use to accomplish those goals and the identification of the causal relationships between the activities and the program's effects. An important component of the evaluation effort is to compare program theory and logic models with actual program impacts and outputs to assess the achievement of stated goals and objectives. This section presents a brief introduction to program theory and logic models and their intended use in evaluating DLCo's portfolio of EE&C programs.

The program theory describes, in detail, the expected causal relationships between program goals and program activities in a way that allows the reader to understand why the proposed program activities are expected to result in the accomplishment of the program goals.

The logic model is the graphical representation of the program theory showing the flow between activities, their outputs, and subsequent short-term, intermediate, and long-term outcomes. The logic diagrams are divided horizontally into sections placing program intervention in one of five sequential categories:

- Program Activities
- Activity Outputs
- Short Term Outcomes
- Intermediate Term Outcomes
- Long Term Outcomes

Planned activities, outputs (immediate results of activities) and expected short-term, intermediate and long-term outcomes are connected by lines that link program intervention events. Each linkage indicates a hypothesized causal relationship between the activities, outputs and outcomes identified. The links are numbered to identify each hypothesized causal link. For each link, there are a number of potential performance indicators. During the

evaluation process, DLCo and its Team will measure or otherwise assess the performance indicators to ascertain the extent that planned activities were conducted and outcomes were achieved. Preliminary program logic diagrams are provided in Appendices C and D for the following programs:

- Low Income Energy Efficiency Program (LIEEP)
- Residential Energy Efficiency Rebate Program (REEP)
- Residential School Energy Pledge Program (SEP)
- Residential Refrigerator Recycling Program (RRRP)
- Upstream Lighting Program
- Commercial Sector Umbrella Program and Sub-programs
- Industrial Sector Umbrella Program and Sub-programs

For each logic model, DLCo provides specific performance indicators. The performance indicators identify key programs issues and important program assumptions the Team needs to address. DLCo and its Team will use the identified performance indicators to measure the outputs and outcomes of the EE&C programs. With respect to the evaluation, each of these performance indicators can be linked to either the impact evaluation, the process evaluation or the cost-effectiveness evaluation. DLCo and its Team have reviewed all the logic models and their related performance indicators and allocated them to one of the three evaluation types. This allocation is preliminary, and subject to revision pending program design changes, input from the SWE or modifications that arise during the evaluation process.

During the first quarter, the Team must review and finalize the program theories, logic models, and performance indicators for each of these programs and program groups. The Team must also develop these same materials for the Upstream Lighting Program.

1.2.6. Program Level EM&V Organization

For the purpose of conducting cost-effective EM&V, certain industrial and commercial programs will be grouped based on shared characteristics. Commercial sector retail, health care, large and small office and public agency partnership programs are similar enough in structure to be treated as one evaluation group.[9] In the industrial sector, all sub programs will function in a similar enough manner that they will be treated as one evaluation group. However, because of their unique program features, each Residential program will be treated independently for evaluation purposes. As illustrated in Table 1-8: Evaluation Groups, below, this program level EM&V organization results in eight distinct evaluation groups. Note that program theory and logic models have been developed for seven of the eight evaluation groups.[10]

[9] Note that in cases where the programs must be consolidated for practical M&V purposes, the sample data can be used to provide an unbiased estimate of the average savings per project the program group. While average savings per project can be broken out for each program in the group, the precision will be lower due to the smaller sample sizes.

[10] Upstream Lighting Program Theory and Logic Model have yet to be developed.

Table 1-7. Evaluation Groups

Evaluation Groups	**Included Sub Programs**
Residential Energy Efficiency Rebate Program	Single program group
Low Income Energy Efficiency Program	Single program group
Residential Refrigerator Recycling Program	Single program group
Residential School Energy Pledge Program	Single program group
Upstream Lighting Program	Single program group
Commercial	Umbrella, Small Office, Large Office, Health Care and Retail, Public Agency Partnerships/Education
Industrial	Umbrella, Primary Metals, Chemical Products and Mixed Industrials

Recall that in the commercial program group, all sub-programs contain the same measures and incentive levels as set forth in the Umbrella Program. This is also the case with the industrial program group.

2. Impact Evaluation Methods

The impact evaluation methods are designed to yield greater accuracy, confidence and precision for measure groups and individual measures which have significant impacts and project size. The determination of sample size and design (as described below) will be made at the time a given impact evaluation is being conducted (see schedule overview in Section 1.1.5 Evaluation Schedule, above), with the body of projects and reported savings accrued to date.

Every program evaluation must balance concerns about precision, accuracy, and costs for conducting evaluations so as to ensure program performance is well documented without excessive costs to the rate payers. The goal of these methods is to establish an overall approach that provides evaluation efficiencies in the contracting, supervision and implementation of evaluation efforts. The methods set forth in this section are focused on the eight program evaluation groups listed in Table 1-7.

After describing the research objectives, we set forth the approaches that the Team must take to allocate evaluation resources and reduce uncertainty. Next, we address the general approaches to estimating both the gross energy and demand impacts. In addition, this section touches on baseline energy consumption and the estimation of net-to-gross ratios (NTGRs), which, while not currently required, will be estimated in order for DLCo to assess levels of free-ridership. These methods were developed to align with and support the regulatory guidelines and evaluation protocols described in Section 1.1.4.

2.1. Research Objectives

The primary research issues for the impact evaluation center around determining gross and net ex post impacts associated with each program. Specific research and assessment issues include:

1. Review program-level gross and net ex ante impact calculations (kWh, kW) for reasonableness and accuracy.

2. Estimate ex post program level gross energy and demand impacts using a variety of Audit-Plan-compliant techniques.

3. Estimate ex post program level net-to-gross ratios using the self-report approach. Estimates of participant spillover will be incorporated into the estimated NTGRs. The estimated NTGRs will be used to adjust estimated gross impacts. Although there is no Commission requirement to estimate NTGRs for 2009 or 2010, NTGRs will be estimated since such early feedback regarding the freeridership will be invaluable to the DLCo program managers.

2.2. Preliminary Assignment of Rigor Levels by Program/Program Group

The first task is to allocate the budget to the residential and nonresidential sectors. This allocation should be done based on each sector's share of the total expected portfolio savings over the four-year period.

At the time of specific impact evaluation activities (see schedule in Section 1.1.5 Evaluation Schedule, above), DLCo and the Team will conduct a high-level assessment of the evaluation needs of each program or program component in terms of impacts to date. This assessment considers - among other factors:

1. The share of expected program group savings in the DLCo portfolio,
2. The estimated uncertainty surrounding the expected program group savings, and
3. The levels of rigor specified in the EM&V and M&V protocols contained in the Audit Plan.

2.2.1. Share of Savings

For each program group, Table 2-1 presents the forecasted shares of DLCo's portfolio energy savings.

Table 2-1. Share of Portfolio Energy Impacts, by Evaluation Groups

Evaluation Groups	Included Sub Programs	Total Energy Savings (kWh)	Share of Portfolio Energy Savings
Residential Energy Efficiency Rebate Program	Single program group	118,121,083	21.6%
Residential Refrigerator Recycling Program	Single program group	11,667,840	2.1%
Residential School Energy Pledge Program	Single program group	4,725,000	0.9%
Low Income Energy Efficiency Program	Single program group	30,055,105	5.5%
Industrial Sector Programs	Umbrella, Primary Metals, Chemical Products and Mixed Industrials	110,040,980	20.1%
Commercial Sector Programs	Umbrella, Small Office, Large Office, Health Care and Retail, Public Agency Partnerships/Education	273,390,676	49.9%
Residential Upstream Lighting Program	Single program group	TBD	TBD
Total		548,000,684	100.0%

2.3. Uncertainty

Many evaluations rely on surveys of customers and/or trade allies, and usually economic/engineering models to produce estimates of program impacts. As a result, precision and accuracy in the survey results and in the application of appropriate analytic methods is important. One way to view these challenges is to think about challenges to precision accuracy in the survey efforts and in the analytic efforts.

Table 2-2 illustrates one way to think about these different sources of error.

Table 2-2. Sources of Error

Issues in Survey and Data Collection Precision & Accuracy		Issues in Analytic Methods
Sampling: • Sample size • Resulting standard errors of the *estimates*	*Non-Sampling:* • Measurement errors • Non-response bias in survey implementation • *In appropriate (e.g., non-*random) sampling methods. • Inappropriate determination of the *sampling frame* (e.g., faulty information on the population)	• *Miss-specification of the model or* analysis. • Violations of model assumptions (e.g., regression model assumptions, or such things as interactive effects in *engineering models)* • In-appropriate external validity assumptions (i.e., extrapolating model findings to an inappropriate set of customers, measures, or program *metrics)* • Modeler Error • Use of deterministic parameters and measurements when there may be uncertainty in these model constructs.

Note that this is not an exhaustive list, but factors like self-selection bias would be a violation of regression model assumption. This would also impact the external validity of the model and the extrapolation of model results to a larger population. Table 2-2 presents general categories of issues in assessing accuracy that embody a wide range of model specific issues.

In general, statistical precision is associated with the size of the drawn sample while bias (the lack of accuracy) is associated with the other types of errors (e.g., bias in sample design, measurement errors, self-selection, modeler error, etc.). Attempting to achieve appropriate levels of precision and accuracy is the goal of every evaluation. Both statistical precision and bias are important to address in the design of an evaluation and also in the presentation of evaluation results. Balancing the need for precision and accuracy subject to budget and data constraints is a challenge faced by every evaluation.

A variety of approaches to reduce the many possible sources of uncertainty will be used. For example, sample error will be minimized by maximizing sample sizes, subject to budget constraints. Measurement errors can be minimized, for example, by calibrating all instruments before field data collection begins, training all field data collection personnel to carefully collect all data using prescribed data collection forms, metering for a sufficiently long period of time for the end use being studied, choosing an appropriate baseline, training all telephone interviewers who conduct both the NTGR surveys and process evaluation surveys, and addressing non-response bias. In addition, on-site M&V activities will focus on those measures and parameters around which there is the greatest uncertainty.

The Team should employ a M&V process that will include a thorough documentation (in the quarterly, annual and final evaluation reports) of methods used to minimize both sampling and other sources of error. Accordingly, for each program group, the Team will compile and provide the SWE with the salient information (as described in Table 2-3) core to establishing the precision and accuracy of a particular evaluation study.

Table 2-3. Determining Factors: Sampling Method and Engineering Model Accuracy

Sampling Methods	Engineering Models
• Describe method used to determine sample size • Population size • Sample size • Assumed error ratio or coefficient of variance • Estimated evaluation costs at unit, program, portfolio level • Desired confidence and precision at program level • Expected savings at the program and portfolio levels • Estimated savings at the program and portfolio levels • Portfolio level confidence and precision levels	• Describe primary sources of uncertainty in deemed and measured parameters • Describe construction of the baseline and how the selection of baseline affects development of gross impacts vs. net impacts. • Discuss efforts to guard against measurement error associated with various M&V data collection • Discuss site selection and potential non-response bias, any tests performed to assess potential bias • Describe any potential measurement or bias (engineering model, modeler, or deemed parameter) issues associated with measurement approaches and tools used as applied to specific program parameters and estimates. • Meter bias – systematic error in meter and/or sensor

The Team should also address estimate the difference between (a) actual energy consumption and (b) what energy consumption would have been had the efficiency measures not been installed is an estimate of energy (and demand) savings.[11] That is, to what extent did the program(s) cause the observed reduction in energy and demand. To address program attribution, the Team should use the self-report approach to estimating net-to-gross ratios (NTGRs). Details of this approach are presented in Section 2.6.

2.4. EM&V Protocols by Level of Rigor

The Audit Plan specifies two levels of evaluation rigor for energy and demand, Basic and Enhanced. The level of rigor and subsequent gross energy impact protocols are summarized in Table 2-4. Note that, rigor level and corresponding IPMVP method assignments do not provide specific guidance for specific programs or technologies. Program or technology specific protocols or a method for developing such specific protocols are detailed in Section 2.5.

TRM *deemed measures* will receive the Verification protocol within the basic level of rigor. *Partially deemed* measures below a yet to be determined threshold defined by the Technical Working Group (TWG) and based on expected kW and kWh savings by project will receive the Simple Engineering Methods protocol within the basic

[11] National Action Plan for Energy Efficiency (2007). *Model Energy Efficiency Program Impact Evaluation Guide.* Prepared by Steven R. Schiller, Schiller Consulting, Inc. <www.epa.gov/eeactionplan>

level of rigor.[12] The M&V protocol for the *enhanced* level of rigor described below will apply primarily to custom measures and TRM Partially Deemed Measures with savings above a yet to be determined threshold defined by the Technical Working Group (TWG) and based on expected kW and kWh savings by project. Note that, Custom Measures are generally more complex and typically exhibit significant measure interactions. Evaluations of Custom Measures or programs offering these measures must use the methods falling under the enhanced level of rigor. The enhanced level of rigor is mainly applicable to Custom Measures that are too complex to report impacts accurately at a basic level of rigor. It is also applicable to TRM Partially Deemed Measures above the savings threshold yet to be identified by the TWG

Table 2-4. Gross Energy Impact EM&V Protocols

Rigor Level	Minimum Allowable Methods for Gross Energy Evaluation
Basic	1. Verification for TRM Deemed Measures - Verification of number of installations, stipulated operating hours and other assumptions and inputs to the deemed savings estimates specified in the TRM. 2. Simple Engineering Methods with M&V similar to IPMVP 'Option A' for TRM Partially Deemed Measures. Verification of appropriate application of the TRM savings algorithms. Spot measurements and other site-specific stipulations where subscribed by the TRM.
Enhanced*	1. Retrofit Isolation Engineering methods as described in IPMVP 'Option B'. This method is used in cases where full field measurement of all parameters for the energy use for the system in which the efficiency measure was applied are feasible and can provide the most reliable results in an efficient and cost-effective evaluation. 2. Building energy simulation models that are calibrated as described in IPMVP 'Option D' requirements. If appropriate, may alternatively use a process-engineering model (e.g., AirMaster+) with calibration. This option is suitable for programs that influence commercial, institutional, residential and other buildings where the measures impact the heating, ventilation or air conditioning (HVAC) end-use. This method is likely to be used for new construction programs and building, HVAC or shell upgrades in commercial and residential programs. In addition, industrial efforts can include changes in process operations where the appropriate type of model could be a process-engineering model. These are specialized engineering models and may require specific software to conduct engineering analysis for industry-specific industrial processes. Where these types of models are more appropriate, the gross energy impact protocol allows the use of a process engineering model with calibration. 3. Billing Regression Analysis. An engineering analysis of consumption information from utility bills with inclusion/adjustment for changes and backgrounds variables. The regression analysis will statistically adjust for key variables which change over time and are potentially correlated with gross or net energy savings. As appropriate, this analysis will incorporate weather-normalized consumption as the dependent variable or include heating- and cooling-degree days. Other variables that may be included in this analysis may be economic indicators, fuel prices, occupancy changes, behavior changes, changes in operation and changes in schedule.

** For the enhanced level of rigor, neither building energy simulation models nor billing regression analysis will be used to estimate gross impacts.*

The level of rigor and subsequent demand impact protocols are summarized in Table 2-5. Note that, the determination of gross demand impact is dependent on the time period in which the demand impact is to occur. Demand impact time frames shall comply with system coincident peaks as defined in TRM Table 1-1. This Plan only addresses protocols for evaluation of demand impacts for "Permanent Demand Reduction Measures". These

[12] Because the TWG project size thresholds have yet to be determined, the Team will coordinate with the SWE as they make decisions around M&V rigor levels by project type.

measures will have different peak demand coincidence factors based on both the technology implemented and the time frame targeted for defining a demand reduction.

Table 2-5. Gross Demand Impact EM&V Protocols

Rigor Level	Minimum Allowable Methods for Gross Demand Evaluation
Basic	Demand savings calculated and reported based on the TRM, using peak load coincidence factors specified in the TRM. This typically applies to the TRM Deemed and Partially Deemed Measures below a specified threshold. Custom Measures will follow the enhanced level of rigor. At a minimum, on-peak demand savings are estimated based on allocation of gross energy savings through the use of allocation factors, coincidence factors or end-use savings load shapes. These secondary data are available in the TRM.
Enhanced	Applied mainly to custom measures and the large TRM Partially Deemed Measures above a specified threshold. Estimation of demand impact will be based on the calculated average demand reduction estimates during these hours. The enhanced rigor level for the gross demand impact protocol requires primary data from the program participants. This could be interval-metered data, TOU consumption billing data, from field measurement or from billing demand data. Estimation of peak demand savings estimates is required. If the methodology and data used can readily provide 8,760-hour output, these should be provided. For permanent demand reduction measures: • If interval meter data is available, it should be used to construct hourly load shapes for the peak hours in the system peak window. A regression analysis should be conducted on the pre- and post-data to account for variations in typical weather patterns, daytime and other pertinent change variables. • If interval meter data is not available, spot or continuous metering/measurement at peak pre- and post-retrofit should be conducted during the period of system coincident peak load as defined in TRM Table 1-1. These data will be used with one of two engineering modeling approaches: (1) full measurement IPMVP Option B or (2) calibrated engineering model 'Option D, where the modeling approach must meet all requirements as provided in the M&V section below.

In the following section (Detailed Methods), with these general protocol-approved approaches and levels of rigor in mind, we provide greater detail regarding the specific methods that will be used to estimate gross energy and demand impacts.

2.5. Detailed Methods

This section outlines the overall structure, process and components of DLCo's Impact Evaluation Plan for measuring and evaluating the savings impact of DLCo's EE&C programs. Specifically, the impact evaluation effort will involve detailing and implementing an EM&V Plan to identify ex-post estimates of the gross and net energy impacts across DLCo's EE&C programs.

The impact evaluation will determine DLCo program-specific induced benefits, which include reductions in energy and demand usage (namely kWh and KW,) that can be directly attributed to the energy efficiency program being evaluated. Generally, impact evaluations have two components: determining gross impacts and determining net impacts. The gross impact evaluation includes reviewing ex-ante savings estimates, conducting field monitoring on a sample to derive ex-post impact estimates, and then applying the impacts from that measurement back to the full program population. Net impact evaluation is an adjustment of ex-post verified gross impacts to

account for free-riders and participant spillover. This RFP will cover gross impact and net impact evaluation of programs. Section 2.5.3 details the process of completing a PA PUC sanctioned impact evaluation.

The methods identified in the TRM for quantifying gross impacts fall into the three general categories shown below in Table 2-6.

Table 2-6. TRM Measure Categories to be Verified

Categories	Description	Examples	Assumptions	Quantification Required
TRM Deemed Savings	Deemed KW and KWh	CFLs, Appliances	Baseline, Hrs. Impact	Number, Type
TRM Partially Deemed	Savings Algorithms with Open Variables	C&I Lighting C&I VFD	Baseline, Impact Algorithms for building HVAC and air compressors	Number, Type, Hrs HP, Load Factor, Motor Efficiency, etc
Custom Measures	Not addressed in TRM	Industrial process, atypical applications of common measures, common measures not in TRM	Site-specific	All parameters

The following sections outline calculations used in conducting the impact evaluation:

- Verification of deemed measures
- Estimation of gross savings for partially deemed
- Estimation of gross savings for custom measures
- Estimation of Net to Gross (NTGR) Ratios
- Method for Calculating Savings, and
- Acceptable Levels of Measurement and Verification.

2.5.1. Verification of Gross Savings for Deemed Measures

For deemed measures for a given program, a method is needed to adjust, according to certain criteria, the total ex ante gross kWh and kW impacts in the participant population. The total ex ante gross kWh (or kW) impacts for a given PMRS record are defined as the claimed units installed multiplied by the unit energy savings (UES). Such measures will receive the basic level of rigor, *Verification*, defined in Tables 2-3 and 2-4 above. With the Verification approach for deemed measures, there are two sub-levels of rigor, basic and enhanced. The level rigor depends on the size of the savings. The basic level of rigor will be used for measures for which the rebate is less than $2,000. The enhanced level of rigor is reserved for measures for which the rebate is equal to or greater than $2,000.

2.5.1.1. Basic Level of Verification Rigor

In this section, we describe the relatively straightforward basic verification methods for TRM deemed measures. There are two basic steps:

1. Based on a random sample of participants, verification rates are first estimated.
2. The claimed ex ante gross kWh and kW impacts for each PMRS record in the population from which the sample was drawn are then multiplied by this verification rate.

The basic verification used for TRM deemed measures will consist of a six-step process:

Step 1. The verification checklist for deemed savings measures includes data downloaded from PMRS and/or taken from hardcopy documentation for each participant installation or can be obtained by telephone or on-site visit. The verification checklist for deemed savings measures shall include:

1. Participant has valid utility account number
2. Measures is on approved list
3. Proof of purchase identifies qualifying measure and is dated within the period being verified.
4. Rebate payment date is in the current program period being verified
5. Unit kWh and kW are correct for each listed measure.
6. Measure was actually installed at the customer site (telephone survey for basic level of rigor).
7. Measure specific data listed in Appendix H Prescriptive Measure Data Tracking Requirements for Residential Measures or Appendix I Prescriptive Measure Data Tracking Requirements for Commercial Measures

Step 2. A simple random sample of participants is selected from the PMRS database. The sample could be stratified by end use (e.g., lighting, HVAC, and Other) or some other variable (e.g., building type, climate zone) if the verification rate is thought to vary substantially by these variables.

Step 3. Relevant documentation for item #1 through #4 from PMRS or other hardcopy documentation is then obtained for each sampled PMRS record.

Step 4. Next, with respect to the fifth criterion, telephone interviews are conducted with each sampled customer to confirm that they participated in the program, received the rebate, and purchased and installed the efficient measure.

Step 5. Using the data collected from program files and telephone surveys, a verification rate (VR) is calculated. The VR is a function of three separate parameters:

1. sample-based program-qualifier rate (PQ),
2. a realization rate (RR), and
3. an installation rate (IR).

The **PQ** is a function of whether the first three criteria were all met. If a sampled participant record did not to meet all three criteria, the PQ would be set to zero. If a sampled participant record met all three criteria, the PQ would be set to one. Based on the sample, the proportion of records meeting all three criteria (the PQ) is calculated.

Next, per the fourth criterion, for each sampled case, the unit kWh and kW for each PMRS measure are reviewed to make sure that they are consistent with agreed-upon deemed values. A realization rate (**RR**), which is simply the ratio of verified deemed values to PMRS deemed values, is then calculated.

Next, per the fifth criterion, telephone interviews are conducted to verify that the measure was in fact installed. The results of the telephone interviews are used to calculate the installation rate (**IR**) which is the ratio of the telephone-verified installations to the PMRS installations.

Next, for each sampled record, the **VR** is then calculated as: PQ x RR x IR.

Finally, across all sampled records, two **weighted average VRs** are calculated. One average VR is weighted by total gross ex ante kWh impacts for each record. The second VR is weighted by the total gross ex ante kW impacts for each record. Recall that for a given sampled PMRS record, the total ex ante gross kWh and kW impacts are simply the unit energy savings (UES) multiplied by the units installed.

Step 6. The final step involves multiplying the total gross ex ante kWh and kW impacts for each record in the PMRS population from which the sample was drawn by the kWh-weighted average VR and the kW-weighted average VR, respectively.

2.5.1.2. Enhanced Level of Verification Rigor

The enhanced level of rigor is the same as the basic except that the verification of installations is done on-site.

2.5.2. Gross Savings Calculation Methods for Partially Deemed and Custom Measures

The basic approach to adjusting the ex ante savings in PMRS will be through the use of a realization rate. A realization rate is defined as the percent of the EDC *ex ante* savings that were estimated through an *ex post* evaluation, (or *ex post* gross savings divided by *ex ante* gross savings). In accordance with the protocols described in Section 2.4 EM&V Protocols by Level of Rigor, the Team will sample program participants to conduct field inspections of the sample installations and review the installation data files and engineering calculations (at the specified level of rigor) used to report the savings. The sample-based estimate of the realization rate will be extrapolated to the population of each program group from which the sample was originally drawn.

The Team will collaborate with the SWE throughout this process to develop an accurate realization rate for gross savings. This may entail activities such as disclosing evaluation site visits and providing the SWE a reasonable opportunity to review the files and attend the evaluation site visit as well.

For partially deemed and custom measures, ex post estimates of gross savings (the numerator in the realization rate) will be based on the protocols and guidance provided within the TRM, or those developed for specific measures.

- For *partially deemed* measures, the estimation of ex post gross savings will be based on the on-site validation of parameters not stipulated in the TRM. Site verification will adopt required levels of rigor defined in Section 2.5.3.5.

- *Custom* measures savings impacts will be verified through application of project specific M&V Plans and protocols reviewed and approved by the SWE prior to project implementation consistent with the Audit Plan. The Team will collect all necessary data according to the approved project M&V Plan.

The SWE has indicated that it will be making recommendations for year two and the remainder of the Act 129 program years to enhance the TRM. It is expected that the Team will reference the latest gross impact calculations listed in updated versions of the TRM and related SWE protocols.

2.5.3. Overall Measurement and Verification Methods

For partially deemed and custom measures, the gross savings will be estimated using on-site engineering methods that are informed by the M&V Protocols. This section provides guidance on M&V protocols for conducting unbiased evaluations of the impact of DLCo's portfolio of energy saving programs. Overall, DLCo's impact evaluation effort will involve following measure or program specific protocols for determining energy savings, and calculating the results as ex-post estimates of the energy savings for DLCo's programs. The ex-post estimates will be based upon a methodical process of reviewing program data and calculating energy savings, which includes evaluating statistically valid samples of the programs that will then be extrapolated to the full participant population to obtain a complete estimate of program impacts.

In compliance with PA 129, the M&V plans will be aligned with M&V protocols and methods that are stated in the preceding sections of this document, which include directives from the TRM and the Audit Plan (which is in part based on common evaluation frameworks found in the IPMVP, and the California Framework/Protocol). In addition, this M&V plan relates to DLCo's filed Energy Efficiency and Conservation Plans as described in Section 1.2 Program Descriptions. As applicable, and within the constraints of time and budget allocated to the evaluation effort, the Team shall make every effort to respond to and integrate updates of required M&V protocols issued by the SWE over the course of M&V Plan development and implementation. As described in Section 2.5.3.2 of this Plan, and specifically the M&V methods outlined in this section will be reviewed by the SWE and appropriate modifications to these M&V methods will be made to comply with SWE comments.

As defined in Section 1.2 Program Descriptions, the DLCo EE&C program structure (industrial, commercial and residential) and characteristics of individual sub programs permit the Team to categorize the sub programs into eight evaluation groups for the purpose of developing program specific Measurement and Verification (M&V) plans. This section outlines the systematic process and structure that the Team will follow in order to arrive at ex-post estimates for DLCo's energy savings programs. The impact evaluation process for DLCo's energy saving programs includes developing and implementing an M&V Plan and reporting the results. This process includes five steps:

1. Data Gathering and Review: collection of all relevant program information from DLCo, program providers and program recipients to assess ex-ante impact estimates and to lay the foundation for specific M&V plans as needed.
2. Plan Development: development of specific M&V plans that follow sanctioned protocols, as well as applicable best practices for developing ex-post program estimates.

3. Field Monitoring: conducting of field measurements at program recipients' sites to verify, measure and monitor savings, and collect baseline data as necessary.
4. Calculation of Savings: application of algorithms, engineering models and deemed values to collected data in order to calculate savings.
5. Reporting of Results: timely reporting of M&V results to the SWE in the appropriate data format.

The immediately preceding sections of this document detail guidance for executing steps 1-3. The protocols and procedures described in steps 1-3 form the basis for the calculations carried out in step 4. Instructions on executing step 5 can be found in Section 5 Evaluation Reporting Protocol.

2.5.3.1. Data Gathering and Review

In preparation for developing an M&V plan for a program, the Team will collect and review all critical program specific data required in developing such a program. Following the sampling protocol described in Section 2.9 Impact Sample Design, the Team will define appropriate levels of evaluation effort for specific programs and measures, and use this definition to establish parameters for specific program or measure level data collection and review. Broadly, data collected will include: DLCo program descriptions, including procedural guidelines developed by DLCo for CSPs, and activities descriptions and description of program service territory, participant data collected from the program-tracking database, PMRS; program savings objectives; name of firms participating in the delivery of the program or program component(s) (e.g., vendors, installers, retailers, etc.); DLCo's filed EE&C program plans; and other data as appropriate to the plan. Data collection requirements for commercial & industrial and residential plans will vary from each other, and therefore collection efforts should be sensitive to sector specific data source issues in order to ensure a comprehensive data collection effort.

Information will include standardized audit and application forms completed by CSPs for each energy saving project conducted. The template will include information listed in Section 3.3.3 of the Audit Plan, which includes M&V data requirements by commercial, industrial and residential program type. All plans will include the data requirements established for C&I sector measures: Lighting, Motor, HVAC, and Variable Frequency Drive and residential sector measures: HVAC, New Construction, Energy Star Appliance, Refrigerator/Freezer Retirement Program, Energy Star Lighting, Windows.

DLCO and its Team will conduct an in-depth review to assess the engineering methods, parameters and assumptions used to generate all ex-ante impact estimates. Program reviews will serve to familiarize the Team with the gross impact approach applied in the program calculations. The review will allow the team to develop additional data and monitoring needs and likely sources for obtaining those analytic inputs. Data sources may include program implementers, interviews with vendors and CSPs that participated in a given project, and several possible on-site sources, including interviews to be completed at the time of the on-site, visual inspection of the systems and equipment, EMS data downloads, spot measurements, short-term monitoring (e.g., less than four weeks), and mid-term monitoring (4 to 8 weeks).

The Program and measure data collection and review process will form the basis of any program specific M&V plans, yet to be created. The results of the reviews, especially any recommended procedures for specific M&V plans, will be shared with the SWE to assure conformance with Act 129 goals.

2.5.3.2. Plan Development

As determined through the protocol-compliant methods described above (Section 2.5 Detailed Methods) and based on the results of the data collection and review process just described, program specific M&V Plans will be developed as needed. A specific M&V Plan lays the foundation for completing a successful M&V impact process. These M&V plan(s) will adhere to the TRM, the Audit Plan and any embedded protocols (e.g. IPMVP) as well as evaluation best practices. Depending on the needs at the time of particular impact evaluations, specific M&V Plans will be grouped as described in Table 1-7.. Specific M&V plans for any given program or measure will include the following elements, described in the following sections:

- Goals and Objectives
- Site Characteristics
- M&V Methods
- Data Analysis Procedures and Algorithm
- Field Monitoring Data Points
- Verification and Quality Assurance Procedures
- Recording and Data Exchange Formats

2.5.3.3. Goals and Objectives

Specific M&V Plans will state the goals and objectives of the energy saving program to be evaluated. DLCo's energy savings goals by sector and target audience form the basis for identifying the objectives of each program and are documented in DLCo's filed Energy Efficiency and Conservation Plan. Specifically, any impact evaluation related performance indicators identified in the program logic models in Appendices C and D will be referenced in the development of the goals and objectives section. DLCo program materials obtained during the data collection and review process will provide more up to date information or any modifications of program goals or objectives that were implemented after the filing of the original program plans.

The statement of goals and objectives will provide the focus for the M&V activities, and the expected target from which to benchmark M&V results.

2.5.3.4. Site Characteristics

Section 1.2 Program Descriptions of this report provides brief descriptions of the program characteristics. These characteristics determine the sites where CSPs will be implementing their programs. These sites encompass a multitude of uses, including residential, multi-family, retail, small businesses, large office buildings, industrial sites, institutions, and others. It is anticipated that detailed site information for specific programs will be obtained from the CSPs during the data collection and review process.

Where feasible and appropriate, specific M&V plans will document the following site characteristics:

- General building configuration and envelope characteristics such as building floor area, conditioned floor area, number of building floors, opaque wall area and U-value, window area, U-value and solar heat gain coefficient;
- Building occupant information such as number of occupants, occupancy schedule, and building activities;

- Internal loads such as lighting power density, appliances, plug and process loads;
- Type, quantity and nominal efficiency of heating and cooling systems;
- Important HVAC system control set points;
- Changes in building occupancy or operation during the monitoring period that may affect results; and
- Description of the energy conservation measures at the site and their respective projected savings.

2.5.3.5. On-Site M&V Methods

For partially deemed and custom measures, for which site-specific M&V are required (i.e., when IPMVP Option A, B, or D is required), a site-specific M&V plan will detail the methods used to evaluate DLCo's energy saving measures. These methods shall be first aligned with the M&V protocols that have been identified in the TRM and the Audit Plan. A primary source for M&V Methods for energy saving calculations will be DLCo's procedural guidelines for CSPs, which detail the specific calculation methods to be used for every program measure. Where additional guidance and information is needed other evaluation protocols such as the IPMVP, Federal Energy Management Program protocols, or best practice evaluation protocols will be used.

As previously stated, the determination of M&V algorithms and protocols for custom measures is subject to review and acceptance by the SWE. The review of the M&V plans will include necessary audit activities to assess the quality control, accuracy and uncertainty of M&V activities and impact evaluations. Once the SWE approves the M&V Plans, the Commission Officer will verify the approval and the EDC can begin the credible EM&V work. The SWE will maintain a catalog of custom measure protocols and M&V plans in order to expedite the process of developing custom M&V plans for future projects.

Each of these rigor levels require a different quantity and quality of information to be collected in order to estimate the savings at a particular site within a given level of confidence and margin of error. All Specific Plan M&V methods will meet these minimum levels of data collection and analysis as outlined in Tables 2-6 M&C Protocol for Basic Level of Rigor and 2-7 M&V Protocol for Enhanced Level of Rigor below.

Table 2-6: M&V Protocol for Basic Level of Rigor

Rigor Level:	**Minimum Allowable Methods for Gross Impact Evaluation:**
Verification	Physical inspection of all or a sample of installations to verify correct measure installation and installation quantity (except programs where physical inspection is not specified e.g. CFL handouts)
IPMVP Option	Option A
Source of Data	Technical Reference Manual, industry literature, manufacturers catalog data, stipulated operating hours (where applicable)
Baseline Definition	Consistent with TRM definition. May include federal or state codes and standards. This may include applicable state and/or federal efficiency standards and or common replacement or design practices
Monitoring Strategy and Duration	Use IPMVP Option A where applicable.

Table 2-7: M&V Protocol for Enhanced Level of Rigor

Rigor Level:	***Minimum Allowable Methods for Gross Impact Evaluation:***
Verification	Physical inspection of all or a sample of installations to verify correct measure installation and installation quantity

IPMVP Option	Option B or Option D
Source of Data	Technical Reference Manual, industry literature, manufacturers catalog data, logged operating hours, metered end use consumption
Baseline Definition	Site specific baseline definition based on short term metering of end use parameters or expanded stipulated values of pre and post equipment
Monitoring Strategy and Duration	Short term or continuous metering including weather adjustments

Utilizing the stratification methods outlined in Section 2.5 Detailed Methods, the Team will obtain guidance from determined M&V methods for specific measures in specific M&V plans. As noted above, all specific M&V plans will be reviewed by the SWE for alignment with Act 129, the TRM and the Audit Plan. Table 2-8 Gross Energy Impact Protocols below outlines M&V requirements by measure type as defined in the PA Audit Plan.

Table 2-8. Gross Energy Impact Protocols

Program/Measure Type:	**Basic Rigor Level:**	**Enhanced Rigor Level:**
Appliances	·Verification of TRM inputs (type of unit, energy source, usage, location)	·Verification of TRM inputs. ·Spot measurements (kW). ·Short term metering (kW, operating hours).
CFL Rewards/Give Away	·Verification of quantity based on invoices for bulbs purchased by category (wattage, size etc.). ·Predefined operating hours based on TRM.	·NA
Weatherization, Envelope Improvements	·Verification of measure installation. ·Software simulation for verifying energy savings.	·Verification of measure installation. ·Software simulation for verifying energy savings.
Residential HVAC Efficiency	·Verification of measure installation (quantity, type, efficiency). ·Baseline efficiency defined by TRM (baseline efficiency equals efficiency of old equipment for early replacement; for end of life replacement and new construction baseline efficiency equals efficiency of standard equipment compliant with code). ·New equipment efficiency from manufacturer's catalog data. ·Stipulated operating hours (TRM defined, defined by baseline studies or customer reported)	·Verification of measure installation (quantity, type, efficiency). ·Pre and post installation site visits to verify efficiency levels. ·Baseline efficiency equals efficiency of old equipment for early replacement; for end of life replacement and new construction baseline efficiency equals efficiency of standard equipment compliant with code). ·Short term metering (pre or post) to calculate EFLH.
Residential Lighting	·Verification of measure installation (fixture quantity, type). ·Stipulated operating hours (TRM defined)	·NA
C&I Lighting	·Verification of measure installation (fixture quantity, type). ·Pre and post fixture types and performance. ·Operating hours (TRM defined, undefined).	·Verification of measure installation (fixture quantity, type). ·Pre and post fixture types and performance. ·Short term metering to log operating hours and stipulated categories.

Program/Measure Type:	Basic Rigor Level:	Enhanced Rigor Level:
C&I HVAC Efficiency	·Verification of measure installation (quantity, type, efficiency). ·Baseline efficiency defined by TRM (baseline efficiency equals efficiency of old equipment for early replacement; for end of life replacement and new construction baseline efficiency equals efficiency of standard equipment compliant with code). ·New equipment efficiency from manufacturers catalog data. ·Stipulated operating hours (TRM defined, defined by baseline studies or customer reported)	·Verification of measure installation (quantity, type, efficiency). ·Pre (where applicable) and post installation site visits to verify baseline and retrofit equipment information. ·Short term or continuous metering (kW) for a minimum of three weeks to calculate pre and post energy use.

Guidance in determining baselines for evaluation is expected to be released from the SWE in 2010. Where baseline information is not stated in the TRM, the SWE has indicated that baselines from 2010 data will be used for impact impacts that are conducted in 2011.

2.5.3.6. Data Analysis Procedures and Algorithms

The Data Analysis Procedures and Algorithms section of each specific M&V plan will detail the engineering calculations, stipulated values and models that will be used to calculate ex-post results. All data analysis procedures must be fully specified so that a logical and comprehensive M&V process can be conducted. Guidance on the process the Team can follow in calculating the savings is described in more detail in Section 2.5

Calculations and stipulated values in each specific M&V plan will reference the most up-to-date version of the TRM and related SWE protocols. In particular, the Team will take as a starting place, energy savings calculations detailed in DLCo's procedural guidelines for CSPs. All algorithms, values, calculations and models will be documented and sources cited within the Plan. In addition, all documentation supporting baseline assumptions shall also be stated within this section. Sufficient citation of all supporting documentation, values and calculations will be provided such that the SWE team and other parties can review and perform the calculations independently of the Team, as needed.

As described previously, algorithms and calculation methods for custom measures will be reviewed and approved by the SWE. As DLCo's Procedural Guidelines for CSPs will be reviewed by SWE, in many cases the review of the algorithms and calculation methods will already be defined and approved, however M&V protocols will need to be defined for all measures and programs. During the specific plan development process, the Team will review any existing assumptions, develop appropriate M&V protocols, and SWE will provide feedback on the entire specific plan proposed.

As appropriate, program engineering analysis will be based on models that make use of program files and on-site gathered information surrounding the installation and operation of equipment installed in that program. Algorithms may include requirements for short-term monitoring, application of ASHRAE methods and algorithms, and other specialized algorithms and models.

2.5.3.7. Field Monitoring Data Points

The Field Monitoring Data Points section of each specific plan shall specify complete details of any planned field measurements. For deemed measures, partially deemed or custom measures that require field verification, data sampling or monitoring, this section will identify critical technical details such as required sensor types, location and engineering units for individual data points.

The Sampling protocols (Section 2.8 Impact Sample Design) will determine the quantity and type of field monitoring that will be required to develop rigorous ex-post estimates. In addition, the professional judgment of the experienced M&V engineers on the Team will also inform the quantity and quality of data points in the field monitoring plan.

As DLCo's programs encompass a wide range of residential, commercial and industrial sites, field monitoring will need to be specifically tailored to the unique needs of those sites. Residential sites may not be accessible; certain industrial sites might be hard to reach, as well as there may be other constraints in sampling at certain commercial sites. Therefore, all field monitoring programs must realistically assess the conditions at the field site and the ability to execute a field monitoring plan.

The level of effort required for each Field Monitoring will depend on the needs of the specific plan. As described in section 2.5.3.5 On-Site M&V Methods above, sites that require a basic level of rigor, the engineer should physically inspect all or a sample of the installations to verify measure installation and installation quantity. For sites that require an enhanced level of rigor, more detailed on-site data collection needs to occur, such as reviewing monitoring records (such as instantaneous spot watt measurements for process equipment, measured condensate temperatures, data from chiller logs, and energy management system (EMS) downloads), equipment nameplate data, system operation sequences and operating schedules, and, of course, a careful description of the baseline condition being modeled.

2.5.3.8. Verification and Quality Assurance Procedures

The Verification and Quality Assurance Produces section of each specific M&V plan will specify data analysis procedures that will be used to identify invalid data and treatment of missing data. This section will correlate with the stratification methods especially the sampling design and treatment of uncertainty discussed above, and will include quality assurance procedures to verify data acquisition system accuracy and sensor placement issues.

The Team will also employ internal QA controls, such as having team engineers who are not working on a given specific M&V plan review each site plan. This peer- to-peer engineering review will focus on the quality and clarity of the documentation and consistency and validity of the estimation methods.

2.5.3.9. Recording and Data Exchange Formats

The Recording and Data Exchange Formats section of each specific M&V plan will describe the data formats to be used within the Plan. Data formats shall be compliant with the data reporting guidelines described in the Audit Plan as well as the reporting procedures and processes of DLCo's Energy Efficiency Program Management and Reporting System (PMRS).

Per Section 8.1 of the Audit Plan, the general data requirements to be reported for each project include:

- EDC incentive total($)
- EDC Incentive per measure
- Application date
- Close date
- Installation date
- Project number/Unique Identifier
- Number of measures installed by type for each unique project/installation, and the basis for the overall kWh and kW savings
- For each measure, per unit kWh and kW savings
- For each measure installation, provide whether the measure is an "early replacement," "replace on burnout," or new measure
- Total cost of equipment
- Participant Cost
- EDC Costs

The ex-post results of the Impact Evaluation will be reported to the SWE three times a year, in the proper data format.

2.5.3.10. Field Monitoring

Applying the protocols outlined in the Field Monitoring Data Points section of the Plan, site specific data will be collected from sites where the targeted energy saving measures have been implemented and where a specific M&V plan has called for field monitoring.

The process of gathering field data will entail scheduling and conducting on-site data collection activities. Team members will create field monitoring work plans that coordinate all appointments with their key contacts (whether customer/resident/facility manager). It may be necessary in some cases to work through the utility account and program representatives to facilitate participation and scheduling of any on-site work and or other evaluation interviews.

During the on-site audit, data points identified in the Field Monitoring Data Point section of specific M&V plans will be setup and data will be collected. With the customers consent and where appropriate to the measure, equipment will be installed for short-term or long-term measurement, to carry out the evaluation plan.

The on-site audit should consist of a combination of interviewing and taking measurements. Following this interview, the Team member should make a series of detailed observations and measurements of the building and equipment. All information should be immediately recorded, and checked for completeness before leaving the site. All Team members who conduct audits will be trained and experienced in completing inspections for projects that are similar in nature, and will follow common protocols for on-site performance of evaluation activities. For example auditors will:

- Carry all the equipment required to conduct the planned activities.
- Check in with the site contact upon arrival at the building, and check out with that same site contact, or a designated alternate, on departure.
- Meet with a building representative who is knowledgeable about the facilities' equipment and operation, and ask a series of questions regarding such matters as operating schedules, location of equipment, and equipment operating practices.

2.5.3.11. Calculation of Savings

Upon completion of field data collection, including monitoring data, energy and demand impacts should calculated based on the on-site data, monitoring data, application information, and third-party implementer records and, in some cases, billing/interval data. All calculations will follow the algorithms and engineering calculations defined for that specific M&V plan. The M&V calculations should detail all assumptions and parameters used to estimate savings. Calculations will be used to prepare impact evaluation reports as defined in Section 5 Evaluation Reporting Protocol.

2.6. Net to Gross (NTGR) Ratios (Optional Task[13])

2.6.1. Self-Report Approach

Program attribution is concerned with estimating the program's influence on the customer's decision to install the efficient equipment. One measure of program attribution is the net-to-gross ratio (NTGR). The Audit Plan defines the NTGR as:

$NTGR = 1 - FR + SO$

where,

FR = Free-Ridership which quantifies the percentage of participants who would have implemented the measure in absence of the EDC program

SO = Spillover which quantifies the reduction in energy consumption or demand at the participant site caused by the presence of the EDC program, but which the program does not directly influence.

As mentioned in Section 2.1, although there is no Commission requirement to estimate NTGRs for 2009 or 2010, NTGRs will be estimated since such feedback regarding the efficacy of the programs will be invaluable to DLCo program managers. In keeping with the SWE's request, the Team will employ the SRA to estimate the NTGR and participant spillover rates, using sampling techniques, data collection approaches, survey questions, survey instruments, and analysis methodology standardized across Pennsylvania EDCs. Appendix B of the Audit Plan and Evaluation Framework for PA Act 129 provides an example of 'Standardized Method for Determining Free-

[13] The estimation of NTGRs is an optional task since it has not as yet been required by the Commission. In an appendix, bidders should propose an approach and a budget.

Ridership Rates'. We note that improvements have recently been made to this approach. In 2007-08, leading evaluators such as Ridge & Associates, Megdal & Associates, PA Consulting, Itron, and KEMA, working under contract to the California Public Utilities Commission, developed new SRA methods and instruments for both the residential and nonresidential sectors. These more recent NTGR methods should be used as appropriate. Examples of both residential and nonresidential NTGR methods, instruments and algorithms can be found at www.energydataweb.com.[14]

2.6.2. Theory-Driven Approach

In addition to the SRA, evaluators have developed other non-experimental approaches to demonstrating causality. For example, Yin (1994) provides guidelines for assessing causal relationships using case studies. Tashakkori and Teddlie (1998) also argue that their ". . . conceptualization of internal validity is not limited to experimental studies and causal relationships (p. 67)." Finally, consider Weiss (1997, 2000) who suggests that a theory-driven evaluation can substitute for classical experimental study using random assignment. She suggests that if predicted steps between an activity and an outcome can be confirmed in implementation, this matching of the theory to observed outcomes will lend a strong argument for causality: "If the evaluation can show a series of micro-steps that lead from inputs to outcomes, then causal attribution for all practical purposes seems to be within reach" (Weiss 1997, 43). It is the theory-driven approach that will be used in conjunction with the SRA to estimate the net energy and demand impacts of programs.

The logic models for each program group will be used to guide the process evaluations. Using the results of the process evaluations, the hypothesized relationships between inputs, key activities and various outputs and outcomes can be tested, i.e., causal linkages can be tested. This information, combined with the results of the SRA surveys can be used to assess program attribution.

2.7. EM&V: Upstream Lighting Program

The upstream lighting program requires a unique approach to estimating both gross energy and demand impacts. While the savings per bulb are deemed, the issue of leakage must be addressed. Leakage is defined as the purchase and installation of IOU-discounted lighting products by non-IOU customers. Leakage can also occur prior to the sale and/or installation of IOU-discounted products (e.g., IOU-discounted products re-routed at distribution centers to retailers located outside of IOU service territories, re-sale of IOU-discounted products on eBay or through other means, etc.). This evaluation will not be able to determine quantitative estimates of this type of leakage; however, qualitative evidence from manufacturers and retail buyers in other studies indicates that leakage prior to sales is not significant. We are not sampling non-participants to establish baselines.

Leakage will be addressed primarily through efforts by ECOS Consulting in their selection of participating stores. Specifically, ECOS will restrict participation to stores that have consistent sales data that evidence an overwhelming majority of customers (e.g.: 99% or greater) who typically reside within Duquesne service territory zip codes. To further refine this leakage analysis, DLCo and its Team may chose to direct EM&V resources to conduct customer intercept surveys within a sampling of these stores, in order to confirm (or adjust) the

[14] While access to these documents is free, one will first be prompted to establish an account using your e-mail address and password.

percentage of customers purchasing CFLs onsite and who also reside within DLCo's service territory. Also, note that the in-service rate (the percent of bulbs purchased that have been installed in fixtures) is a deemed value.

Finally, note that no effort will be made at this time to estimate the *net* impacts of the Upstream Lighting Program.

2.8. Impact Sample Design

The goal of these sampling methods are to provide guidance for approaches that will yield reasonably precise ex post estimates of gross (and net in subsequent years) savings. Sampling will occur for groupings of measures on a project-by-project basis, where census data collection is neither warranted nor feasible. By defining an efficient sample design, and by conducting data collection and site-specific analysis in a manner free of substantial measurement error (i.e. bias), the Team's statistical analysis should provide an unbiased estimate of each population's characteristics of interest along with a good measure of the achieved statistical precision. By following a suitable sample design in selecting the sample projects, the estimates of population characteristics developed from the sample data should be close to the true values that would have resulted if the data collection had been carried out for all projects in the population. Further, DLCo and its Team will calculate an error bound to assess the statistical precision of the results. Note that, sampling any population does carry the risk of biased estimates; therefore, the Team will be careful to pay particular attention to the following issues that can impact the ultimate savings reported:

- Bias in research design, data collection, or analysis and
- Bias due to non-response, refusals or substitutions to initial sample design and project selection.

The methods outlined in this section will be used by the Team, and any subcontractors hired to conduct specific evaluations, to determine what project sites are to be visited or surveyed. The sample methods will not specify what to measure or how many measurements to take at one particular site, as this will be determined using Section 2.4 EM&V Protocols by Level of Rigor. Site-specific samples will vary from project to project depending on the number of site-specific installations, the variability of savings between installations, and the feasibility of M&V activities.

The sampling protocols utilized by the Team are based on those developed for the State of Pennsylvania Act 129 Energy Efficiency and Conservation Programs and those that have been adapted from *The California Evaluation Framework*[15]

There are three major sampling approaches the Team can pursue for surveying DLCo's program populations, namely: census, probability sampling, and systematic sampling. Although a survey of the entire population, known as a "census" approach, would yield the total energy and demand impacts for a given program without any *sampling* error, such an approach is typically not cost-effective except in some specific circumstances where the projects' size so warrants and where the population size is small enough that a census is not cost prohibitive. In the interest of cost-effective evaluation, the Team will, in most cases, limit resource-intensive data collection and

[15] Prepared by TecMarket Works for the California Public Utilities Commission and the Project Advisory Group in June 2004.

analysis to a random sample of projects. The next two sections provide an overview of the two primary sampling methods to be used for estimating the savings associated with a particular program or bundle of measures, namely: (1) simple random sampling and (2) stratified ratio estimation.

2.8.1. Simple Random Sampling

For simple random sampling (Audit Plan, p.66), a sample of a given size, denoted *n*, is selected from the projects in the population following any randomized procedure in which all possible subsets of projects are equally likely to be selected. Once the sample (i.e., projects) is surveyed and the data analyzed, the sample statistics will be extrapolated to the corresponding population (i.e., program) parameters. The precision of these estimates is a function of desired level of confidence and precision (relative error) as well as the expected variability in the population. Simple random sampling will be used principally for programs in which the expected variability in project-level savings is low.

2.8.2. Stratified Ratio Estimation

The stratified ratio estimation (Audit Plan, p. 67-71) sampling technique will be used whenever possible to increase sampling efficiency. The stratified ratio estimation method combines a stratified sample design with a ratio estimator. Both stratification and ratio estimation take advantage of information that will be reported in the PMRS tracking system and available for each project in the program. The two key parameters in the stratified ratio estimate the ratio between ex post (denoted as the "Y' variable) and ex ante (denoted as the "X" variable) estimates of gross saving, which is sometimes referred to as the realization rate. The ratio or the realization rate measures the accuracy of the tracking estimates from project to project across the sample of projects. The second parameter is the error ratio, which is a measure of the variability in the relationship between the ex post and ex ante estimates. Both variables help to define the relationship between the tracking estimates of savings and the actual project savings.

At the program level, the realization rate is the ratio of the total ex post savings to the total ex ante savings. If a stratified ratio estimator is used, then the ratio is calculated within each stratum and strata weights are applied to arrive at a program-level ratio. A stratum is a subset of the projects in the population that are grouped together based on ex ante savings that are expected to be this known information. In other words, a stratification of the population into strata is a classification of all units in the population into mutually exclusive strata that span the population. Under this design, each stratum is sampled according to simple random sampling protocols and the weighted estimates of parameters can be extrapolated to the entire population. The table below presents the relevant pages in the Audit Plan for each of the attempts to summarize the sources for directing protocols for simple random versus stratified ratio sampling methods/components that DLCo and its Team will follow.

2.8.3. Sampling Roadmap

In this section, we present an overall roadmap for evaluation sample planning. The Team intends to conduct annual comprehensive impact evaluations in order to document the progress of programs in a timely, cost effective manner that also provides for mid-course program improvements. For each annual impact evaluation (see schedule in Section 1.1.5 Evaluation Schedule above), the Team will devise and implement sample designs for those EE&C programs based on impacts to date, the four-year goal, resource allocation and level of rigor considerations. As described below, where a census is not feasible, the Team will employ a mix of simple random samples and stratified random samples of projects or measure groups. When stratified designs are used, samples will be stratified, at a minimum, by gross ex ante savings contained in the PMRS and end use.

The targeted levels of precision in Table 3-35 of the Audit Plan are specified for various combinations of customer segments (i.e., residential, commercial and industrial) and measure groups (e.g., lighting and HVAC). We have taken a somewhat different approach and established targeted levels of confidence and precision for each of the programs and program groups listed in Table 2-7. Thus, rather than sampling across eight program groups and programs for each of these eight combinations of customer segments and measure groups, we have chosen to sample across the measure groups for each program and program group. This strategy puts the focus on the evaluation of the relative effectiveness of the various intervention strategies represented by the programs and program groups rather than on measure groups. Of course, all the measure groups will be represented in the eight programs and program groups. To demonstrate this, we have added a Segment/Measure Group ID to Table 2-7 that is then mapped into Table 2-8. Note that the evaluation results for these programs and program groups can be post- stratified by these eight segment/measure group combinations with adequate levels of confidence and precision.

Table 2-7. Desired Confidence and Relative Precision for M&V Activities by Program Type

Program/Measure	Category ID	Basic Rigor Level	Enhanced Rigor Level
Appliances	1	90/30	90/10
CFL Rewards/Give Away	2	90/30	N/A
Weatherization, Envelope Improvements	3	90/10	90/10
Residential HVAC Efficiency	4	90/30	90/10
Residential Lighting	5	90/30	90/10
C&I Lighting	6	90/10	90/10
C&I HVAC Efficiency	7	90/30	90/10
Custom Technology	8	90/10	90/10

Table 2-8. Mapping of Segment/Measure Group IDs into Program Groups and Programs

Duquesne Light Program Groupings	Segment/ Measure Group ID
Commercial	6, 7, 8
Industrial	6, 7, 8
Residential: Contractor/ Custom	3, 4, 5
Residential: EE Rebate	1, 2, 3, 4, 5
Residential: Low Income Energy	1, 2, 3, 4, 5
Residential: Refrigerator Recycling	1
Residential: School Energy Pledge	2, 4

Given the focus on programs and program groups, we begin with Table 2-9 that shows the size of eligible customer population for each program group and program and the expected penetration and number of transactions over the three year period for each. Table 2-9 also shows the percent of these transactions that are expected to involve deemed measures versus custom measures and the associated number of transactions.

Table 2-9. Estimated Sample Frames, Three-Year Levels of Participation, and Deemed versus Custom Transactions

Program Groups	Population	% participation (over 3 years)	Total Program Transactions	% deemed	% custom	Total deemed transactions	Total Custom Transactions
Commercial M&V Program	52,620	30%	15,786	90%	10%	14,207	1,579
Industrial M&V Program	1,049	20%	209.80	67%	33%	141	69
Residential: EE Rebate	544,400	10%	54,440	95%	5%	51,718	2,722
Residential: Low Income Energy	544,400	6.25%	34,000	95%	5%	32,300	1,700
Residential: Refrigerator Recycling	544,400	2.25%	11,815	100%	0%	11,815	-
Residential: Schools Energy Pledge	544,400	2.57%	14,000	95%	5%	13,300	700
Upstream Lighting (Res & Small Comm.	564,400	2.00%	11,288	100%	0%	11,288	-
Total			141,539			134,769	6,770

Next, in Table 2-10, for each program group and program, we have divided the total expected deemed and custom transactions by three to arrive at the expected annual transactions. Table 2-10 also shows the deemed and custom sample sizes, the total sample size, and the targeted annual confidence and precision. Table 2-10 reflects the targeted 90-percent confidence and resulting precision based on annual and program period sampling.

Table 2-10. Anticipated Annual Sample Sizes and Targeted Relative Precision, by Program Grouping

Program Groups	Expected Deemed Transactions Per Year	Expected Custom Transactions Per Year	Deemed Sample Size	Custom Sample Size	Total Sample	Targeted Annual Confidence & Precision	Targeted Program Period Confidence & Precision
Commercial M&V Program	4,736	526	33	31	64	9.2%	5.2%
Industrial M&V Program	47	23	9	17	26	9.7%	5.6%
Residential: EE Rebate	17,239	907	33	32	65	9.2%	5.2%
Residential: Low Income Energy	10,767	567	55		55	10.0%	5.7%
Residential: Refrigerator Recycling	3,938	0	55		55	9.9%	5.6%
Residential: Schools Energy Pledge	4,433	233	55		55	9.9%	5.7%
Portfolio	41,160	2,257	240	80	320	4.0%	2.1%

The annual confidence and precision is less 90/10 for two program groups and slightly exceed 90/10 for the remaining six. The portfolio confidence and precision are quite good at 90/.055. After the conclusion of the program period, the confidence and precision is less 90/10 for all program groups with a portfolio confidence and precision of 90/.031.

Of course, program managers and the SWE are also interested in savings for each measure group. After the first year, the ex post evaluation results for a given measure group (e.g., residential appliances or residential lighting) can be combined across program groups to provide savings estimates with 90% confidence and relative precision of approximately 10 to 14 percent. After the conclusion of the program period, the ex post evaluation results for a given measure group (e.g., residential appliances or residential lighting) can be combined across program groups to provide savings estimates with 90% confidence and relative precision of approximately 6 to 10 percent.

At the conclusion of each quarter, samples will be drawn from all the projects installed *and* paid in that quarter. Within a given program quarter, the Team will stratify the population of projects based on the ex ante project savings based on procedures outline in the California Evaluation Framework (p. 347). The Team will examine

requisite impact data on project installations from CSPs on an ongoing basis (see schedule Table 1-1), but as noted in the schedule Section 1.1.5 Evaluation Schedule above, the Team will summarize impact data on a quarterly basis, and provide a biannual progress report all of which will complement the annual extended evaluations.

Pursuant to the SWE directives, the Team will conform sample design, selection and statistical analysis based on the prescribed set of steps and decisions that are detailed in Section 3.3.4 of the Audit Plan.

2.8.4. On-Site Sampling of Installations

DLCo and its Team will determine the number of installations to measure and verify based on the assessments of project impacts to date, sample design, and resource allocation. The actual sample of installations will vary from project site to project site, but the Team will meet, at a minimum, the following protocols:

1. A ***census of all installations on-site*** will be done in cases where only a few or one installation was made at the particular project site or when the variance is large and impacts are high.

2. For instances where multiple installations were made (i.e., 100 lighting installations in one office building), a ***sample of the various installations*** should adequately represent the entire site statistics.

3. ***Samples of measures selected*** for monitoring at a particular site ***shall be representative*** of all measures at the site ***and shall be selected at random***.

4. ***Measures*** within a building are often ***grouped according to similar usage patterns***, thus reducing the expected variability in the measured quantity within each usage group.

5. Within each usage group, ***the sample unit will be the individual measure***, unless otherwise noted.

6. ***Systematic sampling with a random starting point*** is acceptable.

7. The ***target relative precision*** for sampling measures within a site ***is at the 90% level of confidence/20% margin of error*** for measures selected for investigation.

8. The initial assumption regarding the ***coefficient of variation*** for determining sample the size ***is 0.5.***

9. The project savings should be accepted at the claimed value if the ***evaluation adjusted savings is within 5%.***

3. Process Evaluation Methods

The definition and goals of a process evaluation are provided in the California Evaluation Framework:

> The process evaluation is an important tool in the evaluation toolbox. The process evaluation consists of in-depth examinations of the design, delivery, and operations of energy programs in order to improve the ability of the program to achieve energy savings and accomplish other program goals. The process evaluation also provides a vehicle for sharing program design and operational improvements with other professionals in the field. When process evaluation results are shared with other energy efficiency professionals, these professionals can assess the relevance of the evaluation findings and recommendations to their policies, programs, and program portfolios. This is especially true for program designers and managers who may want to determine if the evaluation results can be used to improve the cost-effectiveness of their programs. (p. 206)

The primary objective of the process evaluation is to provide a programmatic assessment of DLCo's energy efficiency programs. The process evaluation consists of in-depth analysis of the design, delivery, and operations of DLCo's energy efficiency program. The outcome of this analysis will provide conclusions and recommendations for enhanced performance for DLCo's energy efficiency programs. Recommendations are designed to affect one or more areas of each program's operational practices, such as marketing, internal communications or the incentive application process. The overall goal of this effort is to improve the ability of each of the programs to achieve energy savings and accomplish other program goals. DLCo's Process Evaluation plan includes mechanisms to ensure that roadblocks to meeting energy savings goals area can be identified and addressed in a timely manner.

The section describes the process evaluation methods to be used by the Team across all relevant DLCo's energy efficiency programs. This plan is based on guidelines described in the Audit Plan.

3.1. Research Objectives

The primary research issues for the DLCo Team center around assessing program design and operation. Specific researchable issues are briefly listed below.

- Document and review program operations (e.g. Program Management Plans) to provide baseline description of program operations and management to compare design and operational practices with the program theory and logic models.
- Design and utilize interview and survey techniques to describe and assess program operations, which can be compared to original design intent; and to measure participant satisfaction and program performance, which can be analyzed to identify gaps between program goals and results.
- Identify and recommend changes in a program's operational procedures or systems that can be expected to improve the program's efficiency or cost-effectiveness

3.2. Evaluation Timing & Frequency

Process evaluations will be conducted in a timeframe appropriate to each program's design and implementation process. Below are descriptions of the kinds of evaluation activities that will occur at each phase of program implementation.

- ***Design Feedback.*** As soon as Program Management Plans (PMPs) are delivered to DLCo, the Team will develop a logic model, key performance indicators, and a program theory for each program and program group. This effort will involve reviewing all program documentation (e.g., procedure manuals, program plans, and budgets) and interviewing key program staff. Once completed, the Team will be better equipped to identify possible process issues and flaws in the underlying rational for key program components. In addition, the list of variables to track over the next three years will be based on the key performance indicators. The Team will summarize its findings and share the results with the CSPs and the SWE.
- ***Early Implementation Feedback***. Early program evaluation feedback to all DLCo's energy efficiency program designers and managers will be conducted so that program managers can make any necessary mid-course correction in the design and delivery of their programs. Early implementation feedback will be provided according to the schedule in Table 1-1. These reports will summarize the findings and share their results with the CSPs and the SWE.
- ***Final Process Evaluation***. Final conclusions and recommendations based on the results of all process evaluation activities will be presented in the final report.
- ***Spot Evaluations.*** In order to allow DLCo to identify and address critical programmatic challenges in a timely manner, the Team will also conduct spot process evaluations as needed. These spot evaluations will be based on needs identified through "evaluation triggers." An evaluation trigger is any anomalous impact data identified in the quarterly PMRS impact evaluation summary compiled by the Team. A spot evaluation will be similar in intent to a full process evaluation, but will be much condensed and will seek to identify why the evaluation trigger occurred. A spot evaluation will consist of strictly telephone interviews to key stakeholders. The following triggers have been identified at this time; others may be added as needed by the Team or SWE.
    - No impacts reported
    - Impacts reported are greater than 15% below target for the period
    - Budget exceeds projections for the period by more than 25%
    - Significant amount of missing or incomplete data in PMRS (e.g.: >15% customers missing contact details)

3.3. Quality Control of Process Evaluation

DLCo will report to SWE on any process evaluation activities in the quarterly, annual, and final reports and through the submission of specific process evaluation deliverables (program design feedback, early implementation process evaluations, final process evaluations, spot evaluations). Depending on SWE feedback, DLCo process evaluation activities may be modified in order to adequately address process or protocol modifications that the SWE deems appropriate or necessary. This third party evaluation of DLCo's process evaluation activities by SWE will serve as a quality control mechanism for the evaluation activities.

3.4. Evaluation Components

For each of DLCo's energy efficiency programs, the Team will focus on the following issues in the first year process evaluation effort:

- Program design and operational systems,
- Program tracking and information management systems,
- Internal program communications,
- Program delivery organization and staffing,
- Program staff understanding of program goals and objectives,
- Skill levels needed to implement the program,
- The methods and procedures used to target the outreach efforts,
- The marketing materials and incentive levels used to promote the program,
- Program operational efforts and their relationship to the program theory and logic model,
- The outreach efforts and the structure and content of these efforts, and
- Early program satisfaction and customer service experiences.

The Team will examine these issues during the first year of all DLCo's energy efficiency program operations.

In the second or third year, the Team will address the below issues, as they represent aspects of the process evaluation that will be more successfully assessed after the first year of program operations:

- Assessing the relationship between the current program services and the needs of the market or participant,
- The program implementation system and its influence on customer perception of the program,
- The influence of the program on customer behavior and actions, and
- Field practices and their effects on energy savings achieved.

The Team will address the process evaluation plan through four specific areas applicable to DLCo's programs under review:

- Program design
- Program administration
- Program implementation and delivery
- Market response

Each of these four areas is addressed in the sections below. These four areas are based on guidance provided in the Audit Plan, *The California Energy Efficiency Evaluation Protocols: Technical, Methodological, and*

Reporting Requirements for Evaluation Professionals[16], and *The California Evaluation Framework*[17]. The details of these four areas correspond to the procedures discussed in DLCo's Filed Program Plans.

3.4.1. Program Design

The design of an energy efficiency program sets the foundation for the program's future development and growth. Evaluating the degree to which the CSP has successfully implemented their planned program design is critical to identifying possible issues with program operations and eliminating potential complications in the future. The Team will address the following procedures pertaining to program design

Table 3-1: Program Design Procedures for Process Evaluation

Objective	Target	Mechanisms
Assess program mission, goals, design, and operations in order to make recommendations for changes that will improve the ability of the program to cost-effectively obtain energy savings	Lead program planners and managers, their supervisors, and a sample of program staff, including both central staff and field staff	Interviews, surveys, and /or focus groups
Assess program mission, goals, design, and operations in order to make recommendations for changes that will improve the ability of the program to cost-effectively obtain energy savings	Lead program planners and managers, and their supervisors	Analysis of program and market operations theories and supportive logic models, theory assumptions and key theory relationships.
Assess program mission, goals, design, and operations in order to make recommendations for changes that will improve the ability of the program to cost-effectively obtain energy savings	Lead program planners and managers, their supervisors, and a sample of program staff, including both central staff and field staff	Documented use of new practices or best practices

3.4.2. Program Administration

Program administration is crucial in ensuring that a program runs smoothly and efficiently, as it deploys and manages day-to-day tools and resources, including staff that all programs are dependent upon to operate. Evaluating the efficiency and quality of the CSP's program administration is critical so that administrative issues do not undermine the achievement of program goals. The Team will address the following procedures pertaining to program administration.

[16] TecMarket Works, *The California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals.* State of California. Public Utilities Commission, April 2006. http://www.calmac.org/events/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf

[17] TecMarket Works, *The California Evaluation Framework.* State of California. Public Utilities Commission, June 2004. http://www.cee1.org/eval/CEF.pdf

Table 3-2: Program Administration Procedures for Process Evaluation

Objective	Target	Mechanisms
Better understand how the program is implemented in practice and test the content and accuracy of the program records and their management	Program records and materials, including but not limited to program electronic tracking systems and reports, program database, and customer files	Review, assessment and testing
Determine if program tools and the operational procedures relating to the use of the tools are consistent with the ability of the program to accomplish its goals	Relevant program tools (i.e. use of software and hardware)	Assessment
Assess the program design and operations, in particular program databases and the processing of incentive payments	Lead program planners and managers, their supervisors, and a sample of program staff, including both central staff and field staff	Interviews, surveys, and /or focus groups
Assess the program design and operations, in particular the program's productivity	Program workflow, production and productivity measurements	Assessment
Assess the program design and operations, in particular program staffing	Program staffing allocation and requirements	Assessment
Assess the program design and operations, in particular program training and staffing	Management and staff skill and training needs	Assessment
Ensure validity and reliability of program measures and savings data	Required CSPs' data management plan, which identifies data management processes, procedures, and quality assurance activities	Assessment

3.4.3. Program Implementation and Delivery

No program can be successful without a high quality and effective implementation and delivery mechanisms. Evaluating the success of program implementation and delivery mechanisms provides essential information to program designers and managers about how the program's operational systems and strategies are functioning on a day-to-day basis. The Team will address the following procedures pertaining to program implementation and delivery.

Table 3-3: Program Implementation and Delivery Procedures for Process Evaluation

Objective	Target	Mechanisms
Keep the program on track	Program staff detailing their efforts, activities and responsibilities, including the steps they take	Interviews, surveys, and /or focus groups
Review operational responsibilities, activities, and monitoring efforts	Program managers and supervisors	Interviews, surveys, and /or focus groups
Obtain insights into what the program is doing well in and what can be improved	Key stakeholders and market actors such as product manufacturers, distributors, installation contractors, and service personnel	Interviews, surveys, and /or focus groups
Determine if program management and operational efforts are consistent with the primary program goals	Management and operational systems	Assessment
Review and examine procedures on customer handling and service delivery	Project staff and sample participants of program	Interviews, surveys, and /or focus groups
Ensure programs are being implemented	Internal audits conducted each full year of	Assessment

Objective	Target	Mechanisms
as designed and to determine to what extent performance indicators are being addressed	program operation by program managers of each DLCo's energy efficiency programs	
Observe program operations and assess the quality of work provided	Program operations and field activities	Announced or unannounced operational observations and field-testing
Observe customer interaction practices and customer education procedures and techniques used	Program participants/customers	Field observations with or without program staff
Observe program operations and assess the quality of work provided	Level of financial incentives for program participants	Assessment
Keep the program on track	Program timing, timelines and time-sensitive accomplishments	Assessment
Observe program operations and assess the quality of work provided	Production plan and implementation timeline that the CSP will be updating on a monthly basis	Assessment
Observe program operations and assess the quality of work provided	Required CSP quality assurance plan, which will detail quality control on projects, regulatory compliance processes and performance auditing	Assessment

3.4.4. Market Response

Ultimately, the most important aspect of the program is the market response. Verifying program impact on the market and customer involvement in program operations and implementation is a key component in the success of DLCo's energy efficiency programs. Evaluating this response, especially the customer level experience of the program verifies and helps shed light on the magnitude of each program's impact on the market and provides insight into opportunities for expanding the program within the market. The Team will address the following procedures pertaining to market response.

Table 3-4: Market Response Procedures for Process Evaluation

Objective	Target	Mechanism
Assess feedback, such as levels of satisfaction with the program and their participation experience and satisfaction with various elements of the program, including satisfaction with the product(s), the organization, scheduling, educational services, quality of work performed, attitude of site staff, responsiveness to questions/ concerns, level of savings achieved, custom handling, etc. Also assess changes in awareness, knowledge and attitudes of customers with respect to energy efficiency and likelihood that customer will invest in energy efficiency.	Program participants/customers	Interviews, surveys, and /or focus groups
Examine barriers to participation and methods for overcoming those barriers	Non-program participants/customers	Interviews, surveys, and /or focus groups
Assess levels of satisfaction, needs, and the ability of the programs to provide for those needs	Trade allies, contractors, suppliers, manufacturers and other market actors and stakeholders	Interviews, surveys, and /or focus groups
Better assess market trends and responses	Third-party sources (e.g. equipment vendors, trade allies and stakeholders and market data suppliers)	Collection and analysis of relevant third party data
Better assess market trends and responses	Customer/participant energy efficiency or load reduction needs and the ability of the programs to provide for those needs	Assessment
Better assess market trends and responses	Low participation rates or associated	Assessment

	energy savings and reasons for overly high free-riders or too low a level of market effects, free-drivers or spillover	
Assess if all required marketing goals and objectives laid out by the CSP have been accomplished	Required CSP marketing plan, which discusses their detailed marketing plan, including specific marketing goals and objectives and the necessary actions required to achieve those objectives	Review and assessment
Assess the effectiveness of CSPs's marketing materials for promoting and communicating the value of DLCo's energy efficiency programs	Marketing materials (e.g. brochure, application procedures, letters and inserts for targeted mailings, e-mails, newsletter articles, fact sheets, case studies, website, etc.) for customers and/or vendors	Track, review and assessment

3.4.5. Conducting Investigative Efforts

As much of the process evaluation includes in-person or on-site investigations with potentially subjective participant responses as a key component, it is critical that a process evaluation's site-specific methods be transparent and credible. The Team will adhere to investigative practices outlined in the California's Energy Efficiency Evaluation Protocols[18], as well as industry best-practices. In all cases the Team will document procedures in advance of implementation so that reviewers can readily identify methods utilized in the process evaluation. Although specific methods for investigation will be detailed at the time evaluations are being conducted, this section provides an overview of the Team's procedures for specific investigative efforts associated with relevant process evaluation areas of DLCo's programs.

- ***Interviews***. The Team will conduct one-on-one interviews with specific individuals who are expected to provide detailed process information. Interviews may be in-person (off-site or on-site), or by telephone. Interviews will be scheduled in advance, and interviewees will be informed about the expected length of the interview in advance. Where appropriate the Team may utilize additional approaches that can be considered or used, such as web-conferencing or web-interviews.
- ***Group Interviews***. The Team will conduct group interviews with groups of individuals typically having one or more similar characteristics. Group interviews will be scheduled in advance, interviewees will be informed about the expected length of the interview in advance, and interviewees will be briefed about the purpose of the interview at the outset and provided an opportunity to ask questions about the purpose and procedures. Group interviews will focus on group level responses to a limited set of issues.
- ***Surveys***. The Team will utilize different survey techniques (e.g. telephone, mail, e-mail, internet, etc.) depending on the situation and/or target group being surveyed. For instance, when there are large numbers of participants or non-participants or when the inquiry will benefit from the respondent seeing an illustration, the Team will utilize other survey techniques such as mail, e-mail or Web- based approaches and other types of surveys. Similarly, for small-targeted surveys with trade allies or program participants, the Team will use an e-mail/Internet combined survey.

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[18] TecMarket Works, *The California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. State of California. Public Utilities Commission, April 2006.. http://www.calmac.org/events/EvaluatorsProtocols_Final_AdoptedviaRuling_06-19-2006.pdf

- ***Observations and Field Testing.*** The Team will conduct relevant field-testing and observations in a way that allows the observation or testing of a DLCo program as it would be operating in the absence of the evaluation professional. The Team observer(s) will instruct program staff that they are to conduct themselves exactly as they would if the observer(s) were not present. Additionally, the Team observer(s) will not engage in activities that act to change the way the activity would have occurred if the observer were not there. All key observations and measurements will be documented at the time of the observation or testing.
- ***Unannounced Participation.*** When appropriate, the Team will enroll in a DLCo program to test the program's operations and delivery aspects. Program management will not be informed of who will be participating, how they will be participating or when that participation will occur. Participation will be unannounced and field observations and measurements will be conducted without the knowledge of the program staff to the extent practical.

Once data collection instruments are drafted, they must be reviewed by the SWE.

In all cases, the Team will design investigation activities so as to account for and minimize all sources of error (see Table 2-2) All questions (for interviews, group interviews, surveys) will follow construction practices that result in objectively worded questions with provisions for recording all expected responses. Questions will be structured so that they are single-subject, focused questions. Procedures and objectives for observations, field testing, and unannounced participation will all be documented in advance and replicated consistently in all sampled sites.

3.5.Sample Design: Process Evaluation

The sample designs for process evaluations will vary depending on the purpose. For some elements, simple random samples or stratified random samples will be drawn.[19] For others, a census might be attempted. A targeted level of confidence and precision of 90/20 for each quarterly survey and 90/10 for each annual survey will be established.

[19] Cochran, William G. *Sampling Techniques*. 1977. New York: John Wiley & Sons.

4. Cost-effectiveness Evaluation Plan

This cost-effectiveness evaluation plan addresses program costs in light of energy efficiency gains in accordance with PA Act 129 of 2008 – Total Resource Cost (TRC) Test Order, issued June 2009. The TRC test will be used to calculate the cost-effectiveness of each Duquesne Light Company (DLCo) program and the portfolio as a whole. The input used to conduct TRC calculations will be developed from findings from impact evaluations and process evaluations as well as from DLCo data on avoided costs and program expenses.

4.1. Evaluation Timing and Frequency

Process evaluations will be conducted in a timeframe appropriate to each program's design and implementation process.

Cost-effectiveness evaluations will occur during program startup, once during the early implementation period, and once following the closure of the program cycle. Below are descriptions of the kinds of evaluation activities that will occur at each phase of program implementation.

- Program Design Cost Review
- Early Implementation Cost Evaluation
- Final Cost Evaluation

Programs will not undergo a cost-effectiveness evaluation every year of their implementation cycle. As described above, new programs will receive program design cost review, and undergo a cost-effectiveness evaluation in the first year, and a final cost-effectiveness evaluation will be conducted at the end of the program cycle. It is anticipated that the Team will be more engaged during the early development efforts and for conducting the early cost-effectiveness evaluation. Table 1-1 presents the schedule for reporting cost-effectiveness results

4.2. Quality Control of Cost-effectiveness Evaluations

DLCo will report to SWE on any cost-effectiveness evaluation activities in the biannual progress reports and through the submission of specific cost-effectiveness evaluation deliverables (program design cost review, early implementation cost evaluations, final cost evaluations). Depending on SWE feedback, DLCo cost-effectiveness evaluation activities may be modified in order to adequately address process or protocol modifications that the SWE deems appropriate or necessary. This third party evaluation of DLCo's cost-effectiveness evaluation activities by SWE will serve as a quality control mechanism for the evaluation activities.

4.3. DLCo's Filed Program Plans

The energy efficiency potential forecast projected technical, economic and achievable energy efficiency potential. Economic potential is defined as technically feasible measures that pass the TRC test. Program measures selected for inclusion in implemented programs each passed the TRC during the forecast stage. Cost-effectiveness evaluation will conduct the TRC for actual program costs and benefits and compare these outcomes to forecasted outcomes as detailed in the Filed Program Plans.

4.4. Total Resource Cost Test

As stated in 66Pa. C.S. § 2806.1(m) – the TRC test is a "standard test that is met if, over the effective life of each plan not to exceed 15 years, the net present value of the avoided monetary cost of supplying electricity is greater than the net present value of the monetary cost of energy efficiency conservation measures." The TRC will form the basis of the Team's cost-effectiveness evaluation, and will require cost data to be collected from DLCo, its CSPs and program participating customers. The TRC test definition, formula, and components to be used are established in accordance with the *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects,* with a number of slight modifications, as specified by the Pennsylvania PUC. For detailed information on the filed forecasted TRC for programs within DLCo's EE&C Portfolio see Appendix F Cost and Benefits from Filed Program Plans.

Accordingly, the DLCo Team will use the following formulas to calculate net present value (NPV_{TRC}), the benefit-cost ratio (BCP_{TRC}), and the levelized costs, as directed by the TRC Test Order of 2009.

$$NPV_{TRC} = B_{TRC} - C_{TRC}$$

$$BCR_{TRC} = \frac{B_{TRC}}{C_{TRC}}$$

$$LC_{TRC} = \frac{LCRC}{IMP}$$

Where

NPV_{TRC}= Net present value of the total costs of the resource

B_{TRC}= Benefits of the program

C_{TRC}= Costs of the program

BCR_{TRC}= Benefit-cost ratio of the total costs of the resource

LC_{TRC}= Levelized cost per unit of the total cost of the resource (Cents per kWh for conservation programs; dollars per kWh for load management programs)

LCRC= Total resource costs used for levelizing

IMP= Total discounted load impacts of the program

4.5. DLCo Costs and Benefits

In preparation to conduct the TRC, the Team will collect information on DLCo incurred expenses and fiscal savings associated with initial and annual program costs and benefits. The table below summarizes the data that is to be gathered as input for DLCo cost and benefit calculations, including expected source of information. This data will be gathered from 1) the Budgets & Expenditures section of the quarterly and annual Energy Efficiency Program Reports and Energy Efficiency Program Portfolio Reports, as required to be delivered to the

Commission per page 90 of the Filed Program Plan; and, 2) program Measure and Financial Flat Files, as required to be available for Commission review per page 98 of the Filed Program Plan. The Project Management Tracking System for each program includes a description for access to each of these reports and files in a secured area on the DLCo website, per page 99 of the Filed Program Plan.

Table 4-1. DLCo Program Costs/ Benefits

Cost of Equipment
Cost of Operations and Maintenance
Cost of Installation
Cost of Program Administration, including marketing and EM&V
Cost of customer dropout and removal of equipment, less salvage value
Cost of Increased supply (transmission, distribution, and generation) costs for any periods when load has been increased
Savings from Avoided supply (transmission, distribution, and generation) costs

The Team will approach breaking out utility supply-specific costs as follows:

- Supply Costs: As noted above, supply costs include transmission, distribution, and generation, which accounts for benefit for periods of demand reduction as well as costs during periods of demand increase.
- Generation Costs: Avoided generation cost is to be calculated using three five-year intervals for the 2009 TRC Order stipulated maximum assumed program/measure life of fifteen years. The following table summarizes source of input for calculation of avoided generation costs.

Table 4-2: Generation Costs

Program Interval	Input Data Source
Year 1-5	NYMEX PJM futures price by "prompt month," two months prior to the filing date.
Years 6-10	NYMEX natural gas futures price by "prompt month," two months prior to the filing date EIA forecast implied heat rate
Years 11-15	Energy Information Association Annual Energy Outlook data. (Data will be "shaped" by month and season as needed.)

- Transmission and Distribution Costs: In order to account for avoided cost of transmission and distribution costs, the Team will collect information on DLCo current transmission and distribution costs. The table below summarizes the data that is to be gathered for this portion of the TRC, including expected source of information.

Table 4-3: Transmission and Distribution Costs

Rate	Source of Data
Transmission prices	FERC/ DLCo
Distribution rate	DLCo
Ancillary service rates	DLCo
Escalation factors	U.S. Bureau of Labor and Statistics (BLS), the Electric Power GTD sector, industry index for Electric Power Generation (NAICS 221110)

- Capacity Costs: Capacity costs will be estimated according to the PJM Reliability Pricing Model and escalation rates determined by the U.S. BLS, the Electric Power GTD sector, industry index for Electric Power Generation (NAICS 221110). Prices will be stated on a dollars per MW-day basis, relative to on-peak demand savings.
- Supply Cost Adjustments: Adjustments will be made as needed to accurately calculate supply costs. The following table summarizes adjustments. Data will be gathered as appropriate to account for each adjustment.

Table 4-4. Supply Cost Adjustments

End-Use Adjustments	In cases where it is appropriate and feasible, the end-use load shapes of particular measure will be used to calculate the avoided and/or additional supply costs. Otherwise, class average consumption profile will be used.
GTD Costs	GT&D costs will be adjusted for line losses .
Locational, Temporal, and Zonal Differences	Zonal based adjustment will be made to the GT&D and capacity costs according to the *PJM State of the Market* report data zonal real-time, simple average LMP (dollars per MWh). Additionally, the natural gas prices in years six through ten will be adjusted according to the basis differential between the Henry Hub as the source and TETCOM-3 as the destination, as specified for utilities west of the Susquehanna.
Compliance with AEPS Act and Carbon Issues	The costs of compliance with the AEPS Act will be factored in to program costs.
Discount Factor	For the first year TRC calculations, the particular post-tax weighted average cost of capital (WACC) will be used as a discount rate.[20]
Customer Self-Generating Credits	In cases where customers are self-generating electricity, the full retail rate will be assumed when calculating avoiding energy and capacity costs.

4.6. Customer Costs and Benefits

In preparation to conduct the TRC, the Team will collect information on customer incurred expenses and fiscal savings associated with initial and annual program costs and benefits. The table below summarizes the data that is to be gathered as input for customer cost and benefit calculations, including expected source of information. This data will be gathered from 1) the Budgets & Expenditures section of the quarterly and annual Energy Efficiency Program Reports and Energy Efficiency Program Portfolio Reports, as required to be delivered to the Commission per page 90 of the Filed Program Plan; and, 2) program Measure and Financial Flat Files, as required to be available for Commission review per page 98 of the Filed Program Plan. The Project Management Tracking System for each program includes a description for access to each of these reports and files in a secured area on the DLCo website, per page 99 of the Filed Program Plan.

20 The discount rate to be used beyond the first year of TRC testing will be addressed in future working stakeholder working group session according to the TRC Order of June 2009.

Table 4-5: Customer Costs/ Benefits

Cost of materials and equipment
Cost of sales tax
Cost of installation
Cost of ongoing O&M
Cost of equipment removal
Cost reduction from incentives paid by federal agencies (e.g., federal tax credits, ARRA incentives)[21]
Cost reduction associated with avoided capital and operating costs of equipment/appliance not chosen

The Team will calculate participant incurred equipment costs according to the installation scenario. The following table indicates the cost structure that will be used for each scenario.

Table 4-6. Equipment Cost Calculation per Installation Scenario

Scenario	Calculation for Equipment Cost
Retrofit or early replacement (base equipment being replaced is still fully functional)	Incremental cost is the whole amount of the new efficient device or measure, including all installation costs
Replace on burnout (base equipment being replaced has reached the end of its useful life)	Incremental cost is the extra cost of the new efficient device or measure over the cost of the standard efficiency device or measure
New equipment procurement	Incremental cost is the extra cost of the high efficiency equipment over the current market or code standard efficiency equipment

21 Note: the TRC Order of June 2009 specifically excludes the inclusion of state tax credits or Act 1 incentives from the TRC accounting methods of the Act 129 EE&C programs.

The Team will collect and integrate measure- and program- specific customer costs for input into TRC calculations, listed in below table.

Table 4-7. Equipment Cost Calculation per Installation Scenario

Measure/Program Specific Costs	Data Collection Methodology
Full measure cost	[TBD]
Full baseline measure cost	[TBD]
End-use adjustment"	If it is appropriate and feasible, the end-use load shapes of the particular measure will be used to calculate the avoided and/or additional supply costs. Otherwise, class average consumption profile will be used.[22]

4.7. Miscellaneous TRC Variables

In addition to the above DLCo and customer cost and benefit data, the Team will gather the following variables for input into TRC calculations:

Table 4-8: Additional Variables for TRC input

The discount rate
Planning horizon in five year intervals
The program year
Expected measure life, not to exceed fifteen years

[22] This stipulation is found on pg. 17 of the TRC order.

5. Evaluation Reporting Protocol

5.1. Introduction

Using the information collected during the impact, process and cost-effectiveness evaluations, the Team will summarize evaluations into reports to support the SWE's goals of "identifying best practices exhibited to date, areas for improvements, and any necessary recommendations for updating targets or expectations based on the current findings for each of DLCo's programs"[23]

The objective of the Evaluation Reporting Protocol is to detail the Team's process for preparing DLCo's EE&C evaluation reports and how information in those reports will be presented to the SWE Team. The content of this Evaluation Reporting Protocol will be aligned with the Audit Plan's requirements of EM&V reporting (see Section 8 of the Audit Plan). The Evaluation Reporting Protocol will first identify the common information required across all evaluation reports. It will then describe the additional information and presentation formats for each of the types of evaluation reports. Sections contained in this Evaluation Reporting Protocol include the following:

- Common Information Required Across All Evaluation Reports
- Evaluation Type Specific Reporting Requirements
    - Impact Evaluation Reporting
    - Process Evaluation Reporting
    - Cost-Effectiveness Evaluation Reporting

5.2. Common Information Required Across All Evaluation Reports

The Team will produce evaluation reports that will include, at a minimum, the following sections:

- Cover: the cover page will contain contact information for each of the parties involved in the evaluation, in addition to specific program information.
- Title
- Table of Contents
- Executive Summary: Brief review of evaluation findings and recommendations. 1-3 pages.
- Introduction and Purpose of the Study: Evaluation overview, objectives, and researchable issues.
- Description of Programs Covered in Study
- Study Methodology: Detailed description of evaluation approach.
- Reliability Assessment of the Study Findings: Discussion of threats to validity and sources of bias.

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[23] Audit Plan, Section 9.1 page 138, *Quarterly and Annual Evaluation Reports* describes required SWE reporting activities.

- Detailed Study Findings
- Recommendations for Program Changes (if applicable)
- Appendix A: Discuss conformance to performance metrics.
- Appendix B: Discuss success and timing of data requests provided to DLCo.

See Appendix G for a more detailed description of the common information required across all evaluation reports.

5.3. Evaluation Type Specific Reporting Requirements

The following reporting requirements are in addition to the reporting requirements noted in Section 5.2 above.

5.3.1. Impact Evaluation Reporting

The impact evaluation report will focus on reporting the gross and net (after year 1) achieved energy savings and demand reduction that can be expected as a result of DLCo EE&C program efforts for each program year and for the program at the end of the program cycle. The impact reporting schedule timeframe will be based on either the California *Evaluators' Protocols* framework or a timeframe TBD by the SWE.

- Quarterly Reporting
- Annual Evaluation Reporting

In addition to the common reporting Information described above, impact evaluation reports will include information based on Section 2 Impact Evaluation Methods. This will include total savings and costs for all DLCo programs; total savings and costs per program; savings and costs; and savings by sector, year to date and date range reports.

Additionally, the impact evaluation report will incorporate the following information. As needed, refer California *Evaluators' Protocol* for detailed procedural information.

- **PA PUC approved program ex-ante gross and net (after year 1) kW, and kWh savings goals** recorded at the beginning of a program funding cycle and any modifications to these goals made during the funding cycle. Energy savings targets for the programs included in DLCo's portfolio filings approved by the PUC and any changes to these goals resulting from adjustments made. If the goals have changed during the funding cycle, a brief discussion of the reasons for the change will be reported also. Goals will be reported for each calendar year in which impacts are projected.
- **The DLCo-generated ex post annual gross kW and kWh savings.** Energy and demand savings estimates reported to the SWE as achieved against the PA PUC-approved goals.
- **Evaluation projected ex post annual gross and net MW impacts** measured for each calendar year for each year of the EUL of the measures installed or behaviors taken for the following metrics:
    - Measure-level impacts
    - Demand impacts

- Participant/Nonparticipant spillover
- Impacts that increase or degrade over time

The Team will report the metrics separately for total gross program savings, broken out by program-induced direct and indirect (as appropriate to each study) impacts and for participant spillover effects, if any. Effects will be reported for the measure as a whole, for direct and indirect program effects and participant spillover effects.

- **Evaluation projected annual ex post MWh gross and net savings** measured for each calendar year for each year over the EUL of the measures installed or behaviors taken. The Team will report savings for the program as a whole and include the following three reporting metrics:
  - Measure-level impacts
  - Participant spillover
  - Impacts that increase or degrade over time

  The Team will report the annual gross MWh savings for the program as a whole and separately, for both program participation-based direct and indirect savings, and for participant-spillover-based savings.
- **Measure counts per participant.** This metric will be retrospective and report only the actions taken as a result of the program at the time of the evaluation. However, the evaluation will true up these metrics at the end of each program year so that they can be reported for each program year.
- **Measure count versus program goals.** This metric will be retrospective and report only the actions taken as a result of the program at the time of the evaluation. The Team will base this metric on tracking system reviews, the impact and process evaluations, and the supportive M&V efforts.
- **Measurement reliability metrics.** The Team will report results and all measurement reliability information at the program level, program group level and for any program component or delivery mechanism with a designated separate level of rigor or as designed in the approved evaluation plan. In addition, the Team will report any necessary data reliability metrics for the energy impact estimates provided in the evaluation report.
- **Savings comparison.** The Team will include a presentation and discussion of the PA PUC approved program goals compared to the estimated realized savings from the evaluation findings.
- **Appendix A.** Presentation, assessment, and discussion of the similarities and differences between savings assumptions and projections, and the results of the evaluation findings. The Team will identify what assumptions were confirmed and not confirmed, and identify recommended changes to the assumptions that DLCo used to project savings.
- **Appendix B.** Presentation of the weather data used to conduct the evaluation, including the heating and cooling degree-days used in the study, if any.

5.3.1.1. M&V Reporting

For impact evaluations that are supported by M&V efforts, the evaluation report will present the program-specific M&V plan in enough detail that the plan can be replicated. The plan will describe the following:

- How the M&V samples were identified and selected;

- How the M&V activities were used to support the impact assessment;
- Any disagreement between the sampling plan and the sampling approach used, and how the difference influences the reliability of the study findings;
- Sampling and measurement bias issues and how these biases can be expected to influence the impact estimates;
- How the biases were controlled or mitigated in the M&V efforts and what statistical or measurement approaches were used to adjust the M&V data to inform the impact estimates; and
- How the M&V results were used to estimate net program energy impacts.

The Team will include the justification for the identification and selection of the baseline and an assessment of the baseline selected and its consistency of use for gross and net impacts in the plan.

The Team will also provide site-specific M&V plans prepared during the course of the study in an Appendix to the impact evaluation report. The site-specific M&V plan will include all topics specified in the M&V Protocol, including assumptions used for stipulated parameters, the source of the assumptions and uncertainties associated with the M&V study results

5.3.2. Process Evaluation Reporting

5.3.2.1. Full Process Evaluation Reporting

The process evaluation report, based on Section 3 Process Evaluation Methods, will include the following reporting requirements in addition to Section 5.2 above.

- **Detailed program description.** The process evaluation report will present a detailed operational description of the program that focuses on the program components being evaluated (design, administration, implementation and delivery). A program flow model will be included.
- **Program theory and logic model.** The Team will include a presentation of the logic model and program theory for each program, based on DLCo's EEC/DR Study.
- **Support for recommended program changes**. The Team will assess and, if appropriate, provide recommendations for improving DLCo's programs within the four process evaluation areas (program design, program administration, program implementation, and program delivery).
- **Detailed presentation of findings.** The Team will provide a detailed presentation of the findings, with sections pertaining to each of the four primary areas depicted in the process evaluation requirements.

5.3.2.2. Spot Process Evaluation Reporting

Spot evaluation reporting will consist of a critical incident memorandum identifying evaluation triggers necessitating a spot evaluation. Spot Evaluation triggers are identified in Section 3.2 Evaluation Timing and Frequency. The critical incident memorandum will be immediately submitted to DLCo and to the relevant CSP, with follow-up documentation of the incident and its resolution to the PA PUC as part of the regular reporting cycle.

5.3.3. Cost-effectiveness Reporting

The cost-effectiveness evaluation report, based on Section 4 Cost-effectiveness Evaluation Plan, will include the following reporting requirements, in addition to Section 5.2 above.

- **Detailed presentation of findings.** The Team will provide a detailed presentation of the results of the following three measures of cost-effectiveness:

$$NPV_{TRC} = B_{TRC} - C_{TRC}$$

$$BCR_{TRC} = \frac{B_{TRC}}{C_{TRC}}$$

$$LC_{TRC} = \frac{LCRC}{IMP}$$

6. Cost Proposal

For budgeting purposes, assume the following distribution in Table 6-1 of the expected distribution of installations receiving basic versus enhanced level of rigor for a given year.

Table 6-1. Expected Distribution of Installations Receiving Basic versus Enhanced Level of Rigor for a Given Year, by Program Group and Program

Program Groups	Basic	Enhanced
Commercial	33	31
Industrial	7	13
Residential: EE Rebate	33	32
Residential: Low Income Energy	33	0
Residential: Refrigerator Recycling	33	0
Residential: School Energy Pledge	33	0
Total	**172**	**76**

The basic tasks and subtasks around which to construct the cost proposal are listed below:

Task 1. Develop final research plan

1.1 Review documentation for all programs and program groups

1.2 Review PMRS

1.3 Finalize logic models, performance indicators, and program theories for each program and program group

1.4 Finalize EM&V approach for each program and program group

1.5 Finalize process evaluation approach for each program and program group

1.6 Finalize all sample sizes

Task 2. Data collection

2.1 Develop all data collection instruments

2.2 Process evaluation instruments

2.3 Impact evaluation instruments

2.3.1 Telephone verification instruments

2.3.2 Develop on-site M&V plans and data collection protocols and instruments

2.3.3 Develop NTGR instruments

2.3.4 Pre-test all data collection instruments

2.3.5 Develop and implement sample designs

Task 3. Analysis

3.1 Process evaluation

3.2 Gross Impact evaluation

3.3 NTGRs estimation

Task 4. Reporting

4.1 Quarterly reporting

4.2 Annual reporting

4.3 Final report

Task 5. Administration and management

Appendix A

Acronyms

C&I: Commercial and Industrial

CFL: Compact Fluorescent Light

CSP: Conservation service provider

The Commission: The Pennsylvania Public Utility Commission

DEER: Database for Energy Efficient Resources

DLCo: Duquesne Light Company

DR: Demand response

EDC: Electric distribution company

EE: Energy Efficiency

EE&C Plan: Energy Efficiency and Conservation Plan

EM&V: Evaluation, measurement and verification

EUL: Effective useful life

HVAC: Heating, ventilating, and air conditioning

kW: Kilowatt

kWh: Kilowatt-hour

M&V: Measurement and verification

MW: Megawatt

MWh: Megawatt-hour

GW: Gegawatt

GWh: Gegawatt-hour

PA PUC or PUC: Pennsylvania Public Utility Commission

PMRS: Program Management and Reporting System

SWE: Statewide Evaluator

SWE Team: Statewide Team

TRC: Total Resource Cost Test

TRM: Pennsylvania's Technical Reference Manual

TWG: Technical Working Group

DLC: Direct Load Control

EER: Energy Efficiency Resource

EM&V: Evaluation, Measurement and Verification

IPMVP: International Performance Measurement and Verification Protocol

NPV: Net Present Value

NTGR: Net-to-Gross, Net-to-Gross Ratio

SEM: Simplified Engineering Model

TOU: Time of Use

Appendix B

Commercial and Industrial (C&I) Sector Umbrella Energy Efficiency Program Incentives

The C&I Sector Umbrella Program (CISUP) provides for the payment of incentives to end-user utility customers for the purpose of offsetting the higher cost of high-efficiency equipment when compared to standard efficiency equipment. Importantly, the CISUP establishes the terms, conditions, and incentive levels for industrial sector sub-programs. Changes to inventive levels occur at the ISUP, thereafter referenced by all other programs. Incentive program tracking, reporting and processing are performed under the structures and procedures established under the CISUP.

Prescriptive measure incentive amounts (applicable to both commercial and industrial umbrella and sub-programs) are provided in this appendix (below, on pages 2 and 3). Where customized incentive amounts are appropriate (consistent with adopted program terms and conditions) the following incentive amounts will apply to calculated annual energy savings:

Table B-1. Incentive Payments for Custom Measures

End-Use	$/kWh
Lighting	$0.11
HVAC	$0.28
Refrigeration	$0.21
Office Equipment	$0.12
Industrial Process	$0.06

These customized Incentive categories and amounts are subject to change as required to support program implementation, solely at the discretion of Duquesne Light.

C&I Program incentive amounts reflected below are subject to change. The measures listed in Table B-2 are preliminary and will be adjusted as required to support program implementation, solely at the discretion of Duquesne Light.

Table B-2. Prescriptive Incentive Amounts for Itemized Measures

PRESCRIPTIVE INCENTIVE AMOUNTS FOR ITEMIZED MEASURES				
Line	ID #	Measure Description - See Terms and Conditions for description of measures	Units	$/Units
Lighting Itemized Measures				
		Screw-In Compact Fluorescent Lamps		
1	L-A1	Screw-in Compact Fluorescent Lamp: 5 - 25 watts	lamp	$1.75
2	L-A2	Screw-in Compact Fluorescent Lamp: ≥ 25 watts	lamp	$3.50
		Compact Fluorescent Fixtures		
3	L-B1	Interior Compact Fluorescent Fixture, 5-13 watts	fixture	$9.00
4	L-B2	Interior Compact Fluorescent Fixture, 27-65 watts	fixture	$12.50
5	L-B3	Interior Compact Fluorescent Fixture, 66-90 watts	fixture	$18.00
6	L-B4	Interior Compact Fluorescent Fixture, > 90 watts	fixture	$20.00
7	L-B5	Exterior Compact Fluorescent Fixture, <= 70W Replacement Fixture	fixture	$17.00
		Display and Accent Lighting		
8	L-C1	Cold Cathode Fluorescent Lamp: 2-8 watts	lamp	$2.00
9	L-C2	Integrated Ballast Ceramic Metal Halide PAR lamps	lamp	$25.00
10	L-C3	Screw-in Compact Fluorescent Reflector Lamps: 14 to 26 watts	lamp	$5.00
		Interior Induction Fixtures		
11	L-D1	Induction Lamps and Fixtures, 55-100 watts	fixture	$35.00
12	L-D2	Induction Lamps and Fixtures, >100	fixture	$50.00
		Linear Fluorescent Packages (Lamps & Ballasts)		
13	L-E1	T5 - 4' 2 Lamp - HO - Electronic Ballast	lamps & Ballast	$43.50
14	L-E2	T5 - 4' 3 Lamp - HO - Electronic Ballast	lamps & Ballast	$75.00
15	L-E3	T5 - 4' 4 Lamp - HO - Electronic Ballast	lamps & Ballast	$83.00
16	L-E4	T5 - 4' 6 Lamp - HO - Electronic Ballast	lamps & Ballast	$93.50
17	L-E5	T8 - 2' 1 Lamp - Electronic Ballast	lamp & Ballast	$7.50
18	L-E6	T8 - 2' 2 Lamp - Electronic Ballast	lamps & Ballast	$11.75
19	L-E7	T8 - 2' 3 Lamp - Electronic Ballast	lamps & Ballast	$17.50
20	L-E8	T8 - 2' 4 Lamp - Electronic Ballast	lamps & Ballast	$18.50
21	L-E9	T8 - 3' 1 Lamp - Electronic Ballast	lamp & Ballast	$10.75
22	L-E10	T8 - 3' 2 Lamp - Electronic Ballast	lamps & Ballast	$11.75
23	L-E11	T8 - 3' 3 Lamp - Electronic Ballast	lamps & Ballast	$17.50
24	L-E12	T8 - 3' 4 Lamp - Electronic Ballast	lamps & Ballast	$18.50
25	L-E13	T8 4' 1 Lamp - Electronic Ballast (also applies to 24" U-Tube T-8 lamp and ballast)	lamp & Ballast	$10.75
26	L-E14	T8 - 4' 2 Lamp - Electronic Ballast	lamps & Ballast	$12.00
27	L-E15	T8 - 4' 3 Lamp - Electronic Ballast	lamps & Ballast	$17.50
28	L-E16	T8 - 4' 4 Lamp - Electronic Ballast	lamps & Ballast	$18.50

Table B-2. Prescriptive Incentive Amounts for Itemized Measures (Cont.)

PRESCRIPTIVE INCENTIVE AMOUNTS FOR ITEMIZED MEASURES				
Line	ID #	Measure Description - See Terms and Conditions for description of measures	Units	$/Units
Lighting Itemized Measures				
29	L-E17	T8 - 4' 6 Lamp - Electronic Ballast	lamps & Ballast	$37.50
30	L-E18	T8 - 4' 8 Lamp - HO - Electronic Ballast	lamps & Ballast	$79.00
31	L-E19	T8 - 8' 1 Lamp - Electronic Ballast	lamp & Ballast	$16.00
32	L-E20	T8 - 8' 2 Lamp - Electronic Ballast	lamps & Ballast	$17.50
33	L-E21	T8 - 8' 4 Lamp - Electronic Ballast	lamps & Ballast	$34.75
34	L-E22	T8 - 8' 1 Lamp - HO - Electronic Ballast	lamp & Ballast	$21.50
35	L-E23	T8 - 8' 2 Lamp - HO - Electronic Ballast	lamps & Ballast	$23.50
36	L-E24	T8 - 8' 4 Lamp - HO- Electronic Ballast	lamps & Ballast	$34.00
		Linear Fluorescent Lamp Removal (correcting for over-lit condition)		
37	L-F1	2' Linear Fluorescent Lamp	lamps & Ballast	$4.00
38	L-F2	3' Linear Fluorescent Lamp	lamps & Ballast	$4.00
39	L-F3	4' Linear Fluorescent Lamp	lamps & Ballast	$6.00
40	L-F4	8' Linear Fluorescent Lamp	lamps & Ballast	$9.00
		Interior/Exterior Pulse-Start Metal Halide Fixtures		
41	L-G1	Exterior Pulse-Start Metal Halide Fixtures <= 320 W	fixture	$60.00
42	L-G2	Exterior Pulse-Start Metal Halide Fixtures > 320 W (excludes 450 and 1000W fixtures)	fixture	$95.00
43	L-G3	Interior Pulse Start Metal Halide 175W	fixture	$40.00
44	L-G4	Interior Pulse Start Metal Halide 250W	fixture	$52.00
45	L-G5	Interior Pulse Start Metal Halide 300W	fixture	$55.00
46	L-G6	Interior Pulse Start Metal Halide 320W	fixture	$55.00
47	L-G7	Interior Pulse Start Metal Halide 350W	fixture	$55.00
48	L-G8	Interior Pulse Start Metal Halide 750W	fixture	$114.00
		Controls and Sensors		
49	L-H1	Wall or Ceiling-mounted Lighting Sensor < 500 watts controlled	sensor	$ 16.50
50	L-H2	Wall or Ceiling-mounted Lighting Sensor ≥ 500 watts controlled	sensor	$ 20.00
51	L-H3	High Bay Occupancy Sensor - Integrated	sensor	$ 40.00
52	L-H4	Electronic Ballast, Dimming (with daylighting) (other daylighting controls - Custom)	ballast	$ 10.00
53	L-H5	Photocell	photocell	$ 15.00
54	L-H6	Timeclock	time clock	$ 75.00
		Exit and Channel Signs		
55	L-J1	High Efficiency Exit Sign: Incandescent basecase	fixture	$27.00
56	L-J2	LED Channel Signage (Red), Indoor ≤ 2ft	foot	$4.00
57	L-J3	LED Channel Signage (Red), Indoor > 2ft	foot	$6.00
58	L-J4	LED Channel Signage (Red), Outdoor ≤ 2ft	foot	$2.00
59	L-J5	LED Channel Signage (Red), Outdoor > 2ft	foot	$3.00
Space Conditioning				
60	S-A1	Variable Frequency Drives for Chilled Water Loop	HP	$ 150.00
61	S-A2	Variable Frequency Drives for HVAC Fans	HP	$ 80.00
62	S-A3	Packaged Termainal A-C, Tier 1: 11.0 EER; base 9.9 EER (lodging)	ton	$45.00
63	S-A4	Packaged Termainal A-C, Tier 2: 12.0 EER; base 9.9 EER (lodging)	ton	$60.00
64	S-A5	Packaged Termainal A-C, Tier 3: 13.0 EER; base 9.9 EER (lodging)	ton	$75.00

Table B-2. Prescriptive Incentive Amounts for Itemized Measures (Cont.)

PRESCRIPTIVE INCENTIVE AMOUNTS FOR ITEMIZED MEASURES				
Line	IO #	Measure Description - See Terms and Conditions for description of measures	Units	$/Units
65	F-A1	Boilerless/Connectionless Steamers (6 pan >10 kW): Efficiency >50%	steamer	$750.00
66	F-A2	Insulated Holding Cabinets, Full Size <= 0.4 kW	cabinet	$300.00
67	F-A3	Insulated Holding Cabinet-Three Quarter Size ≤ 0.3 kW	cabinet	$250.00
68	F-A4	Insulated Holding Cabinet-Half Size ≤ 0.2 kW	cabinet	$200.00
69	F-A5	Grill to Order Production Line Equipment Replacement	Unit	$1,500.00
		Commercial Ice Machines (see Terms and Conditions for Specific Efficiency Requirements)		
70	F-B1	Commercial Ice Machines, Air Cooled 101-200 lbs per 24 hrs.	unit	$ 300.00
71	F-B2	Commercial Ice Machines, Air Cooled 201-300 lbs per 24 hrs.	unit	$ 300.00
72	F-B3	Commercial Ice Machines, Air Cooled 301-400 lbs per 24 hrs.	unit	$ 300.00
73	F-B4	Commercial Ice Machines, Air Cooled 401-500 lbs per 24 hrs.	unit	$ 300.00
74	F-B5	Commercial Ice Machines, Air Cooled 501-1,000 lbs per 24 hrs.	unit	$ 400.00
75	F-B6	Commercial Ice Machines, Air Cooled 1,001-1,500 lbs per 24 hrs.	unit	$ 500.00
76	F-B7	Commercial Ice Machines, Air Cooled > 1,500 lbs per 24 hrs.	unit	$ 500.00
		Solid Door Freezers and Refrigerators		
77	F-C1	Solid-Door Freezer/1 door/19-30 ft.	unit	$75.00
78	F-C2	Solid-Door Freezer/2 door/31-60 ft.	unit	$100.00
79	F-C3	Solid-Door Freezer/3 door/61-90 ft.	unit	$150.00
80	F-C4	Solid-Door Refrigerator/1 door/19-30 ft.	unit	$225.00
81	F-C5	Solid-Door Refrigerator/2 door/31-60 ft.	unit	$100.00
Refrigeration Itemized Measures				
82	R-A1	Night Covers for Open Vertical and Horizontal Display Cases - med temp	linear ft	$ 9.00
83	R-A2	Night Covers for Open Vertical and Horizontal Display Cases - low temp	linear ft	$ 9.00
84	R-A3	Strip Curtains for Walk-in Boxes	square feet	$ 3.00
85	R-A4	Door Gaskets on Solid Doors for Coolers	linear ft	$ 4.00
86	R-A5	Door Gaskets on Solid Doors for Freezers	linear ft	$ 4.00
87	R-A6	Door Gaskets on Glass Doors	linear ft	$ 4.00
88	R-A7	Anti-Sweat Heat (ASH) Controls	linear ft	$ 14.00
89	R-A8	New Refrigeration Display Case with Doors (Low Temp)	linear ft	$ 200.00
90	R-A9	New Refrigeration Display Case with Doors (Medium Temp)	linear ft	$ 150.00
91	R-A10	New High Eff. Refrigeration Display Case with Special Doors (Low Temp)	linear ft	$ 200.00
92	R-A11	Auto-Closer for Main Cooler Doors	closer	$ 40.00
93	R-A12	Auto-Closer for Main Freezer Doors	closer	$ 50.00
94	R-A13	Special Doors with Low/No Anti-Sweat Heat on Low Temp Display Case	door	$ 50.00
95	R-A14	Efficient Evaporator Fan Motor - Electronically Controlled Motor (ECM)	motor	$ 20.00
96	R-A15	Efficient Evaporator Fan Motor - Permanent Split Capacitor (PSC) Motor	motor	$ 20.00
97	R-A16	Insulate Bare Suction Pipes	linear ft	$ 1.00
98	R-A17	Evaporative Fans Controller for Walk-in Coolers	controller	$ 75.00
99	R-A18	Vending Machine Controller	controller	$ 90.00
Office				
100	O-A1	Plug Load Occupancy Sensor	sensor	$7.00
101	O-A2	Network Power Management Enabling	PC	$15.00
102	O-A3	High Efficiency Copier	unit	$100.00

Table B-2. Prescriptive Incentive Amounts for Itemized Measures (Cont.)

PRESCRIPTIVE INCENTIVE AMOUNTS FOR ITEMIZED MEASURES				
Line	ID #	Measure Description - See Terms and Conditions for description of measures	Units	$/Units
Premium Efficiency Motor Measures				
103	M-1	Motors 1 HP	Motor	$35.00
104	M-2	Motors 1.5 HP	Motor	$35.00
105	M-3	Motors 2 HP	Motor	$35.00
106	M-4	Motors 3 HP	Motor	$40.00
107	M-5	Motors 5 HP	Motor	$50.00
108	M-6	Motors 7.5 HP	Motor	$60.00
109	M-7	Motors 10 HP	Motor	$70.00
110	M-8	Motors 15 HP	Motor	$80.00
111	M-9	Motors 20 HP	Motor	$90.00
112	M-10	Motors 25 HP	Motor	$135.00
113	M-11	Motors 30 HP	Motor	$230.00
114	M-12	Motors 40 HP	Motor	$300.00
115	M-13	Motors 50 HP	Motor	$320.00
116	M-14	Motors 60 HP	Motor	$355.00
117	M-15	Motors 75 HP	Motor	$540.00
118	M-16	Motors 100 HP	Motor	$720.00
119	M-17	Motors 125 HP	Motor	$945.00
120	M-18	Motors 150 HP	Motor	$1,260.00
121	M-19	Motors 200 HP	Motor	$1,260.00

Appendix C

Program Descriptions, Goals and Budgets

Table C-1. Residential Energy Efficiency Rebate Program Goals and Budget

	Program Year	**2009**	**2010**	**2011**	**2012**	**Total**
Projected Program Budget	Incentives	1,489,038	2,978,075	2,978,075	2,978,075	10,423,264
	Admin	744,519	744,519	744,519	744,519	2,978,075
Projected Program Impacts	On-Peak Demand Reduction (kW)	7,845	15690	15690	15690	54,916
	Energy Savings (kWh)	16,874,440	33,748,881	33,748,881	33,748,881	118,121,083

Table C-2. Schools Energy Pledge Program Goals and Budget

	Program Year	***2009***	***2010***	***2011***	***2012***	**Total**
Projected Program Budget	Incentives	90,000	180,000	180,000	180,000	630,000
	Admin	342,667	342,667	342,667	342,667	1,370,667
Projected Program Impacts	On-Peak Demand Reduction (kW)	608	1215	1215	1215	4,253
	Energy Savings (kWh)	675,000	1,350,000	1,350,000	1,350,000	4,725,000

Table C-3. Residential Refrigerator Recycling Program Goals and Budget

	Program Year	**2009**	**2010**	**2011**	**2012**	**Total**
Projected Program Budget	Incentives	209,056	418,112	418,112	418,112	1,463,391
	Admin	104,528	104,528	104,528	104,528	418,112
Projected Program Impacts	On-Peak Demand Reduction (kW)	415	831	831	831	2,908
	Energy Savings (kWh)	1,666,834	3,333,669	3,333,669	3,333,669	11,667,840

Table C-4. Residential Low Income Program Goals and Budget

	Program Year	**2009**	**2010**	**2011**	**2012**	**Total**
Projected Program Budget	Incentives	547,150	1,094,299	1,094,299	1,094,299	3,830,048
	Admin	273,575	273,575	273,575	273,575	1,094,299
Projected Program Impacts	On-Peak Demand Reduction (kW)	1,751	3501	3501	3501	12,254
	Energy Savings (kWh)	4,293,586	8,587,173	8,587,173	8,587,173	30,055,105

Table C-5. Commercial Umbrella Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	229,065	458,131	458,131	458,131	1,603,457
	Admin	114,533	114,533	114,533	114,533	458,131
Projected Program Impacts	On-Peak Demand Reduction (kW)	575	1151	1151	1151	4,027
	Energy Savings (kWh)	2,681,269	5,362,539	5,362,539	5,362,539	18,768,885

Table C-6. Commercial Office Program Goals and Budget

	Program Year	**2009**	**2010**	**2011**	**2012**	**Total**
Projected Program Budget	Incentives	1,317,126	2,634,251	2,634,251	2,634,251	9,219,880
	Admin	658,563	658,563	658,563	658,563	2,634,251
Projected Program Impacts	On-Peak Demand Reduction (kW)	3,170	6340	6340	6340	22,189
	Energy Savings (kWh)	15,417,298	30,834,596	30,834,596	30,834,596	108,521,087

Table C-7. Commercial Retail Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	529,714	1,059,427	1,059,427	1,059,427	3,707,995
	Admin	264,857	264,857	264,857	264,857	1,059,427
Projected Program Impacts	On-Peak Demand Reduction (kW)	1,330	2661	2661	2661	9,312
	Energy Savings (kWh)	6,200,435	12,400,870	12,400,870	12,400,870	43,403,046

Table C-8. Commercial Health Care Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	486,764	973,528	973,528	973,528	3,407,347
	Admin	243,382	243,382	243,382	243,382	973,528
Projected Program Impacts	On-Peak Demand Reduction (kW)	1,222	2445	2445	2445	8,557
	Energy Savings (kWh)	5,697,697	11,395,394	11,395,394	11,395,394	39,883,880

Table C-9. Commercial Public Agency Partnership Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	1,158,267	2,316,535	2,316,535	2,316,535	8,107,871
	Admin	579,134	579,134	579,134	579,134	2,316,535
Projected Program Impacts	On-Peak Demand Reduction (kW)	2,884	5768	5768	5768	20,187
	Energy Savings (kWh)	8,973,397	17,946,794	17,946,794	17,946,794	62,813,778

Table C-10. Industrial Umbrella Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	112,978	148,025	148,025	148,025	557,051
	Admin	125,609	164,574	164,574	164,574	619,330
Projected Program Impacts	On-Peak Demand Reduction (kW)	194	388	388	388	1,360
	Energy Savings (kWh)	1,257,611	2,515,222	2,515,222	2,515,222	8,803,277

Table C-10. Industrial Chemical Products Program Goals and Budget

	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	279,776	366,566	366,566	366,566	1,379,476
	Admin	311,056	407,549	407,549	407,549	1,533,703
Projected Program Impacts	On-Peak Demand Reduction (kW)	481	962	962	962	3,367
	Energy Savings (kWh)	3,114,336	6,228,671	6,228,671	6,228,671	21,800,349

Table C-11. Industrial Primary Metals Program Goals and Budget

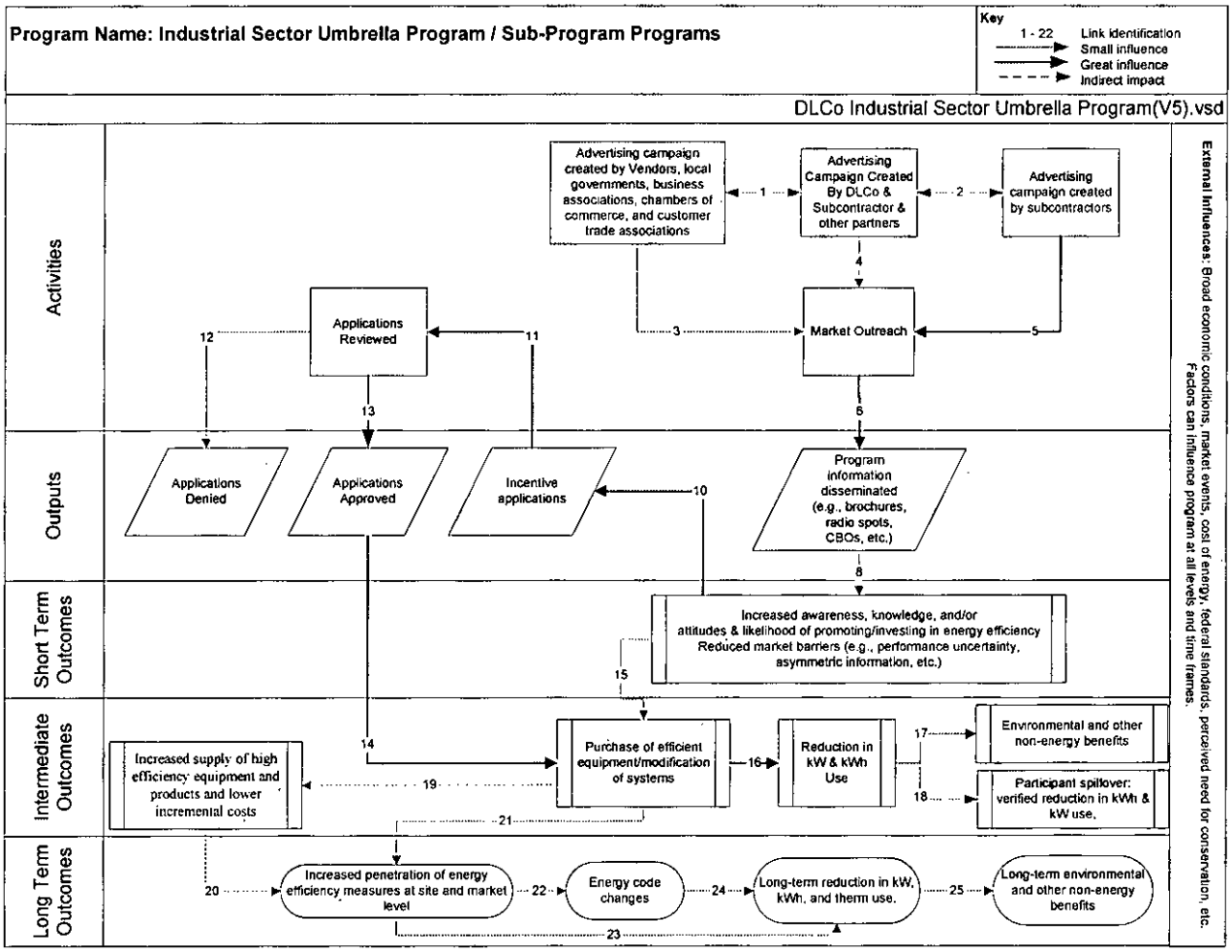
	Program Year	2009	2010	2011	2012	Total
Projected Program Budget	Incentives	769,851	1,008,668	1,008,668	1,008,668	3,795,853
	Admin	855,921	1,121,438	1,121,438	1,121,438	4,220,235
Projected Program Impacts	On-Peak Demand Reduction (kW)	1,324	2647	2647	2647	9,265
	Energy Savings (kWh)	8,569,603	17,139,207	17,139,207	17,139,207	59,987,224

Table C-12. Industrial Mixed Segments Program Goals and Budget

	Program Year	**2009**	**2010**	**2011**	**2012**	**Total**
Projected Program Budget	Incentives	249,615	327,048	327,048	327,048	1,230,759
	Admin	277,522	363,613	363,613	363,613	1,368,360
Projected Program Impacts	On-Peak Demand Reduction (kW)	429	858	858	858	3,004
	Energy Savings (kWh)	2,778,590	5,557,180	5,557,180	5,557,180	19,450,130

Appendix D

Figure D-1: Commercial / Industrial Sector Logic Model



Appendix E

Residential Logic Models

Figure E-1. Low Income Program Logic Model

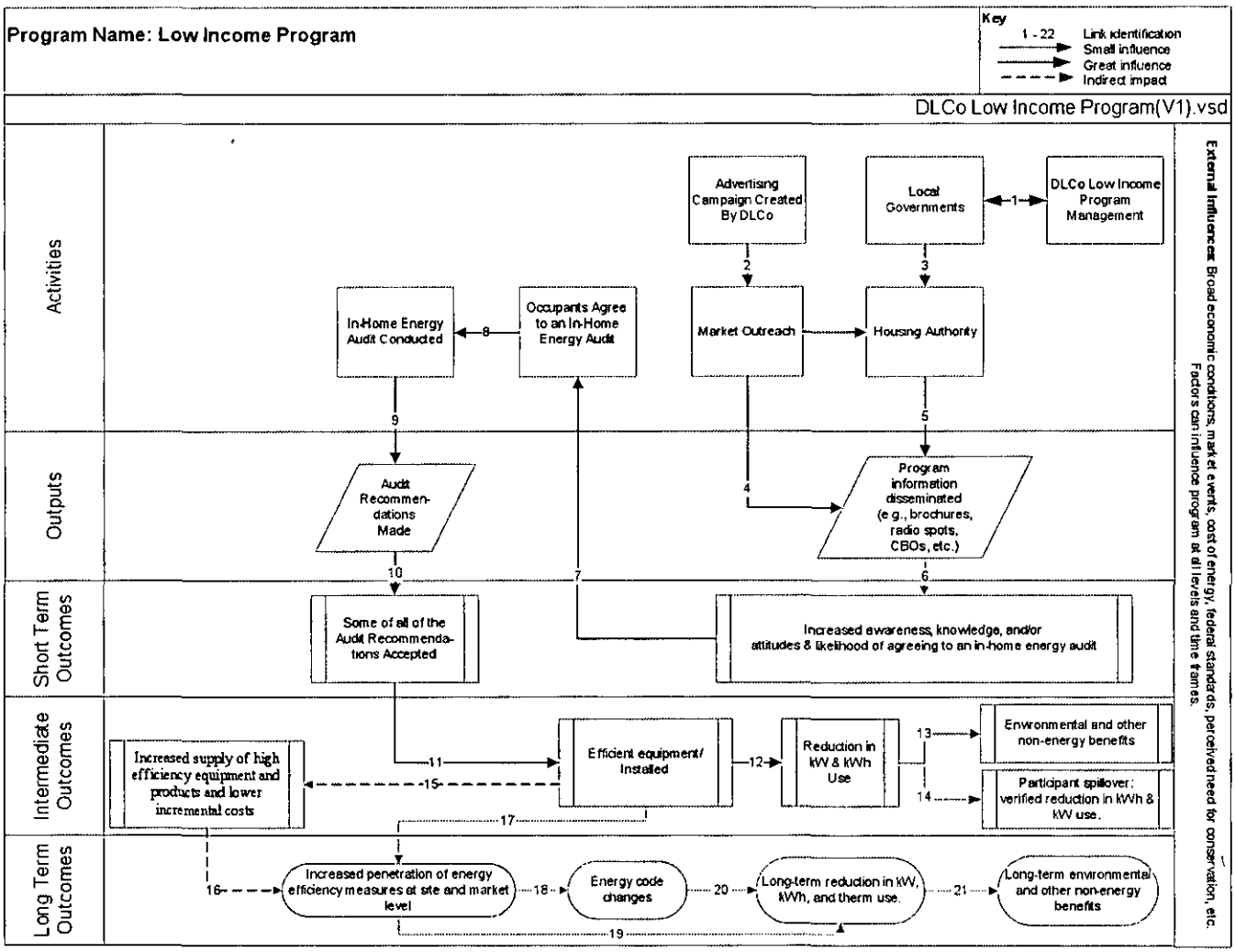


Figure E-2. Residential Rebate Program Logic Model

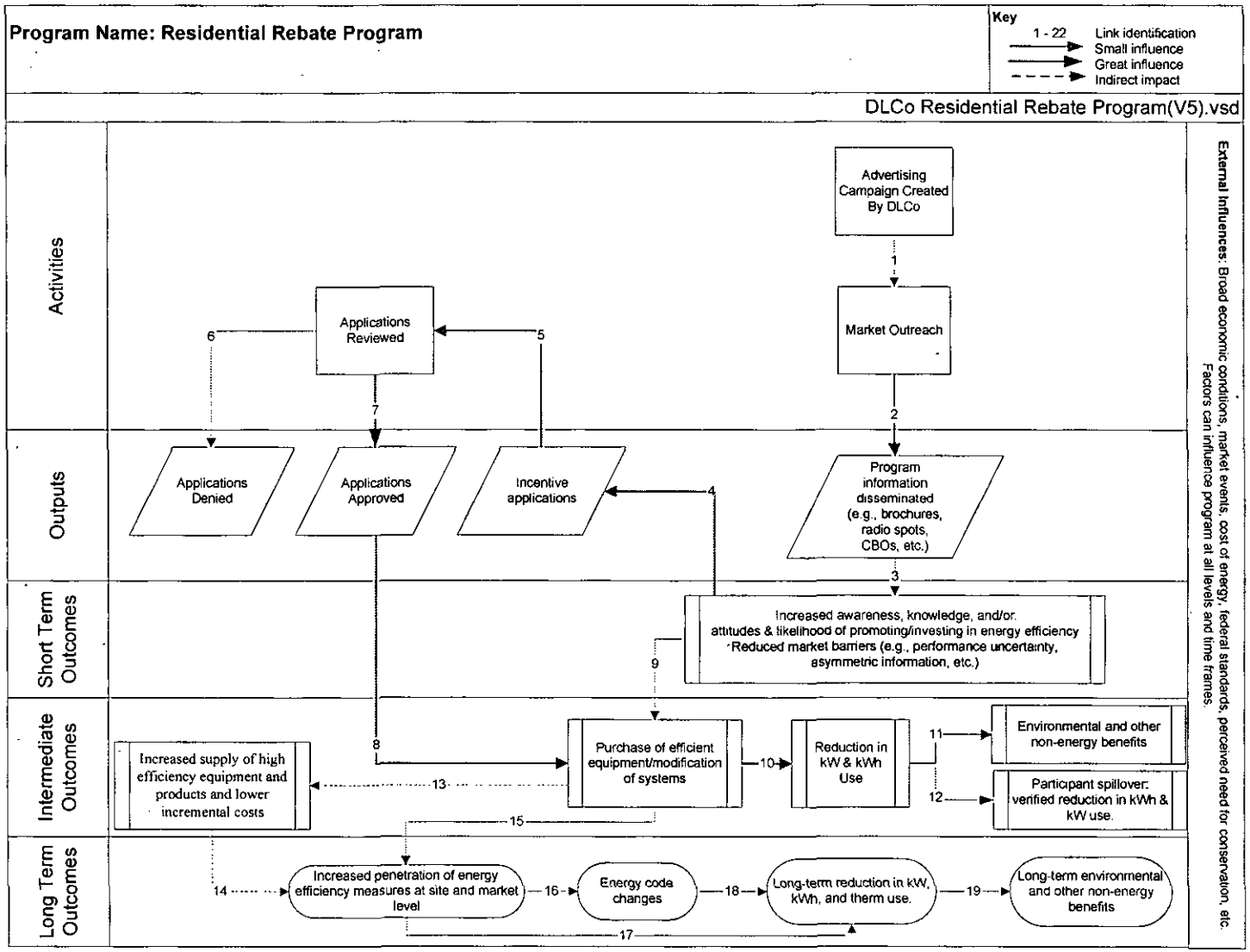


Figure E-3. Schools Energy Pledge Program Logic Model

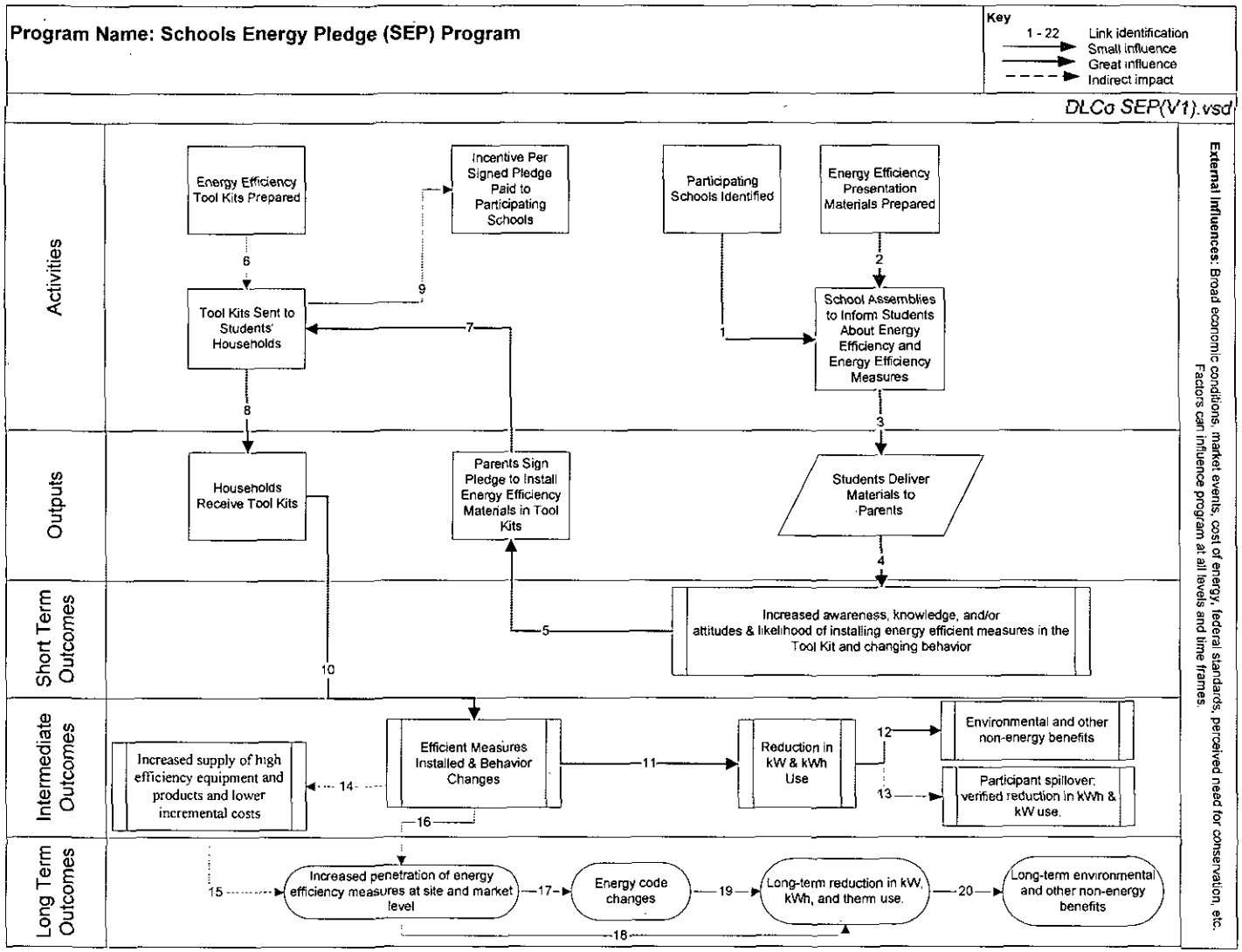
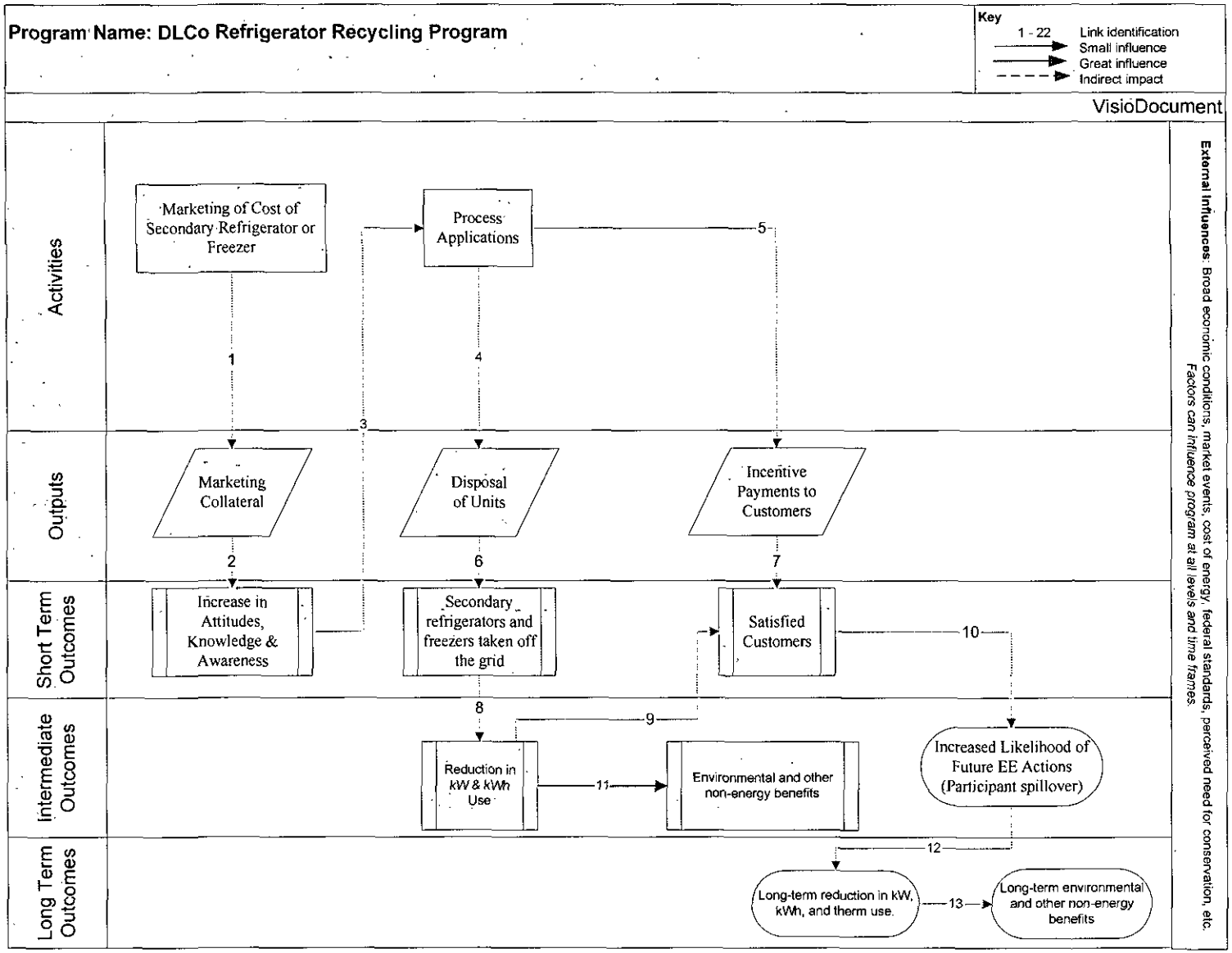


Figure E-4: Refrigerator Recycling Program Logic Model



Appendix F

Cost and Benefits from Filed Program Plans

Table F-1: Portfolio Summary of Lifetime Costs and Benefits

Portfolio	Discount Rate	Total Discounted Lifetime Costs ($000)	Total Discounted Lifetime Benefits ($000)	Total Discounted Net Lifetime Benefits ($000)	TRC
Residential *(exclusive of Low-Income)*	6.9%	$15,022,964	$95,632,188	$80,609,225	3.0
Residential Low- Income	6.9%	$4,131,925	$16,933,805	$12,801,880	2.3
Commercial/ Industrial Small	6.9%	$8,068,451	$55,005,460	$46,937,009	2.9
Commercial/ Industrial Large	6.9%	$34,701,408	$204,662,623	$169,961,215	2.9
Governmental / Non-Profit	6.9%	$8,746,918	$37,827,759	$29,080,841	2.5
Total Energy Efficiency	6.9%	$70,671,665	$410,061,835	$339,390,170	2.8
Res. A/C Cycling	6.9%	$2,375,511	$3,124,717	$749,206	1.3
Small C&I A/C Cycling	6.9%	$807,412	$1,421,451	$614,040	1.8
Large C&I DR	6.9%	$457,519	$1,998,226	$1,540,706	4.4
Total DR	6.9%	$3,640,442	$6,544,394	$2,903,952	1.8
EE and DR	6.9%	$74,312,107	$416,606,229	$342,294,122	2.8

Appendix G

Common Information Required Across All Evaluation Reports

A. **Cover** - All evaluation reports will contain the following information on the report cover of both the electronic and hard copy files:

   a. Report title that reflects the type(s) of evaluation(s) being conducted (e.g., Energy and Demand Impact Evaluation, Process Evaluation, Effective Useful Life Evaluation, Codes and Standards Program Evaluation, Market Effects Evaluation, or Market Effects Evaluation);

   b. Official name of the program(s) as recorded in the PUC's program tracking system;

   c. Date of the evaluation report;

   d. Name of the organization conducting the evaluation;

   e. Name of the organization administering the evaluation;

   f. Name of the organization administering the program; and

   g. Name of the organization implementing the program

B. **Title Page** –The title page of both hard copy and electronic formats must include the following information:

   a. The same information provided on the report cover, plus the following:

   b. Name of the organization conducting the evaluation and full contact information for the evaluation lead(s) responsible for the study;

   c. Name of the organization administering the evaluation and full contact information for the lead DLCo administrator; and

   d. Name of the organization implementing the program and full contact information for the lead program director or manager.

   e. (Contact information should include individual's name, address, phone number, fax number and e-mail address.)

C. **Abstract** - Following the title page, the report will include a report abstract. The abstract should be less than 200 words and include important key words that allow search engines to locate the report during routine searches.

D. **Table of Contents**

E. **Executive Summary** - This section will very briefly present a review of the evaluation findings and the study's recommendations for program change (no more than 1-3 pages). The findings and recommendations included in the summary will reference the primary text location within the report where each finding or recommendation is analyzed and presented.

F. **Introduction and Purpose of the Study** - This section will give a summary overview of the evaluation and the evaluation objectives and researchable issues. This section will discuss if each of the researchable

issues presented in the evaluation plan was addressed in the evaluation report and identify if any issues were not addressed and provide the reason why not.

G. **Description of Programs Covered in Study** - This section will provide a description of the program(s) being evaluated in enough detail that readers can understand the program(s) and have an understanding of the program and program components that delivered the evaluation identified effects. This section will also include:

   a. *Counts of the number of participants at the end of each program year for each program*
   b. *Estimates of the technical potential (measure counts) for each measure covered by the program.* This market potential will estimate the number of units that could be installed by the program if the technical potential was achieved for each measure covered by the program within the program's target market. The technical potential will be provided by the program DLCo and will be included in the data request delivered to the DLCo. If the DLCo does not provide the data, the report will so stipulate, identifying the data requested and the reason why the data could not be provided. If the DLCo cannot provide the requested technical potential data, the report may not be able to discuss the technical potential and the fraction of this potential achieved by the program.

H. **Study Methodology** - This section will describe the evaluation approach in enough detail to allow a repetition of the study in a way that would produce identical or similar findings. This study will include following:

   a. Overview of the approach;
   b. Questions addressed in the evaluation;
   c. The Protocols and rigor levels assigned to the study;
   d. Description of the study methodology;
   e. How the study meets or exceeds Protocol requirements;
   f. How the study addresses issues presented in the Protocols regarding the methods;
   g. Sampling methodology;
   h. Expected precision or power analysis results (as required by the Sampling & Uncertainty Protocol);
   i. Sample descriptions (including population characteristics, contact information availability and sample disposition rates);
   j. Description of the baseline; Sources of baseline data; Description of measures; and
   k. Assumptions on measure performance (including data sources).

I. **Reliability Assessment of the Study Findings** – This will include a discussion of the threats to validity and sources of bias and the approaches used to reduce threats, reduce bias and increase the reliability of the findings, and a discussion of study findings precision levels. This section of the report will focus its presentation and discussion on the targeted and achieved precision levels for the key findings presented, the sources of uncertainty in the approaches used and in the key findings presented, and a discussion of how the evaluation was structured and managed to reduce or control for the sources of uncertainty.

J. **Detailed Study Findings** - This section will present the study findings in detail.

K. **Recommendations for Program Changes** – If applicable. This section will be a detailed identification and discussion of the recommended changes, including the anticipated cost of the recommended change and the expected effect of the change on the operations and cost-effectiveness of the program(s). This section need only be added if changes have been identified during the evaluation process.

L. **Appendix A** - Appendix A will be a presentation of the performance metrics that apply to the types of programs being evaluated and a presentation of the evaluation's assessment of the performance of the program for each of the performance metrics covered in the evaluation plan.

M. **Appendix B** - Appendix B will present and discuss the success and timing of the data requests provided to DLCo and the amount of time between the response and the receipt of the requested data. This section will discuss the success in obtaining the information needed to conduct the evaluations and identify any request made that were not provided in accordance with the provisions in this Evaluation Reporting Plan. If information was requested and not provided, the appendix should discuss the implications of not obtaining the data on the accuracy and reliability of the study findings.

Appendix H

Prescriptive Measure Data Tracking Requirements for Residential Measures

Form Data	Units	Unit Qty	Unit Description		Unit Rebate	Invoice Cost	Rebate Amount
es							
Dehumidifier	Dehumidifier				$50.00		
			Manufacturer: (Req'd for ES				
			Model No.: (Req'd for ES Verification)				
			Production Capacity Pints/Day				
Energy Star Freezer	Freezer				$11.00		
(check box best			1. Upright with manual defrost				
			2. Upright with automatic defrost				
			3. Chest Freezer				
			4. Compact Upright with manual				
			5. Compact Upright with automatic				
			6. Compact Chest Freezer				
Energy Star Refrigerator	*Refrigerator*				*$10.00*		
			Manufacturer: (Req'd for ES				
			Model No.: (Req'd for ES Verification)				
(check box best describing)			1. Manual Defrost				
			2. Partial Automatic Defrost				
			3. Top mount freezer without door ice				
			4. Side mount freezer without door ice				
			5. Bottom mount freezer without door				
			5. Top mount freezer with door ice				
			6. Side mount freezer with door ice				
Energy Star Room Air	A-C Units				$10.00		
			Manufacturer: (Req'd for ES				
			Model No.: (Req'd for ES Verification)				
			Btu/hr				
			EER				
Central Air Conditioner or	Tons				$32.50		
			Appliance Type:				
			Seasonal Energy Efficiency Ratio (SEER)				
			Btu/Hr				
			DLC Project Number:				
Duct Testing & Repair							

Form Data	Units	Unit Qty	Unit Description		Unit Rebate	Invoice Cost	Rebate Amount
Duct Testing	Test		Tested Duct CFM @ 50 Pa		$35.00		
	Conditioned		Final Duct CFM @ 50 Pa		$0.13		
			DLC Project Number:				
Duct Insulation	Conditioned		Dwelling total conditioned ft^2		$0.12		
			Existing Duct Insulation R-Value				
			Final Duct Insulation R-Value				
			DLC Project Number:				
Furnace w/High-Efficiency	Furnace		Manufacturer: (Req'd for ES		$65.00		
			Model No.: (Req'd for ES Verification)				
			DLC Project Number:				
Programmable Thermostat (check one box)	Thermostat				$50.00		
			Electric space heating				
			Electric space heating & A-C				
			N-Gas/propane/oil space heating				
			Non-electric space heating & A-C				
Whole House Fan	Fan		Manufacturer:		$130.00		
			Model No.:				
			Fan cubic feet per minute (CFM) Rating				
CFL: Screw-In 5 - 25 watts	Lamp		Lamp Wattage (0-25)		$1.75		
CFL: Screw-In ≥ 26 watts	Lamp		Lamp Wattage (26-215)		$3.50		
Interior CFL Fixture, 5-25	Fixture				$9.00		
Interior CFL Fixture, 26-65	Fixture				$12.50		
ES Outdoor Fixture	Fixture				$13.00		
ES Torchiere	Torchiere				$18.40		
Linear Fluorescent T8	Lamp				$1.25		
Faucet Aerator (check one box)	Aerator				$3.50		
			Bathroom faucet aerator				
			Kitchen faucet aerator				
Low Flow Showerhead	Showerhead		Gallons per minute flow rate		$10.00		

Form Data	Units	Unit Qty	Unit Description		Unit Rebate	Invoice Cost	Rebate Amount
Water Heater Pipe Wrap	Water		Gallons Capacity Electric Water Heater		$1.65		
Solar Water Heat	Water				$300.00		
			Brand				
			Model				
			Solar Fraction				
			Gallons Capacity Electric Water Heater				
Ceiling Insulation	Square foot		Original R-Value		$0.40		
			Final R-Value				
			Electric space heating				
			Electric space heating and air				
Occupancy sensor lighting	Control		Manufacturer		$12.00		
			Model No.				
High Efficiency Pool Pump	Motor w/Controls				$60.00		
			Variable Speed Pool Pump				
			Variable Speed Pool Pump Model				
			If Applicable (see qualifying products				
			Variable Speed Controller				
			Variable Speed Controller Model				

Appendix I - Prescriptive Measure Data Tracking Requirements for C&I Measures

ID	Measure	Units	Unit Qty	Unit Description		Unit Rebate	Invoice Cost	Rebate Amount
L-A1	CFL: Screw-In	Lamp		New Lamp Wattage Building Type		$1.75		
L-A2	Screw-in CFL ≥	Lamp		New Lamp Wattage Building Type		$3.50		
L-B1	Interior CFL	Fixture		New Fixture Watts Building Type		$9.00		
L-B2	Interior CFL	Fixture		New Fixture Watts Building Type		$12.50		
L-B3	Interior CFL	Fixture		New Fixture Watts Building Type		$18.00		
L-B4	Interior CFL	Fixture		New Fixture Watts Building Type		$20.00		
L-B5	Exterior CFL	Fixture		New Fixture Watts Building Type		$17.00		
L-C1a	Cold Cathode	Lamp		New Lamp Wattage Building Type		$2.00		
L-C1b	Cold Cathode	Lamp		New Lamp Wattage Building Type		$6.50		
L-C2	Integrated Ballast Ceramic	Lamp		New Lamp Wattage Building Type		$25.00		
L-C3	Screw-in CFL Reflector	Lamp		New Lamp Wattage Building Type		$5.00		
L-D1	Induction	Fixture		New Fixture Watts Building Type		$35.00		
L-D2	Induction	Fixture		New Fixture Watts Building Type		$50.00		
L-E1	T5 - 4' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$43.50		

L-E2	T5 - 4' 3 Lamp -	lamps & ballast		New Lamp Code Building Type		$75.00		
L-E3	T5 - 4' 4 Lamp -	lamps & ballast		New Lamp Code Building Type		$83.00		
L-E4	T5 - 4' 6 Lamp -	lamps & ballast		New Lamp Code Building Type		$93.50		
L-E5	T8 - 2' 1 Lamp -	lamp & ballast		New Lamp Code Building Type		$7.50		
L-E6	T8 - 2' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$11.75		
L-E7	T8 - 2' 3 Lamp -	lamps & ballast		New Lamp Code Building Type		$17.50		
L-E8	T8 - 2' 4 Lamp -	lamps & ballast		New Lamp Code Building Type		$18.50		
L-E9	T8 - 3' 1 Lamp -	lamp & ballast		New Lamp Code Building Type		$10.75		
L-E10	T8 - 3' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$11.75		
L-E11	T8 - 3' 3 Lamp -	lamps & ballast		New Lamp Code Building Type		$17.50		
L-E12	T8 - 3' 4 Lamp -	lamps & ballast		New Lamp Code Building Type		$18.50		
L-E13	T8 4' 1 Lamp -	lamp & ballast		New Lamp Code Building Type		$10.75		
L-E14	T8 - 4' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$12.00		
L-E15	T8 - 4' 3 Lamp -	lamps & ballast		New Lamp Code Building Type		$17.50		
L-E16	T8 - 4' 4 Lamp	lamps & ballast		New Lamp Code Building Type		$18.50		

L-E17	T8 - 4' 6 Lamp	lamps & ballast		New Lamp Code Building Type		$37.50	
L-E18	T8 - 4' 8 Lamp -	lamps & ballast		New Lamp Code Building Type		$79.00	
L-E19	T8 - 8' 1 Lamp	lamps & ballast		New Lamp Code Building Type		$16.00	
L-E20	T8 - 8' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$17.50	
L-E21	T8 - 8' 4 Lamp	lamps & ballast		New Lamp Code Building Type		$34.75	
L-E22	T8 - 8' 1 Lamp -	lamps & ballast		New Lamp Code Building Type		$21.50	
L-E23	T8 - 8' 2 Lamp -	lamps & ballast		New Lamp Code Building Type		$23.50	
L-E24	T8 - 8' 4 Lamp -	lamps & ballast		New Lamp Code Building Type		$34.00	
L-F1	2' Linear	lamps & ballast		New Lamp Code Building Type		$4.00	
L-F2	3' Linear	lamps & ballast		New Lamp Code Building Type		$4.00	
L-F3	4' Linear	lamps & ballast		New Lamp Code Building Type		$6.00	
L-F4	8' Linear	lamps & ballast		New Lamp Code Building Type		$9.00	
L-G1	Exterior Pulse-Start Metal	Fixture		New Fixture Watts Building Type		$60.00	

Existing : Wattage: ____
Type: ☐Incandescent
☐Metal Halide ☐

L-G2	Exterior Pulse-Start Metal Halide Fixtures ~ 320 W	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$95.00	
L-G3	Interior Pulse Start Metal	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$40.00	
L-G4	Interior Pulse Start Metal	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$52.00	
L-G5	Interior Pulse Start Metal	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$55.00	
L-G6	Interior Pulse Start Metal	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$55.00	
L-G7	Interior Pulse Start Metal	Fixture		New Fixture Watts Building Type Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐		$55.00	
L-G8	Interior Pulse	Fixture		New Fixture Watts		$114.00	

				Building Type				
				Existing : Wattage: Type: ☐Incandescent ☐Metal Halide ☐				
L-H1	Wall or Ceiling-mounted	sensor		Controlled Load - Building Type		$16.50		
L-H2	Wall or Ceiling-mounted	sensor		Controlled Load - Building Type		$20.00		
L-H3	High Bay	sensor		Controlled Load - Building Type		$40.00		
L-H4	Electronic Ballast,	ballast		Controlled Load - Building Type		$10.00		
L-H5	Photocell	photocell		Controlled Load -		$15.00		
L-H6	Time Clock	time clock		Controlled Load -		$75.00		
L-J1	High Efficiency Exit Sign:	fixture		New Fixture Code Existing Equipment		$27.00		
L-J2	LED Channel Signage (Red),	linear foot		Building Type Existing Equipment		$4.00		
L-J3	LED Channel Signage (Red),	linear foot		Building Type Existing Equipment		$6.00		
L-J4	LED Channel Signage (Red),	linear foot		Building Type Existing Equipment		$2.00		
L-J5	LED Channel Signage (Red),	linear foot		Building Type Existing Equipment		$3.00		
S-A1	Variable Frequency	HP		Building Type		$150.00		

S-A2	Variable Frequency	HP		Building Type		$80.00		
S-A3	Packaged Terminal A-C,	Ton		Btu/hr capacity Rated EER		$45.00		
S-A4	Packaged Terminal A-C,	Ton		Btu/hr capacity Rated EER		$60.00		
S-A5	Packaged Terminal A-C,	Ton		Btu/hr capacity Rated EER		$75.00		
F-A1	Steamer: Boilerless/Conn	steamer		Manufacturer Model Number		$750.00		
F-A2	Insulated Holding	cabinet		Manufacturer Model Number		$300.00		
F-A3	Insulated Holding	cabinet		Manufacturer Model Number		$250.00		
F-A4	Insulated Holding	cabinet		Manufacturer Model Number		$200.00		
F-A5	Grill to Order Production Line	System		Steam Production Dry Production		$1,500.00		
F-B1	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$300.00		
F-B2	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$300.00		
F-B3	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$300.00		
F-B4	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$300.00		
F-B5	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$400.00		

F-B6	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$500.00	
F-B7	Commercial Ice Machines, Air	Ice Machine		Capacity pounds of		$500.00	
F-C1	Solid-Door	Freezer		Internal Volume ft^3 Annual Energy Use		$75.00	
F-C2	Solid-Door	Freezer		Internal Volume ft^3 Annual Energy Use		$100.00	
F-C3	Solid-Door	Freezer		Internal Volume ft^3 Annual Energy Use		$150.00	
F-C4	Solid-Door	Refrigerator		Internal Volume ft^3 Annual Energy Use		$225.00	
F-C5	Solid-Door	Refrigerator		Internal Volume ft^3 Annual Energy Use		$100.00	
R-A1	Night Covers for Open	linear ft		Mfg case rating Compressor EER		$9.00	
R-A2	Night Covers for Open	linear ft		Mfg case rating Compressor EER		$9.00	
R-A3	Strip Curtains	square ft		Building Type Restaurant Small Grocery Medium/Large		$3.00	
R-A4	Door Gaskets	linear ft		Building Type Restaurant Small Grocery Medium/Large		$4.00	
R-A5	Door Gaskets	linear ft		Building Type Restaurant Small Grocery Medium/Large		$4.00	

R-A6	Walk-in Cooler	linear ft		Building Type Restaurant Small Grocery Medium/Large		$4.00		
R-A7	Anti-Sweat (per linear	linear ft		Manufacturer Model No.		$14.00		
R-A8	New Refrigeration	linear ft		Case Manufacturer Mfg case rating Compressor EER Anti-Sweat Heater		$200.00		
R-A9	New Refrigeration	linear ft		Case Manufacturer Mfg case rating Compressor EER Anti-Sweat Heater		$150.00		
R-A10	New High Eff. Refrigeration	linear ft		Case Manufacturer Mfg case rating Compressor EER Anti-Sweat Heater		$200.00		
R-A11	Auto-Closer for	closer		Cooler ft^2		$40.00		
R-A12	Auto-Closer for	closer		Freezer ft^2		$50.00		
R-A13	Special Doors with Low/No	door		Case Manufacturer Mfg case rating Compressor EER Anti-Sweat Heater		$50.00		
R-A14	Efficient Evaporator Fan	motor		Reduction in motor Compressor EER No. Motors per case Display case length		$20.00		
R-A15	Efficient Evaporator Fan	motor		Reduction in motor Compressor EER		$20.00		

				No. Motors per case			
				Display case length			
R-A16	Insulate Bare	linear ft		Suction pipe		$1.00	
R-A17	Evaporative Fans Controller	controller		Number evaporators		$75.00	
				Fan HP			
				Fan motor			
				Fan motor			
				Existing Fan			
				Compressor duty			
R-A18	Vending	controller		Can capacity		$90.00	
O-A1	Plug Load	sensor		Description of		$7.00	
O-A2	Network Power	PC		Desk-top PCs		$15.00	
				Lap-top PCs			
O-A3	High Efficiency	unit				$100.00	
				Brand			
				Model			
				TEC Rating			

UPS CampusShip: View/Print Label

1. **Print the label(s):** Select the Print button on the print dialog box that appears. Note: If your browser does not support this function select Print from the File menu to print the label.

2. ***Fold the printed label at the solid line below.*** *Place the label in a UPS Shipping Pouch. If you* do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers without a Daily Pickup
   Schedule a same day or future day Pickup to have a UPS driver pickup all your CampusShip packages.
   Hand the package to any UPS driver in your area.
   Take your package to any location of The UPS Store®, UPS Drop Box, UPS Customer Center, UPS Alliances (Office Depot® or Staples®) or Authorized Shipping Outlet near you. Items sent via UPS Return Services℠ (including via Ground) are also accepted at Drop Boxes.
   To find the location nearest you, please visit the Resources area of CampusShip and select UPS Locations.

   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

FOLD HERE