APPENDIX A - LITERATURE REVIEW FOR
NATIONAL ENERGY EFFICIENCY BEST PRACTICES STUDY

This literature review was conducted and complied in summer 2003.

I.   REPORT SUMMARIES

1.   Eto, J., S. Kito, L. Shown, and R. Sonnenblick 1995. "**Where Did the Money Go? The Cost and Performance of the Largest Commercial Sector DSM Programs.**" LBL-38201 Lawrence Berkeley National Laboratory, Berkeley, CA.

This report calculates and compares the total resource cost for 40 of the largest 1992 commercial sector DSM programs. The calculation includes the participating customer's cost contribution to energy saving measures and all utility costs, including incentives received by customer, program administrative and overhead costs, measurement and evaluation costs and shareholder incentives paid to the utility.

The authors conducted exploratory analyses seeking to explain factors that help explain variations in program costs. They found **program type** and **program size** to be statistically significant factors, and their overall regression equations explained about 30% of the variance in the TRC of energy savings. The authors point out that measuring the cost of energy savings is difficult because accounting practices and conventions differ among utilities. In particular, information on participant costs is especially difficult to collect but is important: these costs account for almost a third of the TRC of energy savings. The authors also decided not to adjust the savings estimates because they found that differences in savings evaluation methods were not statistically correlated with changes in program costs, and because any adjustments would have had to be supported with very detailed examinations of assumptions, methods and underlying data.

Overall, the authors found that taken as a whole, the programs have been highly cost effective when compared to the avoided costs faced by the utilities when the programs where developed.

2.   Peters, J. 2002. "**Best Practices from Energy Efficiency Organizations and Programs**." Energy Trust of Oregon. Portland, OR.

This report presents the findings of a survey of best practices for organizational practices and programs in the energy efficiency industry for the Energy Trust of Oregon. The study contacted key informants to obtain over 70 program nominations. These programs were then reduced to 62 programs or practices targeted for further analysis. In the end, 45 programs or practices were summarized and analyzed for transferability to the Energy Trust.

The analysis was purely qualitative. The authors identified a list of key informants in conjunction with the Energy Trust of Oregon. These informants were contacted to compile a list of programs and organizational practices. Each organization or program

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manager was then interviewed to obtain a summary of the organization or program. The team was able to complete summaries on 45 programs or administrative practices.

The selected programs or organizations were divided into four categories: organizational practices, residential energy efficiency programs, commercial and industrial energy efficiency programs, and miscellaneous energy efficiency programs. The organizations were screened for best practices in communications, organization structure, performance metrics, subcontracting, measure screening, program delivery, project contracting, project screening, circuit riders, non-profit staffing, contracting procedures and staffing ratio. Each organizational practice was analyzed for transferability to the Energy Trust. The residential programs were screened for best practices in trade allies & community action programs, in financing incentives, education, marketing outreach and quality control. The commercial and industrial programs were screened for best practices in trade allies, financing incentives, application process, marketing outreach and quality control. Finally, the miscellaneous programs were screened for best practices in trade allies and caps, financing incentives, education, marketing outreach and quality control.

The report provides in-depth qualitative summaries of each program or organization, including a discussion of why the program or organization was nominated and an analysis of transferability to the Energy Trust of Oregon. The appendices contain the names of the nominating parties, as well as copies of the survey instruments.

The author points out that many of the programs nominated for best practices have been programs that took time to evolve to their current state and have had time to adapt to a changing environment. They concluded that programs must be designed to respond to current conditions and must have good staff or contractors to make a difference.

3.   West, P. 2002. "**Innovative Practices in Renewable Energy - A Review of Domestic and International Experience – Summary**." Energy Trust of Oregon. Portland, OR.

This report summarizes the finding of a review of international renewable energy efforts, conducted for the Energy Trust of Oregon. This qualitative analysis provides 16 individual program case studies and 5 individual administrative case studies, as well as an analysis of common pitfalls and remedies in the promotion of renewable resource programs.

Over 75 programs were initially catalogued. The list was reduced by applying various qualitative criteria:

- Incentives applicable to Oregon

- Technology consistent with the trust's mission

- Low incentives levels per kWh delivered

- High success rate of installations

- Market transformation and repeatability

- Addresses programs experienced elsewhere

- Ensures a wide technology and program mix in final selection

In addition, the authors also took into account industry input and recommendations from the Energy Trust and the Trust's Renewable Advisory Council to select the final cases.

In order to study administrative best practices, the Energy Trust provided a list of 10 administrative practices that were of interests. The authors then found 10 programs consistent with this list and qualitatively selected 5 for analysis.

In conclusion, the authors analyzed the selected programs and administrative agencies to identify major pitfalls to be avoided and remedies to use in developing effective renewable energy programs.

4.   York, D. and M. Kushler 2003. "**America's Best: Profiles of America's Leading Energy Efficiency Programs.**" ACEEE Report Number U032. American Council for an Energy Efficient Economy, Washington, DC.

This report summarizes ACEEE 's project to conduct a national review and assessment of current utility-sector energy efficiency efforts in order to identify exemplary programs that might be replicated by those in other jurisdictions. The intent of the project was to provide information about top quality programs and recognize those who are doing an excellent job in their energy efficiency efforts.

ACEEE sought programs of all types: resource acquisition, market transformation, industry collaboratives, and professional education. They also sought programs that served all customer classes and covered a wide variety of end-use technologies.

The programs were selected through solicited nominations from key contacts at public service commissions, utilities, state energy offices and other related organizations, as well as from national experts. In identifying exemplary programs, ACEEE asked the nominators to consider the following factors: **direct energy savings**, **market transforming effects**, **evaluation results**, **qualitative assessment**, **innovation** and **reliability**. The nominating panel did not necessarily select programs for awards in all categories of programs received. Rather, the selections were based on recognizing programs for their achievements and that offered excellent models for evaluation and replication.

ACEEE received about 130 nominations for programs. Program categories were not defined ahead of time to encourage submission of a wide variety of program types. As a result the panel received nominations from a wide variety of program types, and decided not to consider K-12 energy education programs as well as RD&D programs.

ACEEE received nominations from programs serving customers in a total of 31 states, and administered by a wide variety of organizations (from utilities to state governments to private businesses). The types of programs nominated also showed wide variation

along three main dimensions: (1) sector served, (2) targeted end-uses, and (3) program services.

ACEEE created two categories of awards: exemplary and honorable mention. In the end it issued awards in 20 categories, and issued exemplary and honorable mentions in some cases to multiple programs in each category.

ACEEE also observed a list of common traits in leading programs, including: using comprehensive approaches, providing customized services, focus tightly on a service or technology, providing financial incentives, using partnerships and collaboratives, and providing effective supporting services.

5.   **DEEP Survey Instruments Review**

The DEEP survey instruments are aimed to collect general program information such as program status, program objectives, program type and implementing agent, as well as specific and detailed information on program impacts, impact methodologies, program costs, program participation and documentation. The survey instruments break down the programs by sector (residential, commercial, industrial, agricultural and other) and subsectors. It also breaks down measures by end-use type (HVAC, Lighting, Water Heating, Motors, Building Envelope, Refrigeration, Demand Control and Other) and subtypes.

The data collection instruments seek to collect quantitative information on energy and demand effects, free riders and free drivers, utility costs (broken down by financial incentive type, administrative, M&V, planning, shareholder incentives and other), and non-utility costs (participant costs & other costs). The survey instruments are also designed to collect quantitative information on cost effectiveness and customer satisfaction.

The survey instrument is very detailed and comes with a well-documented set of instructions for completing the survey.

6.   **INDEEP Database Review**

The International Database on Energy Efficiency Programs (INDEEP) is a web-based searchable database of energy efficiency programs to aid utilities and government agencies in designing effective programs. The database, started in 1994 continues to operate and is available at http://dsm.iea.org/INDEEP/prog/home.asp.

INDEEP is a worldwide database, open to participation from any interested country. The database compiles simple summaries of participating programs. The programs appear to be cataloged with the following searchable information, where available:

Country
Implementation agency (i.e. utility, government, ESCO, etc.)
Name
Program Status (i.e. pilot vs. full-scale)
Evaluation Status (i.e. ongoing, completed, etc.)

Ongoing/Terminated
Energy Objectives (energy efficiency, load optimization or fuel switching)
Energy Source Affected
Energy Savings
Participation Rate
Residential Customer Target
Non-Residential Customer Target
Marketing Instruments (i.e. rebates, direct install, gifts, etc.)
Marketing Method (i.e. direct mail, energy audit, etc.)
Reason for DSM Activity (i.e. economic development, customer retention, etc.)
Program Type (i.e. market transformation, load control, appliance standard, etc.)

The results of a search provide program summaries in either text of pdf format, and list key program characteristics if available. The data appear to be dated.

The 4-page INDEEP data collection survey instruments can be found at: http://dsm.iea.org/NewDSM/Work/Tasks/1/Dci.html

7.   Nilsson, H. and Wene, C. 2001. "**Best Practices in Technology Deployment Policies**". Workshop on Good Practices in Policies and Measures, Copenhagen.

This article report on a project initiated by the IEA to find out if there are some success-factors for projects aiming at developing markets for a more efficient use of energy. The analysis focuses on the deployment of energy efficient technologies (rather than programs) in the European Unit, and uses CFL's as a case study. The findings suggest that successful programs have been developed over a long time, combine several policy issues and areas, reflect over they own results and rely on the force of the users (demand-driven).

The report does not compile or provide any specific information on energy efficient programs. The approach is market-based, i.e. looking at changes in demand, volume, cost and price to determine how successfully energy efficient technologies gain hold in a market. As such, it is of limited applicability to the study at hand.

8.   Mowris, R. and Associates, 1998. "**California Energy Efficiency Policy and Program Priorities**". Prepared for the California Board for Energy Efficiency.

This report presents the results of a study to review existing, new and proposed energy-efficiency programs in California and other states, in order to develop criteria, methodology and rules to make recommendations to the California Board for Energy Efficiency (CBEE). The analysis selected 170 programs and grouped them into 52 groups of like-programs. To these were added 8 new program concepts. Taken together, these represent 60 program types consisted of 28 programs for the residential sector, 17 for the non-residential sector, and 15 for the new construction sector.

The study then evaluated the programs for recommendation to the CBEE using the CPUC *Adopted Policy Rules for Energy Efficiency Activities*. The study evaluated programs for cost-effectiveness, market transformation, and balanced portfolios. It also developed specific rules to evaluate incentive programs, SPC programs and CPUC activities.

The study then characterized the programs as either being *highly recommended*, *recommended*, *recommended pending cost-effectiveness*, *recommended pending further study*, *merits consideration with redesign*, or *does not meet criteria*. Only one program (Large CIA Downstream Incentives) received a highly recommended citation. Most programs fell into the Recommended category, while a few where recommended pending cost-effectiveness, since a complete cost-effectiveness calculation was not possible due to missing data. Note that the study did not decompose the programs into key elements and evaluate those elements individually.

To facilitate the analysis, Mowris and Associates developed criteria for dividing programs into groups of like programs, and created a program summary template to describe each of the program types. The program categories are further discussed below in Section II.2, and the summary template can be found in the Mowris report.

The final report also contains summaries of recommendations across all programs by administrator area, one and a half page summaries of each program recommendations and reasons for recommendation, and a 3 to 4-page summary for each program type in an Appendix.

9. Wisconsin Powers & Light Company, 2002. " **Assessment of Shared Savings Program: Final Report**". Global Energy Partners, Lafayette, CA.

This report summarizes the results of an analysis of the Wisconsin Shared Savings Program and of a benchmarking review of nationwide Standard Performance Contracting (SPC) programs, to provide a context for understanding the efficacy of the shared savings program in Wisconsin.

As part of the benchmarking study, the authors review and compare SPC programs in California, New York, the Pacific Northwest, Massachusetts, Texas, New Jersey and Colorado. The analysis is qualitative in nature and not necessarily consistent across all states. The report does distill best practices and lessons learned in a few cases, particularly as they apply to the Wisconsin situation. Table 3-5 provides useful summary information on the SPC programs studied in the states mentioned above.

10. Rufo, M., Lee, A., Corfee, K. & Tobiasson, W., 1999. "**Compilation and Analysis of Currently Available Baseline Data on California Energy-Efficiency Markets**". Xenergy, Oakland, CA.

This report presents the results of a study whose objective was to summarize available baseline data on California energy efficiency markets from a wide variety of sources, to support future evaluations. The study entailed benchmarking 92 studies and conducting a gap analysis in the inventory of identified studies and to make recommendations on data collection to facilitate future evaluations.

To conduct the study, the authors defined energy efficiency markets according to primary determinants (sector and vintage of the building or facility) and secondary determinants (which could be end-uses, sectors or activities). The primary determinants used were: residential, non-residential and new construction. The secondary

determinants varied across primary determinants. Taken together, 19 market categories were analyzed. The breakdown is discussed further in section II.2.

The types of information assessed were organized in three categories: (1) how the market is structured and how it functions, (2) energy efficiency products and services and (3) market actors. For each category, the authors studies different baseline characteristics, for a total of 15 unique baseline characteristics. For example, in the market structure and functioning section, the authors looked at characteristics such as distribution channels, market barriers, market size, etc. Likewise, characteristics in the Market Actors category address issues such as behavior, psychographics, etc.

In order to evaluate and score the baseline data available, the authors considered the following criteria: (1) timeliness (i.e. how recently the data was produced); (2) relevance to California; (3) reliability and validity of the data; and (4) completeness. Data elements could receive a score ranging from 0 to 2. Only data elements that met all four criteria receive a score of 2. Data point that met the first two criteria but only one of the third or fourth received a score of 1. All other data sets received a score of 0.

As part of the analysis, the authors conduct an in-depth gap analysis on the data sources they reviewed. To identify gaps, it was necessary to examine each specific market and the extent of information available on each specific baseline characteristic in that market. Using the market categories and baseline characteristics defined above, the authors analyzed the frequencies of studies scoring "2" across categories and characteristics. This then indicated areas lacking good comprehensive information.

11.   "**Application for Approval of Energy Efficiency Plan**", 2003. Interstate Power & Light Company, Iowa Utilities Board.

Chapter 5 of this document describes a benchmarking analysis of energy efficiency programs designed and implemented by utilities outside of Iowa, in support of an energy efficiency plan submitted to the Iowa Legislature.

The chapter categorizes programs as residential or non-residential, and further breaks down each category into electric programs, gas programs and fuel independent programs.

The chapter distills key themes that have emerged from the analysis of programs, organized by residential, non-residential, and over-arching themes. The themes are describes in purely qualitative fashion.

Likewise, the benchmarking discussion is also purely qualitative, focusing on discussing, comparing and contrasting several aspects of different programs. The benchmarking analysis looks at end-uses within each segment and categorizes programs according to the following list:

- **Residential – Fuel Independent**: Information Oriented Programs, Bill Credit Programs, Rating Systems, Energy Audits, Weatherization Renovations and Retrofits, Low-Income Programs, Windows Programs, New Construction

- **Residential – Electric**: HVAC, GHP, Lighting, Water Heating, Refrigerators, Appliance Programs.

- **Residential – Gas**: HVAC, Appliances, Water Heating

- **Non Residential – Fuel Independent**: Comprehensive Retrofits, Comprehensive New Construction, School Retrofits and NC Projects

- **Non Residential – Electric**: Load Management, Commercial Prescriptive Rebates, Lighting, HVAC, HVAC Tune Ups, Chiller Programs, Geothermal Heat Pumps, Industrial Compressed Air, Industrial Motors, LED Traffic Lights, Farm Initiatives

- **Non Residential – Gas**: Gas HVAC Training, Gas HVAC Incentives, Commercial Water Heating, Commercial Cooking, Industrial Engines

12. "**California Summary Study of 2001 Energy Efficiency Programs**", 2003. Submitted to CALMAC by Global Energy Partners, LLC, Lafayette, CA.

This study reviews California's energy efficiency programs in operation during the energy shortage crisis in 2001. The authors analyze all energy efficiency programs to determine the savings potentials, both in kWh and MW, as well as the costs, attributable to energy efficiency programs.

The authors review programs broadly categorized as residential, non-residential and new construction. The report provides detailed information on the programs themselves and on the evaluations of such programs. In particular, Appendix A provides summary information on each program, including program summary, cost and savings information, for a total of 218 programs. The detailed descriptions of each program in Section 3 also provide various specific figures on each program, such as the number of units installed (in some cases) or persistence information. While 218 programs are documented in this report, the authors only performed in-depth analyses for 154 programs.

In addition to the report, there is an Excel Spreadsheet documenting budgeted and spent costs as well as projected and documented savings.

13. "**Multi-Utility Low-Income Energy Efficiency Program Comparison Project**", 1995. Submitted to the New York Low Income Evaluation Task Force, ULIEEP, by Cambridge Systematics, Inc., Cambridge, MA.

This study reviews and compares the evaluation results of utility energy efficiency pilot programs for the low-income segment in the state of New York. This comparison study uses a decomposition approach to evaluate and compare various elements of these programs. It distinguishes program characteristics (broken into program delivery, marketing, measures offered and administration) from the unchangeable context against which the program are run. In order to compare and contrast various program elements, the study uses a substitution methodology to help determine what changeable program element may contribute to a program's success. For a given program, the authors modify one changeable element of the program while keeping the others constant. They then

recalculate an outcome metric (TRC cost/benefit ratio) to determine whether the change in the program element results in an improved outcome. They then use the results of that analysis to determine whether the program element can impact the outcome of a program, identify elements that contribute to program success and explore program re-design possibilities.

14. Eto, J., E. Vine, L. Shown, R. Sonnenblick and C. Payne 1994. "**The Cost and Performance of Utility Commercial Lighting Programs.**" LBL-34967 Lawrence Berkeley National Laboratory, Berkeley, CA.

This report documents the review of 20 utility-sponsored commercial lighting programs from the Database on Energy Efficiency Programs (DEEP). The programs represent a mix of technologies and financial mechanisms, and account for 15% of total DSM spending in 1991. The authors point out to the absence of consistent data sets and reporting definitions as a barrier to achieving meaningful comparison across different programs. Nonetheless, they observer relationships between program costs and program design choices. For example, they find that the largest programs have been substantially less expensive than the smallest programs. They also find that several of the more costly programs were developed by utilities facing very high avoided costs.

15. "**Business Programs Evaluation: Best Practices Report**' prepared for the Focus on Energy Statewide Evaluation, State of Wisconsin, Department of Administration, Division of Energy, by Kema-Xenergy, March 2003.

This report documents a high-level analysis of best practices for energy efficiency programs, distilled from a review of programs offered by MidAmerican Energy, Xcel Energy, California, NYSERDA and Efficiency Vermont. The programs were reviewed to develop a set of best practices program profiles. The program profiles selected are: prescriptive rebate programs, energy analysis programs, new construction programs for commercial buildings, and specialized programs for niche markets. The programs reviewed are analyzed and compared for the markets they target, the end-uses they target, the delivery strategy or process they use, the promotion process, the financial incentive strategy, the technical assistance strategy, and the measurement and verification process.

The analysis is qualitative in nature and at a very high-level. It is geared specifically to address the needs of the Wisconsin Focus on Energy organization, and as such is of limited value to a nationwide study.

16. Various Non-Energy-Efficiency Best Practices Studies

We also conducted a web-based search of various non-energy-efficiency best practices studies to help assess whether other organizations, government entities or companies have tried to develop a similar methodology to analyze best practice components.

While there are many best practices studies or documents available on the Internet, few use (or at least document) a quantitative approach to analyze Best Practices. The search focused on studies to assess best practices within programs that seek to correct a market

imperfection (for example environmental externalities, renewable resources, mass transit). The following sources were found to have some potentially useful information:

1. National Governors' Association, Center for Best Practices: http://www.nga.org/center/

   Reports on a variety of subjects but no real in-depth quantitative analysis.

2. Preserving Housing: A Best Practices Review: http://www.auditor.leg.state.mn.us/Ped/pedrep/0305all.pdf

   Uses an innovative format for reporting.

3. City of Los Angeles Waste Water Program Best Practices Report: http://www.ci.la.ca.us/cao/WasteWaterStudy

   Provides some quantitative analysis on the impact of implementing recommendations.

4. Best Practices for Comprehensive Tobacco Control Programs: http://www.cdc.gov/tobacco/research_data/stat_nat_data/bestprac-dwnld.htm

II. THEMATIC SUMMARIES

1. Program Screening

All studies use a qualitative approach to screen programs for further analysis. In many cases, an initial list of criteria is developed ahead of time, against which a selection committee qualitatively rates the programs and determines which merit further review. In all cases, a selection committee or the funding agency provides final input as to which programs should be included. The following criteria are frequently used in the initial screening process:

- Transferability to the funding organization or region

- The need to obtain a wide technology and/or program mix in the final selection

- Typical success indicators (i.e. energy savings or participation rate)

- Availability of complete data or evaluation results.

2. Program Categorization

A few studies broadly divide their analysis into both programmatic best practices (where the unit of study is a program), and administrative best practice (where the unit of study is an organization or administrative entity). Programmatic best practices tend to be categorized in extensive detail, whereas administrative best practices tend to be analyzed very qualitatively using a predetermined set of criteria.

Programs are often broken down into two levels, usually first by **targeted sector** and then by **targeted end-use**. Often, a catchall "other" or "miscellaneous" category is created to capture programs that cannot easily fit into a sector/end-use category. In some cases, the second-level breakdown is usually a mix of **end-use, program type and/or program sub-sector**.

The CABD study looks at markets (rather than programs) and divides them into 19 categories. The first level break down is a categorization that distinguishes residential programs, non-residential programs, and new construction programs. The residential programs are subsequently divided by end-use or activity (HVAC, lighting, appliance, shell, and renovation). The non-residential programs are also divided by end-use or activity (HVAC, lighting, motors, refrigeration, office equipment, compressed air, shell, process, comprehensive retrofit, and remodeling or renovation). Finally, the new construction programs are divided into sectors (residential, commercial, industrial and agricultural).

The Mowris study uses by far the most complex method to characterize is programs and divide them into groups of "like programs". The Mowris study breaks down the programs by CBEE administrator area, then by market segment and delivery strategy, then by end-uses and then by market actors. Note that the purpose of this grouping was to create categories that would be used to make general recommendations to the CBEE. In total, the Mowris study generated 28 types of nonresidential programs, 17 types of residential programs, and 15 types of new construction programs.

Outside of the Mowris study, none of the other studies analyzed go beyond a two-level breakdown. In many cases, the breakdowns appear to have been created after the initial screening of available programs was completed. For instance, ACEEE's "Profiles of Leading Energy Efficiency Programs" study purposely did not define the program categories eligible for consideration in the nomination process. Nor did it find it necessary to select exemplary programs in all categories of programs received.

3.   *Dimensions of Analysis*

The Mowris study is the only study that has clearly defined dimensions of analysis to evaluate its programs. As described in the summary above, Mowris and Associates use a set of criteria to evaluate program performance (as a whole) and applies a distinct set of rules to evaluate the criteria for recommendation. In general, the stronger the cost-effectiveness and market transformation plan, the higher the recommendation. Evidence supporting cost-effectiveness and evidence supporting a market transformation plan are also crucial. Note, however, that program elements are not scored individually.

Surprisingly, most of the other studies have not established rigid dimensions of analysis in order to score or select best practices or programs. The Energy Trust of Oregon Best Practices study, for instance, identifies areas of study for each program (for example, it summarizes its residential programs according to trade allies, financial incentives, education, marketing outreach and quality control), but it does not specifically rate each program according to these areas. Rather, it summarizes programs individually and qualitatively. Similarly, the ACEE "Profiles" study does not break down its analysis in the summary to its report. The Wisconsin Shared Savings analysis takes a look at SPC

programs in many states and provides summaries on program structure, M&V, operations & delivery, minimum program size, delivery mechanism and impacts, but those fields are not consistently analyzed across all states.

It appears that in many cases, the initial program screening criteria are the only dimensions of analysis. Once the programs have been screened pass, the analysis becomes purely qualitative. The selection and scoring of programs is based on a consensus by a committee.

4. *Analysis Metrics*

None of the best practices studies reviewed thus far use any sort of formal metrics to score the programs selected. However, in their study of the performance of the largest Commercial Sector DSM programs, Eto et al. identify two variables (program type and program size) as statistically significant when analyzing regression equations for the Total Resource Cost. The **program type** variable distinguishes between direct install and rebates. The **program size** variable is a measure of the annual kWh saved. Note that the authors only find weak (not statistically significant) relationships between the TRC and the presence of shareholder incentives, the economic lifetime of savings, the savings per participant and the avoided costs.