DSM's Best Kept Secret: The Process, Outcome, and Future of the Pepto-Maryland Collaborative

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Today, Potomac Electric Power Company's (Pepco) energy-efficiency investments make its DSM portfolio among the most comprehensive and ambitious in the United States. While Pepco's transformation could not have taken place without the genuine willingness and commitment by Pepco management to try new ideas, set ambitious savings goals, and ultimately to strive for excellence in DSM program design and implementation, much of the change is attributable to constant critical review and collaborative planning by non-utility parties.

The collaborative parties have worked closely to develop programs designed to be comprehensive in terms of customers served, magnitude of per-participant savings, and mechanisms for program delivery. Each program stresses comprehensive savings within facilities through both the design and delivery approaches. Recent enhancements include a program component to encourage commercial customers considering rebuilding older cooling equipment to instead replace it with new, more efficient units. This program is explicitly designed to reduce the installed cooling capacity of the new equipment by capturing and capitalizing on cooling load reductions from other measures such as lighting retrofits. Another recent improvement in Pepco's DSM portfolio is the In-Home Retrofit Program which provides direct installation of measures in all types of customers' homes using state-of-the-art diagnostic and installation procedures.

Introduction

Evolution of DSM Programs at Pepco and Other Utilities

Like other utilities, basic approaches to market intervention to improve customer efficiency at Pepco have undergone three stages of evolution. Distinctions between the three generations of DSM programs are highlighted in Table 1. While most of the industry remains mired in second-generation or first-generation DSM, in terms of this evolution of program design, the collaboratively designed programs at Pepco are among the most advanced third generation of DSM programs.

First-Generation DSM

In the late 1970s and early 1980s the first generation of DSM programs took shape on the assumption that lack of accurate and readily accessible information on energy efficiency was the primary barrier to economically optimal consumer behavior. Utilities concluded for the most part that reinforcing price signals with added information would be sufficient to overcome this barrier. Once such information reached consumers, according to this approach, efficient markets for energy efficiency would naturally follow.

Second-Generation DSM

By the mid 1980s, utilities found that information alone was not enough. The experience of the U.S. Residential Conservation Service was typical; few customers participated, and among those who did, participants chose to install only relatively few low-cost measures. Because of the high unit costs of fielding programs that yielded few results, these limited efforts often were not cost effective.[1]

Second-generation programs supplemented information with other inducements aimed at other specific market barriers. For example, some utilities offered market rate financing to overcome the lack of capital for energy-efficiency investments.[2] Others offered financial incentives that covered a modest portion of measure costs, in an

Table 1. Three Generations of DSM Programs

	Marketing	Technical Assistance	Financial Incentives	Measure Delivery
First generation Late 1970s—Mid 1980s	Limited; typically through bill stuffers	Limited; "canned" energy audits, often "do it yourself"	None	Do it yourself
Second generation Mid 1980s—present for most utilities	Limited; typically through bill stuffers	On-site energy analysis, computerized	Partial rebates or loans	Do it yourself or trade allies
Third generation 1990 to present for collaborative utilities	Concentrated, personalized, with persistent follow-up	On-site energy analysis, often with sophisticated equipment, specialized consultants	Full incremental costs for lost opportunity; full or almost all costs covered for retrofits	Direct installation or trade allies

attempt to offset some of the first-cost barrier. In general, utilities with second-generation DSM programs sought to overcome individual barriers with programs that focused on individual technologies or end uses, such as lighting or residential air conditioning.[3] Such programs are typical of the offerings of utilities with energy-saving DSM portfolios today.

Second-generation programs employ partial remedies for individual market barriers, remedies that fail to capture maximum levels of cost-effective efficiency savings. Customer participation, while sometimes better than in first-generation programs, was still well below the apparent potential. Measure penetration among participants in second-generation programs was also disappointing. On the other hand, second-generation experience did firmly establish a fact that was not apparent from first-generation programs: energy-efficiency savings can be achieved very cost effectively. Thus, although second-generation programs saved less energy than predicted, they were economically competitive with supply.

Third-Generation DSM

The disappointing results of second-generation programs could have been interpreted as evidence that estimates of cost-effective achievable savings had been seriously overstated. However, careful analysis and a handful of demonstration projects, such as the Hood River Conservation Residential project, suggested that utilities had still not pressed DSM programs to their cost-effective limits.

The third generation of utility demand-management programs grew out of this experience with second-generation efforts, starting in 1989. Third-generation programs are organized around points of intervention in conservation markets, such as a decision to replace old equipment, rather than individual end uses or technologies. They emphasize comprehensive treatment of efficiency opportunities for all participating customers, and pay whatever is deemed necessary up to full incremental cost to achieve customer participation and installation of cost-effective measures. This approach has led to financial incentives that cover high fractions of measure costs in all market segments, including full incremental costs for most lost-opportunity resources.

Third-generation program designs also include aggressive non-financial strategies, such as extremely focused and sustained marketing efforts, and high levels of customer technical and managerial assistance. Table 1 compares program strategies between third-generation programs and their weaker predecessors. With these strategies, third-generation DSM programs seek to address the many market barriers impeding efficiency choices. Third-generation efforts also include components that continue after measures are installed, such as equipment commissioning and operation, and maintenance services. Monitoring and evaluation are integral parts of third-generation program planning and implementation.

Pepco's DSM History

Pepco's DSM programs have evolved from fledgling first-generation efforts in the early 1980s to advanced third-generation programs today. In some cases, Pepco's collaboratively designed programs are defining the leading

edge of DSM program design. This progress has taken place over five stages.

Pepco's first DSM efforts began in 1981. At the time, Pepco offered general information about energy conservation to its customers. These limited efforts played virtually no role in Pepco's resource planning.

The second stage in Pepco's DSM evolution saw the maturation of load management and time-of-use pricing (which Pepco refers to as Energy Use Management or EUM programs). This took place generally between 1982-87. During this period Pepco also operated first-generation energy audit programs.

The next transition in Pepco's DSM program evolution occurred in 1988. Pepco had, until then, relied exclusively on the No-Losers test, also known as the Rate Impact Measure (RIM) test, which rejected the kinds of second-generation energy-efficiency programs that were by then considered the state of the art in DSM.

In the early 1990s, two factors helped Pepco move to the fourth stage in its DSM programs, into third-generation DSM programs: continued scrutiny of Pepco's DSM efforts by the District of Columbia and Maryland Public Service Commissions and other parties, and the formation of the Maryland DSM collaborative.

The fifth and latest stage in Pepco's programs was a direct outcome of the last twelve months efforts of the Maryland DSM collaborative. Programs have been refined and in some cases expanded to reflect the lessons learned from the first cycle of implementation of the third-generation programs in 1992-93. In September 1993 the Maryland collaborative had just completed five months of intensive negotiations with Pepco to establish new goals and modified program designs in Maryland.

Advanced Features of the Collaboratively Designed Programs

The leading edge of programs designed by the parties in the Pepco-Maryland Collaborative can be demonstrated in three ways:

1. By the amount of planned electric energy savings compared to other utilities, both those with third-generation programs and more typical utilities deploying second-generation programs;

2. By the amount of money Pepco is spending and planning to spend on DSM compared to other third-generation utilities; and

3. By the scope and quality of Pepco's program designs.

Comparison to Other Utilities

It is interesting to compare Pepco's collaboratively designed DSM efforts to those of two sets of utilities. First, Pepco's planned savings are compared with seven utilities with collaboratively-designed DSM programs in the Northeast and California. The second group contains ten utilities, primarily from the Midwest and Mid-Atlantic regions, with fairly typical DSM portfolios. These groups allow us to compare Pepco's DSM to utilities with aggressive, comprehensive, fully developed DSM programs (exemplified by the collaboratively-developed third-generation programs), and to utilities with less ambitious DSM programs (exemplified by the utilities with second-generation DSM portfolios).

There are at least three useful ways for comparing utilities' DSM efforts. The most familiar way to gauge the relative magnitude of energy savings is to express energy savings accumulated over time as a percentage of energy sales at the end of a period. This table indicates how significantly a utility's long-range DSM commitment is expected to contribute to future levels of energy service requirements. A second way to look at the magnitude of utility efficiency acquisitions is to divide the average savings added each year by the average energy sales. This gives an idea of how much a utility's DSM acquisitions contribute toward meeting annual energy requirements. The third way to compare energy savings with energy sales is to divide the overall increase in energy savings over a period by the projected increase in energy sales over the same period. This shows how much of new energy requirements are being met by new demand-side management. This is especially pertinent because it is generally growth on a utility's system that is usually most responsible for the need for new resources.[4]

Pepco's Projected Energy Savings

For its service area as a whole, Pepco expects its DSM programs to reduce projected annual electric energy sales cumulatively by 11.0 percent by 2006 and annually by 0.86 percent. These savings constitute over a third of planned growth in energy sales.

Comparison to Other Utilities

As shown in Table 2, Pepco's planned DSM acquisitions exceed the average of the most aggressive DSM portfolios in the United States.

With respect to utilities with second-generation programs, these comparisons are presented in Table 3. Here the difference between Pepco's savings plans and other

Table 2. Projected Energy Savings from Demand-Side Management by Selected Third Generation Utilities

	Energy savings, last yr. of DM prog. GWh (1)	Pre-DM energy req'ts, last yr. of DM prog. GWh (2)	DM as % of energy req'ts last yr. of DM prog. (3)	Avg. annual incr. DM GWh (4)	Avg. annual energy req'ts in prog. period GWh (5)	Avg. annual DM as % avg. energy req'ts in prog. period (6)	Growth in DM GWH (7)	Growth in energy req'ts GWh (8)	New DM as % of new energy req'ts (9)
Boston Edison (1990-1994)									
System	527	13,854	3.8%	104	13,298	*0.78%*	520	1,500	*34.6%*
Eastern Utilities (1991-2000)									
System	339	5,683	6.0%	34	4,996	*0.68%*	339	1,220	*27.8%*
New England Electric (1991-2010)									
System	2,956	32,385	9.1%	129	27,812	*0.46%*	2,586	9,251	*28.0%*
New York State Electric & Gas (1993-2008)									
System	1,598	19,773	8.1%	85	17,478	*0.49%*	1,367	4,513	*30.3%*
Northeast Utilities (1991-2000)									
System	3,460	30,756	11.3%	346	27,695	*1.25%*	3,460	5,857	*59.1%*
United Illuminating (1991-2010)									
System	827	7,284	11.4%	40	6,195	*0.65%*	803	2,137	*37.6%*
Sacramento Municipal Utility District (1992-2010)									
System	3,418	14,790	23.1%	178	11,877	*1.50%*	3,378	5,760	*58.6%*
Pacific Gas & Electric (1993-2011)									
System	9,890	230,695	9.3%	521	94,020	*0.55%*	9,890	25,437	*38.9%*
Aggregate Figures:									
System	23,015	106,170	10.0%	1,437	203,370	*0.71%*	22,343	55,675	*40.1%*
For comparison:									
Potomac Electric - Whole Service Territory (1992-2006)									
System	4,217	38,389	11.0%	278	32,460	*0.86%*	4,175	11,923	*35.0%*
Potomac Electric - DC Territory (1992-2006)									
System	2,026	15,363	13.2%	134	13,083	*1.02%*	2,004	4,391	*45.6%*

utilities is pronounced. Pepco's commitment to achieve energy savings far exceeds that of fairly typical utilities throughout the country.

When comparing Pepco's programs with those of utilities with third-generation programs, on average, these aggressive utility DSM portfolios generate energy savings annually that amount to 0.71 percent of average annual electric sales. Pepco's DSM programs produce savings equivalent to 0.86 percent of system-wide sales. Targets within the group range from 0.5 percent of average sales (New York State Electric and Gas) to 1.2 percent (Northeast Utilities). Collectively, these utilities plan to meet 40 percent of new energy sales with acquisitions from energy-efficiency programs; Pepco plans to meet 35 percent of its sales growth system wide with DSM energy savings, slightly below average.

Comparison to Other DSM Collaborative

Pepco's projections of DSM energy and peak savings are compared to the savings projection of eight utilities in the Northeastern U.S. and California whose DSM programs were designed in collaboration with non-utility parties. The utilities in this comparison group include Boston Edison (BECo), Eastern Utilities (EUA), New England

Table 2. (contd)

General comments:
Pepco's DSM includes conservation only -- some of the other utilities include load management in addition.
Aggregate figures are the sum of all third generation utilities listed in this table, except Pepco.
All sales forecasts are pre-DSM, i.e., the effects of DSM have not yet been netted out.
All growth calculations are inclusive of the first year of the period.
For example, growth in sales for the period 1991-2010 inclusive is measured as sales in 2010 minus sales in 1990.

Utility-specific comments:
BECo's DSM only includes conservation programs and not load management savings.
EUA totals in main table include losses (and street lighting).
Figures assume that all DSM given in load forecast is new, i.e., it includes no savings from previous DSM efforts.
NEES's DSM includes savings from load management.
NYSEG's GWh demand for the system includes street lighting and other misc. uses, and also includes losses.
Total DSM savings are the sum of res., C/I, and agricultural DSM. Savings include load management.
NU figures are exclusive of load management programs. System sales include sales for resale, street lighting, and railroad sales. NU's original sales and peak projections include reductions due to DSM. In order to obtain a pre-DSM forecast, we have added NU's DSM savings back into the Company's sales peak projections. NU system DSM includes reduction due to street lighting.
UI's load and sales projections include reductions due to DSM. In order to obtain a pre-DSM forecast, we have added UI's DSM savings back into the interruptible, TOU rates, and cool storage programs, but might include other smaller load control.
SMUD's system energy requirements and DSM include transmission and distribution losses.
Load management is included in the DSM savings.
PG&E's load forecast is interpolated for the years 1990-1995.
Load management and building standards are excluded from PG&E's DSM savings.
Pepco DSM savings include conservation only, not savings from Energy Use Management programs.

Sources:
Boston Edison, "Long-Range IRP -- 1990-2014, Vol. II: Energy and Peak Load Forecast," May 1, 1990, pp. 68, 102, 112, 168
Boston Edison, "Energy Conservation for the 90's," March 1990, pp. 6-8.
Eastern Utilities, "Long-Range Forecast & Resource Plan, Vol. IV: Tables," May 1991, Tables E-8A, E-8B, E-10B and E-11-S
NEES, "Integrated Resource Management Draft Initial Filing: Technical Volumes," May 20, 1991, pp. I-8, I-9
NYSEG system figures from NYSEG's 1992 DSM filing;
Northeast Utilities, "The N.U. System 1991 Forecast of Loads and Resources for 1991-2010," March 1, 1991, pp. II-11, II-12, III-16, III-17
United Illuminating Company, "Report to the Connecticut Siting Council," March 1, 1991, pp. IV-6 -- IV-10, IV-48
SMUD, "1991 Load Forecast," April 30, 1991, pg. 48.
PG&E DSM from "Form R-6.6," page 4, February 5, 1992.
PG&E load forecast from CEC's "Electricity Report," Table 2-4, September 1992.
Pepco 1992 Integrated Least-Cost Resource Plan, Main Report Volume, Table 1-1.

Electric Service (NEES), Northeast Utilities (NU), New York State Electric and Gas (NYSEG), United Illuminating (UI), Sacramento Municipal Utility District (SMUD), and Pacific Gas& Electric (PG&E). The energy savings of these utilities indicate the level of savings that can be expected for a utility that implements aggressive and comprehensive DSM programs in all major conservation market segments.

The collaborative utilities are targeting large amounts of electricity savings compared to their projected demand growth. For the most part, the program plans of these leading utilities are aimed at achieving all cost-effective DSM savings from utility customers over time. Their program designs include such critical elements as financial incentives covering most or all of the costs of efficiency measures; hassle-free service delivery; and intense and focused marketing. These features are compared with less advanced program strategies in Table 1.

More so than any other utilities in the U. S., these companies are following the least-cost planning objectives of utility demand-side planning and acquisition Accordingly, their program plans best represent the

Table 3. Projected Energy Savings from Demand-Side Management by Selected Second Generation Utilities

	Energy savings, last yr. of DSM prog. GWh (1)	Pre-DSM energy req'ts, last yr. of DSM prog. GWh (2)	DM as % of energy req'ts last yr. of DSM prog. (3)	Avg. annual incr. DSM GWh (4)	Avg. annual energy req'ts in prog. period GWh (5)	Avg. annual DSM as % avg. energy req'ts in prog. period (6)	Growth in DSM GWH (7)	Growth in energy req'ts GWh (8)	New DSM as % of new energy req'ts (9)
Wisconsin Electric Power Co. (1991-2010)									
System	1,331	35,551	3.7%	67	30,780	*0.22%*	1,331	11,142	*11.9%*
Southern Indiana Gas & Electric (1992-1995)									
System	49	5,194	0.9%	12	5,036	*0.24%*	49	421	*11.6%*
Public Service of Indiana (1992-2000)									
System	1,102	28,086	3.9%	119	26,079	*0.46%*	1,071	5,317	*20.1%*
Ontario Hydro (1990-1996)									
System	16,995	233,793	7.3%	677	190,511	*0.36%*	16,925	96,887	*17.5%*
Metropolitan Edison Co. (1992-1996)									
System	165	11,257	1.5%	33	10,755	*0.31%*	165	1,426	*11.6%*
Jersey Central Power & Light (1992-1996)									
System	346	18,603	1.9%	67	17,813	*0.38%*	335	1,546	*21.7*
Los Angeles Dept. of Water & Power (1993-2009)									
System	2,628	34,963	7.5%	111	29,832	*0.37%*	1,880	9,370	*20.1%*
Long Island Lighting Col. (1993-2008)									
System	1,216	20,917	5.8%	48	19,200	*0.25%*	766	3,803	*20.1%*
Niagara Mohawk Power Corp. (1993-2008)									
System	2,111	44,997	4.7%	90	41,018	*0.22%*	1,438	8,600	*16.7%*
Iowa Public Service Electric (1993-2001)									
System	170	4,480	3.8%	17	4,043	*0.43%*	157	830	*18.9%*
Aggregate Figures:									
System	26,113	437,841	6.0%	1,241	375,067	*0.33%*	24,117	139,342	*17.3%*
For comparison:									
Potomac Electric - Whole Service Territory (1992-2006)									
System	4,217	38,389	11.0%	278	32,460	*0.86%*	4,175	11,923	*35.0%*
Potomac Electric - DC Territory (1992-2006)									
System	2,026	15,363	13.2%	134	13,083	*1.02%*	2,004	4,391	*45.6%*

savings, expenditures, and program characteristics associated with truly comprehensive DSM plans.

Pepco's DSM targets compare quite favorably with plans by these utilities. The average utility fielding second-generation programs expects to reduce sales by 0.33 percent annually. Pepco plans to reduce annual sales by about three times this percentage. No utility in the group comes closer than half the annual savings Pepco plans to obtain on a percentage basis. When savings are compared to projected sales growth, second-generation utilities typically offset only 17.3 percent of increased energy requirements. By contrast, Pepco is committed to meeting over twice this fraction of growth with DSM.

Pepco's projected DSM spending clearly measures up to plans by third-generation utilities as shown in Table 4. Spending plans for six of the utilities shown in Table 3 are presented here. The average annual spending as a fraction of annual operating revenue is 4.6 percent. Pepco's spending plans contained in the 1992 Energy Plan represent almost an identical share of 4.4 percent.

Table 3. (contd)

General comments:
Aggregate figures are the sum of all available data.
All sales forecasts are pre-DSM, i.e., the effects of DSM have not yet been netted out.
All growth calculations are inclusive of the first year of the period.
For example, growth in sales for the period 1991-2010 inclusive is measured as sales in 2010 minus sales in 1990.

Sources:
WEPCo, "Advance Plan 6 Update," p. F-8U -- F-11U, F-43U, F-44u, F-62U, October 2, 1991.
Southern Indiana Gas and Electric Co., "Development of Integrated Resource Plan for SIGECo," February 1991.
PSI, Petitioner's Exhibit No. A (MJR), PSI Energy, Energy Forecast, p. 10; pre-DSM forecast assumed. Request 57, data request No. 2, for 1995.
Ontario Hydro, Interrogatory 1.7.37, Addendum A, Tables 1-6. Data after 2010 extrapolated from 2005-2010 growth rate. Providing the Balance of Power Reference Document R22: Demand Management in the 1989 Demand/Supply Plan, page 60. Figure 5.0(1), revised. 1994, 2000, 2014 data from Balance of Power Demand/Supply Plan Report Figure 7-16, revised.
Metropolitan Edison Company, "Annual Resource Planning Report," 57.43a Responses, May 1, 1991, pp 2-2, 12-16.
Jersey Central Power & Light, GPU Fall 1990 Forecast. Base case sales after DSM1/BID adjustment (pages JC-20, 21) + planned DSM (page A-10). JCP&L Demand Side Management Plan (Feb. 4, 1992), Section 4. Sum of core and performance-based programs from Tables I-V.
LADWP data from their "Executive Summary, 1991 Loads and Resources," May 1992, Table 5, pg. 21.
"LILCO 1991 Forecast of Annual Energy Requirements By Customer Classification;" Pre-1993 DSM is subtracted from forecast. 1992 System energy forecast is estimated from 1990 filing Table 3. "LILCO Electric Conservation and Load Management Long Range Plan, Table 1" for 1992-1994; "LILCO DSM Goals: 1995-2008" (Response to request from KEA).
"NMPC 1992 Long Term Electric Energy Sales Forecast, 1991-2015, Base Case," FAX from Paul D. Edmundson to Francis Wyatt of Resource Insight. "NMPC 1993 Integrated Demand-Side Management Plan, Volume 1, 1993 Long Range Demand-Side Management Plan," Section 6.3, Table 6.2.
IPS "Energy Efficiency Plan, Volume I," April 1, 1992, section 35.9(1), pages 32, 58, 70, 97.
IPS "Energy Efficiency Plan, Volume IV," April 1, 1992, schedule KAC-16, pg. 1.
Pepco 1992 Integrated Least-Cost Resource Plan, Main Report Volume, Table 1-1.

Features of Pepco's DSM Programs Qualify Them for Favorable Comparison With the Best of the Industry

Three aspects of the Company's program design, implementation, and planning indicate that its DSM programs belong among the most advanced utility efforts:

- The programs follow the essential least-cost planning principles for DSM programs;
- The programs use third-generation strategies of the best programs in the industry; and
- The programs have early program successes in 1992-93, and will undergo enhancements and expansion for 1993-94 that further improve Pepco's portfolio relative to the best DSM portfolios.

Least-Cost Planning Principles Followed by Pepco

Pepco's programs consciously follow the main least-cost planning objective for DSM programs, as well as the three essential least-cost planning requirements for DSM. First, Pepco's programs have been explicitly designed to satisfy the primary least-cost planning objective for DSM programs: to achieve maximum cost-effective efficiency savings. The Memorandum of Understanding initiating the Pepco-Maryland Collaborative makes explicit the objective of achieving maximum cost-effective savings in all sectors of opportunity in Pepco's Maryland service territory. This objective was often the deciding factor in negotiations over alternative approaches. Based on the Pepco experience, program options have been chosen to produce maximum net benefits for Pepco's customers as a whole. This decision-making approach has extended from choosing between competing measures or measure combinations, to deciding on which program delivery strategies to employ, to setting program goals.[5]

Table 4. Demand-Side Management Spending by Selected Leading Utilities

	Demand-Side Management Budget (1991$) (1)	Avg. Annual DSM Budget (2)	(2) as % of 1990 Revenues (3)
Boston Edison (1990-1994)	$223,156,000	**$33,631,200**	3.8%
Eastern Utilities (1991-1995)	$69,549,000	$13,909,800	3.1%
New England Electric (1991-1995)	$421,793,000	$84,358,600	4.6%
New York State Electric and Gas (1993-1997)	$159,104,679	$31,820,936	3.0%
Western Massachusetts Electric (1991-1995)	$93,141,000	$18,628,200	5.1%
Sacramento Municipal Utility District (1993-2000)	$488,038,278	$61,004,785	8.9%
Aggregate Figures:	$1,454,781,956	$42,392,253	4.6%
For Comparison:			
Potoman Electric - Whole Service Territory (1992-1996)	$246,258,113	$49,251,623	4.4%

Notes:
(1) Expenditures are cumulative over the program period.
(3) Utility 1990 ultimate consumer revenues from P.U.R. Analysis of Investor-Owned Electric and Gas Utilities, 1991 edition; 1990 figures inflated to 1991, 5% inflation assumed.
SMUD 1990 revenues from personal communication with D. Estrada of SMUD.

Sources:
Boston Edison, "The Power of Service Excellence" (3/90)
Eastern Utilities Association, An Overview of Montaup's Residential and Commercial C&LM Programs, February 1991.
New England Electric Systems Integrated Resource Management Draft Initial Filing (5/91)
New York State Electric & Gas, Demand Side Management Filing, Volume II, October 1990.
Western Massachusetts Electric Application for Pre-Approval of Conservation and Load Management Programs, Testimony of E.F. Taylor, Jr. (3/91).
SMUD "Business Plan for Achieving Energy Efficiency Goals 1992-2000," April 8, 1992, pp 89-90, Tables 22, 23.
Pepco 1992 Integrated Least-Cost Resource Plan, Main Report Volume, Table 11-3.

Second, Pepco's DSM program planning consistently adheres to three requirements that are essential for realizing the full, least-cost potential for DSM:

- ensuring that programs pass through a capability-building stage;
- aggressively and quickly pursuing all lost-opportunity resources; and

. investing comprehensively.

Incorporated Capability Building

Pepco's programs are planned to pass through staged implementation. Pepco's staged implementation approach has three advantages that support realization of DSM's least-cost potential. First, Pepco programs ramp up rapidly enough to a scale of implementation sufficient to field test large-scale delivery. Second, the Company develops monitoring and evaluation plans to assess likely program impacts from further implementation, and suggest refinements in program design and implementation. Third, Pepco projects long-term savings through subsequent stages of implementation, assuming that the first stage proves successful and that monitoring and evaluation indicates future cost effectiveness.

This staged implementation is decidedly different from the far more tentative approaches of most utilities. The significant scale of the first implementation stage is well beyond the "pilot" programs that are usually suggested by utilities. Pilot programs typically have very limited purposes, such as testing customer acceptance of a measure or delivery approach. Pilot program implementation and testing also is often spread over several years, requiring

the utility to put off decisions about whether to expand the program to full-scale implementation. The upshot is that utility planning implicitly assumes that the concept being tested will make no contribution to long-term resource planning. Additional supply is included instead in such utilities' resource plans.

In Pepco's case, best estimates of probable savings from full-scale implementation are made and incorporated into resource planning. The practical advantage for customers is that Pepco does not commit itself to supply-side resources while it figures out exactly how well the DSM program concepts being tested will "fly."[6] Any adjustments to the initial savings projections from full-scale programs are made after evaluation of the first stage of implementation. Pepco's staged implementation approach is also flexible with regard to the possibility of future program design changes to improve cost effectiveness. Even if monitoring and evaluation shows that the initial concept would be uneconomical to continue, Pepco's approach allows for changes in program strategies or measure eligibility that might increase savings or lower costs.[7]

Pepco's Programs Adequately Pursue Lost-Opportunity Resources

Table 5 is a table listing all major conservation market segments by customer class. This table distinguishes between lost-opportunity market segments and discretionary market segments. Pepco's portfolio covers virtually all lost-opportunity market segments that apply to the Company's service area.[8] In the residential sector, Pepco covers the new construction market with the Energy Saver Home program. Equipment replacement is covered by the residential Air Conditioner and Heat Pump program, and the refrigerator and water heater components of the Save and Save Again (SASA) point-of-sale program.[9] In the commercial sector, the Company's DSM portfolio covers new construction and major renovation with the New Building Design (NBD) program. 10 Equipment replacement and remodeling is covered by the Custom Rebate program.

Pepco's DSM Portfolio Is Comprehensive

Pepco's DSM programs are comprehensive in terms of the market segments and customers covered and in terms of the efficiency measures targeted by the programs.

In addition to covering all the lost-opportunity market segments, Pepco's programs also cover all significant retrofit opportunities. For residential customers, Pepco offers the Save and Save Again program, which offers incentives for residential lighting efficiency and water heating efficiency products. The In-Home Pilot and Multifamily Direct Installation programs both supplement the Save and Save Again program with on-premises installation of weatherization, lighting, and water heating efficiency measures. In the commercial sector, retrofits for customers over 25 kW in billing demand are covered by the Custom Rebate program and smaller customers are served by the Shop Doctor program.

Pepco's Programs Are Comprehensive in Terms of the Fraction of Eligible Population Pepco Plans to Reach

In all market segments, Pepco's programs aim to reach all eligible participants. Of course, no utility program can be expected to reach everyone. But like other third-generation programs, Pepco plans to reach most eligible participants over time in almost all market segments. Pepco's plans call for it to achieve over 50 percent participation among the eligible population in new residential and commercial construction, residential HVAC replacement, and multifamily and small commercial retrofit.

Pepco's Programs Are Comprehensive in Terms of the Efficiency Measures Targeted

One indication of the comprehensiveness of efficiency measures targeted by Pepco's programs is the relatively small number of programs Pepco offers. A piecemeal portfolio would have many more programs, each aimed narrowly at an individual measure and/or end use. For example, Pepco's commercial Custom program replaced the previous Lighting program. Rather than focus on lighting in one program and cooling efficiency in another, Pepco markets one comprehensive program to achieve savings from as many end uses and measures as possible. This comprehensiveness tends to increase savings achieved and reduce costs of savings realized.

Designs of individual programs further reveal the comprehensiveness of Pepco's programs. In both residential and commercial new construction programs, for example, participants are given strong incentives to implement all cost-effective savings, not just the easiest or cheapest savings. In the NBD program's comprehensive path, for example, the total rebate paid per unit of savings becomes progressively higher the deeper the savings achieved.[11] The direct installation programs serving both residential and small commercial customers are designed to install all cost-effective measures. For the smallest customers, all eligible measures are installed at no direct charge to participants. These programs therefore ensure that Pepco does all it reasonably can to motivate participants to accept all cost-effective measures. Consequently, the need for repetitive

Table 5. Utility Conservation Investment Opportunities by Conservation Market Segment

Conservation Market	Market Segment	Residential	Commercial	Industrial
Lost Opportunity	New Construction	Yes*	Incl. substantial renovation	Incl. expansion*
	Renovation Replacement	Negligible Refrigerators HVAC* Water Heating Lighting	Remodeling* HVAC* Lighting* Windows* Motors/drives	Process overhaul* Motors/drives Refrigeration Pumps Process Cooling
Discretionary Retrofit	Early retirement	Limited HVAC Limited refrigeration Lighting	Lighting HVAC	Motors, drives, and motor re-sizing Lighting
	Supplemental measures	Insulation Air sealing Water heating HVAC controls	Lighting Controls HVAC controls Envelope	Motor controls Heat recovery

*Opportunities to invest comprehensively, with all end uses and available technologies. (For other segments, the opportunities indicated are primary sources of cost-effective savings.) Replacement decisions associated with these opportunities are often linked to discretionary retrofits.

marketing and delivery effort for individual customers is minimized, and the savings yielded from Pepco investment is maximized.

Pepco's Programs Employ Third-Generation Strategies

Pepco's programs make use of virtually all the third-generation strategies highlighted in Table 1. Following are some examples of the third-generation strategies Pepco's programs employ:

- Technical assistance: In the NBD program, Pepco makes available a Design Assistance Professional (DAP) to work with architects, engineers, and developers to identify and analyze comprehensive efficiency options. The program also covers extra design fees of the developer's architects and engineers incurred to examine efficiency options, up to $5,000.

- Financial assistance: Pepco covers full incremental costs of lost-opportunity measures in the NBD, Custom Rebate, Energy-Saver Home, and SASA programs. Pepco covers the full installed costs of retrofit measures in the Multifamily Direct Installation program, of lighting and water heating measures in the In-Home Pilot program, and of measures installed in the small commercial Shop Doctor program.

- Measure delivery: Pepco offers direct installation in the In-Home Pilot, the Multifamily Direct Installation program, and the small commercial Shop Doctor program. Pepco offers to remove and properly dispose of second refrigerators for customers in the Appliance Turn-In program.

Successes in Pepco's First Stage of Third-Generation Program Implementation

Results from Pepco's 1992-93 experience with six programs were particularly promising. These outcomes are summarized as follows:

- Save and Save Again: This program pays rebates covering roughly 75 percent of the price premium on a large and diverse set of efficiency lighting products. Pepco has been highly successful in motivating a large number of retailers to stock a wide variety of compact fluorescent lamps. The number of customers participating in the program and the number of lamps

purchased has consistently exceeded predictions. To our knowledge, this is the most successful program of its kind in the U.S.

- In-Home Pilot: As indicated above, this program was designed to test customer acceptance of direct installation of residential retrofit measures. In 1992, Pepco ran the portion treating lighting and water heating potential. The pilot succeeded in installing an average of over ten compact fluorescent lamps per household. This far exceeds the experience of any other utility in the U.S. Part of the success is due to the wide variety of lamps that installers bring to the home, and the sophisticated protocols used to test applicability of and customer preference for lamps.

- Multifamily Direct Installation: This full-scale program also greatly exceeded its goals in terms of lamps installed per participant (approximately eight). The variety of equipment and effective installation protocols are again partly responsible for this unprecedented success.

- Air Conditioner/Heat Pump: This program pays customers progressively greater incentives for selecting higher-efficiency air conditioners and heat pumps when they replace existing equipment. It marked a redesign of an earlier program. It was extremely successful in two ways. First, participation exceeded projections substantially. Second, the program was more successful in pushing the market to higher efficiency levels than anticipated. The success of this program has made it a model for other utilities.

- Shop Doctor: This program achieved significantly higher participation than Pepco initially planned or committed to. Almost all customers offered the program's services accepted them. (Fewer measures were applicable per participant than originally anticipated, so measure installation per customers was lower than predicted.)

- New Building Design: This program exceeded participation and savings per-participant goals, despite the severe downturn in new non-residential construction in Pepco's service area.

New Program Designs

The most recent cycle of collaborative program planning at Pepco has produced several significant changes that will further enhance and expand current program offerings. Two of the most significant changes are summarized as follows:

- In-Home Retrofit program: Based on the unexpectedly positive response to the pilot program, the program has been expanded to full-scale implementation using the staged-implementation approach described above. This expansion will apply to the lighting and water heating component summarized above, and to weatherization of homes that are centrally heated and/or cooled with electricity.

  The lighting program will be well synchronized with the SASA retail lighting efficiency program to transform the market for residential lighting efficiency. While the retail program will build delivery infrastructure for lighting efficiency at the point of sale, the direct installation component will create a long-term demand for replacement products. Also included in the next cycle of implementation will be a pilot component to test rebates for installation of hard-wired compact fluorescent fixtures where existing fixtures cannot accept screw-in compact fluorescent lamps. Included in the program serving electrically heated and centrally air-conditioned homes will be highly sophisticated technical assistance and measure delivery. Building on the success of the direct-installation protocols in the lighting component, this component will include, where appropriate, instrumented diagnosis and installation of air infiltration and duct leakage reduction measures.

- Custom Rebate program: The Collaborative has committed to adding a new component to this program, known as the Chiller Early Retirement program. This highly advanced strategy is designed to capitalize on market-driven overhauls of existing commercial cooling equipment. Ordinarily, customers invest in rebuilding large chillers and replacing compressors in packaged cooling equipment. These overhauls preserve the existing levels of inefficiency in older equipment for at least another ten years.

  This new component to the Custom program pursues three opportunities simultaneously by encouraging early retirement: (1) to motivate the customer to invest in efficiency improvements that reduce cooling load in commercial space, primarily through lighting retrofits; (2) to translate these cooling load reductions into lower cooling capacity, which reduces the capital cost for customers of new cooling equipment; and (3) to select the highest-efficiency new cooling equipment. If successful, the combined result is extraordinarily large, permanent, and cost-effective savings from a downsized, highly-efficient system installed in conjunction with deep lighting and other retrofits. The contribution of this program component over the next several years will be particularly significant as commercial customers accelerate

overhauls on existing systems to eliminate ozone-depleting refrigerants.

Endnotes

1. From 1981 to 1988, utilities across the U.S. spent millions of dollars on programs to provide energy audits to thousands of customers. Few utilities did much to help customers act on this information. Consequently, few customers participated in the audit programs, and even fewer participants installed the high-cost, high-savings measures recommended by the audits.

2. Residential weatherization loan programs were pioneered by the Tennessee Valley Authority and Pacific Power and Light in the mid-to-late 1970s.

3. Early leaders with second-generation programs include California utilities such as Pacific Gas and Electric, with its Great Hardware Rebate Program for non-residential customers, and Public Service Electric and Gas in New Jersey, which was one of the first utilities to offer rebates for high-efficiency residential air conditioners.

4. Retirements of existing generating units or expiration of existing purchase contracts also contribute to the need for new resources.

5. For example, Pepco's Energy Saver Home program, which treats new residential construction, allows builders several alternative prescriptive measure packages. These packages were carefully selected to produce the maximum net economic benefits (rather than less aggressive packages that would cost less but generate less net benefits as well). The commercial Shop Doctor program provides free direct installation of all cost-effective measures because this approach maximizes total net benefits. While a less aggressive approach would cost less in terms of program expenditures per participant, the lower participation and per-participant savings would generate lower net benefits.

6. The 1992 Energy Plan contained several exceptions to this approach. For example, Pepco fielded a pilot program for in-home direct installation of weatherization, lighting, and water heating retrofit measures. The pilot approach was agreed to in Maryland because of significant doubts that this approach would be as acceptable and successful in Pepco's service territory as it had been for other utilities. Pepco's experience and future plans with this approach are discussed below.

7. Of course, such projections are made with the understanding that monitoring and evaluation could indicate that the program would not be cost effective to continue. The next planning cycle would then delete savings from such programs.

8. The industrial sector is almost nonexistent in Pepco's service territory. For program planning, the light industry that does exist is treated as a sub-sector of the commercial class.

9. Pepco will begin fielding a refrigerator rebate program in 1994 that will aim at the top-efficiency models available. This decision was based on market research conducted in 1992-93, and on careful measure screening that indicates that only the highest efficiency refrigerators are likely to provide enough net benefits (compared to efficiency required under federal standards) to cover the anticipated costs of administering a program.

10. The NBD program also covers multi-unit residential construction.

11. For developers unable or unwilling to pursue the comprehensive participation path, prescriptive rebates cover full incremental costs of a wide variety of equipment,