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A CONCEPTUAL FRAMEWORK FOR EVALUATING LOW INCOME DISCOUNT RATE PROGRAMS: THE CASE OF THE POTOMAC ELECTRIC POWER COMPANY'S RESIDENTIAL AID RIDER (RAR) PROGRAM

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Introduction

According to the 1988 Annual Report on Utility and Carrier Regulation of the National Association of Regulatory Utility Commissioners (NARUC), many states have residential lifeline rate programs. For example, in the telecommunications area, 12 states have preferential tariffs for non-profit organizations. Almost all states - 49 (including the District of Columbia) - have reduced telephone rates for handicapped customers. Twenty-two (22) states have low income lifeline programs and 20 of these states have their own low income telephone assistance programs. More recent data from the January 1990 Monitoring Report of the Federal-State Joint Board indicates 30 states have telephone lifeline rates.

There is also evidence of such programs for the electric utilities. The 1988 NARUC Annual Report shows 16 states with lifeline or inverted residential rate structures for electric utilities.

Given the prevalence of such discount programs, the purpose of this paper is to present a conceptual framework for the economic analysis and evaluation of low income discount programs based on the experience with the Potomac Electric Power Company's (PEPCO's) Residential Aid Rider (RAR) program.

Background Information

On December 29, 1982 in Order No. 7716 in F.C. No. 785 (PEPCO rate case), the Commission approved a PEPCO proposal for an experimental Residential Aid Rider (RAR) tariff. The proposal called for a discount on the residential rate for PEPCO's low income customers.

PEPCO's rationale for the proposal was that RAR was a more effective means for targeting assistance to low income customers than the 450 kwh rate block, which the company alleged was not cost based. It is thus necessary to examine the RAR proposal in the context of the residential rate structure.

Over the years between 1973 and 1982, the Commission maintained a special low rate for PEPCO's low usage residential customers "who have not contributed to the need for the new investment and the new capacity required by PEPCO in order to meet its public service obligation." This low usage rate was embedded in the rate for the first block of 450 kwh of consumption. In F.C. No. 785, PEPCO proposed an increase in the rate on the first 450 kwh of consumption by residential customers in conjunction with a new discount rate - the RAR rate - which would be "targeted" only for low income customers. Thus, with the RAR rate, there would be less need for a "subsidized" rate in the rate for most residential customers. Moreover, the Commission decided that any "revenue loss associated with RAR should be borne by all customer classes equally, on an across-the-board basis." RAR costs allocated to PEPCO's residential class shall be borne by non-RAR residential customers whose consumption exceeds 400 kwh per month.

Relationship between RAR and Residential Rates

Prior to the F.C. No. 785 filing, the monthly residential rate structure for PEPCO was as follows:

Minimum Charge - 30 kwh		$2.25 per month
Next 420 kwh		5.423 cents per kwh
450+ kwh	(Summer)	7.509 cents per kwh
	(Winter)	6.014 cents per kwh

Effective December 31, 1982, the Commission approved the following RAR rate structure:

Minimum Charge - 30 kwh		$2.25 per month
Next 420 kwh		5.098 cents per kwh
450+ kwh	(Summer)	7.058 cents per kwh
	(Winter)	5.653 cents per kwh

The RAR rates represented a 6 percent discount on the above residential rates. However, at the same time, the Commission approved the RAR rates, it also increased the residential rates for the tailblock as follows:

Minimum Charge - 30 kwh		$2.25 per month
Next 370 kwh		5.423 cents per kwh
400+ kwh	(Summer)	8.804 cents per kwh
	(Winter)	7.163 cents per kwh

Thus, the RAR discount in relation to the residential rates in existence as of F.C. No. 785 was substantially larger, as follows:

Usage between 400 and 450 kwh	-	42.1% (Summer)
	-	28.8% (Winter)
Usage greater than 450 kwh	-	19.8% (Summer)
	-	21.1% (Winter)

These rates remained in effect until April 2, 1985. At that time, the Commission, in Order No. 8127 in F.C. No. 813, increased the residential rates accordingly:

Minimum Charge - 30 kwh	$2.40 per month
Next 370 kwh	5.463 cents per kwh
400+ kwh (Summer)	10.169 cents per kwh
(Winter)	8.275 cents per kwh

The RAR rates were increased somewhat because they were still pegged to the pre F.C. No. 785 rates. The new RAR rates are listed as follows:

Minimum Charge - 30 kwh	$2.25 per month
Next 420 kwh	5.463 cents per kwh
450+ kwh (Summer)	7.575 cents per kwh
(Winter)	6.068 cents per kwh

Thus, the effective discount grew larger, as indicated below.

Usage between 400 and 450 kwh	-	46.3% (Summer)
	-	41.1% (Winter)
Usage greater than 450 kwh	-	25.5% (Summer)
	-	26.7% (Winter)

In the next PEPCO rate case, F.C. No. 869, the Commission, in Order No. 9216, brought the RAR rates more in line with the concurrent residential rate structure. A 25% RAR discount was approved, but applied to the new residential rates. Thus, the rate blocks for RAR were also changed. A comparison between the RAR and residential rates is provided below.

	Residential Rate	RAR Rate
Minimum Charge - 30 kwh per month	$2.03	$2.03
Next 370 kwh, (Summer), per kwh	4.615 cents	3.461 cents
(Winter), per kwh	4.618 cents	3.464 cents
400+ kwh (Summer), per kwh	8.592 cents	8.592 cents
(Winter), per kwh	6.992 cents	6.992 cents

The residential rates are lower than the previous rates because the Commission had approved a rate reduction for PEPCO. The new rates were effective March 4, 1989.

There has since been one more adjustment in both the residential and RAR rates. In Order No. 9509 in F.C. No. 889,

effective August 1, 1990, the Commission increased both the residential and RAR rates as follows:

	Residential Rate	RAR Rate
Minimum Charge - 30 kwh per month	$2.05	$2.05
Next 370 kwh, per kwh	4.677 cents	3.508 cents
400+ kwh (Summer), per kwh	8.917 cents	8.917 cents
(Winter), per kwh	6.917 cents	6.917 cents

As can be seen from the table, the 25% differential between the residential and RAR rate was maintained.

Eligibility Criteria

Low income customers are eligible for the RAR discount if they are eligible for (but not necessarily receiving) benefits under the Low Income Home Energy Assistance Program (LIHEAP) or Complimentary Energy Assistance Program (CEAP). The LIHEAP and CEAP income guidelines vary by family size. The program is jointly administered by PEPCO and the D.C. Energy Office. Participants must be certified anew each year by the D.C. Energy Office (DCEO). However, they may submit applications by mail or in person at PEPCO or one of its community satellite offices, or the DCEO.

Trends in RAR Participation

Table 1 shows the trend in the number of participants in the RAR program since 1983. Beginning in 1985, the Commission has required PEPCO to file quarterly reports which provide this information. An RAR working group composed of staff from PEPCO, the Commission, the Office of the People's Counsel and the D.C. Energy Office meet on a regular basis to discuss efforts to promote the program. Attachment 1 shows participation in the program peaked in March of 1987 and has been declining ever since. Some of the decline, especially in 1989 was due to a lag in certification because of a change by the DCEO in the documentation required and in the hours for enrollment. In addition, to offset this decline, a number of steps have been taken as follows:

1. Development of a joint application form for use by all three utilities in obtaining participants for their low income discount programs. Thus, a person can apply for the gas or telephone company's program, and be simultaneously enrolled for PEPCO's program.

2. Use of print and radio media ad campaigns by both PEPCO and the D.C. Energy Office.

3. Preparation and distribution of brochures in Spanish and Chinese.

4. On-site enrollment of applicants at large public housing and low income rental units.

Conceptual Framework for Program Evaluation Purposes

Research Aim

A secondary purpose of the RAR rate was to aid PEPCO in studying the consumption patterns and cost of service of low income customers. To this end, a series of studies were initially contemplated. They included a special load study of a sample of RAR customers and a comparison with the load profile of other residential customers and a cost allocation study. Since that time, an effort has been made to articulate a load research plan for the analysis of the PEPCO's low income customer population. The purpose of this paper is to present this framework and the results of the studies that have been undertaken to date.

RAR Conceptual Framework

Tables 2, 3, and 4 illustrate the evaluation framework developed for the RAR program. Each represents a more detailed representation of the analysis.

Table 2 presents the logical sequence of inquiry. When the RAR program was implemented, it was first promoted to specific target groups (e.g. the low income). RAR participants from the target group consume electricity which contributes to demand and capacity growth. The extent to which the RAR participants contribute to this demand and capacity growth helps determine the extent to which the RAR discount rate is cost justified and it serves as a basis for ascertaining cost recovery.

Table 3, is consistent with the logical sequence in Table 1. It identifies the relevant questions which need to be addressed at each stage of the evaluation process. For example, at the promotion stage, the pertinent question is, What are the barriers to getting people to participate or to increase participation? Analysis of the target groups requires information on who is being reached and who is not. Once participants consume electricity after receiving the RAR discount, the analytical question which arises is, Will the discount lead to an increase in consumption? It is also important to know to what extent RAR customers contribute to peak demand which drives capacity growth and higher costs. Thus, RAR load profiles, in comparison with load analyses of other customer classes, are important to consider. Finally, depending on the information from the load profiles, questions need to be answered regarding the extent to which the program is cost justified and if not, the extent to which there is a subsidy from the residential or other rate classes. This information is also vital in establishing the amount of the discount.

Table 4 links specific studies to the above questions. The questions of barriers to participation can be address in an RAR awareness study. The information on which is and is not being reached can be obtained from appliance saturation surveys. The impact of the RAR discount rate on consumption is ascertained

through an econometric consumption impact study. Load studies of the RAR and residential classes are used to address the question of the extent to which the RAR contribute to demand and capacity growth. Last, cost allocation studies form the basis of the cost justification and cost recovery analyses.

The purpose of the following sections is to summarize the results of each of these types of studies for the PEPCO RAR program.

RAR Awareness Study

PEPCO, in conjunction with the RAR Working Group, undertook a survey of potential RAR customers in an effort to understand why customers who are eligible for the RAR program do not participate in it. The survey instrument was a short questionnaire mailed to approximately 5,000 PEPCO customers. The 5,000 customers were selected based on an analysis of LIHEAP eligible customers within zip codes.

The questionnaire collected basic demographic information for each customer such as type of dwelling, own/rent, etc. The questionnaire also asked for specific income and family size information and specific reasons why the customer was not participating in the RAR.

Preliminary analysis of the approximately 240 respondents who were eligible for but not participating in the RAR indicated that they were not aware of the program. The three reasons cited most often for not participating were:

a.) needed more information
b.) needed to know how to sign up
c.) needed to know where to apply.

Forty six percent of the respondents reported household members over 60 years of age living at the residence.

RAR Profile Analysis

Information obtained from PEPCO's Residential Appliance Saturation Survey can be used to determine the similarities and differences between the demographics of RAR customers and other residential customer groups. An analysis of RAR customers versus non-RAR low income customers based on 1988 data revealed the following:

a) RAR customers reported a higher incidence of electric ranges and electric heating than non-RAR low income customers

b) Over 85% of RAR customers reported at least one color television and over 27% reported a VCR.

c) 26% of the RAR customers reported no air conditioning while 17.2% of the non-RAR low income group reported no air conditioning

d) About 57% of the RAR customers reported no one working outside the home whereas 36.5% of the non-RAR low income customers reported no one working outside the home.

e) The majority (59%) of both RAR and non-RAR low income customers with household members over 60 years of age own their residences.

Additional information can be found in Table 5.

RAR Consumption Impact Study

Econometric regression analysis was used to estimate the effect of the RAR rate on the kwh consumption of participants. The data used for this purpose consisted of time series cross-sectional consumption data collected from three groups of customers. These three groups consisted of: 1) customers who became RAR participants during the study period so that before and after consumption data would be available for these customers 2) customers who were eligible to participate in RAR during the study but did not, and 3) customers who were on the RAR rate for the entire study period. Customers in each group were identified using PEPCO's Customer Information System or Residential Appliance Saturation Survey data. Monthly kwh were included as variables in the regression model for each customer in each group.

The basic regression model was designed to separately estimate the effects of the RAR rate from the effects of weather and other time-related trends. Essentially four regressions were run; for each season, summer and winter, and for customers with and without electric space heat.

The preliminary results indicate a small but statistically significant increase in the monthly kwh for both space heat and non space heat customers in the summer and statistically insignificant effects for both groups in the winter season.

RAR Load Study

During 1984, PEPCO conducted a special load study of a sample of 45 RAR customers and it compared this information with comparable data for a sample of 142 non-RAR residential customers. Based on information obtained from metering devices, the load data showed the RAR customers had substantially lower kwh and peak demand consumption than the non-RAR residential customers. (Table 6 presents the specific results.)

Three conclusions can be drawn from the RAR load study in comparison with the residential load data. First, RAR customers use less electricity than other residential customers. Second, RAR

customers contribute less to the system peak. Third, on the basis of the first two conclusions, a lower rate for the RAR customers is cost justified because they impose lower costs on the system.

RAR Cost Allocation Study

Also in 1984 PEPCO conducted an RAR cost allocation study. Five conclusions were evident and they are listed as follows:

1. The cost-based discount for RAR customers from the non-RAR rate which would produce a rate of return equal to the non-RAR class was $389,475 or 11.93 percent below current non-RAR rates.

2. Based on their load characteristics and the cost allocation study, revenue from RAR customers would have to be $304,718 or 11.86 percent higher than their current level to produce a rate of return equal to non-RAR customers.

3. Total revenues from the RAR customers were $694,193 or 21.27% lower than they would have been if these customers were billed on the non-RAR residential rate.

4. The rate of return on non-RAR sales was 3.20% and the rate of return on RAR sales was 1.13%.

Conclusions and Recommendations

The findings from the five types of studies described above verify the need for the RAR program. They also highlight areas for possible improvement, particularly in outreach efforts. The RAR working group will utilize these findings to propose ways to improve the participation rates and cost effectiveness of the program.

TABLE 1

NUMBER OF RAR PARTICIPANTS

DATE	NUMBER
9/30/83	8,049
9/30/85	9,183
12/31/85	9,306
4/30/86	12,184
6/30/86	13,384
9/30/86	13,495
12/31/86	13,756
3/31/87	14,464
6/30/87	13,785
9/30/87	13,037
12/31/87	11,267
3/31/88	12,890
6/30/88	13,082
9/30/88	12,087
12/31/88	10,184
3/31/89	11,093
6/30/89	11,454
9/30/89	9,780
12/31/89	8,513
3/31/90	11,753
6/30/90	12,534
7/31/90	12,327

TABLE 2

EVALUATION FRAMEWORK - LOGICAL SEQUENCE

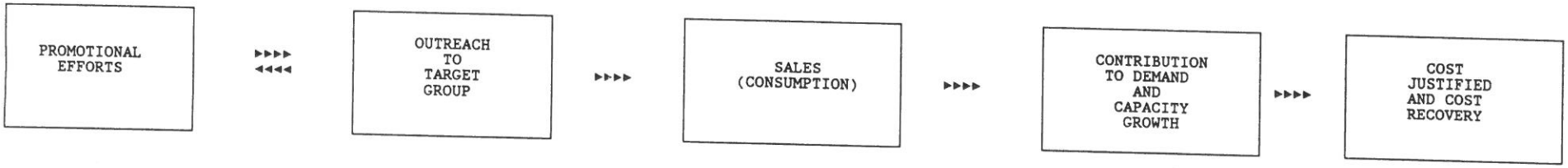

TABLE 3

EVALUATION FRAMEWORK - QUESTIONS TO BE ADDRESSED

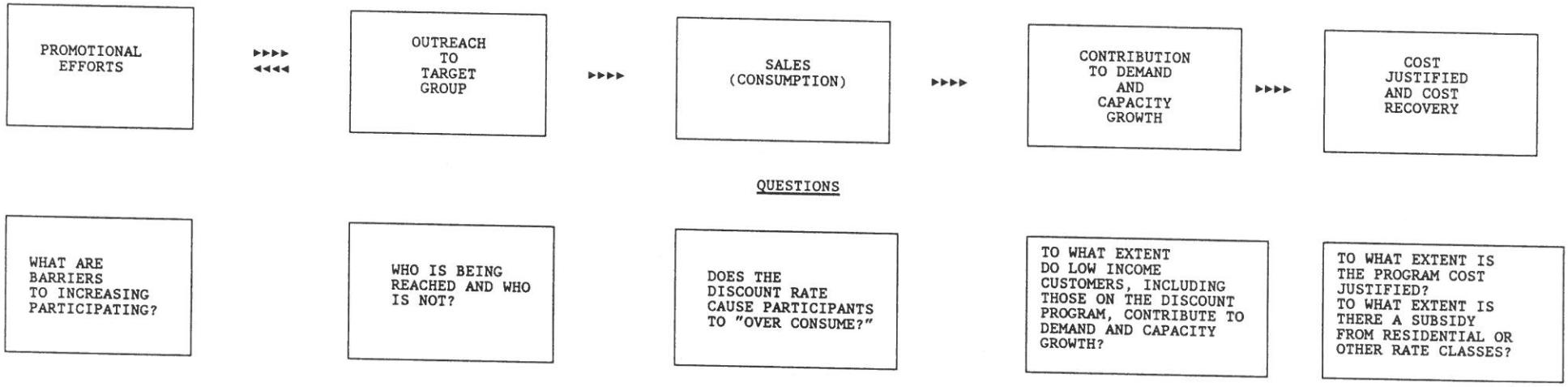

TABLE 4

EVALUATION FRAMEWORK - QUESTIONS AND STUDIES

PROMOTIONAL EFFORTS	OUTREACH TO TARGET GROUP	SALES (CONSUMPTION)	CONTRIBUTION TO DEMAND AND CAPACITY GROWTH	COST JUSTIFIED AND COST RECOVERY
		QUESTIONS		
WHAT ARE BARRIERS TO INCREASING PARTICIPATING?	WHO IS BEING REACHED AND WHO IS NOT?	DOES THE DISCOUNT RATE CAUSE PARTICIPANTS TO "OVER CONSUME"?	TO WHAT EXTENT DO LOW INCOME CUSTOMERS, INCLUDING THOSE ON THE DISCOUNT PROGRAM, CONTRIBUTE TO DEMAND AND CAPACITY GROWTH?	TO WHAT EXTENT IS THE PROGRAM COST JUSTIFIED? TO WHAT EXTENT IS THERE A SUBSIDY FROM RESIDENTIAL OR OTHER RATE CLASSES?
		STUDIES		
RAR AWARENESS STUDY	ANNUAL APPLIANCE SATURATION SURVEYS AND PROFILES OF RAR NONRAR LOW INCOME AND OTHER RESIDENTIAL CUSTOMERS	RAR CONSUMPTION IMPACT STUDIES	RAR AND RESIDENTIAL ALLOCATION STUDIES LOAD STUDY	RAR AND CLASS COST ALLOCATION STUDIES BASIC USE STUDY

TABLE 5

APPLIANCE SATURATION SURVEY - 1986

PROFILES

	RAR	NONRAR	RESIDENTIAL
SAMPLE SIZE	178	188	2260
% WITH FROST FREE REFRIGERATOR	39	48	64
% WITH FREEZERS	32	28	30
% WITH ELECTRIC RANGE	24	16	19
% WITH COLOR TV	91	84	92
% WITH DRYER	12	16	48
% WITH WASHER	43	38	60
% WITH DISHWASHER	5	6	35
% WITH HOME COMPUTER	2	2	11
% WITH VCR	23	12	40
% WITH MICROWAVES	9	8	26
% HEAT WITH ELECTRIC	29	18	18
% WITH RADIATOR OR ELECTRIC BASEBOARD	41	47	46
% WITH REPLACED HEATING SYSTEMS SINCE '77	21	20	26
% WITH SUPPLEMENTAL HEATING SYSTEM	32	13	29
% WITH AIR CONDITIONING	71	70	84
% WITH CENTRAL AIR	12	10	20
% WITH ELECTRIC WATER HEATING	19	14	16
% LIVE IN APARTMENT	55	60	39
% OWN	32	38	60
MEDIAN AGE OF HOUSE	<1950	<1950	<1950
MEDIAN SIZE OF HOUSE (NO. OF ROOMS)	5-9 (51%)	1-4 (52%)	5-9 (57%)
MEDIAN NO. OF OCCUPANTS	2 (55%)	2 (79%)	2 (62%)
% WITH OCCUPANTS OVER AGE 60	38	59	32

TABLE 6

RAR/RESIDENTIAL LOAD STUDY FINDINGS

PEAK MONTH JUNE 1984

INDICATOR	RAR		NON RAR	
NO. IN SAMPLE	45			142
	AMT.	%	AMT.	%
KWH PER CUSTOMER	531	100	763	100
ON PEAK	139	26	205	27
KW PER CUSTOMER				
COINCIDENT WITH SYSTEM PEAK (KW)	1.15		2.27	
COINCIDENT WITH RESIDENTIAL CLASS PEAK (KW)	1.31		2.53	

TABLE 6

ANNUAL DATA - 1984

INDICATOR	RAR		NON RAR	
NO. IN SAMPLE	47		149	
	AMT.	%	AMT.	%
KWH PER CUSTOMER	6,558	100	7,274	100
KW PER CUSTOMER				
CLASS DEMAND LEVEL COINCIDENT WITH SYSTEM PEAK	7,768		401,755	