

Stalking the Golden Carrot: A Utility Consortium to Accelerate the Introduction of Super-Efficient, CFC-Free Refrigerators

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Utility residential DSM programs offer consumers incentives to choose more efficient appliances. These programs lead manufacturers to ship more efficient models to areas offering rebates. They may not affect the national shipment-weighted average efficiency by altering production decisions, since utility programs often have short lead times or short durations. Long-term DSM incentives can be designed to induce manufacturers to utilize advanced technologies while providing the time needed to commercialize them. Additional benefits from such programs would accrue: (1) standardization of programs among utilities provides the manufacturer with more consistency; (2) utility incentives paid directly to the manufacturer may be more cost-effective than retail rebates; (3) coordinated program administration could reduce administrative overhead through economies of scale; and (4) individual utilities gain greater strength to influence manufacturers' production plans. Utilities have committed approximately \$30 million to a *Golden Carrot Refrigerator Request for Proposals* to produce a CFC-free refrigerator at least 25% more efficient than the 1993 D.O.E. standard. The Consortium for Energy Efficiency, a new non-profit organization formed by forward-looking electric utilities, government agencies, and non-profit organizations, will explore other end-use areas where such a coordinated approach can be used effectively.

Introduction

Present Approaches

Utility incentives: In recent years, utilities in the U.S. and Canada have steadily increased their Demand Side Management (DSM) services. To date, over 500 utilities have offered more than 1000 programs. In 1991, utilities budgeted some \$2 billion for DSM investments. Rebates and other appliance incentives increase the attractiveness of more efficient products by reducing the first cost to consumers, who usually value purchase price over minimum life cycle costs.

Utility conservation programs reflect short-term market needs. They stimulate sales of efficient appliances already on the market, but do not give manufacturers enough lead time to affect production schedules. In addition, utilities do not work together to pool their demand for efficient products, so manufacturers perceive a "crazy quilt" of

coordinated short-term programs. Thus, manufacturers receive no sustained, coordinated or future-oriented market signals which would induce a shift in their longer-term *production* priorities toward advanced, super-efficient technologies.

Federal Standards: Under NAECA, the National Appliance Energy Conservation Act, the U.S. Department of Energy (DOE) sets standards for appliance efficiency based on technical feasibility and cost-effectiveness. This has led to significant improvements, but it is inherently adversarial, pitting government and academics against the manufacturers to "discover" the limits of cost-effective technology. NAECA only sets a performance floor, and provides no incentives for significant new innovations that would lead to large efficiency improvements. Still, many utilities have discontinued rebates, citing efficiency improvements stimulated by NAECA.

The "Golden Carrot"

The *Golden Carrot* is an innovative approach in which utilities join together to offer long-term DSM program incentives to the manufacturer. It could induce manufacturers to utilize more advanced technologies while providing the time needed to develop and incorporate them into commercial production lines. The core concept is a significant utility incentive offered in return for a large step forward in energy efficiency.

The Golden Carrot complements NAECA's regulatory "stick." By bringing advanced technology to the market, a successful Golden Carrot program provides the DOE with the information it needs to determine whether higher efficiency standards are technically feasible and economically justified. Thus, one feature of a successful Golden Carrot program is that perpetual utility conservation investments in a given technology are not necessary.

The Consortium for Energy Efficiency

To facilitate Golden Carrot strategies, several private and public organizations have formed a unique, non-profit institution, the Consortium for Energy Efficiency (CEE). The purposes of CEE are to accelerate the commercial introduction of energy-efficient technologies which decrease energy consumption and promote policies of pollution prevention, and to improve communication and coordination of programs in this field.

Pacific Gas and Electric Co, the Natural Resources Defense Council, the American Council for an Energy Efficient Economy, and the U.S. Environmental Protection Agency (EPA) worked together to set up the Consortium for Energy Efficiency, and have been joined by many other leading utilities. CEE will assess super-efficient technologies, select candidates for commercialization, and design coordinated utility programs that use market forces to accelerate their penetration.

Opportunity for Technological Improvements in Refrigerators

CEE's first effort is the *Super Efficient Refrigerator Program* (SERP), whose aim (discussed in the section on Institutional Design for the Golden Carrot Program) is to take advantage of a short window of opportunity to affect production decisions of refrigerator manufacturers and lead them to offer much more efficient units. In addition, the accelerated CFC phaseout schedule announced early in 1992 by President Bush requires manufacturers to eliminate chlorofluorocarbons (CFCs) in refrigerators by

Table 1. Utility Members of the Super Efficient Refrigerator Program (at time of printing)

Arizona Public Service
Atlantic Electric Company
Baltimore Gas and Electric Company
Bonneville Power Administration (BPA)
Central Maine Power
Commonwealth Electric Co.
Jersey Central Power and Light (JCP)
Long Island Lighting Company (LILCO)
Los Angeles Department of Water and Power (LADWP)
Madison Gas and Electric
New England Electric System (NEES)
Northern California Power Agency
Northern States Power of Wisconsin
PacifiCorp
Pacific Gas and Electric Co.
Public Service Electric and Gas Co.
Sacramento Municipal Utility District (SMUD)
Southern California Edison (SCE)
Western Area Power Administration
Western Massachusetts Electric
Wisconsin Electric Power
Wisconsin Power and Light
Wisconsin Public Service Corporation

January 1, 1996. CFC replacement in the refrigeration cycle and insulation requires potentially costly product and manufacturing process redesign between 1992 and 1994. Manufacturers are concerned with making this technology transition while maintaining their standards for durability and reliability, controlling costs, and keeping market share.

At the same time, the 1998 NAECA refrigerator standards will be promulgated by January 1, 1995; early demonstration of technological potential can impact these standards. However, since most manufacturers feel that consumers are unwilling to pay increased purchase prices even for very cost-effective efficiency improvements, the Golden Carrot is critical to having the ongoing redesigns capture efficiency opportunities. Without a strong and early "pull" for efficiency, the opportunity to simultaneously improve efficiency and eliminate CFC-use may be irrevocably lost. Since production and capital decisions made in 1992-93 will affect new products sold until past the end of the decade, it is important to take advantage of this opportunity. Considering that the average refrigerator lasts 19 years, these decisions will have economic and environmental effects for decades.

To evaluate the potential and cost-effectiveness of alternative refrigerator technologies, the U.S. EPA sponsored an evaluation of three groups of technical pathways to super-efficient, non-CFC refrigerators:

- Conventional, Single Evaporator Refrigerators.
- Lorenz Cycle Refrigerators, which use one compressor, a non-azeotropic mixtures of refrigerants, and two evaporators. By utilizing the difference in boiling temperature of the two fluids, it is possible to design a simple system that provides different levels of cooling to the refrigerator and freezer compartments.
- Dual Loop Refrigerators which have separate compressors, condensers, and evaporators for the refrigerator and freezer.

The baseline was a "typical" 18 ft³ refrigerator meeting the 1993 DOE standard using a mix of technologies, with R11 and R12 in the insulation and refrigerant cycles. Hence, the first step was to model their replacement with the most likely replacements, HCFC-123 and HFC-134a, respectively. Since these CFC replacements are less efficient, they increase the energy consumption of the refrigerator over the original 1993 baseline. Technologies were then changed to reduce energy consumption. In the single evaporator pathway, combinations of existing technologies reduced consumption from 665 kWh/yr to the 340-370 kWh/yr range; more advanced technologies brought consumption down as low as 175 kWh/yr. Four Lorenz pathways were modelled, and yielded consumption in the 265-355 kWh/yr range, about 50% better than the 1993 CFC baseline. The three dual loop configurations resulted in a slightly higher consumption range of 275-400 kWh/yr.

The first important finding of the *Multiple Pathways* study is that cost-effective technologies exist today to build super-efficient refrigerators without loss of utility. The second finding is that many paths to greater efficiency are available with existing technologies. This implies that no single company can monopolize the "best" way to build super-efficient refrigerators through its ownership of key patents or technologies. Indeed, we expect that different firms will submit designs that differ because of their own manufacturing strengths, supplier networks, or research traditions.

The Super Efficient Refrigerator Program

Institutional Design for the Golden Carrot Program

The first effort of the Consortium for Energy Efficiency (CEE) is the Super-Efficient Refrigerator Program (SERP). SERP is a mutual benefit, non-profit corporation formed to centrally administer the program for the participating utilities. This framework limits control of SERP to utilities investing in it; provides these utilities with cost-effective, coordinated program administration; and the mutual benefit structure allows utilities to recover any unspent funds when the program ends. Table 1 lists SERP utilities. SERP has been endorsed by the American Council for an Energy-Efficient Economy (ACEEE), CEE, the Electric Power Research Institute (EPRI), the National Association of Regulatory Commissioners (NARUC), the Natural Resources Defense Council (NRDC), the Northwest Power Planning Council, and the U.S. Environmental Protection Agency (EPA). Non-utility entities are represented on the Board of Trustees of CEE, but not SERP, and many of these groups are actively promoting the Golden Carrot.

Program Design: The SERP Request for Proposals (RFP)

SERP has raised about \$30 million in utility market incentive commitments for the manufacturer who can most quickly, reliably and cost-effectively produce and distribute a super-efficient, non-CFC refrigerator. Consultants to SERP suggest that this amount of money will substantially offset the cost of developing a new refrigerator model and its production processes. The money will go to the manufacturer as payments for Golden Carrot refrigerators that are shipped into participating utility service territories, not as up-front research and development funding. SERP chose a Request for Proposals (RFP) framework because it seems to meet the needs of all participants as well as possible. First, the RFP provides a clear and binding commitment to utilities, regulators, and manufacturers. Second, the RFP format can provide a guaranteed pool of incentives sufficient to induce a strong competitive technology response, as well as defining the process for disbursing the incentives in

return for a product specified well in advance of its market introduction. Third, the bids responding to the RFP will provide early information on what efficiency levels can be achieved and by when, which will help both SERP and non-SERP utility planners set their targets for general refrigerator efficiency programs in the mid-1990's. Fourth, this information will be available to the U.S. DOE for the NAECA rulemaking. Finally, because the competitive process is open to all major refrigerator manufacturers, we believe that competition will bring advanced technologies and high efficiency to the market at the lowest possible cost.

SERP is a technology demonstration and commercialization program. Its \$30 million dollars will provide incentives for production of no more than about half a million units during a period when more than 20 million units are expected to be sold. We expect that complementary utility rebate programs during the mid-1990s will give all manufacturers opportunities to sell an expanded line of super-efficient refrigerators.

Determining Maximum Incentive Levels

Utilities with high avoided costs can afford to pay more in incentives for advanced refrigerators than other utilities can. To avoid inter-utility subsidies and maximize the potential pool, SERP has established an "expanding" award pool. Group A utilities, which account for \$26 million in total investments, are fully participating. They will offer up to the maximum SERP incentive level, which is about \$0.50 per kWh saved the first year by the refrigerator. [For example, if a manufacturer were to bid a unit that saves 200 kWh/year relative to the 1993 DOE standard, the Group A utilities could pay no more than a \$100 incentive (nominal dollars).] Group B utilities, with lower avoided costs, can only afford to pay 75% as much as the Group A maximum. The Group B incentive pool accounts for approximately \$5 million in total investments. These utilities, however, will only participate if the winning manufacturer requests an incentive that is at or below \$0.375 per kWh saved the first year. All participating utilities will pay the same incentive levels; if the winning bid is less than \$0.375 per fist year kWh, then both Group A and Group B utilities will pay the same bid amount.

Competition Elements

In order to compete in the SERP RFP, a manufacturer will have to meet minimum standards:

- automatic defrost, refrigerator/freezer(s) not containing CFCs either as a refrigerant or in the insulation;
- unit electricity consumption no more than specified by Trial Standard 5 for the relevant type and capacity, that is, shipment-weighted average savings of 200 kWh/year or better;
- if the manufacturer is bidding a single model, its nominal interior capacity must be between 17.5 and 22.4 ft³. If the manufacturer bids multiple models, the allowable size range is 14.5 - 24.4 ft³.
- the manufacturer may request no more than the maximum SERP Group A incentive for a particular model (see above);
- the manufacturer must have mass-production capabilities and a national distribution and service network, and assemble the models in North America;
- the manufacturer must adhere to a schedule for producing a prototype, field test units, and the commercial unit delivery schedule it proposes in the bid (with commercial deliveries ending by June 30, 1997); and
- the manufacturer must provide name and address information for at least 25% of the buyers of the Golden Carrot units, so that sales can be tracked to individual utility territories (this information can be gathered from warranty cards).

Bid Evaluation

Manufacturers who meet these minimum requirements will have their bids evaluated on a 100 point scale which is broken into three main categories:

1. Net value of efficiency gain (75 points). Each bidder will be required to specify the type and size of the unit or units bid, their unit energy consumption (UEC), the proposed schedule for deliveries, and the requested incentive per unit bid. This bid information will be evaluated with the bid scoring formula of Table 2 which computes the average unit net present value, in dollars as the difference between the present values of the unit energy saved and the unit incentive requested. These values will be normalized to a scale of 75 points, with the high scorer receiving 75 points and the other bidders receiving proportional fractions.

Table 2 shows that the greater the unit's efficiency, the more energy saved and the greater the score calculated above. Similarly, the quicker the deliveries are promised, the higher the present value. Finally, the lower the incentive requested, the lower the value of the term that is subtracted, and the higher the calculated net value. In addition, the manufacturer who requests an incentive level less than the Group B threshold will be eligible for the full "expanded" award pool, thereby enjoying economies of scale in the number of refrigerators for which sales incentives are guaranteed.

2. Corporate Reliability (22 points). To demonstrate his ability to meet the commitments in his proposal, each bidder will reveal his experience with the technologies proposed, his marketing strategy, his procedure for collecting customer tracking information (either by warranty card or other mechanisms), strength of product warranty, and other corporate economic indicators, all on a confidential basis. This information will be evaluated by a SERP technical committee.

Table 2. Computation of Bid Score for Saved Energy

$$\text{BID VALUE} = \sum_{T=1}^8 \left(\left[\frac{UD_T}{1.075^T} \right] (\text{STD} - \text{UEC}) (.781) \right) - (.749) (\text{RIP})$$

Where:

Bid Value = The present value in dollars of the savings generated by the R/F bid, as the sum of a stream of eight shipment blocks.

T = Time in eight one-half year increments as follows:

T	Calendar Dates
1	7/1/93 - 12/31/93
2	1/1/94 - 6/30/94
.	.
.	.
8	1/1/97 - 6/30/97

1.075 = The value of energy savings delivered by each shipment is discounted at 15% per year.

UD_T = Percent of total units delivered in time period T.

STD = DOE standard (1993) for model type and size bid in kWh/yr.

UEC = Unit Energy Consumption in kWh/yr of complying unit.

.781 = Present value factor for 19 year stream of kWhs saved at \$.07/kWh and 6% real discount rate.

.749 = Present value factor for incentive requested by manufacturer (2 years at 15% per annum).

RIP = Requested incentive per unit.

3. Bonus (3 points). Each bidder can earn up to 2 bonus points by avoiding chlorine-bearing HCFC compounds in the refrigerant and the insulation. The bidder can also earn up to 1 point by proposing models with no air movement between the freezer and fresh food compartments (to improve food preservation).

Bid Evaluation and Prototype Run-off: Determining the winner may involve a run-off by the two highest-scoring bidders, who will demonstrate working prototypes of the models they bid. In this blind run-off, neither finalist would know details of the other manufacturer's bid. The bids would be re-scored, to give additional credit for measured energy performance beyond the bid by the prototype models in the run-off.

SERP Program Time Line: The input from all parties in the RFP development process has clarified how to balance the utilities' need for products soon, the regulatory time lines for NAECA efficiency determinations and CFC phase-out, and the manufacturers' need for time to develop new product lines. Table 3 gives the critical points on the time line that has emerged from the SERP consensus process.

Central Administration and Direct Manufacturer Payments

The winning bidder will contract with SERP to deliver a specific number of refrigerators into the service territories of each participating utility. This number will depend on the model(s) bid, the unit incentive(s) requested, and the participating utility's investment level. In any case, each participating utility will receive a number of units proportional to its investment. The more it invests, the more refrigerators it will ultimately receive. In general, utilities are investing about \$1.50-\$2.00 per residential account. The number of incentives that this will support depends of course on the bids received, but it is expected to approximate 5-10% of the total sales in the service territory for each year of the program.

Each utility will contract to pay, or deposit its investment in accounts administered centrally by SERP, which will pay the manufacturer when units are delivered, and carry out quality assurance and program evaluation on behalf of its member utilities. This structure reduces risk to the utilities.

Many SERP administrative costs are fixed, such as the cost to evaluate bids and to set up an incentive payment mechanism. Thus, more utilities participating and more utility investment leads to economies of scale. Based on anticipated utility investments, SERP estimates

Table 3. SERP Program Time Line

5/91-6/92	Membership recruitment for SERP and investment in bid pool by utilities. This includes assistance to regulators in developing appropriate treatment and incentives for utility investments.
2/12/92	Pre-bid Manufacturer review of draft RFP begins.
3/31/92	Deadline for manufacturer feedback on draft RFP.
7/7/92	RFP officially issued by SERP
10/15/92	RFP response deadline; manufacturer bids due at SERP.
12/1/92	SERP announces winner, or two finalists for blind prototype run-off.
5/1/93	Prototypes delivered to SERP (laboratory).
7/1/93	Announce contract (winning manufacturer).
1/1/94	Deadline for delivery of field test units to SERP.
7/1/97	Deadline for final delivery of SERP units to dealers in service territories of participating utilities.
1/1/98	Deadline for delivery of additional units for cross-border correction.

administrative costs to be 10.256% of the total. Each participating utility invests a percentage of its overall commitment each year as its share of the up-front costs of program marketing, RFP design and management, and administration.

Selling Golden Carrot Refrigerators

The winning manufacturer will determine how to market and sell Golden Carrot refrigerators, subject to specific contract requirements. These include requirements that the units be delivered to dealers when promised in the contract and in numbers that fulfil the commitments made by each participating utility. The manufacturer will commit to introduce the units to the retail distribution chain at a price comparable to that for conventional units with the same features.

In other respects, the manufacturer will choose the feature sets, marketing strategy, and sales channels without utility or SERP interference. Each utility will decide whether to provide co-marketing support to dealers, and how. The

program may also provide distinctive labels that call out the values of the Golden Carrot units.

If the winning bidder asks a \$100/unit incentive, a \$30 million (net of administrative costs) bid pool would imply 300,000 units. During the 1995-1997 period of the program, the Association of Home Appliance Manufacturers forecasts total domestic sales of 22 million units (AHAM 1991), so the Golden carrot would represent only about 1% of domestic sales. Within the territories of the participating utilities, the annual sales of Golden Carrot refrigerators would probably represent about 5% of refrigerator sales, depending on the incentive required by the winning bidder.

Discussion

Program Advantages

One key distinction between SERP and conventional rebate programs is that SERP incentives go directly to the manufacturer, instead of being paid as retail rebates. This means that a higher fraction of the funds reaches the manufacturer (because the direct payment is not "diluted" by markups in the retail chain). Also, the customer view of this is likely to be an "instant rebate" or "preferred utility customer discount" (as opposed to the customer filling out a form and waiting for a rebate). This should be an effective selling tool. Finally, direct manufacturer incentives paid for bulk shipments will be much simpler to process than hundreds of thousands of individual consumer rebates.

Co-marketing: In addition to the price effect of the direct manufacturer incentive and the attraction of the "instant rebate" in selling refrigerators, units with Golden Carrot performance levels will benefit from substantial publicity sponsored by supporting groups. Program publicity will include logos that identify models on the showroom floor as environmentally superior.

Reduced utility program staff effort: A central program administrator issues rebates directly to manufacturers. This reduces costs for all utilities by eliminating duplicate efforts and systems.

No free riders: Golden Carrot refrigerators are not sold today. Without the Super Efficient Refrigerator Program, no consumer could buy a super-efficient, CFC-free R/F. Thus, there are no free riders (people who would have bought the product even without a utility incentive).

Cross-border leakage: Utilities want to pay the manufacturer for the sale of refrigerators that save energy in their

own service territories, not for units that save energy for another utility's customers and ratepayers. On the other hand, manufacturers do not control to whom the retailer makes the final sale. In some cases, units will be sold to customers of non-participating utilities, which we call "cross-border leakage." The best way to minimize cross-border leakage is to achieve solid utility program participation in key regions. As the number of contiguous participating utilities rises, the proportion of cross-border sales to non-participating utility customers declines.

SERP members have agreed to share the cost of cross-border leakage by setting up a special fund within the program, equal to 4.27% of the total incentive pool. SERP will require the winning manufacturer to provide customer sales data for at least 25% of the total sales of Golden Carrot units. This level approximates the warranty card response rate, so the cost of providing customer information will be minimal. SERP will cross-check Golden Carrot refrigerator buyers against utility customer lists, and determine the total leakage rate and any particular problem regions. Special efforts will be made to reduce leakage in problem regions where non-participating utilities have extensive borders and share media markets with participating utilities.

Regulatory Treatment of Golden Carrot Programs

The long-term DSM procurement perspective of a Golden Carrot program requires new approaches by regulators. It involves commitments to future utility payments for delivered savings when new products are sold. These are not research and development projects, so Golden Carrot programs resemble customary DSM programs. On the other hand, the long-term perspective is new to utility DSM programs. To expect manufacturers to respond, participating utilities should sign contracts committing to payments for the products. In this sense, the Golden Carrot is like a supply option, requiring long-term commitments by utilities and at least conditional approval by their regulators. The endorsement of the Golden Carrot by the National Association of Regulatory Utility Commissioners (NARUC) reflects their support for this proposition.

Relationships to Other Efforts

Other rebates: SERP provides strategic leverage to bring advanced technologies to the marketplace, in part because it is targeting only about 5% of sales in each utility's territory. It will not completely replace existing refrigerator rebate and turn-in programs. We expect that some SERP participants and other utilities will continue to offer

consumer rebates for some products. However, the outcome of the SERP RFP is likely to strongly influence efficiency levels, eligibility standards, and rebate amounts.

Early retirements: SERP utilities may also complement their bid pool investment with additional incentives for customers to early-retire inefficient refrigerators and replace them with super-efficient units. Early retirement incentives linked with new sales incentives are more likely to be offered for super-efficient refrigerators than today's high-efficiency refrigerators, because each additional kWh saved adds to the likelihood that an early retirement program will be cost-effective. Significant environmental benefits can accrue through regional handling, recycling and disposal programs. The extra services that the utility provides in picking up and handling old refrigerators in an environmentally sound manner can also yield public relations benefits. An early retirement program also would increase demand for new refrigerators and result in quicker market penetration of environmentally superior refrigerators than would be the case with the SERP program targeted only at normal replacements.

EPRI Research Programs: SERP complements research on refrigerator technologies at the Electric Power Research Institute (EPRI). The Golden Carrot links longer-term, high-risk research (EPRI) and commercialization of available technologies. SERP differs from the EPRI program in that (1) it has the specific purpose of putting a product on the market; (2) it involves much greater funds, thereby providing a stronger incentive to manufacturers to commercialize the best technology that is available now; (3) it has a more specific goal than the EPRI program; and (4) because an energy consumption goal is specified, utilities can better subject the SERP program to cost-effectiveness screening. EPRI's Residential Task Force has endorsed SERP.

Other Issues

Because the Golden Carrot is novel, many issues have arisen. The group had to decide on a business framework (CEE and SERP). There were challenges in explaining DSM to appliance manufacturers, who were reluctant to consider the utility as a "visible hand" in the market. Many utilities were new to incentive-based DSM programs and to the concept of long-range commitments for DSM resource acquisition. Commissions also needed time to understand this aspect of an energy services strategy. This section reviews a few of the challenging issues that have arisen.

Long-range DSM resource acquisition: Although utilities plan supply side resource acquisition with very long lead

times, utilities do not usually plan to acquire DSM resources years in advance of their availability. Regulators in most states have not yet developed procedures for approving budgets and expenses today for DSM programs that will yield fruit several years in the future.

Mismatches with Regulatory Time Tables: SERP is the first program of its type, and it came before DSM incentives for DSM were available in many states. This has affected several important states, including Florida, Pennsylvania, and Texas.

RFP Design: The Request for Proposals is a consensus document which required agreement on key issues including:

- *Should environmental values beyond efficiency be included as bid factors?* We compromised on excluding CFCs and giving bonus points for avoiding HCFCs.
- *How do we assure that we get bids from companies that can produce and sell refrigerators?* We required evidence of production capacity (such as making 100,000 units/year for the U.S. market during the past three years), and set aside 22% of the bid score for the capability of the bidding firm.
- *Single or multiple bid winners?* Clearly, having more than one super efficient refrigerator brand on the market would increase retail price competition, but it was felt that dividing the incentive pool would decrease bid competition. Given limited resources, SERP wanted to provide enough incentive to largely offset the cost of introducing the new model(s) also argued for a single winner. Concerns about the possibility that the winning manufacturer might default and a desire to avoid saturating the market favored multiple winners. In the end, SERP chose to use a prototype run-off between the two highest scorers to select the final winner. This provided some insurance that at least two manufacturers were seriously looking at the potential of this market segment. At the same time, SERP allowed the bids to include multiple models, to increase program effectiveness without saturating any segment.
- *Where is the line between the utility and the manufacturer's need to produce a marketable product?* SERP essentially limited its requirements to energy performance, CFC-free and auto-defrost design, and a size range that includes the bulk of the market (A bonus point is available for designs without air movement between refrigerator and freezer sections).

The manufacturer can decide the feature set, design (side-by-side or top-and-bottom), and the market segment(s).

- *How do we balance the utility's need to verify installation in its service territory with the manufacturer's desire to have the simplest possible system, one consonant with his current relationships with his dealers? We have chosen to use warranty cards for verification.*

Because this program is so novel, many other issues have arisen since the precursor group met at the 1990 ACEEE Summer Study to formulate plans. Three are illustrative: (1) The dual legal structure (CEE and SERP) reflects the contributions multiple stakeholders can make strategically to selecting appropriate technology transformation targets, while vesting fiduciary authority with the utilities who have responsibility for ratepayer funds. (2) It took time for divergent utility agendas to coalesce, and to learn to converse effectively with individual manufacturers (anti-trust issues limited their ability to coordinate responses). (3) The mechanics and trust-building required to launch an independent organization of this type are formidable.

Further Work

Although the final RFP deadline for utility falls on September 1, 1992, some utilities are still interested but were not be able to work through all the steps required for approval. Such utilities could run parallel programs, but these would be less cost-effective; options should be considered for them.

CEE is beginning to screen other new technologies that are ready but kept off the market by institutional barriers, industry conservatism, or other factors. These could include high efficiency low-demand air conditioners, ground source heat pumps that require no resistive back-up, or end-user photovoltaics to meet peak capacity needs.

This starts with technology assessment, in which emerging technological opportunities for cost-effective DSM are identified. CEE will then look at relevant markets to determine the players and the obstacles to emerging technologies. CEE will then determine whether a coordinated utility consortium could be effective, and design a way to bring these technologies to market. Finally, if warranted, CEE will promote forming a program-specific organization to recruit utilities and administer the program on their behalf. The program may use an RFP, or could use alternative mechanisms, such as coordinated rebates, long-term advance notification of rebate schedules (dollars and efficiency levels) for large efficiency improvements, or negotiated agreements with manufacturers.

Finally, SERP must make the refrigerator program work. This means careful attention to doing all the details right the first time: utility contracts, a "bullet-proof" RFP, keeping a level playing field for all qualified manufacturers, objective and accurate Proposal evaluation, establishing a process for prototype testing, and ultimately arranging for efficient processing of the paperwork involved with large sums of money. If SERP works, the way will be cleared for other innovative programs, whether they are for residential heat pumps, commercial air conditioners, or advanced motors. CEE can help transform technology and the economy, and benefit our environment.

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