CONNECTICUT'S COLLABORATIVE PROCESS EXPERIENCE UTILITY CONSERVATION AND LOAD MANAGEMENT PROGRAM FOR ELECTRICALLY HEATED NEW RESIDENTIAL CONSTRUCTION

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In 1987, the Connecticut Department of Public Utility Control issued a precedent setting order to The Connecticut Light and Power Company (CL&P): meet and consult on the design and implementation of conservation and load management programs with groups who were previous adversaries to the Company. This order has since produced a "collaborative process" between the utility, regulators, and outside parties such as state energy planners, legislators, and environmental and consumer advocates. Conservation and load management program design and implementation has been dramatically affected by the collaborative process.

Electricity as a residential heating fuel was the key subject for robust debate over the course of nearly two years. Engineering and economic analyses indicated that electric heating was cost effective for the residential customer and the utility when combined with improved construction standards. However, this finding differed with other opinions within the collaborative group which viewed the use of electricity as a heating fuel as placing an unnecessary and avoidable demand on the region's electric systems, and, as such, inconsistent with the least cost planning tenets of State energy policy.

The development of CL&P's electric heat residential construction program offers unique lessons. This paper examines the experience of the collaborative process in reaching agreement on the specific electric heat program design and implementation issues, including assessment of whether it resolved opinion and program issue conflicts faster, better, and at less cost than the former adversarial relationships.

The results of the collaborative process and its influence on the technology potential assessment, program design, state and utility policy implications, and program implementation can be valuable assets for those responsible for utility program and energy policy making.

INTRODUCTION

Electric utility companies have a long history of involvement with residential construction activities. The extent of involvement has varied with strategies adopted by the utilities in response to internal and external forces. The nature of involvement has also varied with time, originating with promotional efforts designed to create markets for residential electric end uses, and more recently with efforts designed to promote conservation. In Connecticut, electric heat has been popular among homeowners and builders for over three decades with penetration rates that have ranged from 40 to 50 percent of all new residential constructions. Electric resistance baseboard system installations have predominated in

the service territory of Northeast Utilities' subsidiary, The Connecticut Light and Power Company (CL&P).

CL&P's experience with residential construction programs is significant; the company has implemented various residential construction programs that have covered the spectrum from load building to conservation initiatives. Regardless of the purpose of the programs, participation was entirely voluntary. Builders and developers had to incorporate building envelope thermal and construction techniques that surpassed those mandated by the building code to have their homes included in the programs.

To encourage adoption of the programs, combinations of financial and marketing assistance were offered by CL&P. The financial incentives consisted of insulation upgrade allowances designed to offset the incremental costs of building to levels beyond those mandated by code. At varying times, the marketing assistance included CL&P-placed builder recognition advertising, builder-placed cooperative advertising, and point-of-purchase advertising such as lawn signs and gold medallions. All of these efforts were supported by utility-sponsored general consumer awareness advertising.

Historically, these programs were designed solely under the auspices of CL&P and filed with the regulatory commission in what has been termed the traditional rate case proceeding. Interested parties, known as intervenors, were given the opportunity to submit testimony and query the company and the commission in an adversarial courtroom-like process. Based on the evidence submitted, the commission would effect any changes that it felt were necessary and issue an order to the company.

That scenario was changed when, in 1987, the Connecticut Department of Public Utility Control (DPUC) issued a precedent setting order to CL&P: meet and consult on the design and implementation of all conservation and load management programs with groups who were previously adversaries to the company.[1] This order gave rise to the "collaborative process" between the utility, regulators, and outside parties such as state energy planners, legislators, and environmental and consumer advocates.

CL&P's electric heat residential construction program development through the collaborative process offers unique lessons. In this paper, we will examine the collaborative process experience in electric heat program design and implementation issues.

THE COLLABORATIVE PROCESS

The collaborative process began with the assemblage of the players that, on the surface, appeared to be a rather diverse group. In the order to CL&P, the DPUC had nominated the Conservation Law Foundation of New England, Inc. (CLF) to coordinate the design of a comprehensive set of electric conservation and load management (C&LM) programs for all classes of customers: commercial, industrial and residential. CLF had established itself in the energy arena with the publication of the "Power to Spare" report (1986) which posited the potential benefit that aggressive electric conservation and load management programs would have on New England's present and future generation capacity. CL&P entered into an agreement with CLF that provided funding for CLF to retain the services of nationally recognized experts to consult in design of C&LM programs.

Joining with CLF and utility staff were representatives from various Connecticut state agencies; the Prosecutorial Division of the DPUC, the Office of Consumer Counsel, and the Energy Division of the Office of Policy and Management (OPM).

A three-tiered hierarchy was established to conduct the work of achieving consensus on the design and delivery of C&LM programs prior to their being filed by the utility with the DPUC, replacing the traditional adversarial approach common in rate case proceedings. At the first tier, CL&P and state agency staff representatives met with the CLF consultants to identify target markets, conservation technologies, and delivery systems appropriate to the needs of the markets and to perform preliminary cost benefit analyses. The results of this group's work were raised to the middle tier, known as the Working Group, which consisted of management

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[1] *Connecticut Department of Utility Control.* Order No. 3, 87-07-01. *New Britain, Connecticut. 1987.*

representatives from CLF, CL&P, and the state agencies. Here, in addition to reviewing and modifying the technical program design work from the first tier, levels of effort in terms of participation rates and resource allocation proposals were developed and supported by further, longer-term cost benefit analyses. The Working Group became the venue where C&LM policy differences that existed among the collaborators were to be resolved. When, and if, consensus was achieved by the Working Group, the proposals were presented to the Executive Committee, the third tier of the collaborative process consisting of upper management from CL&P, CLF, and the state agencies. Programs that passed this review were filed with the DPUC.

The collaborative process was successfully utilized in the design and implementation of commercial, industrial, and residential C&LM retrofit programs. A new commercial/industrial construction program was also devised and launched through the collaboration. However, consensus on the residential construction program proved to be elusive.

The lack of consensus was not based on the technical potential associated with the program as much as it was on the policy issues surrounding its conduct.

PROGRAM BACKGROUND

CL&P had previously sponsored the Energy Value Home (EVH) conservation in residential construction program which offered incentives to builders that incorporated certain prescriptive thermal criteria beyond those levels required by the building code. Originally, the EVH designation was extended to any home verified as meeting the thermal requirements of the program regardless of the heating fuel used. In 1987, in response to an order from the DPUC which prohibited the subsidization of conserving other fuels with funds collected from electric ratepayers, CL&P reconfigured the EVH program to include only electrically heated residences. Also in 1987, the thermal requirements of Connecticut's Basic Building code were upgraded to levels that approximated those of the then EVH program.

Beginning in 1986, CL&P conducted extensive research to assess the economic potential associated with increasing residential insulation levels above state code for various combinations of fuel sources and heating systems. A key finding of this study was that based on construction codes and electric rates in effect at the time, increased insulation levels in homes with electric resistance heat could be economically justified on a life cycle cost basis from the customer's perspective. Annual heating consumption for homes constructed in accordance with the recommendations was estimated to be two-thirds lower than comparable homes built to code. This was resultant from improved thermal envelope measures combined with reduced infiltration rates.[2]

This research was used as the justification for CL&P to revise the EVH thermal package for the 1988 program year. Perhaps the most significant change in the new EVH program was the R-26 sidewall requirement for program compliance that replaced the R-19 requirement of the previous program. Recognizing that this provision changed general building design and construction practice, an ambitious training effort for the design community and builders was proposed to ease transition and faster acceptance of the new EVH program.

However, the 1988 EVH program was withdrawn from public offering almost as soon as it was implemented in deference to the Order from the DPUC that established the collaborative process.

PROGRAM DESIGN

At the onset of the EVH design efforts, the members of the Working Group discussed policy issues that would ultimately determine the overall thrust and focus of the program. The nonutility members came to the initial meeting with two proposals that were indicative of their position regarding the use of electricity for residential space conditioning.

Under the terms of the first proposal, builders and developers of new facilities would be required to purchase a bond from CL&P "for an amount equal to some fraction of the present value of revenue

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2 *W. S. Fleming and Associates Inc.* Economic Relationships of the Effect of Heating Fuel Sources on Residential Superinsulation. *Syracuse. 1986.*

requirements associated with the additional generating capacity that the company projects it will have to build over the life of the new customer facility to serve the building's load."[3] The rationale for this approach was to have builders incorporate optional energy conservation features into their buildings by forcing an internalization of the costs of additional generating capacity that they caused.

The second proposal would have required CL&P to work with customers to determine, for specific end-uses, fuels which are most economical on a life-cycle costing basis.[4] The effect that the adoption of this proposal would have resulted in the installation of oil- or gas-fired space and water heating equipment where analyses indicated that they had a cost-effective advantage over electric alternatives.

Both of these proposals were counter to CL&P's position regarding the use of electric heat. A series of responses were prepared by the company that were discussed during subsequent meetings of the Working Group.

With regard to the bond issue, CL&P countered that such a program would be contrary to state energy policy as it would increase dependence on oil supplies and other energy sources that are subject to interruption and substantial price variability. Further, CL&P argued that, as it evolved as a summer peaking utility, the electric heating load is not the driving force behind long-term, least-cost resource planning.[5] The contribution to the winter peak from the residential electric heat customers accounted for less than 15 percent of that peak.

CL&P argued that the bond proposal was punitive and discriminatory because it had no basis in the revenues and costs incurred by the company to serve new electric heating customers. Citing the regulatory support for cost-based rates as an example, the company reported that the rates paid by electric heating customers fully covered the costs of providing them with service. Instead, the company expressed its desire to conduct the EVH program by providing incentives to builders that voluntarily constructed homes in accordance with the yet to be determined EVH thermal guidelines in a manner similar to that of the previous residential construction programs.

Consideration of the second nonutility proposal, which promoted fuel switching under certain circumstances, was short-lived. The DPUC had clearly prohibited such cross-subsidization in the Order to CL&P which transformed the EVH program to an all-electric effort.

Concurrent with the policy discussions occurring at the Working Group level, CL&P staff and a consultant retained through the collaborative process began a review of the technical potential of a revised EVH program. Using copies of the 1986 Fleming report on the economics of improved insulation levels, the Connecticut Basic Building Code manual, the *R. S. Means Residential Construction Cost Estimating* guide, the 1988 edition of American Council for an Energy-Efficient Economy's *The Most Energy-Efficient Appliance* listing and the *Sears Roebuck and Company Catalog* as references, the group set about the task of designing a new EVH program.

The result of this effort was a proposal for a new EVH program that expanded on the previous ones with the inclusion of criteria that addressed heat pumps, central air conditioning units, domestic water heaters, dishwashers, refrigerators, and lighting, in addition to beyond-code prescriptive thermal envelope measures. Preliminary cost benefit analyses suggested that utility investment via incentive payments for the various improvements were cost-justified from both the customers' and the utility's perspectives.

These recommendations were submitted to the Working Group where they became the subject of robust debate. Issues raised by the nonutility parties included:

- Could greater electric savings be justified through higher thermal criteria for windows and ceiling insulation?

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3 *Conservation Law Foundation of New England, Inc.* Mandatory Capacity Investment Bond. *Boston. April 1988.*

4 *Conservation Law Foundation of New England, Inc.* Fuel Choice Optimization. *Boston. April 1988.*

5 *Northeast Utilities.* Where NU Stands. *Berlin, CT. August 1988.*

- Are the energy and economic performances of Energy Value Homes beneficial to the resident when compared to electric and other heating fuel and air conditioning systems under Connecticut Code construction?
- What is the effect of the EVH guidelines on the performance of air conditioning?

The services of W. S. Fleming and Associates were retained through the collaborative group to perform a detailed analysis in an attempt to answer these questions. Fleming proposed a two-part methodology for the conduct of their work. In part I, a determination of the range of improved thermal integrity through incremental to code insulation and construction practices was modeled through an optimization analysis to assess the most beneficial improvements from the customer's side.

Part II of Fleming's work determined the economic and energy performances of the various heating and air-conditioning system types, comparing these performance levels with the results from part I and those of code construction on a 30-year, life-cycle cost basis.

Fleming completed the study in late 1988, the results of which culminated in a specific set of EVH thermal and equipment guideline criteria and estimates of their incremental to code construction and HVAC equipment costs and kilowatt-hour savings.[6]

Copies of the study were provided to all members of the collaborative for review prior to a formal presentation to the Working Group. While general agreement on the technical findings of the study was reached, policy issues regarding program operation and implementation remained unresolved.

First and foremost among these issues was the concern by OPM and OCC as to how the EVH program could be positioned so as not to increase the relative market penetration of electric heat in new homes.

A two-fold compromise solution to this issue was proposed during the summer of 1989. First, CL&P agreed to limit the scope of the EVH program by conducting it on a research and demonstration basis and offering incentive payments for a maximum of 150 homes during 1990. The incentive payments for the thermal envelope measures started at $2,400 for single-family homes, and scaled down to $1,400 per dwelling unit for multifamily projects. Additional incentives were proposed for the incorporation of passive solar features, set-back thermostats and high efficiency heat pumps, central air conditioning units and water heaters. Secondly, in order to reduce the electric heat promotional potential of EVH, OPM proposed to sponsor a residential construction program for fossil fuel-heated homes, structured in a manner similar to that of EVH in that incentive payments for qualified units would be issued by OPM.

CL&P accepted the terms of this compromise and further agreed to perform the inspections of the homes built under the OPM-sponsored program.

However, consensus on all aspects of the EVH program was not achieved by the collaborators. For instance, OPM expressed concern that the incentive levels for the installation of high efficiency heat pumps and central air-conditioning units were too high and would result in an increase in relative market penetration. CLF indicated that the effort for 150 homes was too small and supported a market-based program more extensive than the research and demonstration compromise.

Another point of contention focused on how the EVH program should be monitored and evaluated. The opinions within the collaborative were as numerous as the participants. Topics of debate included the numbers of control and EVH participants necessary to support the evaluation. Should nonelectrically heated homes be included in the control group? Should the program be evaluated on the basis of total household energy use or by individual end uses?

Nevertheless, CL&P filed the compromise EVH program with the DPUC in the last quarter of 1989 in anticipation of receiving an order to implement coincident with builders' planning for 1990 construction activities. Members of the collaborative who held dissenting positions were invited by the commission to comment on the CL&P filing.

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6 *W. S. Fleming and Associates.* Analysis of Residential Heating and Air Conditioning. *East Syracuse, New York. November 1988.*

PROGRAM IMPLEMENTATION

The DPUC issued a Draft Supplemental Decision on the EVH program in March 1990. The order to implement the program changed neither the thermal and equipment guidelines nor the associated incentive payments from the levels as filed. However, apparently out of concern for the perceived promotional aspects of the program, the number of homes for which incentive payments could be made was halved from 150 to 75 homes for the 1990 program year. In an attempt to regulate widespread builder participation in the program, the DPUC ordered CL&P to cap builders' incentive payments at three homes per builder.

While the DPUC supported the company's plan to conduct the impact evaluation of the EVH program, responsibility for the compilation of the process component was shifted from CL&P to an independent consultant to be selected through the collaborative process.

The DPUC order directed CL&P to review, on an annual basis, EVH program goals, budgets, and modifications to thermal and equipment guidelines through the collaborative process, expanded to include representation from lenders, builders, legislators, and building code officials.

Upon receipt of the order, CL&P mobilized to field the EVH program. The timing of the order to implement was less than fortuitous as many builders and developers had already made their plans for 1990 construction activities. Program implementation manuals, requests for proposals for inspection services, and builder support materials including an EVH Builders Guide, most of which had been drafted during the later days of the design phase, were finalized and rushed into production.

A training session on energy-efficient residential construction techniques for builders was held during April of 1990. This program was developed and sponsored jointly by the Home Builders Association of Connecticut, the United Illuminating Company, CL&P, and OPM. The session was well attended by electric and gas utility personnel who sought to familiarize themselves with the more advanced construction practices in anticipation of their companies implementing new residential conservation construction programs such as EVH.

Protocols and procedures were finalized for the end-use metering of a sample number of EVH and other newly constructed electrically heated homes of comparable size by CL&P and its contractors to support the impact evaluation of the program. The plan provided for the monitoring of space conditioning and domestic hot water end-uses in both control and EVH-participant houses.

To publicize the program, a press release was issued, radio interviews were conducted with the EVH Program Administrator, and CL&P field staff were directed to begin the builder recruitment effort.

CONCLUSIONS

How then to measure the success of the collaborative process in the design of the EVH program? The lack of consensus among the collaborators ultimately caused the DPUC to reprise its role as arbiter. If the amount of time expended only in the design phase is considered, then two years seem excessive for a program limited to the participation of 75 homes. The costs of the collaborative program development certainly exceeded those incurred in previous, traditional rate case proceedings. The time elapsed also raises the issues of residential construction conservation opportunities lost during the negotiations when over 8,000 dwelling units were permitted for construction in the CL&P territory.

The EVH program's basic thermal and equipment levels were unchanged from those originally proposed during the initial meetings between CL&P and the collaborative consultant excepting refrigeration and lighting, which were removed from the program's requirements during development. However, substantiating these levels in terms of costs and benefits proved to be very time-consuming. Establishing incentive payment levels and determining the scope of the program protracted policy discussions within the collaborative. In general, the collaborators were in agreement about the technical features of a residential construction program but differed as to how it

would best be implemented. CL&P remained strongly in favor of a program of voluntary participation.

Another event occurred during 1989, external to the collaborative process that could have potentially confounded the work of the EVH program planners. A bill requiring the payment of a "hook-up charge" for electrically heated homes was raised in the state legislature with the support of OPM.[7] CL&P joined with the Homebuilders Association of Connecticut in opposition to this legislation which was ultimately defeated during that year's session only to be reintroduced during 1990.

A series of focus group meetings were held with builders by CL&P during EVH development.[8] Two key findings of the sessions were contrary to the program as it became operational. First, builders reported a preference for receiving marketing assistance as opposed to cash incentives for utility program participation. As a research and demonstration program, communications budget for the 1990 EVH provided for no broad-based consumer awareness activities. CL&P was also criticized by focus group participants for historically changing program requirements too frequently. As ordered by the DPUC, the EVH program could change from year-to-year based on the results of the annual collaborative review.

CL&P and CLF agreed that maximum benefit would be achieved if the EVH program was shifted away from that of a research and development effort with utility incentive payments to one with more market-based incentives. Possible means to this end include increasing the availability of CL&P marketing assistance for the sale of the homes and working to establish a linkage with the lending community to ensure that homes built to EVH levels are eligible for preferential mortgage offerings.

Perhaps the collaboration's success lies in the cooperative relationship that developed with the product's importance eclipsed by the process used in its creation. The participation of the consultants retained to assist in program design provided CL&P personnel with exposure to resources previously unused. The C&LM expertise of nonutility parties was sought and used in program design replacing the previous exclusive utility-side planning activities. As a function of the amount of time spent in the collaborative process, the positions of the players were better understood in the informal, nonconfrontational setting of conference rooms than they might have been in the more rigid atmosphere of rate case hearing rooms.

A new spirit of cooperation is evident in activities such as the joint CL&P and OPM development, and sponsorship of residential conservation-in-construction workshops for builders scheduled for 1990. Discussions regarding the 1991 EVH activities began during the second quarter of 1990, coincident with the implementation of the first year's effort.

Based on the experience in Connecticut, The Massachusetts Department of Public Utilities (DPU) initiated a similar collaborative process in 1988. NU's Western Massachusetts Electric Co. (WMECO) joined with five other electric companies operating within the Commonwealth, CLF, the Attorney General's Office, and the Massachusetts Public Interest Group, to plan comprehensive C&LM programs. The goal of this multiutility process is to design programs that will be offered on a statewide basis.

Time, participation, and acceptance rates along with process and impact evaluation will combine to be the ultimate yardstick by which success will be measured.

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