

The Politics of Fuel Switching: A Vermont Case Study

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Fuel Switching, from electricity to other fuels, is being considered by more jurisdictions as a demand-side management measure to be implemented by regulated utilities. However, there are many reasons why fuel switching is very different from other types of demand-side management measures:

- (1) There exists a more mature and active market place for alternative fuels than for electric efficiency measures.
- (2) Fuel switching does not resolve the problem of customers operating inefficiently.
- (3) In general, gas companies, oil distributors and propane manufacturers and distributors are not conducting least-cost planning, offering DSM services or following least cost pricing principles.
- (4) Fuel switching to unregulated fuels, such as oil or propane, exposes the customer to the risks of fuel availability and price volatility and exposes the electric utility to partial or full conversions back to electricity.
- (5) It is unclear whether electric utilities are the appropriate societal agent to encourage fuel switching, especially since they are put at a competitive disadvantage.
- (6) The local, regional and national environmental impacts of fuel switching to alternative fuels have not been adequately assessed; programs which encourage fuel switching may not be improving the environment.

Vermont is in the forefront of wrestling with these issues. This paper will present an account of how the two largest utilities in Vermont are addressing these issues and how the politics of the state and region have molded the evaluation of fuel switching as a demand-side management measure.

Introduction

During recent years, a new trend in demand-side management (DSM) and least-cost planning for electric utilities is the consideration of fuel switching as a DSM resource. This is extremely controversial for many reasons, including those summarized in a decision restricting Georgia Power's promotional practices by the Georgia Public Service Commission when they stated, "...the use of monetary inducements to choose a particular energy source constitutes unfair competition, reduces customer choice, creates economic inefficiencies, and discourages the conservation of energy." (Georgia Public Service Commission 1990). A number of companies selling competing fuels are endorsing fuel switching as a DSM resource, viewing it as an opportunity for expanding their business. In contrast, many electric utilities are concerned about regulators mandating customer choice of fuels.

This paper briefly outlines the events that have transpired in Vermont. Then the paper discusses the Vermont experiences grappling with three major controversial questions which need to be addressed in evaluating and designing fuel substitution programs: (1) When is fuel switching cost-effective?; (2) Are there market barriers to fuel conversions which should be overcome by programmatic intervention?; and (3) If fuel substitution programs are necessary, who should pay? The opinions, findings, conclusions and recommendations expressed herein are solely those of the authors and do not necessarily reflect the views of either utility.

Vermont Case Study

For many years, Vermont has been in the forefront of energy efficiency efforts. While the state as a whole has long pursued an ethic to enhance overall energy efficiency, both of the largest utilities in the state, Central Vermont Public Service (CVPS) and Green Mountain Power (GMP), have also been viewed as leaders in the testing and implementation of innovative energy programs. Prior to the initiation of the fuel switching debate, both CVPS and GMP had a variety of initiatives including innovative pricing, load management and energy efficiency. For example, both utilities have had both seasonal and time-of-day rates since the 1970's.

Since the mid-1980's, as part of their efficiency programs, both utilities have offered unbiased analysis and assistance to customers who wish to consider switching from electric space and water heat to another fuel. CVPS has also been offering financing for residential fuel switching. Both utilities have pursued policies of discouraging the use of electric space heat in most new residential construction applications. Due to these pricing and promotional efforts, approximately 5% of CVPS' and 14% of GMP's residential customers use uncontrolled electric heat as their primary heating system. Another 4% of CVPS' and 2% of GMP's residential customers have storage electric heat or operate their electric heat during off-peak hours on time-of-day controlled rates. Thus, fuel switching activities are not totally new to Vermont's two largest utilities.

As further background, because Vermont is one of the most rural states in the U.S., natural gas is not widely available. Only 10% of CVPS' and GMP's customers have access to natural gas. Thus, for most customers in Vermont the primary option to electric space and water heat are unregulated fuels (e.g. propane, oil, wood, kerosene or coal).

In January, 1989, and January, 1990, CVPS and GMP, respectively, entered separate collaborative planning processes to work with the Vermont Department of Public Service (DPS), the Conservation Law Foundation and other intervening parties to plan and design comprehensive demand-side management programs (Weedall and Gamble 1992). Fuel switching was a very contentious part of those collaborative planning efforts. Both utilities adopted the position that fuel switching was not an appropriate demand-side management strategy for the reasons cited in the abstract of this paper. In response, the intervening parties participating in both collaboratives set as one of their highest priorities to incorporate fuel switching as a key element in the programs planned for both utilities.

This debate was further clarified in April, 1990 when the Vermont Public Service Board (PSB) issued their final Order following an extensive investigation into least-cost planning and demand-side management as part of Docket No. 5270 (State of Vermont Public Service Board 1990). As part of that Order, the PSB declared that fuel switching is a DSM resource, including conversions from alternate fuels to electricity.

While the ruling of the PSB sought to clarify the general policy on fuel switching, the Order in Docket 5270 did not provide specific direction regarding the parameters of how fuel switching should be implemented. Because CVPS had initiated their collaborative planning process a year earlier than GMP, CVPS found themselves in the forefront of the fuel switching debate. That debate became a battle as the intervening parties sought to break the deadlock in their negotiations by filing a motion on June 11, 1990 which would compel CVPS to fund fuel switching. CVPS responded on June 14, 1990 with a memorandum stating that the PSB did not have the authority to mandate the funding of fuel switching.

On March 19, 1991, the PSB ordered all parties to the CVPS Collaborative to analyze the merits of fuel switching measures and, where those measures prove to be cost-effective for Central Vermont and its rate payers, to file a plan for the acquisition of such energy efficiency resources. In its Order, the PSB asserted that it has the authority to require specific utility actions necessary for the provision of proper service at minimal cost. However, the PSB further explained that "the decision to require specific fuel switching measures should be made only where there is strong evidence that fuel switching will be cost-effective, that it will not occur in the absence of utility action, that the planned utility action is no greater than necessary, and that the apparent cost benefits for customers are not outweighed by the risks of price volatility and supply disruption inherent in increased reliance on unregulated fuels." (State of Vermont Public Service Board March 1991).

In requesting the analysis, the PSB directed both CVPS and the parties to their collaborative to address specific questions concerning fuel switching. The structure of these questions illustrates the PSB's focus on the variety of issues surrounding fuel switching. In summary, the PSB requested answers to the following questions:

- (1) When might fuel switching be cost-effective? The PSB asked the parties to analyze the relative risk and reliability of using electricity versus the alternate fuels for each end-use and market.

- (2) For cases where fuel switching is cost-effective, are there any market barriers?
- (3) Where market barriers exist, what interventions are necessary to overcome them?
- (4) Who is the most appropriate agent to assist in overcoming market barriers to fuel switching?
- (5) If some form of incentive from Central Vermont is deemed appropriate, what is the appropriate program design?
- (6) If Central Vermont encourages customers to switch to an alternate fuel, should CVPS also pay for conservation measures for that end-use?
- (7) Should Central Vermont be able to develop programs for fuel switching from non-regulated fuels to electricity?

CVPS responded to the PSB's questions with a 100+ page analysis and a 150+ page technical appendix of fuel switching in all sectors and appropriate end-uses. (Central Vermont Public Service Corporation 1991). As of May, 1992, none of the non-utility parties to the CVPS collaborative has complied with the PSB's Order. During 1990 and 1991, GMP was progressing with its collaborative process. Wrestling with many of the same issues, their planning process had also slowed to a crawl.

For both utilities, a change in the political environment was the harbinger of a resolution to the fuel switching debate. In January of 1991, a new Governor assumed office and appointed a new Commissioner of the Department of Public Service (DPS). As ratepayer advocate, the DPS was an intervening party in both the CVPS and GMP collaboratives. Under the tenure of this Commissioner, both utilities reached agreement regarding how fuel switching would be implemented as a demand-side management strategy.

This resolution was in large part based upon information CVPS and GMP presented, demonstrating that a significant level of fuel switching was already occurring without active financial intervention by the utilities. Table 1 provides a summary of electric fuel switching activity which has taken place within CVPS' and GMP's service territory during previous years. This information proved critical to demonstrating that an active, effective market already existed.

While both CVPS and GMP reached separate agreements regarding fuel switching in their respective collaboratives,

both arrangements are essentially identical. For the sake of brevity, only the CVPS final stipulation from that collaborative planning process will be discussed.

A major principle of the CVPS consensus stipulation on fuel switching filed on May 28, 1991 (Vermont Department of Public Service and Central Vermont Public Service Corporation 1991), is that, "To the extent possible, fuel switching programs will be designed so that the participating customers pay for the costs of the measures they receive such that other customers do not bear additional costs on account of fuel switching." The stipulation further calls for CVPS to "offer a comprehensive audit to all customers from the targeted market segments for whom fuel switching may be cost-effective"...and "provide these customers with accurate information on the costs and benefits to the customers of all such fuel switching and electrical efficiency measures." The utility will also arrange for market based financing which provides positive cash flow for cost-effective fuel switching measures. In addition, CVPS can provide fuel switching programs to electricity from other fuels, where these are cost-effective. "No Company funding will be provided for measures that are designed to save fuels other than electricity." CVPS will provide any necessary services to low-income customers to ensure cost-effective fuel switching measures are not rejected by these customers due to financial barriers.

On July 12, 1991, the PSB approved the CVPS stipulation on fuel switching stating that "This stipulation generally reflects a creative, sensible, and potentially effective approach to a challenging area of energy services." (State of Vermont Public Service Board July 1991). In this Order the PSB stated that the stipulation represented "a reasonable good-faith effort to test the threshold level of utility action that is necessary to acquire savings from cost-effective fuel switching investments." GMP's proposed fuel switching strategy was approved by the PSB as part of their collaborative program filing on September 5, 1991 with similar direction and content. (State of Vermont Public Service Board September 1991).

Discussion

In Vermont much of the controversy related to three key questions which need to be addressed in evaluating and designing fuel switching programs: (1) When is fuel switching cost-effective?; (2) Are there market barriers to fuel switching which should be overcome by programmatic intervention?; and (3) If fuel switching programs are necessary--who should pay?

Table 1. Summary of Electric Fuel Switching Activity in Vermont

	CVPS ^(a)		GMP ^(b)	
	Total Eligible Customers	Customers Who Switched Fuels	Total Eligible Customers	Customers Who Switched Fuels
Electric Space Heat	10,800	2,610	8,580	980
Conversion to Oil		1,500		300
Conversion to Propane		630		160
Conversion to Wood		480		90
Conversion to Other		0		440
Electric Space Water Heat	47,000	3,000	35,620	1,920
Conversion to Oil		1,610		950
Conversion to Propane		1,390		690
Conversion to Other		0		590

(a) Numbers represent fuel switching activity from 1987 through 1989 based on 1990 Residential End-Use Study. Number of eligible customers as of 1987.

(b) Numbers represent fuel switching activity from 1988 to 1989 based on Residential Dwelling Appliances Survey. Number of eligible customers as of 1987.

Cost-Effectiveness Analysis

In analyzing the cost-effectiveness of efficiency and fuel switching alternatives in Vermont, the PSB ordered that utilities primarily utilize the societal test. Simply put, the societal test compares the present value benefits (avoided electrical system costs) to the present value costs (alternate equipment and running costs including expenditures for the alternate fuel) to see if the benefits outweigh the costs. The fuel switching analysis controversy in Vermont has primarily centered on the following methodological issues: (1) the value for externalities; (2) the value for risks; and (3) the analysis period.

Externality Adder. The PSB has ordered that an additional 5% be added to supply costs when comparing them to DSM resource costs to account for environmental externalities not accounted for in the utility avoided supply costs. The DPS and other intervening parties contend this adder is appropriate when analyzing fuel switching measures as with other DSM resources. The utilities maintain that fuel switching has environmental impacts not fully considered when developing the 5% adder for the reasons listed below.

First, the localized environmental impacts of fuel switching have not been adequately addressed. Fuel switching in customers' homes and businesses results in the emission of pollutants through stack levels near customer locations. This compares to thermal plants which are generally farther from customers' homes and have higher stacks. In addition, power plants have emission controls and smaller houses and businesses don't. It is also harder to retrofit environmental controls on a multitude of homes and businesses than on a centralized power plant.

Second, the distribution of alternate fuels can give rise to environmental concerns. Whether by ship, pipeline, truck or tanker, there are externalities associated with the delivery of alternate fuels. There are also environmental impacts not commonly considered associated with the production of these fuels. For example, the pollutant streams from petrochemical refining facilities.

Finally, it is less likely that additional conservation measures will be installed once a customer has converted since gas, oil and propane companies do not have marginal pricing and do not promote efficiency improvements. Since electric utilities are saving all of the load of an

end-use through switching, it makes no sense for them to offer conservation services on loads which they convert to other fuels.

For these reasons the utilities contend there is no sound basis to include an environmental adder which benefits non-electric fuels when conducting cost-effectiveness analysis using the societal test. The PSB will be issuing an Order resolving this issue in the summer of 1992.

Risk Discount. The PSB also ordered that DSM costs be reduced by 10% due to the fact that there are less risks and more flexibility associated with acquisition of small DSM resources versus supply resources. However, in the area of fuel switching, the utilities maintain that there are additional risks, to the utility, the customer and society which negate this benefit. For example, the customer is open to the additional price volatility and supply uncertainty associated with unregulated fuels. Similarly, the utility is at risk of customers converting all or part of their loads back to electricity if the price supply situation changes.

In addition, important national security concerns arise if we increase our dependence on foreign fuel supplies, as evidenced by the recent Persian Gulf War or the oil embargo of the recent past. As far back as 1979 the US General Accounting office was urging New England to reduce its dependence on foreign oil through conservation and renewable resource development including hydroelectric development. Conversions to oil, the major cost-effective available fuel in Vermont does not fit with this goal.

As with the externality adder, the DPS disagrees with the utility stance, and the PSB is in the process of writing an order on this issue. However, both the DPS and PSB have agreed that there are some form of additional risks associated with fuel switching as evidenced by a clause in the DPS/CVPS Fuel Switching Stipulation indicating that fuel switching has to pass a higher threshold test to be eligible for utility assisted financing arrangements. Specifically, in the presence of a cost-effective mutually exclusive non-fuel-switching efficiency measure, the incremental benefits of the fuel switching measure compared to the non-fuel-switching measure must exceed its incremental costs by at least 10%. (Department of Public Service and Central Vermont Public Service Corporation 1991). In accepting this stipulation, the PSB stated this is "one reasonable way to quantify our Order that fuel switching programs should be required 'only where there is strong evidence that fuel switching will be cost-effective'." (State of Vermont Public Service Board July 1991). In addition, the PSB has also acknowledged

the existence of additional risks of price volatility and supply disruptions associated with increased reliance on unregulated fuels (State of Vermont Public Service Board March 1991). Therefore, the risks associated with fuel switching need to be furthered analyzed.

Analysis Period. Although all of the DSM cost-effectiveness analysis in the State has generally been done over the life of the measure (or less due to planned turn-over or obsolescence), the DPS has urged that fuel switching be analyzed over 30 years, without the additional costs of replacing a system at the end of its life. The utilities maintain that the equipment life should be used. There are risks that the equipment life time may be shorter due to conversions back to electricity or the fact that within a few years the customer would have converted without utility involvement. If these risks become reality neither the customer nor the utility may benefit from the conversions as planned.

Results. CVPS conducted fuel switching cost-effectiveness analysis for all sectors and appropriate end-uses. To assess the economics of fuel switching, CVPS performed the analyses from the societal, participant and non-participant perspectives. Alternatives to fuel switching, such as off-peak usage of electricity on a control rate, direct controlled usage of electricity and switching to a heat pump or dual fuel system were also analyzed.

In the case of CVPS, it is important to note that with the Company's retail electric rates being generally twice marginal costs, fuel switching is generally more cost-effective from the participant perspective than the societal perspective. Since it is expected that the region will be in an electricity surplus circumstance and utility avoided costs will remain below their average costs for many years, none of the fuel switching options pass the non-participant test.

The analysis from the societal perspective indicates there are some circumstances where substitute fuels could be utilized by customers to cost-effectively achieve the same end-uses that are currently provided by electricity. The most prominent examples are conversions to: (1) oil hydronic boilers with integrated water heat systems for high-use residential customers; and (2) certain water heating applications in the commercial sector. The analysis does not indicate any end-uses where CVPS can unilaterally say that fuel switching is cost-effective. The resultant conclusion, which was adopted in the fuel switching stipulation and accepted by the PSB, is that the cost-effectiveness of fuel switching needs to be analyzed on a case-by-case basis reflecting additional customer costs and benefits whenever possible.

Market Barriers

A "market barrier" may be defined as a constraint which limits a customer's choice and therefore, the efficient operation of the market. In other words, market barriers hamper the cost-effective production and distribution of goods and services.

In the area of fuel switching from electricity to fossil fuels, there are four primary areas where market barriers may exist: (1) availability of competing fuels; (2) access to accurate objective information; (3) access to capital; and (4) indirect pricing or "split-incentive" situations.

As discussed earlier, CVPS' and GMP's market research indicates that conversion to alternate fuels is occurring quite regularly where it is cost-effective, without significant utility assistance (see Table 1). As such, both utilities concluded that market forces are present and active within their service territories and that few barriers appear to be inhibiting customers' pursuit of cost-effective fuel conversions.

Availability of Competing Fuels. First, CVPS and GMP determined that customers have easy access to alternate fuels. There are over 150 fossil fuel dealers presently providing energy and services to all customer segments located within the State of Vermont. These include both large and small scale distributors of oil and propane as well as competing wood and other renewable energy suppliers (i.e., solar contractors). As noted earlier, the only fuel that is not available throughout Vermont is natural gas. Given the widespread availability of alternate fuels, there appears to be no barrier associated with availability of competing fuels.

Access to Information. Although there is a significant amount of information available to customers concerning the cost-effectiveness of fuel switching measures and technologies in Vermont, much of it is in the form of advertising which can be incomplete and often not objective. As such, as part of the fuel switching agreements, both CVPS and GMP agreed to provide unbiased, objective information on the costs and savings of various fuel switching measures and technologies. As part of DSM monitoring and evaluation, the utilities will analyze if the customers' information needs are being met through the utility efforts.

Access to Capital. Capital is available in the Vermont market to finance cost-effective end-use fuel conversions. This is true for most classes of customers in all market areas. For example, propane and oil vendors offer financing arrangements or special offers to promote fuel

switching from electricity for water and space heating. These include leasing, financing and rental plans for the purchase or conversion of space and water heating systems to propane and oil. Lending institutions offer three or four types of loans that can be utilized for energy efficiency improvements and fuel switching.

However, since it may not be readily apparent to customers that financing can generally be arranged offering positive cash flow CVPS and GMP will arrange for market-based financing to assist customers in affecting their fuel conversions where they meet the cost-effectiveness criteria. In addition, the utilities will work with low-income agencies to offer additional financial assistance to low-income customers.

"Split-Incentive" Situations. Another market barrier exists in situations where parties have different incentives for fuel switching for the same end-use. For example, it may be in a tenant's interest to invest in cost-effective fuel conversion in order to reduce operating costs. In the same circumstance the landlord may not wish to finance the investment when the tenant is paying for energy costs. While both parties may agree that fuel conversion is appropriate, because of the split in their individual incentives, they may not be able to reach agreement on the means to effect the conversion. This situation occurs particularly in the area of low-income housing. While CVPS and GMP are still identifying all the possible split incentives situations, CVPS and GMP have agreed to develop marketing and program approaches that will act to overcome these barriers.

Who Should Pay for Fuel Switching

The issue that caused the greatest controversy is the issue concerning who should pay for fuel switching activities: (1) the utility and its customers; (2) fuel switching participants; (3) the alternate fuel supplier and its customers; or (4) society at large (through taxation). Without some form of financial assistance, the participants bear the entire cost. Currently, in the absence of electric utility programs, many organizations including the alternate fuel suppliers, financial institutions and energy service companies (ESCO's) offer information, financing and in some cases installation services.

If additional investments are necessary, one possible solution is to allocate costs proportionally to the share of the net benefits received by each of the various groups. In Vermont, the net benefits primarily extend to the fuel switching participants and the alternate fuel supplier and its customers. If the fuel switch passes the societal test and participant test, the participants benefit from lower

energy bills. Evidenced by the aggressive pursuit of additional sales, the alternate fuel supplier and its customers seem to benefit from fuel conversions also.

Since the region is in surplus and the utilities' marginal costs are higher than its average costs over the planning horizon, electric utility non-participants do not see benefits, they see increased bills. If one believes there are environmental benefits and societal benefits associated with fuel switching, these accrue to all of society. One could argue it is appropriate to allocate those costs to all of society via state taxes. However, since some fuel switching conversions do pass the societal test using the utility avoided costs, it can also be argued that the utility should have some involvement in fuel switching programs.

The solution developed in Vermont to balance these affects is that the utilities will invest in applicable fuel switching analysis costs as part of energy audits for customers in all sectors. If fuel switching passes the societal test, and in the presence of a mutually exclusive electrical efficiency option, the incremental benefits exceed the incremental costs by at least 10%, the utilities will also arrange for positive cash flow financing. This primarily consists of referring a customer to financing available through financial institutions and/or ESCO's which meet their needs. As a last resort, the utilities may provide financing. In addition, utilities will provide contract arrangement services.

Summary

Substituting one fuel for another is a more complex issue than providing other DSM programs and does not always have such clear cut benefits for different parties. Therefore, regulators should use extreme caution when considering fuel switching options. This paper has focused on topics associated with three of the more nettlesome issues inherent to the fuel switching debate. The authors believe significant additional analysis is required before fuel switching can be successfully adopted as a demand-side management strategy.

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