STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 5270-MRSV-1

Investigation into Least-Cost	)	Hearings at
Investments, Energy Efficiency,	)	Montpelier, VT
Conservation and Management of	)	June 13, 1995
Demand for Energy In Re: Morrisville	)	October 2, 1995
Electric Department's Integrated	)	November 16, 1995
Resource Plan	)	December 5, 1995

Order entered: 04/24/97

PRESENT: Frederick W. Weston, III
Hearing Officer

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I. INTRODUCTION

This case is an investigation into the Integrated Resource Plan ("IRP" or "Plan") of the Village of Morrisville Water and Light Department ("Morrisville"). Many of the issues in the docket have been settled under the terms of a partial stipulation ("Stipulation") entered into by the parties in November 1995. The remaining areas of dispute involve the types and magnitudes of load-management programs for space- and water-heating end-uses, and the manner in which the disposal costs of hazardous materials replaced by higher efficiency measures will be accounted for when calculating customer incentive payments. Today's proposal for decision recommends that the Board approve Morrisville's IRP, as modified by the Stipulation and by the conclusions set out in this proposal for decision.

Morrisville anticipates that its future electricity needs, without demand-side management ("DSM") programs, will increase by 4.3 percent for energy and 2.2 percent for peak demand by 2001. Cost-effective DSM programs are expected to reduce Morrisville's electricity needs by 0.4 percent for energy and 1.4 percent for peak demand in 2001. If the modifications recommended herein are implemented, the anticipated savings of Morrisville's DSM should increase significantly; I also recommend that the Board direct Morrisville to submit revised estimates of those savings within ninety (90) days of a final order in this docket.

II. PROCEDURAL HISTORY

Morrisville filed its first IRP on June 17, 1991. Numerous revisions were filed to that IRP over the next several months as the Department of Public Service ("DPS" or "Department"), Morrisville, and VPPSA had informal discussions regarding it and other VPPSA-members' IRPs.

On May 5, 1992, Morrisville filed, in essence, a new IRP. A prehearing conference was held on June 8, 1992, at which time a schedule for reviewing VPPSA-member IRPs was set. That schedule anticipated that Morrisville's IRP would be reviewed after the IRPs for several other VPPSA members had been reviewed and approved by the Board (Morrisville's IRP is the fifth VPPSA-member system IRP to complete DPS review and technical hearings[1]).

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1. The Vermont Public Power Supply Authority ("VPPSA") purchases electricity and coordinates energy usage for nine municipal electric departments: Village of Enosburg Falls Water and Light Department, Village of Hyde Park Electric Department ("Hyde Park"), Town of Hardwick Electric Department ("Hardwick"), Village of Jacksonville Electric Company, Village of Ludlow Electric Light Department ("Ludlow"), Village of Lyndonville Electric Department ("Lyndonville"), Village of Morrisville Water and Light Department,

(continued...)

On April 19, 1994, a status conference was held to determine a schedule for reviewing Morrisville's IRP. On May 13th, a procedural order was issued that set a schedule linking review of Morrisville's IRP to a final Board order regarding Hardwick's IRP. On April 27, 1995, Morrisville filed final revisions to its IRP and stated that its IRP was ready for DPS review and Board approval. On June 13, 1995, a status conference was held, and, on July 18th, a revised procedural schedule was issued. On September 22, 1995, another status conference was convened, and a schedule for evidentiary hearings was set.

Evidentiary hearings on the stipulation and remaining issues in dispute was held on November 16 and December 5, 1995. Briefs and reply briefs were filed in January 1996.[2]

III. Findings of Fact

The following findings of fact are hereby reported to the Public Service Board in accordance with the provisions of 30 V.S.A. § 8.

A. General

1. Morrisville's load forecast estimates that energy consumption will increase from 45.44 million kWh in 1996 to 47.38 million kWh in 2001, an increase of 4.27 percent. Exh. MRSV-1 (hereinafter "IRP") at 1.1.3.

2. Morrisville's load forecast estimates that peak demand will increase from 7.88 MW in 1994 to 8.05 MW in 2001, an increase of 2.16 percent. *Id.* at 1.1.1.

3. Morrisville estimates that DSM programs will, by 2001, reduce its energy consumption by 0.4 percent (0.167 million kWh) and its peak demand by 1.4 percent (0.11 MW). *Id.* at 1.1.1 - 1.1.5.

B. The Partial Stipulation

4. Morrisville, VPPSA, and the DPS negotiated a settlement that resolved many, but not all, outstanding issues in this docket. Stipulation at 1-12, with Attachments.

1. Transmission and Distribution

5. Morrisville agrees to perform a transmission and distribution ("T&D") study in accordance with the guidelines contained in Attachment I to the Stipulation. In preparation

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1. (...continued)
Village of Stowe Electric Department, and Swanton Village, Inc., Electric Department. VPPSA-member systems with approved IRPs are Ludlow (12/3/92), Lyndonville (11/30/93), Hardwick (12/2/94), and Hyde Park (5/15/95).

2. It is more than a year than since the filing of those briefs. I offer only the sincerest of apologies to the parties for my delay in rendering this proposal for decision.

for the T&D study, Morrisville agrees to submit a compliance filing by June 1, 1996, and the filing shall contain a detailed schedule and budget for the T&D study.[3] Morrisville agrees to complete the T&D study and submit it as a compliance filing by no later than April 1, 1997, and to submit a T&D plan and schedule detailing the timely implementation of the recommendations contained in the T&D study by no later than June 1, 1997. *Id.* at 1-2.

6. Morrisville agrees to modify its T&D equipment acquisition program according to the terms of the Stipulation and its Attachments. The modifications will enable Morrisville to make purchase decisions that consider the economic value of the projected capacity and energy loss savings over the equipment's lifetime, on a societal net present value basis. *Id.*

7. Morrisville agrees to continue its Power Factor Correction Program (to improve the quality of delivered electricity), for those remaining eligible customers, at a rate of one customer per month, until all eligible customers have been served. *Id.*; IRP at 3.8.2.6-7.

2. Load Forecast

8. The parties agree that Morrisville's load forecast methodology, when appropriately implemented, is likely to yield reasonable results for a first-round IRP. Stipulation at 2-3.

9. The parties agreed on a set of principles to guide development of future load forecasts for Morrisville. They include:

- Recognizing the influence, whenever appropriate, of factors such as price and income that may affect the relationship between Morrisville's demand variables and statewide averages;
- Accounting for current and future developments (for example, appliance efficiency standards) that are highly likely to affect electricity demand but which are not fully reflected in historical data;
- Improving the documentation of forecasting techniques, assumptions, inputs, and other factors; and
- Conforming the load forecast to the guidelines set forth in the *Vermont Twenty-Year Electric Plan* (Dec. 1994) regarding Integrated Resource Planning (Chapter 8).

Id. at 3.

10. Morrisville also agrees to evaluate the effectiveness of additional variables in its next load forecast update, including: (i) the anticipated load development of the largest customers on Morrisville's system, where such customers may have a material effect on Morrisville's anticipated loads; (ii) updated econometric data from the Department's

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3. The proposed schedule was filed on June 3, 1996. Two days later, in a letter filed by VPPSA, Morrisville informed the Board that the T&D proposal did not fully conform to the terms of the Stipulation and should therefore be disregarded. VPPSA stated that it was working with Morrisville to correct the deficiencies and would file a revised proposal shortly thereafter. To date, a revised T&D proposal has not been submitted. The Board should direct Morrisville to file that proposal within thirty (30) days of a final Order in this docket.

statewide models and other appropriate sources, including data that reflect present and future appliance efficiency standards; and (iii) the use of alternative cases that reflect the potential effects of a reasonable range of futures. *Id.* at 3-4.

11. The parties agree that Morrisville may use the load forecast in this IRP for identifying avoided costs in order to determine cost-effective T&D improvements and DSM measures and programs. Morrisville agrees not to rely on the load forecast in this IRP for any future supply acquisitions that require approval pursuant to 30 V.S.A. § 248, unless it is revised in accordance with Paragraphs 8 and 9 of the Stipulation and is filed with the DPS at least 30 days prior to filing a petition under § 248. *Id.* at 4.

3. Supply Resources

12. Morrisville and the DPS did not resolve their disagreements over the appropriateness of Morrisville's supply-side plan and analyses. *Id.* at 4-6.

13. Nevertheless, Morrisville agrees to revise its avoided costs according to the method described in Attachment III of the Stipulation. *Id.*at 6.

14. Morrisville also agrees not to use the supply plan in this IRP for any future energy capacity purchase that exceeds a five-year period and represents more than one percent of Morrisville's historic peak demand. The parties agree that approval of Morrisville's IRP, including any particular supply options considered therein, does not signify the Department's agreement that particular supply acquisitions are prudent or necessary, meet the requirements of 30 V.S.A. § 248, or have undergone comprehensive Board review or are the subject of any findings by the Board under 30 V.S.A. § 248. *Id.*

4. Demand-Side Management Resources

15. Morrisville agrees to modify elements of its demand-side management ("DSM") programs according to the terms of the Stipulation. The affected programs are:

- The Farm Program;
- The Large Commercial and Industrial Program;[4]
- The Residential Moderate Use (Direct Install) Program; and
- The Small Commercial Retrofit Program.

In the main, these programs will be modified to conform to the designs approved in Docket 5270-HDPK-1. In addition, Morrisville will develop, in its next IRP, a comprehensive strategy for acquiring lost-opportunity resources. *Id.* at 7-10.

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4. One issue related to this program — disposal of potentially hazardous wastes — was not resolved by the Stipulation. See Sections III.C.1. and IV.C.1., below.

5. Future Integrated Resource Plans

16. Morrisville and the Department agree that Morrisville will submit its next IRP on April 27, 1998. *Id.* at 10.

C. Issues in Dispute

1. Hazardous Waste Disposal (Equipment Replacement and Renovation Program and Large Commercial & Industrial Program)

17. Morrisville proposes that the costs of disposing potentially hazardous materials (*e.g.*, conventional lighting ballasts containing PCBs, replaced during a lighting retrofit) be recognized and accounted for in the societal cost-benefit analysis of equipment replacement and renovations measures. Morrisville also proposes that these costs be reflected in the calculation of the customer incentives (*i.e.*, the buy-down to a two-year payback). Fox pf. at 4-5; tr. 12/5/95 at 145-158.

18. Every utility is responsible for the prudent management of potential environmental risks. Ultimately, the decision of whether Morrisville or the customer should control the disposal of DSM-related wastes is a management decision for the utility to make. In so doing, the utility should not deviate from least-cost planning principles or create barriers to DSM program participation. Tr. 11/16/95 at 120-121, 127-128 (Steinhurst).

19. For the purposes of societal cost-effectiveness testing, waste disposal is a cost of implementing the measure to be included in the total project costs. Tr. 11/16/95 at 122 (Steinhurst).

20. From a societal perspective, the benefits of proper disposal—*e.g.*, protection of public health and the environment—are at least as great as the societal costs. As such, the costs and benefits of proper disposal in the societal test effectively offset each other. *Id.* at 123-124, 136.

21. In addition, the environmental benefits created by an aspect of DSM implementation (in this case, proper waste disposal) are totally distinct from, and in addition to, the environmental benefits of avoided generation which are accounted for in the five percent default adder for avoided costs established in Docket 5270. *Id.* at 130.

22. Customer incentives should be set at the levels necessary to achieve program participation sufficient to assure acquisition of all cost-effective savings. Tr. 11/16/95 at 124-125 (Steinhurst).

23. For purposes of this IRP, the parties agreed that the appropriate incentive level is a co-payment of the total costs (including disposal costs) of cost-effective measures, such that the remainder to be paid by the customer will be recovered through energy-cost savings achieved within two years of the measures' installation (a buy-down to a two-year payback).

Under the Stipulation, Morrisville's co-payment obligation is capped at an amount equal to the sum of 48 months of estimated savings from the measures. Morrisville has committed to delivering the program in this fashion. Stipulation at 8-9; tr. 11/16/95 at 124-125 (Steinhurst) and 225 (Welch); tr. 12/5/95 at 145-146 and 157-158 (Fox).

2. Avoided Costs

24. Like other utilities in Vermont and the region, Morrisville's supply portfolio is currently marked by an excess of capacity and, consequently, market prices for energy are relatively low. At the same time, Morrisville's off-peak avoided energy costs are higher than its on-peak energy costs in the earlier years of the IRP's planning horizon. It is unclear, therefore, that shifting load from peak to off-peak periods is cost-effective Tr. 12/5/95 at 34, 82-85 (Underhill) and 163, 165 (Foley); Foley pf. at 1-2.

3. Residential New Construction Program

25. As part of its Residential New Construction Program, Morrisville proposes to offer an incentive for controlled electric water heating equal to the incremental cost of an 80-gallon tank over the total cost of a 52-gallon one (approximately $100). In the absence of sufficient load to justify taking service under Morrisville's time-of-day rate and assuming, therefore, that the avoided 52-gallon water heater would not have been controlled, this measure is not cost-effective. This is because the total cost of the control will include not merely the $100 incremental cost of the larger water heater but also the cost of the time-of-day metering and control equipment, as well as their installation. Morrisville estimates this cost to be $545. Furthermore, an effective residential new construction program should seek to ensure that electric water heaters are not installed in residential new construction unless it is the most societally cost-effective water heating alternative. Welch pf. at 11-14.

26. With the exception of the water-heating component, Morrisville's new construction program is in other respects consistent with the other VPPSA-member programs already approved by the Board. Tr. 11/16/95 at 227-228 (Welch); tr. 12/5/95 at 44-45 (Underhill).

4. Incentives for Controlled Residential Electric Hot Water Heaters

27. As in the Residential New Construction Program, Morrisville proposes to offer an incentive for customers to install an 80-gallon water heating tank. The incentive will be the incremental cost difference between a 52-gallon and the 80-gallon water heater, on the condition that the residential or farm customer agrees (a) to have the water heater controlled and (b) to be served under Morrisville's residential time-of-day rate. Welch pf. at 3.

28. Morrisville's analysis of the savings from this measure does not account for the increase in stand-by losses from a larger water heater tank. These losses, together with costs of time-of-day metering, render the program non-cost-effective for non-farm residential customers. *Id.*; tr. 11/16/95 at 201-202 (Welch).

29. In its analysis of the cost-effectiveness of off-peak water heating, Morrisville assumes that the customer already takes (or will elect) service under its residential time-of-day rate for the entire house. Therefore, the installation cost estimate used by Morrisville in the analysis is only the incremental cost between the 52 gallon and 80 gallon water heater or $100. Morrisville estimates that, by 1999, only 43 of an estimated 1,440 customers, or about 3 percent, will choose this option. Welch pf. at 10-11.

30. For farm customers, who are more likely to benefit from this program, the $100 installation cost may be an appropriate estimate. Welch pf. at 11-12.

5. Residential Space Heating

a. Residential Electric Thermal Storage Heat Program

31. Morrisville proposes to offer customer incentives for the installation of electric storage heat as a retrofit measure in electrically heated homes in the amount of $50/kW up to a maximum of 10 kW, or $100/kW up to a maximum of 10 kW if automatic set-back thermostats are installed in rooms still heated by electric resistance systems. IRP 3.8.3.5-7; Welch pf. at 3.

32. Morrisville's analysis makes a number of assumptions regarding the installation and operation of electric storage heaters as a retrofit measure for existing electric space heat customers:

(i) Two or three storage heaters totalling about 10 kW will be installed to replace about 7.0 kW of an estimated 10-12 kW of installed baseboard heat in the "average" electrically heated home. This assumes the sizing will be at about 1.4 to 1.5 times the heating load being replaced. These heaters will be controlled through the use of an electronic meter time-clock programmed by the utility to prevent on-peak usage. No customer override is assumed.

(ii) Morrisville assumes that the remaining 3-5 KW of baseboard heat, except a strip of baseboard in the bathrooms, will not be used during peak hours due to the time-of-day rate. Morrisville's winter peak hours are 7:01 am to 9:00 pm weekdays and 4:01 pm to 9:00 pm on Saturdays, according to its existing residential time-of-day tariff S-7.

(iii) A coincident peak demand savings of 3.73 kW per site is used in the cost-effectiveness screening.

These assumptions are not reasonable, and do not justify offering incentives for the installation of electric thermal storage heating measures. Welch pf. at 4-8; exh. DPS-1; tr. 11/16/95 at 192-194, 218, 228-232; tr. 12/5/95 at 30-31, 98, 129-130.

b. Residential Fuel-Switching

33. The level of usage at which residential fuel-switching measures are likely to be cost-effective is approximately 10,000-12,000 kWh per year. Tr. 11/16/95 at 186-187 (Welch).

34. It is more likely that partial fuel-switches will screen as cost-effective than will complete fuel-switches. Tr. 11/16/95 at 237 (Welch).

35. For the purposes of this program, Morrisville did not analyze the cost-effectiveness of alternative measures, such as a partial fuel-switch (that is, leaving in place electric heating units in rooms that would see only limited usage). In contrast, Morrisville's thermal storage heat analysis did assume only a partial conversion (bathroom and bedroom electric baseboards remain in place). A comparable analysis between thermal storage heat and fuel-switching should be performed using similar assumptions. Tr. 11/16/95 at 186-187 (Welch).

c. Methods for Analyzing the Cost-Effectiveness of Space-Heating Options

36. Morrisville's analyses of space-heating options are methodologically flawed, in that they employ improbable assumptions and average savings values that distort results. Morrisville should analyze space-heating measures using a "binning" approach that more accurately estimates costs and savings across a range of usage levels. Correcting these deficiencies will enable Morrisville to reasonably determine whether thermal storage heat is a cost-effective DSM measure. Welch pf. at 8; tr. 11/16/95 at 236-237.

6. Set-Back Thermostats

37. Morrisville proposes to offer a customer incentive of $25 per thermostat, to a maximum $50 per home, for the installation of automatic set-back thermostats. Welch pf. at 9; see Finding 31.

38. While set-back thermostats may save energy and cause an overall depression in the load shape, their use will most likely cause load "spikes" as the heaters come back on to bring the house back to the preferred temperature after the set-back period. This could occur at the time of Morrisville's peak. *Id.* at 9-10.

39. Set-back thermostats, by themselves, do not entirely eliminate the potential for on-peak energy usage by the customer. Tr. 12/5/95 at 130-131 (Fox).

IV. DISCUSSION

A. Positions of the Parties

In this docket, the Board and Department have reviewed Morrisville's first integrated resource plan, filed pursuant to the Board's April 16, 1990 Order in Docket 5270 and 30 V.S.A. § 218c. Morrisville has presented a plan for meeting present and future demand for service, and the utility argues that this plan is least-cost within the meaning of the statute. VPPSA supports that contention.

In contrast, the DPS argues that the Plan is not least-cost. The DPS concedes that many aspects of the IRP are reasonable or not significant enough to render the Plan fatally flawed. The parties have settled those issues and ask the Board to approve the Stipulation. However, agreement could not be reached with respect to a number of DSM program elements, and these questions have been put to the Board for resolution. The Department recommends that the Board approve the Stipulation, but disapprove the IRP and direct Morrisville to do the following (quoted):

> (1) Discontinue offering incentives for the up-sizing and controlling of electric hot water heaters for farm customers and non-farm residential customers.
>
> (2) Adopt and implement the off-peak water heating program approved for the other VPPSA systems (Lyndonville, Ludlow, Hardwick, and Hyde Park) if it can be shown to be cost-effective for the Morrisville system.
>
> (3) Adopt and implement [Washington Electric Cooperative's] assessment fee type residential new construction program design by May 1, 1996.
>
> (4) Discontinue offering incentives for set-back thermostats. This measure should be reconsidered in the future when Morrisville develops a comprehensive residential high-use program design that considers a comprehensive package of efficiency measures for electrically heated homes.
>
> (5) Perform a new analysis of thermal storage heat that utilizes a binning methodology and corrects for the other methodological deficiencies discussed in [the DPS'] Brief. Should the program prove to be cost-effective, customer incentives offered should be comparable to those provided for cost-effective fuel-switching.
>
> (6) Perform a new comprehensive analysis of space heating and water heating fuel-switching using a binning methodology. If the analysis shows that there are cost-effective fuel-switching opportunities, Morrisville should adopt and implement the residential fuel-switching program design approved in Docket No. 5270-HDWK-1.

DPS Brief at 23.

For the reasons that follow, I recommend that the Board adopt the Department's recommendations, with the exception of number (3).

B. The Partial Stipulation

Under the terms of the Stipulation, Morrisville agrees to make certain changes to its planning methodologies (with respect to avoided cost calculations, load forecasting, and transmission and distribution) and its DSM program designs. The IRP, as amended by the Stipulation, is consistent in those respects to the modified IRP of the Village of Hyde Park Electric Department, which the Board approved on May 15, 1995, in Docket 5270-HDPK-1. I conclude that the Stipulation is reasonable and I recommend that the Board approve it. Findings 4-16.

C. Issues in Dispute

There are two general sets of issues to be resolved. The first relates to the manner in which the costs of disposing hazardous materials should be recognized in the calculation of customer incentives to be offered under Morrisville's retrofit programs. The second involves the appropriate design of a variety of load-management measures for space- and water-heating end-uses in residences and farms.

1. Hazardous Waste Disposal

Morrisville argues that the costs of hazardous waste disposal should be accounted for in the calculation of customer incentives. The utility, concerned about the potentially large liability it could face if hazardous wastes generated by its DSM efforts are improperly disposed of, has decided to manage the waste disposal process itself, rather than leaving it to the customer. This raises Morrisville's costs of delivering the DSM program (but, as the DPS rightly notes, it does not increase the societal cost of the program, since the materials must be handled properly, regardless of who actually incurs the cost of doing so). Morrisville proposes a method for calculating the total costs of the retrofit, and then calculating the appropriate customer incentive therefrom.

There was a good deal of testimony and debate about this issue during the hearings. *See, e.g.*, tr. 11/16/95 at 124-125 (Steinhurst) and 225 (Welch); tr. 12/5/95 at 145-158 (Fox). By the end of the discussion, it appeared that clarity had been achieved, and the parties were confident that the matter could be settled. Unfortunately, a settlement was not reached, and the question remains to be resolved. *See* Order Re: Motion in Limine, 4/1/96.

The resolution is straightforward. Under the Equipment Replacement and Renovation and Large C&I Programs, Morrisville will pay an incentive that will reduce the

customer's investment in the efficiency measures to that amount for which the payback period is two years.[5] The total financial costs of a measure (*i.e.*, the project costs), upon which the calculation of the customer's incentive (*i.e.*, the utility's co-payment) is based, should include the legitimate disposal costs of replaced equipment. *See* DPS Reply Brief at 9, fn. 3. The inclusion of those costs will necessarily *increase* the amount of the incentive to be paid, since it must still lead to a two-year payback on the customer's remaining investment. In most cases, the incentive will increase by the amount of the disposal costs.[6] Findings 17-23.

The confusion in this case arose not in consideration of how to calculate the incentive but rather of the actual cash flows that Morrisville charted. Consider an instance where no disposal costs are incurred and project costs total amount, X. Under the program, the customer will pay the entire cost of the project and then receive a payment, Y (analogous to a rebate) from Morrisville. The net cost paid by the customer is therefore Z (that is, X = Y + Z). In a circumstance in which disposal costs (W) are incurred, Morrisville proposes to pay them directly (to assure that its environmental liabilities are properly addressed); the remainder will paid by the customer who will then receive an appropriate rebate. On the assumption that the two-year payback criterion is satisfied in the second example as it was in the first, the mathematics are as follows:

$$P = X + W$$

Where:

P = total project costs
W = waste disposal costs
X = Y + Z
Y = incentive paid to customer by utility
Z = net cost to customer

The total cost incurred by the utility is the sum of the incentive and the disposal costs (Y + W). This is the correct result, because the incentive is calculated as net investment cost

5. Not in all cases, however. Morrisville's share of the investment will be capped at an amount equal to the total of 48 months of estimated savings from the measures.

6. This is true because waste disposal does not affect the amount of energy cost savings that the high efficiency measures produce. It merely increases the costs of the measures. (Of course, this may render the measures non-cost-effective, but that is not the issue here.) If the measure remains cost-effective, Morrisville must still pay enough of an incentive to buy-down the customer's investment to a two-year payback: whether the disposal costs are included in the project costs or not, the net amount to be paid *by the customer* remains unchanged (unless inclusion of the disposal costs would cause Morrisville's share of the measure cost to exceed the 48-month savings cap, in which case the customer's share will increase by the amount of that excess).

for the customer and not as a percentage of total project cost. Morrisville has committed to delivering the programs in this fashion. Finding 23.[7]

2. Avoided Costs

Morrisville presented evidence and testimony describing the peculiar status of its supply-side resource portfolio. The salient fact, argues Morrisville, is the recent loss of its highest-volume user, a talc mill. Morrisville acquired entitlements to serve this customer, whose load it managed in such a way as to achieve a high load factor, thereby lowering the utility's (and customers') average costs.[8] Underhill pf. at 4-5. The loss of the talc mill saddled Morrisville with significant amounts of excess capacity and "must-take" energy, for which it must pay regardless of whether or not it needs the power. Tr. 12/5/95 at 97, 108.

The odd effects of this situation upon Morrisville's avoided costs were the subject of some dispute. Finding 24. A utility's avoided costs are the costs that it incurs to serve a defined increment of load or, conversely, the costs that it does not incur when its load is reduced by some decrement. The Department argues that, if Morrisville's off-peak energy costs are in fact greater than its on-peak energy costs (as VPPSA asserts), then it hardly makes sense to shift load from peak to off-peak periods. Underhill pf. at 7; tr. 12/5/95 at 84 (Underhill) and 165-166 (Foley). VPPSA counters that, though the "must-take" nature of Morrisville's baseload obligations appears to have forced off-peak costs up, the overall costs of off-peak power are such that shifting loads will reduce its total costs of meeting demand. Tr. 11/16/95 at 56.

Ultimately, the issue requires reliable empirical data to resolve. None of the parties presented conclusive evidence on the point. It is unclear to me how an excess of "must-

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7. If, before accounting for disposal costs, the customer incentive had been incorrectly computed, later recognition of the disposal costs might change the amount of the customer's net investment: but this would have nothing to do with the costs of disposal. Another cause of a change in the customer's incentive was described in the previous footnote.

On a related point, while there is no question that the legitimate costs of waste disposal should be included in the societal cost-effectiveness analysis of efficiency measures, there should also be no question that the benefits of such waste disposal should also be recognized. The Department persuasively argued that those benefits are at least equal to the costs, and probably exceed them. I recommend that the Board adopt the DPS's position on this point, and require Morrisville to appropriately account for these costs and benefits in its societal cost-effectiveness analyses of DSM measures.

8. Load factor is calculated as the ratio of total usage (in kWh) in a defined period to the product of maximum demand (in kW) and hours in the period. Capacity factor, a measure of a generating unit's (or portfolio's) output over time, is computed in the same fashion: that is, as the ratio of total output (in kWh) in a defined period to the product of maximum capacity (in kW) and hours in the period.

take" baseload power can increase off-peak avoided costs to a level greater than on-peak costs. As a general matter, the costs of meeting demand increase as demand increases, since the operating costs of additional resources (unused in the off-peak periods) that come on line to serve incremental demand are higher than those of the baseload (high capacity factor) facilities. The essential question in this case is whether any costs, either on-peak or off, can be cost-effectively avoided by targeted DSM investments. Whether such investments should consist of conservation and efficiency measures or load management efforts is itself a factual question, to be answered at the time of cost-effectiveness analysis in the field.

Morrisville's concerns lie not so much with the calculation of avoided costs as they do with the financial reality it faces, that of having a large surplus of "must-take" power, which must be paid for whether or not it is actually used. Although it argues in terms of the relative costs of on- and off-peak power, Morrisville's essential point is that, since many of its costs cannot be avoided, it makes sense to secure the most revenue possible for that power, thereby lowering the utility's average total cost per kilowatthour. VPPSA Brief at 4.

In and of itself, this objective is laudable. However, if its achievement leads the utility to promote electric usage rather than more cost-effective alternatives, the strategy cannot be found to be least-cost. This is the concern raised by the Department in its general opposition to Morrisville's load-management proposals.

I share that concern, but in this case I do not conclude that Morrisville will embark on a sub-optimal resource acquisition strategy. The utility is obligated to pursue the least-cost course of action. 30 V.S.A. § 218a; Docket 5270, Order of 4/16/90. Morrisville has acknowledged that obligation, stating that it is:

> committed to implement whatever DSM measures (be they "load-shifting" or "load-shedding") "screen" most cost-effectively. Morrisville has also committed to re-examine its loads, avoided costs, and other factors, before proceeding with implementation of specific load management measures.

VPPSA Brief at 5 (citations omitted). In light of the fact that the utility has agreed to modify its avoided cost calculations to meet the DPS's concerns, I conclude that Morrisville's pledge to implement the most cost-effective measures on customers' premises is genuine and should be relied upon. Furthermore, it is testable. I recommend that the Board direct Morrisville to maintain detailed records of all DSM investments on customer premises, with particular attention paid to cost-effectiveness analyses. Morrisville must be able to justify that the specific actions that it takes are societally most cost-effective.

3. Residential New Construction Program

Morrisville proposes offering an incentive to customers to install an 80-gallon electric water heating tank in new residences. The incentive will be equal to the incremental cost of the 80-gallon tank, *i.e.*, the additional cost over that of a 52-gallon tank (approximately $100). The Department argues that this measure is not cost-effective and should not be approved therefore. DPS Brief at 9-10.

I agree with the Department. As DPS witness Welch pointed out, Morrisville's analysis of the measure assumes that the customer will be taking electric service under the utility's residential time-of-use rate. This, however, will be highly unlikely, since it would mean that the customer expects to use significant amounts of electricity, presumably for electric space heat (with thermal storage). Finding 25. Such installations are unlikely to occur in new residential construction. In the absence of usage sufficient to justify taking service under the time-of-day rate (which is to say being able to manage one's demand cost-effectively across daily time periods), the 80-gallon electric water tank will not be cost-effective. This is particularly true when the costs of the load control metering technology (around $500) are properly included in the analysis. *Id.*

I therefore recommend that the Board deny Morrisville's request to offer an incentive for this measure.

The Department also recommends that the Board direct Morrisville to amend its New Residential Construction Program to resemble that of Washington Electric Cooperative, which employs an up-front "assessment" to induce builders and customers to install high efficiency measures in new homes. DPS Brief at 10. I do not concur in this recommendation. With the exception of the water-heating component, Morrisville's new construction program is in other respects consistent with the other VPPSA-member programs already approved by the Board. Finding 26. The record in this docket does not support a redesign of the program at this time.

4. Incentives for Controlled Residential Electric Water Heaters

Morrisville proposes to offer the same incentive for installing an 80-gallon electric water heating tank (approximately $100) in pre-existing houses as it proposed for eligible customers in the Residential New Construction Program; and, for the same reasons, the Department opposes the idea. DPS Brief at 12; see Finding 28. However, the DPS suggests that high-usage customers might be excepted, such as farm customers, since they are more likely to be able to manage their loads cost-effectively (even when accounting for the costs of the time-of-day meter and its installation). Welch pf. at 11-12; tr. 11/16/95 at 201-202. Consequently, the Department recommends that Morrisville be permitted to implement the

off-peak water heating program approved for other VPPSA systems, but only if the utility can demonstrate that it is cost-effective. DPS Brief at 23.

The Department's arguments are persuasive. Controlled electric water heating is not the most cost-effective for Morrisville's residential customers and incentives for its adoption should not be offered by the utility. In the case of farm customers who use significant amounts of electricity for other purposes, Morrisville should be permitted to analyze the cost-effectiveness of controlled electric water heating as one among several alternatives. Findings 27-30. If it is found to be cost-effective, then the proposed incentive may be offered; however, if another option is more cost-effective (*e.g.*, propane or oil water heating), incentives for adoption of the alternative should be first offered. In no event should the incentive for a cost-effective, *but sub-optimal*, measure equal or exceed those for the optimal measure.

5. Residential Space Heating

a. Residential Electric Thermal Storage Heat Program

Morrisville proposes to offer customer incentives for the installation of electric storage heat as a retrofit measure in electrically heated homes. The Department argues that Morrisville has made a number of errors in its analysis of the cost-effectiveness of the proposed program. DPS witness Welch catalogued a number of flaws in Morrisville's evaluation of electric storage heat, among them untenable assumptions about (a) the number and sizes of thermal storage units, (b) the usage of remaining, uncontrolled baseboard units, and (c) the expected coincident peak demand savings generated by the measures. Finding 32; *see* Section IV.C.5.c., below.

b. Residential Fuel-Switching

The Department argues that Morrisville failed to analyze fuel-switching alternatives according to the same underling assumptions that it applied to its analysis of electric thermal storage heating measures. Moreover, the utility did not even evaluate partial fuel-switching measures. Tr. 11/16/95 at 186-187; tr. 12/5/95 at 49-51. The Department recommends that Morrisville be directed to perform cost-effectiveness analyses of thermal storage heating and end-use fuel-switching according to the same set of underlying assumptions (as appropriate). The DPS also recommends that, if more than one measure is determined to be cost-effective, the utility should offer comparable incentives for each of the measures, thereby allowing the customer the freedom to choose the preferred option. Lastly, the DPS suggests that Morrisville should set incentives for fuel-switching at the levels approved by the Board in Docket 5270-HDWK-1 (Order of 12/2/94). DPS Brief at 18-19.

In general, I agree with the Department's recommendations. Morrisville should be directed to re-analyze thermal storage heating and fuel-switching measures on consistent bases. With respect to customer incentives, as I stated above (in Section IV.C.4), they should be designed so as to encourage adoption of the optimal measure, when more than one measure is found to be cost-effective. The incentives approved by the Board in Docket 5270-HDWK-1 may be appropriate for Morrisville as well; however, given the added complexity of designing appropriate incentives for more than one cost-effective measure on a premises, it is not immediately clear that the Hardwick program is altogether apposite here. I recommend that the Board direct Morrisville to propose new incentives for this program, consistent with the conclusions set out in this section.

c. Methods for Analyzing the Cost-Effectiveness of Space-Heating Options

Lastly, the Department argues that Morrisville's analyses of space-heating options are flawed methodologically, relying on questionable assumptions and average savings values. DPS Brief at 19. The DPS urges the Board to direct Morrisville to analyze space-heating measures using a "binning" approach that more accurately estimates costs and savings across a range of usage levels. *Id.*; Welch pf. at 8; tr. 11/16/95 at 236-237. The DPS believes that only by correcting its analytical methods can Morrisville reasonably determine whether thermal storage heat is a cost-effective DSM measure. If it is found to be cost-effective, the Department also recommends that the Board direct Morrisville to "ensure that the savings anticipated . . . are realized through provision of a controlled service that would guarantee there would be no override provision for the remaining bedroom baseboard heaters. . . ." DPS Brief at 20.

The Department's recommendations are sensible, and I adopt them. Findings 31-35.

6. Set-Back Thermostats

Morrisville proposes to offer customer incentives for the installation of automatic set-back thermostats. Set-back thermostats will reduce on-peak usage of electric space-heat units. This program, in effect, increases the customer incentive to adopt electric storage heating. The Department recommends that the set-back thermostat incentive measure be omitted from the current IRP, but that it be reconsidered in the future when Morrisville develops a comprehensive residential high-use program design that evaluates a comprehensive package of efficiency measures for electrically heated homes.

I conclude that the Board should adopt the Department's recommendation. Findings 37-39. In certain instances, set-back thermostats may prove to be the optimal energy measure, but the record in this docket does not justify their inclusion in Morrisville's current

set of DSM programs. As currently constituted, the incentives for set-back thermostats may wrongly encourage customers to adopt electric thermal storage measures. In its next IRP, Morrisville is of course free to revisit this question.

D. Conclusion

For the foregoing reasons, I recommend that the Board approve Morrisville's IRP, as modified by the Stipulation and by the conclusions set out in the discussion above. Morrisville should revise its avoided costs, DSM program designs, and DSM analytical methods to conform with the directives in this order. Morrisville's next IRP should reflect these changes as well. Lastly, Morrisville should file revised estimates of peak load and energy growth, with and without DSM, and the annual value of the savings (in dollars, nominal and present value) over the planning horizon. Those estimates should be filed within ninety (90) days of this Order.

This Proposal for Decision has been served on all parties to this proceeding in accordance with 3 V.S.A. § 811.

DATED at Montpelier, Vermont, this 25th day of March, 1997.

s/ Frederick W. Weston, III
Frederick W. Weston, III
Hearing Officer

V. BOARD DISCUSSION

We adopt the findings and conclusions of the Hearing Officer, as modified below.

The proposal for decision ("PFD") was issued on February 24, 1997, for the parties' comments. In a letter dated March 10, 1997, VPPSA informed the Board that it believes that the PFD:

> is generally consistent with the Board's approach to other VPPSA-members' first-round IRPs; VPPSA believes that this conceptual similarity is appropriate. Accordingly, VPPSA is willing to waive its opportunity to submit comments or request oral argument.

VPPSA, 3/10/97 at 1.

On the same day, the DPS, which had originally recommended disapproval of the IRP, filed a letter stating that it generally supports the proposed decision, but that there were several points on which it requested clarification. Ten days later, the DPS filed a second letter, detailing its concerns with respect to the discussion of avoided costs and load-shifting strategies.[9] DPS ltr., 3/10/97 at 1.

Morrisville did not file any comments.

In its letters, the DPS makes six requests for clarification. First, the DPS notes that the PFD does not conclude that Morrisville should redesign its residential new construction program; however, the Department recommends that the Board direct Morrisville to participate in the DPS's multi-utility working group that is currently developing a state-wide program. *Id.* at 2.

Second, the Department points out that the Hearing Officer finds that, when a utility is faced with choosing among several cost-effective DSM measures to serve a particular end-use, it should opt for the "optimal" measure, and should design its customer incentives so as to encourage adoption of that measure. See Sections IV.C.4. and 5., above. The Department requests that we adopt this recommendation and affirm "the long-standing principle of DSM program design that the optimal measure is the one which achieves the highest net benefit." *Id.*

Third, the Department asks that "[w]ith respect to any DSM program for which the PFD recommends denial, the Department requests that the Board specifically state in its order that approval for such program is denied." *Id.*

Fourth, the DPS requests that the sentence on page 21 of the PFD which states that "[s]et-back thermostats will reduce on-peak usage of electric space-heat units" be amended to say "*may* reduce on-peak usage." The DPS argues that, since it is possible that the set-

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9. The DPS had sought, and been granted, an extension of the filing deadline for this purpose.

back thermostats, which are operated by timers on customers' premises, may not be properly set, a definitive conclusion about their impact on peak demand cannot be reached. *Id.*

Fifth, the Department states that:

> [T]his IRP approval comes at a time when the General Assembly is considering electric utility restructuring and the Department is preparing a plan for capturing energy efficiency during the transition to restructuring which will include recommendations regarding municipalities. The Department does not regard the proposed approval in this docket, which concerns an IRP filed in 1991 and substantially revised in 1992, as affecting or preempting any obligations regarding energy efficiency or the mode of DSM payment and delivery (or any other matter) which may apply to Morrisville as a result of actions of the General Assembly, the Department's plan [for acquiring energy efficiency during the transition to competition], or any proceedings of the Board concerning energy efficiency in a restructured environment. The Department requests that the Board's order include a statement to this effect.

Id.

And lastly, in its letter of March 20th, the DPS addresses issues raised by the PFD's discussion of avoided costs and load-shifting. Under the Stipulation, Morrisville agreed to file revised avoided costs by February 15, 1996. However, the utility has not yet done so. This, argues the DPS, poses at least three problems. The first is that, without avoided costs, Morrisville cannot establish whether particular load-management measures are cost-effective. Second, Morrisville has not fulfilled its commitments under the Stipulation. And third, Morrisville is unable to demonstrate that its thermal storage heat program is rightly a component of its least-cost plan. DPS ltr., 3/20/97 at 1-2. As a consequence of these deficiencies, the DPS recommends that the Board take the following actions:

- Direct Morrisville to file, within 30 days of this Order, avoided costs revised in accordance with the terms of the Stipulation; and
- Proscribe Morrisville from implementing any incentive program for thermal storage heat unless and until it files for and obtains approval of revised avoided costs, files for and obtains approval of the analyses of fuel-switching and thermal storage heat called for in the PFD, and files for and obtains approval of proposed incentives for the fuel-switching and thermal storage heat programs.

Id. at 2.

Upon consideration of the parties' comments and proposed decision in this case, we conclude that the specific requests of the Department are reasonable, and we adopt each of them.

VI. ORDER

IT IS HEREBY ORDERED, ADJUDGED AND DECREED by the Public Service Board of the State of Vermont that:

1. The findings and recommendations of the Hearing Officer are adopted.
2. The Stipulation is approved.
3. Morrisville's Integrated Resource Plan, as modified by the Stipulation and the Decision above, is approved.
4. Morrisville shall comply with all directives set out in this Decision, specifically:
   - Morrisville shall file a revised schedule for conducting its T&D Study.
   - Morrisville shall maintain detailed records of DSM investments on customer premises, including all relevant cost-effectiveness analyses and other workpapers.
   - Morrisville shall file, within 30 days of this Order, avoided costs revised in accordance with the terms of the Stipulation.
   - Morrisville shall analyze space-heat fuel-switching and electric thermal storage heat measures using consistent assumptions and methods, as appropriate. In addition, Morrisville shall file, within sixty (60) days of this Order, proposed incentives for fuel-switching and thermal storage measures, designed so as to encourage adoption of the optimal measure. Morrisville shall not implement any incentive program for thermal storage heat unless and until it obtains approval of its revised avoided costs, obtains approval of the analyses of fuel-switching and thermal storage heat, and obtains approval of proposed incentives for the fuel-switching and thermal storage heat programs.
   - Morrisville shall modify its methods for DSM cost-effectiveness testing as directed herein, including adoption of the "binning" approach.
   - Morrisville shall file new estimates of the costs, benefits, and savings of its DSM programs as modified by this Order.
   - Morrisville shall not offer incentives for electric water heating in new construction or in residential retrofits. Morrisville shall participate in the DPS's multi-utility working group that is currently developing a state-wide residential new construction program.
5. Morrisville shall file its next IRP on April 27, 1998.

DATED at Montpelier, Vermont, this 24th day of April, 1997.

s/ Richard H. Cowart	)	PUBLIC SERVICE
	)	
s/ Suzanne D. Rude	)	BOARD
	)	
s/ David C. Coen	)	OF VERMONT

OFFICE OF THE CLERK

Filed: April 24, 1997

Attest: s/ Susan M. Hudson
Clerk of the Board

NOTICE TO READERS: This decision is subject to revision of technical errors. Readers are requested to notify the Clerk of the Board of any technical errors, in order that any necessary corrections may be made.

Appeal of this decision to the Supreme Court of Vermont must be filed with the Clerk of the Board within thirty days. Appeal will not stay the effect of this Order, absent further Order by this Board or appropriate action by the Supreme Court of Vermont. Motions for reconsideration or stay, if any, must be filed with the Clerk of the Board within ten days of the date of this decision and order.