STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 7873

Programmatic Changes to the Standard-Offer Program   )

and Docket No. 7874

Investigation into the Establishment of Standard-Offer   )
Prices   )

Order entered: 3/7/2016

ORDER RE 2016 PRICES FOR THE STANDARD-OFFER PROGRAM

I. INTRODUCTION

On March 1, 2013, pursuant to 30 V.S.A. § 8005a(f)(1), the Vermont Public Service Board ("Board") determined that a request for proposal ("RFP") mechanism would be used to select the standard-offer projects that will fill annual plant capacity available under the program.[1] The Board also established the price caps that would apply to that RFP, and stated that these price caps would be reviewed regularly.

In today's Order, pursuant to Section 8005a(f)(3), we determine the avoided costs that will serve as price caps on the standard-offer projects solicited through the 2016 RFP. In addition, we determine the avoided costs that will serve as the prices for farm methane projects under the standard-offer program.

II. BACKGROUND AND PROCEDURAL HISTORY

Background

Title 30 V.S.A. § 8005a mandated significant changes to the standard-offer program, which include setting standard-offer prices for each renewable energy category at avoided cost

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1. Dockets 7873 and 7874, Order of 3/1/13 (the "2013 Order").

accompanied by a requirement that the Board employ a market-based mechanism to allocate the plant capacity of the standard-offer program.

Section 8005a(f)(2)(B) defines avoided cost as:

the incremental cost to retail electricity providers of electric energy or capacity or both, which, but for the purchase through the standard offer, such providers would obtain from distributed renewable generation that uses the same generation technology as the category of renewable energy for which the board is setting the price.

In addition, pursuant to Section 8005a(f)(B), the definition of avoided cost includes the consideration of each of the following:

(i) The relevant cost data of the Vermont composite electric utility system.
(ii) The terms of the contract, including the duration of the obligation.
(iii) The availability, during the system's daily and seasonal peak periods, of capacity or energy purchased through the standard offer, and the estimated savings from mitigating peak load.
(iv) The relationship of the availability of energy or capacity purchased through the standard offer to the ability of the Vermont composite electric utility system or a portion thereof to avoid costs.
(v) The costs or savings resulting from variations in line losses and other impacts to the transmission or distribution system from those that would have existed in the absence of purchases through the standard offer.
(vi) The supply and cost characteristics of plants eligible to receive the standard offer.

The determination of avoided-cost prices pursuant to Section 8005a(f)(2) is addressed below. Pursuant to Section 8005a(f)(2)(A)(ii), the avoided costs, except for farm methane, serve as caps on the prices solicited through the market-based mechanism.[2]

Section 8005a(f)(3) requires that the Board annually review the established avoided costs "to decide whether they should be modified in any respect in order to achieve the goal and requirements of this subsection."

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2. Pursuant to Section 8005a(g), farm methane projects remain outside the programmatic cap, so these projects do not compete in the market-based RFP process.

Procedural History

On January 15, 2010, the Board established standard-offer prices pursuant to Section 8005.[3] These prices replaced the statutorily set default prices that applied to standard-offer contracts entered into previously.[4]

On January 23, 2012, the Board revised the standard-offer prices for solar projects and wind projects with a nameplate capacity of 100 kW or less ("small wind").[5] In addition, the 2012 Order retained the standard-offer prices for the remaining technology categories that were established in the 2010 Order.

On March 1, 2013, the Board established, pursuant to Section 8005a(f)(1), an RFP mechanism to determine the standard-offer projects that will fill annual plant capacity available under the program, and directed the Standard-Offer Facilitator,[6] by April 1 of each year, to issue an RFP to solicit standard-offer projects to meet the requirements of Section 8005a(c).[7] The 2013 Order also established avoided costs to serve as caps on the standard-offer prices solicited through the RFP. The 2013 Order revised the standard-offer prices for solar projects and retained the standard-offer prices for the remaining technology categories that were established in the 2012 Order.

On March 21, 2014, pursuant to Section 8005a, the Board established avoided costs to serve as caps on the standard-offer prices solicited through the 2014 RFP.[8] The 2014 Order retained the standard-offer prices for all the technology categories that were established in the 2013 Order.

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3. Docket 7533, Order of 1/15/10 (the "2010 Order").

4. The requirements of the standard-offer program were moved to Section 8005a. In addition, the statutory criteria for establishing the standard-offer prices have been altered over time.

5. Docket 7780, Order of 1/23/12 (the "2012 Order").

6. VEPP Inc. serves as the Standard-Offer Facilitator under contract to the Board. The 2016 RFP will be available at: http://vermontspeed.com.

7. Dockets 7873 and 7874, Order of 3/1/13 (the "2013 Order").

8. Dockets 7873 and 7874, Order of 3/23/14 (the "2014 Order").

On March 20, 2015, pursuant to Section 8005a, the Board established avoided costs to serve as caps on the standard-offer prices solicited through the 2015 RFP.[9] The 2015 Order revised the standard-offer prices for solar projects, created a new price cap for food waste anaerobic digestion projects, and retained the standard-offer prices for the remaining technology categories that were established in the 2014 Order.

On April 2, 2015, pursuant to Section 8005a(f)(2), the Board determined the standard-offer prices for farm methane projects, effective for standard-offer contracts executed after April 1, 2015.[10]

On October 30, 2015, Board staff held a workshop to discuss proposals for the calculation of avoided costs, pursuant to Section 8005a(f)(2), to serve as avoided-cost price caps on the standard-offer projects solicited through the 2016 RFP.

On November 19, 2015, the Vermont Department of Public Service ("Department") filed a proposal for avoided-cost price caps for hydroelectric and solar projects.

On December 9, 2015, Allco Renewable Energy Limited ("Allco") and the Vermont Public Power Supply Authority ("VPPSA") filed comments on the proposed avoided-cost price caps.

On December 17, 2015, the Department filed reply comments.

III. PRICE CAP FOR SOLAR PROJECTS

Participants' Comments

The Department proposes an avoided-cost price cap of $0.130 per kWh for solar projects solicited through the 2016 RFP.[11] The Department reviewed the assumptions and cash-flow model used to determine the existing solar price cap. The cash-flow model, which was developed collaboratively by stakeholders in Docket 7533, has been used by the Board in

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9. Dockets 7873 and 7874, Order of 3/20/15 (the "2015 Order").

10. Dockets 7873 and 7874, Order of April 2, 2015 (the "April 2015 Order").

11. The solar price cap for the 2015 RFP was $0.155 per kWh.

previous standard-offer proceedings to estimate the prices that a new project would need in order for the developer of that project to earn a reasonable return on investment.[12]

Specifically, the Department recommends that the following assumptions be used as inputs for the solar cash-flow model:

- Installation Costs: Assume $1.84 per watt, based on data from a recent study of Vermont solar costs.[13] The cost estimate includes the costs for the solar panels and other materials, installation labor, interconnection, and permitting. (The 2015 solar price cap assumed $2.50 per watt.)

- Inverter Replacement Costs: Continue to assume a cost of $400,000 for inverter replacement in year 12 of the project life.

- Annual Maintenance Cost: Continue to assume $25,528 per year. The maintenance cost assumption also includes costs associated with a letter of credit for decommissioning, estimated at 0.4% of the installed project cost.

- Investment Tax Credit Percent Realized: Assume 100% realization of the 30% federal investment tax credit and the 7.2% state investment tax credit. (The 2015 solar price cap also assumed 100%.)

- Annual Tax Rate: Assume approximately $12 per watt, which includes a state uniform capacity tax and a municipal tax on the net present value of the project's cash flows. The uniform capacity tax is assumed to be $4.00 per kW of AC capacity or $8,800 per year. The municipal tax rate is assumed to be 0.75% applied to 70% of the net present value of the project's net cash flows in year one. The value is adjusted annually for inflation. (The 2015 solar price cap assumed annual tax rate of $14 per watt.)

- Land Lease Costs: Continue to assume 6.8 acres per MW (approximately 15 acres for a 2.2 MW project) at $1,000 per acre, which includes the value of an annual property tax payment.

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12. *See* Docket 7533, Order of 1/15/10; Docket 7780, Order of 1/23/12; Docket 7874, Order of 3/1/13; and Docket 7874, Order of 3/10/15.

13. *See Vermont Solar Cost Study*, prepared for the Clean Energy states Alliance and the Vermont Department of Public Service by Leigh Seddon, dated February 2016. The Department's recommendation was based on the draft study. The value in the final study was $1.91 per watt.

- Decommissioning Costs: Assume to be a cost of zero, and continue to include the costs associated with the letter of credit in the project maintenance costs.

- Inflation: Assume 1.80% annually, which reflects the decline in inflation over the past year. (The 2015 solar price cap assumed 1.89% annually.)

- Rate of Return: Continue to assume 9.6%, which is equivalent to GMP's current return on equity.

- Debt/Equity Ratio: Continue to assume that the capital structure of a project would be 60% debt and 40% equity.

- Weighted Average Cost of Capital: Continue to assume 6.09%, based on 60% debt and 40% equity and based on 3% for short-term debt costs and 4.5% for long-term debt costs.

Allco argues that the weighted average cost of capital should be a value greater than 6.09%. In support of its argument, Allco states that the value for GMP is 7.32% and GMP has the ability to cover its financial risk through a rate increase request. With regard to installation costs, Allco argues that the $1.84 per watt value is not supported and argues that the component costs for interconnection ($85,300), permitting ($62,000), and general and administrative overhead ($8,900) are too low. In addition, Allco contends that the installation costs do not account for new screening requirements. With regard to decommissioning costs, Allco contends that the costs associated with a letter of credit are low because they do not include the margin associated with acquiring the letter of credit. With regard to investment tax credits, Allco contends that there are few financing parties in Vermont that can use both the full federal and state investment tax credits.

VPPSA states that the installation cost assumption of $1.84 per watt includes costs for land acquisition or leasing and that the cash-flow analysis accounts for these cost separately. VPPSA recommends that the analysis be adjusted to avoid the double counting of these costs. In addition, VPPSA states that solar installation costs have shown no indication that they will stop declining and that a project with installed costs of $1.84 per watt bid into the 2016 RFP would likely be constructed at a lower price in 2017.

In response to the concerns raised by Allco, the Department agrees that its assumptions for installation and decommissioning costs may differ from Allco's experience because the

Department has relied on a much larger sample of data than Allco's project portfolio. With
regard to the weighted average cost of capital, the Department contends that the most recently
collected official statistics on the prevailing prime bank lending rates and corporate and
municipal bond rates are still within the 6.09% range. With regard to the Vermont investment
tax credit, the Department acknowledges it is possible that standard-offer projects may not
qualify to take advantage of the tax credit, but the Department has not received information to
support Allco's assertion. The Department states that removing the Vermont investment tax
credits would increase its proposed solar price cap to approximately $0.140 per kWh.

In a general response to Allco's concerns about the accuracy of the solar assumptions, the
Department observes that its proposed price cap of $0.130 per kWh is greater than every solar
bid received in the 2015 RFP and is greater than the winning bids in the 2014 RFP. The
Department further observes that the past two RFPs have resulted in over 27 MW of solar bids
(12 unique projects) that offered prices below $0.130 per kWh.

In response to VPPSA's concerns, the Department agrees that the $1.84 per watt estimate
for installation includes the costs of acquiring property. The Department recommends that the
cash flow analysis be updated to avoid double counting of property costs.

Discussion

Based on a review of the assumptions and the cash-flow model analysis, we accept the
Department's recommendation of an avoided cost of $0.130 per kWh for solar projects. With
respect to the appropriate installed costs for solar projects, we are persuaded that the value of
$1.84 per watt is appropriate because that value is based on cost data provided from the February
2016 *Vermont Solar Cost Study*. While Allco raises concerns about the accuracy of this
assumption, no participant, including Allco, provided information to challenge the conclusions of
the Vermont study. VPPSA raises concerns that the $1.84 per watt value includes land
acquisition already accounted for elsewhere in the cash-flow model. The Department based its
$1.84 per watt assumption on a draft study, and the final study estimated solar installation costs
to be $1.91 per watt with land acquisition costs, and $1.86 per watt without land acquisition
costs. The assumption of $1.84 per watt addresses the concerns of double counting and

recognizes the continuing trend of declining solar installation costs.

Allco raises concerns about decommissioning costs, weighted average cost of capital, and investment tax credits, but provides no information to challenge the accuracy of the cash-flow model assumptions. The cash-flow model analysis is sensitive to the assumptions about weighted average cost of capital and assumed realization of the investment tax credit. We agree with the Department's position that recent statistics on the prevailing lending and bond rates support the assumption for 6.09% weighted average cost of capital. In addition, we conclude that there is a reasonable amount of flexibility in capital structures that should allow for a range of developers to bid below the proposed avoided-cost price cap, even if the capital structure assumptions in the cash-flow model do not apply to all developers equally.

The 2014 and 2015 RFP results support this conclusion, with 16 bids to develop solar projects under the recommended price cap. In addition, the 2013 through 2015 RFPs have resulted in the available plant capacity being filled, standard-offer contracts issued, and two plants under construction, meeting the statutory mandate for rapid deployment. Moreover, as in past standard-offer proceedings, we are establishing standard-offer prices based upon the assumption that the projects being developed are reasonably efficient in an effort to balance the statutory directive to ensure sufficient incentive for rapid deployment against ensuring that the incentive is not excessive, and thereby unnecessarily costly for ratepayers. This means that projects are sited and financed so as to avoid excessive costs to electric ratepayers.[14]

Using the assumptions recommended by the Department, the cash-flow model calculates an avoided cost of $0.130 per kWh for solar projects. Accordingly, for the 2016 RFP, we establish an avoided cost for solar projects of $0.130 per kWh, fixed over the life of the project.

IV. PRICE CAP FOR HYDROELECTRIC PROJECTS

Participants' Comments

The Department proposes an avoided-cost price cap of $0.130 per kWh for hydroelectric

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14. *See* Docket 7533, Order of 1/15/10 and Docket 7780, Order of 1/23/12.

projects solicited through the 2016 RFP.[15] The Department reviewed the assumptions and cash-flow model used to determine the existing hydroelectric price cap. The cash-flow model has been used by the Board in previous standard-offer proceedings for estimating the prices that a new project would need in order for the developer of that project to earn a reasonable return on investment.[16]

Specifically, the Department recommends the following assumptions to be used as inputs for the hydroelectric cash-flow model:

- Installation Costs: Assume $4,590 per kW, increasing installation costs by 10% to reflect the cumulative effects of inflation since 2010, when hydroelectric installation costs were last examined. (The 2015 hydroelectric price cap assumed $4,173 per kW.)

- Annual Maintenance Cost: Assume $111 per kW per year, adjusted annually for inflation. The maintenance cost assumption includes a 10% increase to account for the cumulative effects of inflation since 2010. (The 2015 hydroelectric price cap assumed $101 per kW.)

- Investment Tax Credit Percent Realized: Assume that 100% of the federal investment tax credit is realized on 90% of the project's costs and is taken in the first year. Assume 50% of the state investment credit is realized on 90% of the project's costs and is taken in the first year. These assumptions remain unchanged from the 2015 price cap.

- Annual Tax Rate: The state uniform capacity tax is assumed to be $4.00 per kW of AC capacity or $5,112 per year. The municipal tax rate is assumed to be 0.75% applied to 70% of the net present value of the project's cash flows in year one. The value is adjusted annually for inflation and adjusted annually for depreciation by 3.3%. (The 2015 hydroelectric price cap assumed only an annual municipal tax of 0.75%.)

- Land Lease Costs: Assume $3,500 per year, adjusted annually for inflation. The assumption includes annual property taxes. This assumption is similar to the solar cash-flow analysis. (The 2015 hydroelectric price cap assumed no land lease costs.)

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15. The hydroelectric price cap for the 2015 RFP was $0.123 per kWh.

16. *See* Docket 7533, Order of 1/15/10; Docket 7780, Order of 1/23/12; Docket 7874, Order of 3/1/13; Docket 7874, Order of 3/20/15.

- Inflation: Assume 1.80% annually, which reflects the decline in inflation over the past year. (The 2015 hydroelectric price cap assumed 1.89% annually.)

- Rate of Return: Assume 9.6%, which is equivalent to GMP's current return on equity. (The 2015 hydroelectric price cap assumed 9.75%.)

- Debt/Equity Ratio: Assume that the capital structure of a project would be 50.4% debt and 49.6% equity, unchanged from the 2015 price cap assumptions.

- Weighted Average Cost of Capital: Continue to assume 8.42%, based on 50.4% debt and 49.6% equity.

The Department notes that in the 2015 RFP there was one unsuccessful bid for a hydroelectric project at the 2015 price cap of $0.123 per kWh.

No other participant provided comments on the proposed hydroelectric cap.

Discussion

Based on a review of the assumptions and the cash-flow model analysis, we accept the Department's recommendation of an avoided cost of $0.130 per kWh for hydroelectric projects. The Department has recommended reasonable updates to the assumptions used in the cash-flow analysis for hydroelectric projects. Our conclusion is supported by the market interest in the 2015 RFP, in which one bidder showed interest in pursuing a hydroelectric project.

Accordingly, for the 2016 RFP, we establish an avoided cost for hydroelectric projects of $0.130 per kWh, fixed over the life of the project.

V. PRICE CAPS FOR WIND, BIOMASS, LANDFILL GAS, AND METHANE PROJECTS

Participants' Comments

No participant filed comments with regard to the standard-offer price caps for small and large wind projects, biomass projects, food waste anaerobic digestion projects, or farm methane projects.

Discussion

No participant provided evidence to evaluate the existing standard-offer price caps for

small and large wind projects, biomass projects, or food waste anaerobic digestion projects. In addition, based upon past information presented to the Board on landfills in Vermont, the opportunities for landfill gas appear to be limited to already developed projects.

However, the avoided costs determined in the 2015 Order for most of these technologies (except food waste anaerobic digestion) rely on assumptions that are inconsistent with assumptions used in the cash-flow analysis to determine avoided costs for solar and hydroelectric projects. Specifically, the assumptions for inflation and rate of return should remain consistent across all standard-offer technologies, and the analysis used to determine the 2015 price cap schedules for wind, biomass, and landfill gas projects did not use the inflation assumption of 1.80% annually and the rate-of-return assumption of 9.6% used for solar and hydroelectric projects. Accordingly, we are adopting these assumptions for use in the analysis to determine avoided cost schedules for wind, biomass, and landfill gas projects.

Using the updated assumptions for inflation and rate of return, the cash-flow analysis results in levelized avoided costs of $0.253 per kWh for small wind projects and $0.116 per kWh for large wind projects. The cash-flow analysis has not been used to determine avoided costs for biomass or landfill gas projects. Rather, the Board adopted the statutory avoided cost for biomass projects and the participant-recommended avoided cost for landfill gas projects.[17] The Board then determined annual price schedules using the adopted levelized costs and the assumptions for inflation and rate of return. Using the updated assumptions for inflation and rate of return and the adopted levelized costs, updated annual price schedules have been determined for biomass and landfill gas projects.

 Accordingly, we establish 2016 levelized avoided costs for small wind projects of $0.253 per kWh, for large wind projects of $0.116 per kWh, for biomass projects of $0.125 per kWh, and for landfill gas projects of $0.090 per kWh. For food waste anaerobic digestion projects, we are maintaining the avoided costs from the 2015 Order.

Pursuant to Section 8005a(g), farm methane projects remain outside the programmatic cap. No party provided information to evaluate the existing standard-offer price caps for farm methane projects. Therefore, we are maintaining the avoided costs from the April 2015 Order for

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17. been Docket 7533, Order of 1/15/10.

farm methane projects.

VI. CONCLUSION

Pursuant to 30 V.S.A. § 8005a(f)(3), the Board is required to annually review the established avoided costs "to decide whether they should be modified in any respect in order to achieve the goal and requirements of this subsection." Pursuant to Section 8005a(f)(2)(A)(ii), the avoided costs serve as caps on the prices solicited through the annual RFP.

The following avoided-cost schedules will serve as price caps for the 2016 RFP.

2016 Avoided-Cost Schedule for Standard-Offer Projects ($/kWh)							
	Biomass	Landfill Gas	Wind >100 kW	Wind ≤ 100 kW	Hydroelectric	Food Waste Anaerobic Digestion	Solar
Levelized	0.125	0.090	0.116	0.253	0.130	0.208	0.130
Year 1	0.121	0.088	0.112	0.243	for 20 years	for 20 years	for 25 years
Year 2	0.122	0.088	0.113	0.244			
Year 3	0.122	0.089	0.113	0.245			
Year 4	0.123	0.089	0.114	0.247			
Year 5	0.124	0.090	0.114	0.248			
Year 6	0.124	0.090	0.115	0.249			
Year 7	0.125	0.091	0.116	0.251			
Year 8	0.126	0.091	0.116	0.252			
Year 9	0.126	0.092	0.117	0.254			
Year 10	0.127	0.092	0.118	0.255			
Year 11	0.128	0.093	0.118	0.257			
Year 12	0.129	0.093	0.119	0.258			
Year 13	0.130	0.094	0.120	0.260			
Year 14	0.130	0.094	0.121	0.261			
Year 15	0.131	0.095	0.121	0.263			
Year 16	0.132	NA	0.122	0.265			
Year 17	0.133	NA	0.123	0.267			
Year 18	0.134	NA	0.124	0.269			
Year 19	0.135	NA	0.125	0.270			
Year 20	0.135	NA	0.125	0.272			

Pursuant to Section 8005a(g), farm methane projects remain outside the programmatic cap. For farm methane projects with a nameplate capacity greater than 150 kW, we retain an avoided cost of $0.145 per kWh, fixed over the term of the 20-year contract. For farm methane projects with a nameplate capacity less than or equal to 150 kW, we retain an avoided cost of

$0.199 per kWh, fixed over the life of the project.

Section 8005a(e) requires that the term of a standard offer "shall be 10 to 20 years, except that the term of a standard offer for a plant using solar power shall be 10 to 25 years." Consistent with the Board's determination in Dockets 7533 and 7780 and in previous Orders in this proceeding, we conclude that the term of a standard-offer contract should be based on the term used to calculate the standard-offer avoided cost, and that the term should be based on the assumed life of the project capped by the statutory requirement of 20 or 25 years.[18]

As required by the 2013 Order in this proceeding, by April 1, 2016, the Standard-Offer Facilitator will issue an RFP, consistent with the requirements of this Order and prior Orders in this proceeding, to solicit standard-offer projects to meet the requirements of Section 8005a(c).

VII. ORDER

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

1. Effective for any standard-offer contract executed after March 1, 2016, the standard-offer prices for renewable power under 30 V.S.A. § 8005a(b)(2) shall be determined through a request for proposal issued by the Standard-Offer Facilitator and shall be no higher than the avoided costs as specified in this Order.

2. Effective for any standard-offer contract executed after March 1, 2016, pursuant to 30 V.S.A. § 8005a(f)(2), the following avoided costs will serve as the prices for farm methane projects under the standard-offer program: (1) $0.145 per kWh fixed over the 20-year contract for projects with a nameplate capacity greater than 150 kW; and (2) $0.199 per kWh fixed over the 20-year contract for projects with a nameplate capacity less than or equal to 150 kW.

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18. The Board set a term of 15 years for standard offers for landfill gas projects; however, this assumption is based on the fact that the fuel source for landfill gas will decline over time. Docket 7533, Order of 1/15/10 at 65.

Dated at Montpelier, Vermont, this ___7th___ day of _____March_____, 2016.

s/James Volz   )
)   PUBLIC SERVICE
)
s/Margaret Cheney   )   BOARD
)
)   OF VERMONT
s/Sarah Hofmann   )

OFFICE OF THE CLERK

FILED: March 7, 2016

ATTEST: s/Judith C. Whitney
              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 (by e-mail, telephone, or in writing) of any apparent errors, in order that any necessary corrections may be made. (E-mail address: psb.clerk@vermont.gov)
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.