



**Belleayre Mountain Ski Center UMP-DEIS**

**Appendix F**  
**Belleayre Compressor Replacement**  
**Feasibility Study**

**November, 2008**

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# ENERGY EFFICIENCY FEASIBILITY STUDY

## Belleayre Ski Mountain Highmount Falls, New York

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Any questions regarding this report or questions concerning other programs and services offered by NYSERDA or NYPA should be directed to Mark Gundrum at (518) 862-1090, extension 3256 or Steve Harrington at (518) 373-0490. We hope the findings of this report will assist you in making decisions about energy efficiency improvements in your facility. Thank you for your participation in this program.

#### **NOTICE**

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## **ABSTRACT**

The focus of this study is to investigate and report on methods of energy conservation and improvement in the snowmaking system for the Belleayre Ski Mountain located in Highmount, New York.

An energy audit was performed on the facility, and the purpose of this energy efficiency study was to analyze various energy conservation measures associated with the facility's snowmaking operations. Data was gathered by experienced energy engineers during on-site surveys through the visual observation of the facility and its energy consuming systems, analysis of energy records pertaining to electricity and fossil fuel, and interviews with operating personnel.

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## EXECUTIVE SUMMARY

The focus of this study is to investigate and report on methods to improve the snowmaking system at the Belleayre Ski Mountain while improving the energy efficiency of the system and reducing the equipment operating costs at the facility.

The survey, evaluation and assessment of energy conservation measures (ECMs) were conducted by L&S Energy Services, Inc. Equipment documentation and drawings, as provided by the facility management were reviewed. Walk-through audits were performed to observe existing systems and operations including: obtaining equipment nameplate data, reviewing operational schedules, and reviewing historical electric and fuel oil usage.

For each recommended measure a cost estimate was prepared. The costs for the energy conservation measures were developed by using industry standard cost estimating tools (e.g., R.S. Means 2008) and by contacting local representatives from various system manufacturers and vendors. The estimated costs for all ECMs are included in Appendix C. Energy use and projected cost savings were calculated using spreadsheet analysis. Tables summarizing all ECM analysis and calculation data are included in Appendix B. The simple payback period for each measure was calculated. A description was prepared for each cost-effective measure, and those measures were incorporated in the energy study.

Energy conservation strategies outlined in the report include:

- **New Air Compressor System**

Belleayre Ski Mountain currently uses a mix of diesel powered and electric-driven compressors to generate compressed air necessary for snowmaking operations. The diesel generators are rental units while the electric units are own by the facility. The diesel powered air compressors are expensive to rent each season and also have a negative local environmental impact when considering their pollutant emissions. We have evaluated purchasing and installing new, high efficient electric-drive air compressors and associated ancillary equipment. In addition, we have included the installation of electric feeder lines to provide the necessary power to the new air compressors.

It is estimated that full implementation of the recommended changes will decrease the on-site consumption of diesel fuel by 257,746 gallons per year (35,827 MMBtu). There will be a corresponding increase in electric consumption of 3,114,266 kWh. Capital cost, including fees and interest during construction, for the project is estimated at \$5,899,398. Based upon current utility costs, annual energy cost savings are projected to be \$373,507 per year. When the savings from rental fees of \$306,628 are considered the total cost savings are \$680,135 per year. The payback period for this project is 8.7 years. This payback value includes a ten-percent contingency for capital costs, all implementation contractor and NYPA fees as well as capitalized interest during construction.

**Table 1. Energy Savings Summary**

Belleayre Ski Mountain

Energy Conservation Measure Description	kWh Savings	kW Savings	MMbtu Savings	Rental Cost Savings	Annual Energy Savings	Annual Cost Savings	Estimated Total Cost	Payback (Years)	Estimated ECIPP Incentive	Revised Payback (Years)
New Air Compressor System	(3,114,266)	(4,552)	35,827	\$306,628	\$373,507	\$680,135	\$5,651,784	8.3	\$28,902	8.3
Asbestos Abatement (Design, Monitoring, Management)							\$0			
Payment and Performance Bond							\$82,537.93			
Interest during construction							\$165,076			
<b>Total</b>	<b>(3,114,266)</b>	<b>(4,552)</b>	<b>35,827</b>	<b>306,628</b>	<b>373,507</b>	<b>\$680,135</b>	<b>\$5,899,398</b>	<b>8.7</b>	<b>\$28,902</b>	<b>8.6</b>

Note: Estimated Total Cost includes 10% Contingency, Implementation Contractor Fees and NYPA Fees.

**GENERAL NOTES:**

1. For a complete description of each measure refer to the ECM summary sheets in Section 2.
2. ECM supporting calculations and detailed cost estimates are included in Appendices B and C.
3. ECIPP Existing Facilities Program incentives are net 20% submittal/verification costs.

Electric energy conservation measures installed that reduce the use of electricity on site are generally eligible for incentives under NYSERDA’s Existing Facilities Program. The estimated incentive, net of program submittal, verification, and measurement costs is \$28,902. Energy conservation measures are also eligible for the Energy Smart<sup>SM</sup> Loan Fund, which reduces the interest rate on loans by 4%. The maximum loan amount is \$1 million with a maximum loan term of 10 years.

A life-cycle cost analysis was completed to aid in the economic evaluation of the proposed project. The life-cycle cost analysis is presented in Appendix D. The life-cycle cost analysis assumes a 10 year finance period and 20 year project life. The proposed project has a present value life-cycle cost savings of \$3,435,850.

**Belleayre Ski Mountain**  
Energy Services Program

<b>Project Cost: Feasibility</b>			
	<u>Labor</u>	<u>Material</u>	<u>Total</u>
Construction Costs	\$955,468.75	\$3,171,427.50	\$4,126,896.25
Asbestos Abatement Payment and Performance Bond		\$82,537.93	
<b>Totals:</b>	\$955,468.75	\$3,253,965.43	\$4,209,434.18
<b>Construction Contingency:</b>			
10%	\$412,689.63		
<b>Subtotal:</b>	\$4,622,123.80		
<b>Asbestos Abatement Design and Monitoring</b>			
	\$0.00		
<b>Audit, Design &amp; Construction Mgt:</b>			
12.0%	\$544,750.31		
<b>NYPA Project Mgt &amp; Administrative:</b>			
12.5%	\$567,448.23		
<b>NYPA Lighting Material Handling Fee:</b>			
1.5%	\$0.00		
<b>Total Fees</b>	\$1,112,198.54		
<b>Subtotal</b>	\$5,734,322.34		
<b>Interest During Construction</b>	\$165,075.85		
<b>Total Estimated Project Cost</b>	<b>\$5,899,398.19</b>		
<b>Energy Savings</b>			
	<u>Electrical:</u>	<u>Fuel:</u>	
Energy Savings:	-3,114,266 kWh	Fossil Fuel Savings:	35,827 MMBtu
Demand Savings:	-4,552 kW	Fossil Fuel \$ Savings:	\$757,774
Electric Energy \$ Savings:	-\$281,841 kWh \$		
Electric Demand \$ Savings:	-\$102,425 kW \$	Equip. Rental Savings:	\$306,628
<b>Total Amount Saved:</b>	<b>\$680,135.17</b>		
<b>Simple Payback</b>			
Total Project Cost:	\$5,899,398.19		
Total Annual Savings:	\$680,135.17		
<b>Simple Payback:</b>	<b>8.7 Years</b>		
<b>Project Financing</b>			
TOTAL AMOUNT FINANCED	\$5,899,398.19		
Interest Rate	4.00%		
Years Financed	10		
Number of Payments	120		
<b>Annual Debt Service to NYPA:</b>	\$716,742.46		
<b>Monthly Debt Service to NYPA:</b>	\$59,728.54		
<b>Total Project Cost After Financing:</b>	\$7,167,424.62		
Total Annual Savings:	\$680,135.17		

**1. EXISTING CONDITIONS**

Belleayre Mountain has an extensive snowmaking operation served by two air compressor stations, Overlook and Barneyville. Overlook provides compressed air for snowmaking on the upper part of the mountain, and Barneyville provides compressed air to the lower slopes. Water from the Pine Hill Lake is pumped at the Pine Hill Pump house to the Cathedral Glen Reservoir. At Cathedral Glen there are additional pumps that continue the water conveyance to both the lower slopes and to the upper reservoir (located at Upper Pump House). Additional pumps at the Upper Pump House are used to get water to the upper slopes for snowmaking.

The existing air compressor system consists of both owned and rental compressors (as shown in the following table).

Site	Unit	Type	Model	CFM	Use	Annual Run Hours	Air Production (1000 cuft)	
<b>Pre-Retrofit</b>								
<b>Overlook</b>								
	1	Elec	Existing	SSR-2000	1,500	Primary	1,525	137,250
	2	Elec	Existing	SSR-2000	1,500	Primary	1,446	130,140
	3	Elec	Existing	SSR-2000	1,500	Primary	1,412	127,080
	Rental-01	Diesel	Rental	PTS-916	1,600	Primary	891	85,536
	Rental-02	Diesel	Rental	PTS-916	1,600	Primary	936	89,856
	Rental-03	Diesel	Rental	PTS-916	1,600	Primary	1,001	96,096
	Rental-04	Diesel	Rental	PTS-916	1,600	Primary	1,036	99,456
	Rental-05	Diesel	Rental	PTS-916	1,600	Primary	1,159	111,264
	Rental-06	Diesel	Rental	PTS-916	1,600	Primary	1,190	114,240
	Rental-07	Diesel	Rental	PTS-916	1,600	Primary	1,191	114,336
	Rental-08	Diesel	Rental	PTS-916	1,600	Primary	1,282	123,072
	Rental-09	Diesel	Rental	PTS-916	1,600	Primary	1,275	122,400
	Rental-10	Diesel	Rental	PTS-916	1,600	Primary	1,238	118,848
	<b>Total</b>	<b>Elec</b>	<b>Existing</b>		<b>4,500</b>			<b>394,470</b>
	<b>Total</b>	<b>Diesel</b>	<b>Rental</b>		<b>16,000</b>			<b>1,075,104</b>
	<b>Total</b>		<b>All</b>		<b>20,500</b>			<b>1,469,574</b>
<b>Barneyville</b>								
	Rental-01	Diesel	Rental	PTMS-2300	2,300	Primary	1,017	140,346
	Rental-02	Diesel	Rental	PTMS-2300	2,300	Primary	1,017	140,346
	<b>Total</b>	<b>Diesel</b>	<b>Rental</b>		<b>4,600</b>			<b>280,692</b>
	<b>Total</b>		<b>All</b>		<b>4,600</b>			<b>280,692</b>
<b>Belleayre Mountain Total (Air Compressors)</b>							<b>1,750,266</b>	

The existing electric air compressors are not energy efficient compared to comparable equipment available in the marketplace today. The rental units are diesel powered and the emissions from the units are an environmental concern.

Unit Ratings	Model	CFM	CFM/kW	CuFt/kWh	CFM/gph	
Ingersoll-Rand	SSR-2000	Own	1,500	5.08	305	Mfr. Rating
Atlas Copco	PTS-916	Rental	1,600		87.9	Mfr. Rating
Atlas Copco	PTMS-2300	Rental	2,300		86.8	Mfr. Rating

One of the three Ingersoll-Rand SSR-2000 electric air compressors at Overlook.



Location for Rental Diesel Powered Air Compressors



Cooler for Air Compressors



<b>Belleayre Mountain Snowmaking</b>	
<b>Statistical Operating Information</b>	
	<b>2007-2008</b>
<b>TOTAL HOURS/ SNOWMAKING</b>	1525.0
<b>ELECTRIC COMPRESSORS</b>	
#1 Hours	1,525.2
#2 Hours	1,446.4
#3 Hours	1,411.8
<b>Sub Total</b>	<b>4,383.4</b>
<b>RENTAL AIR COMPRESSORS</b>	
#1 Hours	891.3
#2 Hours	939.6
#3 Hours	1,001.3
#4 Hours	1,035.7
#5 Hours	1,158.8
#6 Hours	1,189.6
#7 Hours	1,190.8
#8 Hours	1,282.8
#9 Hours	1,275.3
#10 Hours	1,238.2
<b>Sub Total</b>	<b>11,203.4</b>
<b>WATER PUMPS</b>	
Main (Upper) Pumphouse	
#1 Hours	1,500.2
#2 Hours	513.3
#3 Hours	511.9
Sub Total	<b>2,525.4</b>
#1 Gallons	126,016,800
#2 Gallons	23,098,500
#3 Gallons	23,035,500
Sub Total	<b>172,150,800</b>
Glen Pumphouse	
#1 Hours	1,370.8
#2 Hours	1,370.8
Sub Total	<b>2,741.6</b>
#1 Gallons	61,686,000
#2 Gallons	61,686,000
Sub Total	<b>123,372,000</b>
Pine Hill Pumphouse	
#1 Hours	473.1
#2 Hours	454.8
#3 Hours	360.0
#4 Hours	369.7
Sub Total	<b>1657.6</b>
#1 Gallons	29,805,300
#2 Gallons	28,652,400
#3 Gallons	22,680,000
#4 Gallons	23,291,100
Sub Total	<b>104,428,800</b>

## 1.1 UTILITY COST

Electricity is delivered by NYSEG. The electric usage for the period September 2007 through August 2008 was April 2006 to March 2008 was 4,783,381 kWh, with the single highest monthly on-peak demand of 2,950 kW. No. 2 fuel oil, propane, and diesel fuel is purchased at New York State contract rates. The amount of No. 2 fuel oil used for heating from April 2007 to March 2008 was 31,000 gallons. Propane use during the same period was 3,355 gallons. Diesel fuel use (for the diesel powered air compressors and on-site vehicles) was 276,727 gallons.

### Energy Prices used in Analysis

#### **Electric Cost:**

Cost per kWh = \$0.0905  
Cost per kW = \$7.50

#### **Diesel Fuel (for air compressors)**

Cost per gallon = \$2.94

## **ENERGY CONSERVATION MEASURE SUMMARY SHEET**

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### **2. ENERGY CONSERVATION MEASURES (ECMs)**

The supporting calculation data for the following energy conservation measures can be found in Appendices B and C.

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## ENERGY CONSERVATION MEASURE SUMMARY SHEET

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### ECM NO. 1 - NEW AIR COMPRESSOR SYSTEM

<b>PROJECT COST:</b>	\$5,899,398 (includes NYPA and Implementation Fees)
<b>SIMPLE PAYBACK:</b>	8.7 Years
<b>ELECTRIC ENERGY SAVINGS:</b>	-3,114,266 kWh/Year
<b>DEMAND SAVINGS:</b>	-4,552 kWmax month (-13,657 kW per year)
<b>DIESEL FUEL SAVINGS:</b>	35,827 MMBtu/Year (257,746 Gal/Year)
<b>ANNUAL ENERGY COST SAVINGS:</b>	\$373,507
<b>ANNUAL RENTAL SAVINGS:</b>	\$306,628
<b>TOTAL ANNUAL COST SAVINGS:</b>	\$680,135

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### EXISTING CONDITIONS:

Compressed air used in for snowmaking is produced by both electric and diesel powered air compressors. There are three Ingersoll-Rand SSR-2000 electric rotary air compressors that are owned by Belleayre. This season Belleayre will rent twelve diesel powered air compressors. The quantity, model numbers, and ratings for each compressor are presented in the table in Section 1 of this report. The total compressed air capacity at the mountain is 25,100 cfm.

### ECM SPECIFICATIONS:

We recommend the installation of energy efficient electric air compressors. The new air compressors will eliminate the need to rent air compressors each year. In addition, the local emissions stemming from the diesel use on site will be dramatically reduced (there is diesel and oil use for vehicles and space heating).

We also recommend installation of a new cooling system (aftercooler) to cool the compressed air before it is distributed throughout the snowmaking system.

The electric feeders from the main transformer (located at Discovery) are not adequately sized to handle significant increases in electric load from the new air compressors. In addition, the integrity of the existing feeders have failed and water has been found in the conduit. We recommend installing new feeder lines to both compressor stations.

## **ENERGY CONSERVATION MEASURE SUMMARY SHEET**

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The recommend air compressor project will encompass the following:

Overlook:

- Four (4) new 6,000 cfm energy efficient centrifugal air compressors,
- Cooling System with VSD air-to-air aftercoolers,
- Necessary modifications to existing piping network,
- Compressor building
- 15 kV Feeder from Barneyville

Barneyville:

- Three (3) new 6,000 cfm energy efficient centrifugal air compressors,
- Cooling System with VSD air-to-air aftercoolers,
- Necessary modifications to existing piping network,
- Compressor building
- 15 kV Feeder from Discovery

## **ENERGY CONSERVATION MEASURE SUMMARY SHEET**

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### **Appendix A - Annual Utility Data**

The annual energy usage for Belleayre Ski Mountain is summarized on the following page.

#### **Current Energy Prices**

##### **Electric Cost:**

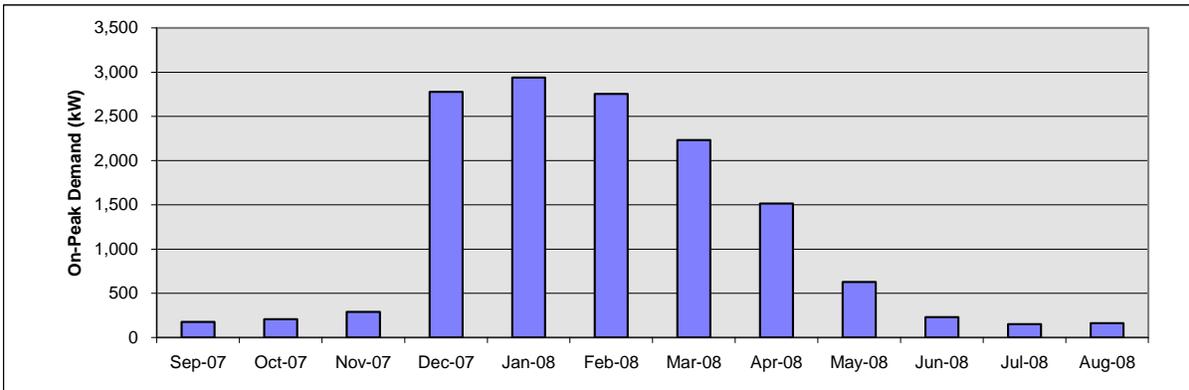
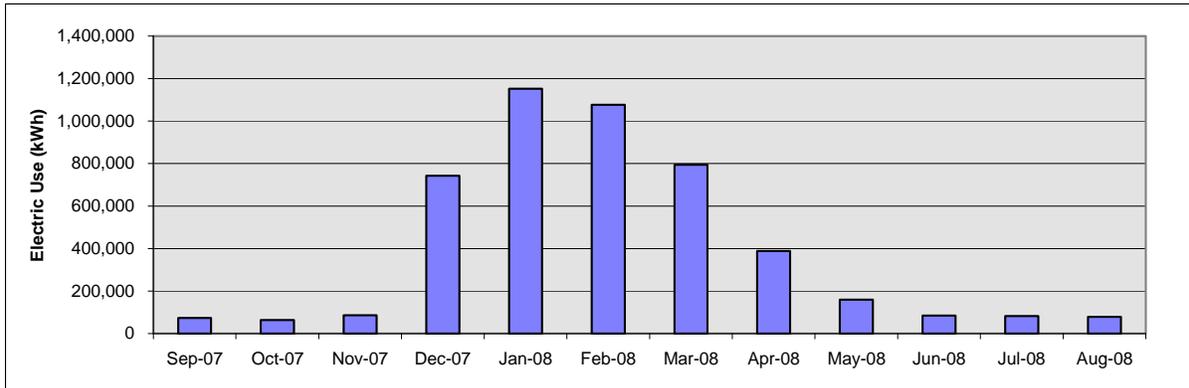
Cost per kWh = \$0.0905  
Cost per kW = \$7.50

##### **Diesel Fuel**

Cost per gallon = \$2.94

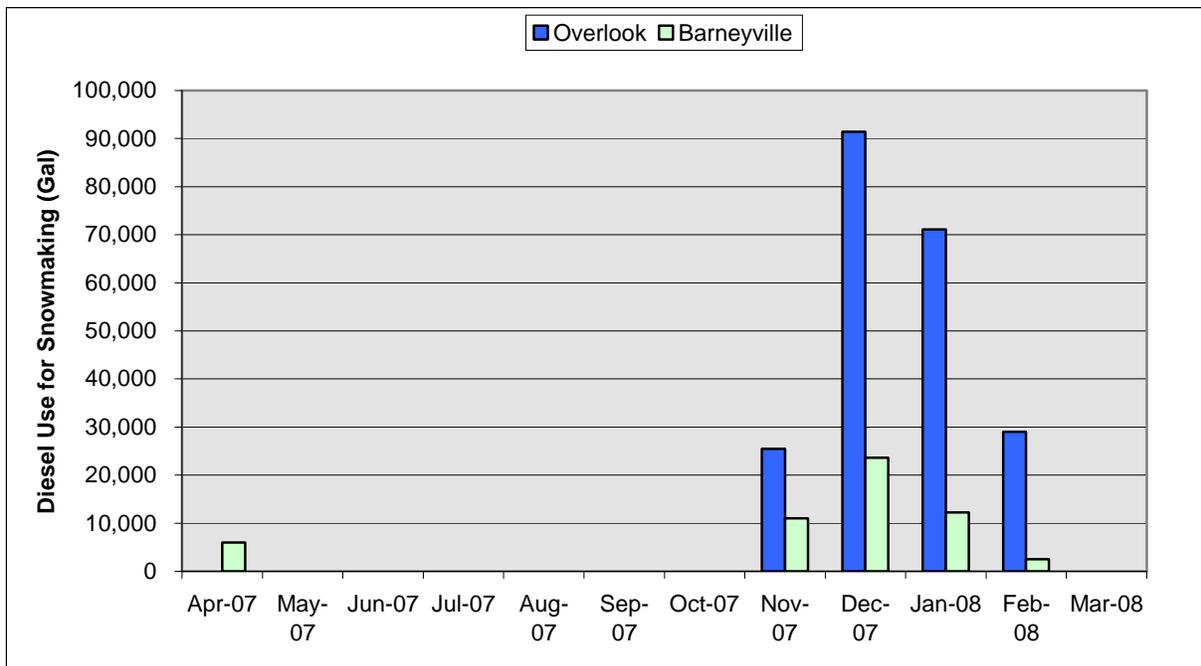
Read Date	No. of Days	On-Peak Demand (kW)	Off-Peak Demand (kW)	On-Peak Energy (kWh)	Off-Peak Energy (kWh)	Total Energy (kWh)	Demand Cost	Energy Cost	Total Cost
09/04/2007	33	176	176	33,502	40,227	73,729	\$1,322	\$7,137	\$8,460
10/02/2007	28	207	988	31,325	32,087	63,412	\$1,549	\$5,377	\$6,927
11/01/2007	30	289	1,379	40,816	45,030	85,846	\$2,171	\$7,293	\$9,464
12/04/2007	33	2,779	2,971	239,658	503,240	742,898	\$20,842	\$57,394	\$78,235
01/03/2008	30	2,940	3,051	472,215	680,161	1,152,376	\$22,048	\$119,352	\$141,400
02/04/2008	32	2,755	3,089	434,692	641,439	1,076,131	\$20,661	\$93,923	\$114,584
03/04/2008	29	2,233	2,692	309,771	485,184	794,955	\$16,745	\$67,889	\$84,634
04/02/2008	29	1,514	2,275	163,306	225,086	388,392	\$11,356	\$34,820	\$46,176
05/02/2008	30	627	1,227	76,379	83,123	159,502	\$4,706	\$14,931	\$19,637
06/03/2008	32	228	1,322	36,372	48,144	84,516	\$1,713	\$6,842	\$8,555
07/02/2008	29	151	1,655	31,191	51,419	82,610	\$1,136	\$8,791	\$9,927
08/04/2008	33	161	2,027	31,984	47,030	79,014	\$1,205	\$9,287	\$10,492
<b>Total</b>	<b>368</b>	<b>14,061</b>	<b>22,853</b>	<b>1,901,211</b>	<b>2,882,170</b>	<b>4,783,381</b>	<b>\$105,455</b>	<b>\$433,035</b>	<b>\$538,491</b>

**Electricity**  
**Average Cost per kWh: \$0.0905**  
**Average Cost per kW: \$7.50**



Bill Date	Overlook		Barneyville		Diesel (Gals)	Total Cost
	Diesel (Gals)	Cost (\$)	Diesel (Gals)	Cost (\$)		
Apr-07			6,000	\$13,908	6,000	\$13,908
May-07					0	\$0
Jun-07					0	\$0
Jul-07					0	\$0
Aug-07					0	\$0
Sep-07					0	\$0
Oct-07					0	\$0
Nov-07	25,500	\$76,365	11,000	\$33,002	36,500	\$109,367
Dec-07	91,431	\$268,544	23,615	\$69,269	115,046	\$337,813
Jan-08	71,134	\$210,395	12,250	\$36,901	83,384	\$247,296
Feb-08	29,000	\$86,782	2,500	\$7,080	31,500	\$93,862
Mar-08	0	\$0			0	\$0
<b>Total</b>	<b>217,065</b>	<b>\$642,086</b>	<b>55,365</b>	<b>\$160,160</b>	<b>272,430</b>	<b>\$802,246</b>

<b>Diesel Fuel</b>	
Average Cost per gallon:	<b>\$2.94</b>
Average Cost per MMBtu:	<b>\$21.15</b>



## **Appendix B - ECM Calculation Data**

The report presents energy savings for each measure that was analyzed. The calculations are displayed in this appendix in the order that they appear in the report. For measures that are implemented in future years, the energy cost savings can be adjusted to reflect energy costs at the time of implementation.

Belleayre Ski Mountain  
New Electric Air Compressors

<b>EXISTING</b>							Annual	Air	Peak	Electric	Diesel		
Site	Unit	Type	Model	CFM	Use	Run	Production	CFM/kW	CFM/gph	Demand	Use	Use	
							Hours	(1000 cuft)			(kW)	(kWh)	(gal)
<b>Pre-Retrofit</b>													
<b>Overlook</b>													
	1	Elec	Existing	SSR-2000	1,500	Primary	1,525	137,250	5.08		295	450,295	
	2	Elec	Existing	SSR-2000	1,500	Primary	1,446	130,140	5.08		295	426,969	
	3	Elec	Existing	SSR-2000	1,500	Primary	1,412	127,080	5.08		295	416,929	
	Rental-01	Diesel	Rental	PTS-916	1,600	Primary	891	85,536		87.9			16,218
	Rental-02	Diesel	Rental	PTS-916	1,600	Primary	936	89,856		87.9			17,038
	Rental-03	Diesel	Rental	PTS-916	1,600	Primary	1,001	96,096		87.9			18,221
	Rental-04	Diesel	Rental	PTS-916	1,600	Primary	1,036	99,456		87.9			18,858
	Rental-05	Diesel	Rental	PTS-916	1,600	Primary	1,159	111,264		87.9			21,097
	Rental-06	Diesel	Rental	PTS-916	1,600	Primary	1,190	114,240		87.9			21,661
	Rental-07	Diesel	Rental	PTS-916	1,600	Primary	1,191	114,336		87.9			21,679
	Rental-08	Diesel	Rental	PTS-916	1,600	Primary	1,282	123,072		87.9			23,336
	Rental-09	Diesel	Rental	PTS-916	1,600	Primary	1,275	122,400		87.9			23,208
	Rental-10	Diesel	Rental	PTS-916	1,600	Primary	1,238	118,848		87.9			22,535
	<b>Total</b>	<b>Elec</b>	<b>Existing</b>		<b>4,500</b>			<b>394,470</b>			<b>886</b>	<b>1,294,193</b>	
	<b>Total</b>	<b>Diesel</b>	<b>Rental</b>		<b>16,000</b>			<b>1,075,104</b>					<b>203,850</b>
	<b>Total</b>		<b>All</b>		<b>20,500</b>			<b>1,469,574</b>			<b>886</b>	<b>1,294,193</b>	<b>203,850</b>
<b>Barneyville</b>													
	Rental-01	Diesel	Rental	PTMS-2300	2,300	Primary	1,017	140,346		86.8			26,948
	Rental-02	Diesel	Rental	PTMS-2300	2,300	Primary	1,017	140,346		86.8			26,948
	<b>Total</b>	<b>Diesel</b>	<b>Rental</b>		<b>4,600</b>			<b>280,692</b>					<b>53,896</b>
	<b>Total</b>		<b>All</b>		<b>4,600</b>			<b>280,692</b>					<b>53,896</b>
<b>Belleayre Mountain Total (Air Compressors)</b>								<b>1,750,266</b>			<b>886</b>	<b>1,294,193</b>	<b>257,746</b>

**PROPOSED**

Site	Unit	Fuel	Model	CFM	Use	Annual Run Hours	Air Production (1000 cuft)	CFM/kW	CFM/gph	Peak Demand (kW)	Electric Use (kWh)	Diesel Use (gal)
<b>Post-Retrofit</b>												
<b>Overlook</b>												
	1	Elec	Existing	SSR-2000	1,500	Backup	0	0	5.08	0	0	
	2	Elec	Existing	SSR-2000	1,500	Backup	0	0	5.08	0	0	
	3	Elec	Existing	SSR-2000	1,500	Backup	0	0	5.08	0	0	
	4	Elec	New	TA-6000	6,000	Primary	1,021	367,560	6.62	906	925,378	
	5	Elec	New	TA-6000	6,000	Primary	1,021	367,560	6.62	906	925,378	
	6	Elec	New	TA-6000	6,000	Primary	1,021	367,560	6.62	906	925,378	
	7	Elec	New	TA-6000	6,000	Primary	1,021	367,560	6.62	906	925,378	
	<b>Total</b>	<b>Elec</b>	<b>Existing</b>		<b>4,500</b>			<b>0</b>		<b>0</b>	<b>0</b>	
	<b>Total</b>	<b>Elec</b>	<b>New</b>		<b>24,000</b>			<b>1,470,240</b>		<b>3,625</b>	<b>3,701,511</b>	
	<b>Total</b>	<b>All</b>			<b>28,500</b>			<b>1,470,240</b>		<b>3,625</b>	<b>3,701,511</b>	
<b>Barneyville</b>												
	1	Elec	New	TA-6000	6,000	Primary	390	140,400	6.62	906	353,474	
	2	Elec	New	TA-6000	6,000	Primary	390	140,400	6.62	906	353,474	
	3	Elec	New	TA-6000	6,000	Backup	0	0	6.62	0	0	
	<b>Total</b>	<b>Elec</b>	<b>New</b>		<b>18,000</b>			<b>280,800</b>		<b>1,813</b>	<b>706,949</b>	
	<b>Total</b>	<b>All</b>			<b>18,000</b>			<b>280,800</b>		<b>1,813</b>	<b>706,949</b>	
<b>Belleayre Mountain Total (Air Compressors)</b>								<b>1,751,040</b>		<b>5,438</b>	<b>4,408,459</b>	

**SAVINGS**

	Peak Demand (kW)	Equivalent No. of Demand Months	Electric Use (kWh)	Electric Cost	Diesel Use (gal)	Diesel Cost	Annual Energy Cost	Rental Cost	Total Annual Cost
Pre-Retrofit	886	3	1,294,193	\$137,056	257,746	\$757,774	\$894,829	\$306,628	\$1,201,457
Post-Retrofit	5,438	3	4,408,459	\$521,322	0	\$0	\$521,322	\$0	\$521,322
<b>Savings</b>	<b>(4,552)</b>		<b>(3,114,266)</b>	<b>(\$384,266)</b>	<b>257,746</b>	<b>\$757,774</b>	<b>\$373,507</b>	<b>\$306,628</b>	<b>\$680,135</b>

Diesel Fuel Cost (\$/gal)	\$2.94
Electric Cost (\$/kWh)	\$0.0905
Demand Cost (\$/kW)	\$7.50

Unit Ratings	Model		CFM	CFM/kW	CuFt/kWh	CFM/gph	
Ingersoll-Rand	SSR-2000	Own	1,500	5.08	305		Mfr. Rating
Atlas Copco	PTS-916	Rental	1,600			87.9	Mfr. Rating
Atlas Copco	PTMS-2300	Rental	2,300			86.8	Mfr. Rating
Cameron	TA-6000	Proposed	6,000	6.62	397		Mfr. Rating

## **Appendix C - ECM Cost Estimates**

The cost estimate for each measure that was analyzed is presented. The cost estimates are presented in the order that they appear in the report. Cost estimates were prepared based on a combination of vendor quotes and estimates developed using Means 2008 and vendor quotes. Note that implementation costs will increase over time.

Project Name: **Belleayre Ski Mountain**

Project No.: \_\_\_\_\_

Calculated by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Sheet No: 1 of 1

Date: 21-Oct-08

Buildings: \_\_\_\_\_

Measure: **ECM #1 New Air Compressor System**

Div.	Description	Qty.	Unit	Unit Labor	Cost Material	Total Labor	Total Material	Total	Ref.
	<b>Overlook</b>								
	<b>Cameron Air Compressor</b>	4	ea	\$50,000.00	\$235,000.00	\$200,000.00	\$940,000.00	\$1,140,000.00	Cameron
	TA-6000 6,000 cfm unit								
	<b>Thermotech Cooling System</b>	1	ea	\$67,500.00	\$450,000.00	\$67,500.00	\$450,000.00	\$517,500.00	Cameron
	<b>Piping Mods</b>	4	ea	\$15,000.00	\$15,000.00	\$60,000.00	\$60,000.00	\$120,000.00	est.
	<b>Compressor Building</b>	1	ea	\$50,000.00	\$50,000.00	\$50,000.00	\$50,000.00	\$100,000.00	est.
	<b>Field Conditions</b>	1	ea	\$10,000.00	\$10,000.00	\$10,000.00	\$10,000.00	\$20,000.00	est.
	<b>Barneyville</b>								
	<b>Cameron Air Compressor</b>	3	ea	\$50,000.00	\$235,000.00	\$150,000.00	\$705,000.00	\$855,000.00	Cameron
	TA-6000 6,000 cfm unit								
	<b>Thermotech Cooling System</b>	1	ea	\$52,500.00	\$350,000.00	\$52,500.00	\$350,000.00	\$402,500.00	Cameron
	<b>Piping Mods</b>	3	ea	\$15,000.00	\$15,000.00	\$45,000.00	\$45,000.00	\$90,000.00	est.
	<b>Compressor Building</b>	1	ea	\$40,000.00	\$40,000.00	\$40,000.00	\$40,000.00	\$80,000.00	est.
	<b>Field Conditions</b>	1	ea	\$8,000.00	\$8,000.00	\$8,000.00	\$8,000.00	\$16,000.00	est.
	<b>Freight</b>	1	ea		\$10,000.00	\$0.00	\$10,000.00	\$10,000.00	est.
	<b>15 kV Feeder</b>	3,200	lf.	\$42.35	\$66.55	\$135,520.00	\$212,960.00	\$348,480.00	EYP
	<b>Discovery to Barneyville</b>								
	#500AWG direct buried Full Neutral								
	<b>15 kV Feeder</b>	400	lf.	\$42.35	\$66.55	\$16,940.00	\$26,620.00	\$43,560.00	EYP
	<b>Barneyville to Overlook</b>								
	#500AWG direct buried Full Neutral								
	<b>15 kV Feeder</b>	2,100	lf.	\$42.35	\$66.55	\$88,935.00	\$139,755.00	\$228,690.00	EYP
	<b>Barneyville to Upper Pumphouse</b>								
	#500AWG direct buried Full Neutral								
	<b>Pad Mount Switching</b>	2	ea	\$4,688.75	\$17,847.50	\$9,377.50	\$35,695.00	\$45,072.50	EYP
	<b>Pad Mount Transformer</b>	2	ea	\$5,898.75	\$34,485.00	\$11,797.50	\$68,970.00	\$80,767.50	EYP
	<b>Handholes/Terminations</b>	1	LS	\$5,898.75	\$15,427.50	\$5,898.75	\$15,427.50	\$21,326.25	EYP
	<b>Permits/Misc</b>	1	LS	\$4,000.00	\$4,000.00	\$4,000.00	\$4,000.00	\$8,000.00	EYP
	<b>Total</b>					<b>\$955,469</b>	<b>\$3,171,428</b>	<b>\$4,126,896</b>	

The costs noted above are estimates only and may be modified by changing conditions or the passage of time.

## Appendix D – Life Cycle Cost Analysis

A life-cycle cost analysis (LCCA) was performed in order to make an economic evaluation of the proposed project. Life-cycle cost analysis evaluates all the costs arising from implementing a project as well as owning, operating, and maintaining the equipment over a given time period with all costs adjusted (discounted) to reflect the time-value of money. The goal of this type of analysis is ultimately to determine which alternative has the lowest life-cycle cost (LCC) and therefore is the most economical in the long run.

The analysis was performed using Building Life-Cycle Cost (BLCC) 5.3 software developed by the National Institute of Standards and Technology under the Federal Energy Management Program (FEMP). The software and methodology complies with ASTM standards related to building economics as well as FEMP guidelines for economic analysis of building projects.

The analysis compares the LCC of the proposed project with the LCC of a base case. For this study, the base case is the continued use and rental of diesel air compressors for the snow making process. The following assumptions have been made and are used as input for the BLCC program. Please refer to the attached input and output reports for details.

### BLCC Assumptions:

- The study period is selected as 20 years.
- The nominal discount rate of 5.5% has been used.
- The annual contract payment is financed total project cost at 7% for 10 years.
- Electricity unit prices follow the Department of Energy (DOE) projected industrial escalation rates (price fluctuations) throughout the study period.
- Diesel fuel gas prices follow the DOE projected industrial escalation rates throughout the study period.

### Present Value Life Cycle Costs

Case/Alternative	PV of Financing Costs (P&I 10 yrs @ 7%)	PV of Rental Costs	PV of Energy Costs	Total Life Cycle Costs
Existing Case (Rental Diesel Air Compressors)	\$0	\$4,813,489	\$11,128,410	\$15,941,898
ECM Case (Efficient Electric Air Compressors)	\$6,196,728	\$0	\$6,309,319	\$12,506,048
<b>Life Cycle Cost Savings</b>	<b>(\$6,196,728)</b>	<b>\$4,813,489</b>	<b>\$4,819,091</b>	<b>\$3,435,850</b>

## NIST BLCC 5.3-08: Input Data Listing

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

### General Information

File Name: C:\Program Files\BLCC5\projects\belleyre mountain.xml  
Date of Study: Mon Dec 22 16:50:18 EST 2008  
Analysis Type: Federal Analysis, Financed Project  
Project Name: Belleayre Mountain  
Project Location: New York  
Analyst: Ron Slosberg  
Base Date: November 1, 2009  
Study Period: 20 years 0 months (November 1, 2009 through October 31, 2029)  
Discount Rate: 5.5%  
Discounting Convention: End-of-Year

Discount and Escalation Rates are NOMINAL (inclusive of general inflation)

### Alternative: Baseline - Rental Diesel Air Compressors

#### Recurring Contract: Annual Rental Fee for Diesel Air Compressors

Amount: \$306,628

#### Escalation Rates

From Date	Duration	Escalation
November 1, 2009	Remaining	3%

#### Usage Indices

From Date	Duration	Factor
November 1, 2009	Remaining	100%

#### Energy: Electricity

Annual Consumption: 1,294,193.0 kWh  
Price per Unit: \$0.09050  
Demand Charge: \$19,935  
Utility Rebate: \$0  
Location: New York  
Rate Schedule: Industrial  
State: New York

#### Usage Indices

From Date	Duration	Usage Index
November 1, 2009	Remaining	100%

#### Escalation Rates

From Date	Duration	Escalation
April 1, 2008	1 year 0 months	3.61%
April 1, 2009	1 year 0 months	-3.32%
April 1, 2010	1 year 0 months	-3.71%
April 1, 2011	1 year 0 months	-0.52%
April 1, 2012	1 year 0 months	-1.7%
April 1, 2013	1 year 0 months	-1.11%
April 1, 2014	1 year 0 months	0.65%
April 1, 2015	1 year 0 months	1.66%
April 1, 2016	1 year 0 months	2.36%
April 1, 2017	1 year 0 months	2.77%
April 1, 2018	1 year 0 months	1.71%
April 1, 2019	1 year 0 months	1.02%

April 1, 2020	1 year 0 months	0.32%
April 1, 2021	1 year 0 months	1.89%
April 1, 2022	1 year 0 months	2.65%
April 1, 2023	1 year 0 months	2.64%
April 1, 2024	1 year 0 months	2.45%
April 1, 2025	1 year 0 months	2.4%
April 1, 2026	1 year 0 months	1.98%
April 1, 2027	1 year 0 months	2.94%
April 1, 2028	1 year 0 months	2.25%
April 1, 2029	1 year 0 months	2.52%
April 1, 2030	1 year 0 months	2.33%
April 1, 2031	1 year 0 months	2.24%
April 1, 2032	1 year 0 months	2.24%
April 1, 2033	1 year 0 months	2.24%
April 1, 2034	1 year 0 months	2.28%
April 1, 2035	1 year 0 months	2.24%
April 1, 2036	1 year 0 months	2.23%
April 1, 2037	1 year 0 months	2.28%
April 1, 2038	Remaining	2.25%

**Energy: Distillate Fuel Oil (#1, #2)**

Annual Consumption:	257,746.0 Gal
Price per Unit:	\$2.94000
Demand Charge:	\$0
Utility Rebate:	\$0
End-Use:	Industrial/Commercial boiler
Rate Schedule:	Industrial
State:	New York

**Usage Indices**

From Date	Duration	Usage Index
November 1, 2009	Remaining	100%

**Escalation Rates**

From Date	Duration	Escalation
April 1, 2008	1 year 0 months	-7.03%
April 1, 2009	1 year 0 months	-5.23%
April 1, 2010	1 year 0 months	0.19%
April 1, 2011	1 year 0 months	-1.94%
April 1, 2012	1 year 0 months	-2.15%
April 1, 2013	1 year 0 months	0.6%
April 1, 2014	1 year 0 months	-0.71%
April 1, 2015	1 year 0 months	-1.58%
April 1, 2016	1 year 0 months	1.12%
April 1, 2017	1 year 0 months	2.79%
April 1, 2018	1 year 0 months	4.68%
April 1, 2019	1 year 0 months	4.82%
April 1, 2020	1 year 0 months	1.73%
April 1, 2021	1 year 0 months	2.52%
April 1, 2022	1 year 0 months	2.51%
April 1, 2023	1 year 0 months	2.44%
April 1, 2024	1 year 0 months	3.34%
April 1, 2025	1 year 0 months	3.32%
April 1, 2026	1 year 0 months	3.16%
April 1, 2027	1 year 0 months	3.08%

April 1, 2028	1 year 0 months	3.33%
April 1, 2029	1 year 0 months	3.37%
April 1, 2030	1 year 0 months	2.83%
April 1, 2031	1 year 0 months	2.69%
April 1, 2032	1 year 0 months	2.68%
April 1, 2033	1 year 0 months	2.68%
April 1, 2034	1 year 0 months	2.67%
April 1, 2035	1 year 0 months	2.66%
April 1, 2036	1 year 0 months	2.72%
April 1, 2037	1 year 0 months	2.71%
April 1, 2038	Remaining	2.69%

**Component:**

**Initial Investment**

Initial Cost Paid By Agency (base-year \$):	\$0
Initial Cost Financed (base-year \$):	\$0
Annual Rate of Increase:	1.8%
Expected Asset Life:	0 years 0 months
Residual Value Factor:	0%

**Cost-Phasing**

Cost Adjustment Factor: 1.8%

Years/Months (from Date)	Date	Portion
0 years 0 months	November 1, 2009	100%

**Alternative: ECM - Efficient Electric Air Compressors**

**Recurring Contract: Debt Service to NYPA (P&I 10yrs @ 7%)**

Amount: \$821,964

**Escalation Rates**

From Date	Duration	Escalation
November 1, 2009	Remaining	0%

**Usage Indices**

From Date	Duration	Factor
November 1, 2009	10 years 0 months	100%
November 1, 2019	Remaining	0%

**Energy: Electricity**

Annual Consumption:	4,408,459.0 kWh
Price per Unit:	\$0.09050
Demand Charge:	\$122,355
Utility Rebate:	\$0
Location:	New York
Rate Schedule:	Industrial
State:	New York

**Usage Indices**

From Date	Duration	Usage Index
November 1, 2009	Remaining	100%

**Escalation Rates**

From Date	Duration	Escalation
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April 1, 2008	1 year 0 months	3.61%
April 1, 2009	1 year 0 months	-3.32%
April 1, 2010	1 year 0 months	-3.71%
April 1, 2011	1 year 0 months	-0.52%
April 1, 2012	1 year 0 months	-1.7%
April 1, 2013	1 year 0 months	-1.11%
April 1, 2014	1 year 0 months	0.65%
April 1, 2015	1 year 0 months	1.66%
April 1, 2016	1 year 0 months	2.36%
April 1, 2017	1 year 0 months	2.77%
April 1, 2018	1 year 0 months	1.71%
April 1, 2019	1 year 0 months	1.02%
April 1, 2020	1 year 0 months	0.32%
April 1, 2021	1 year 0 months	1.89%
April 1, 2022	1 year 0 months	2.65%
April 1, 2023	1 year 0 months	2.64%
April 1, 2024	1 year 0 months	2.45%
April 1, 2025	1 year 0 months	2.4%
April 1, 2026	1 year 0 months	1.98%
April 1, 2027	1 year 0 months	2.94%
April 1, 2028	1 year 0 months	2.25%
April 1, 2029	1 year 0 months	2.52%
April 1, 2030	1 year 0 months	2.33%
April 1, 2031	1 year 0 months	2.24%
April 1, 2032	1 year 0 months	2.24%
April 1, 2033	1 year 0 months	2.24%
April 1, 2034	1 year 0 months	2.28%
April 1, 2035	1 year 0 months	2.24%
April 1, 2036	1 year 0 months	2.23%
April 1, 2037	1 year 0 months	2.28%
April 1, 2038	Remaining	2.25%

**Energy: Distillate Fuel Oil (#1, #2)**

Annual Consumption:	0.0 Gal
Price per Unit:	\$2.94000
Demand Charge:	\$0
Utility Rebate:	\$0
End-Use:	Industrial/Commercial boiler
Rate Schedule:	Industrial
State:	New York

**Usage Indices**

From Date	Duration	Usage Index
November 1, 2009	Remaining	100%

**Escalation Rates**

From Date	Duration	Escalation
April 1, 2008	1 year 0 months	-7.03%
April 1, 2009	1 year 0 months	-5.23%
April 1, 2010	1 year 0 months	0.19%
April 1, 2011	1 year 0 months	-1.94%
April 1, 2012	1 year 0 months	-2.15%
April 1, 2013	1 year 0 months	0.6%
April 1, 2014	1 year 0 months	-0.71%
April 1, 2015	1 year 0 months	-1.58%

April 1, 2016	1 year 0 months	1.12%
April 1, 2017	1 year 0 months	2.79%
April 1, 2018	1 year 0 months	4.68%
April 1, 2019	1 year 0 months	4.82%
April 1, 2020	1 year 0 months	1.73%
April 1, 2021	1 year 0 months	2.52%
April 1, 2022	1 year 0 months	2.51%
April 1, 2023	1 year 0 months	2.44%
April 1, 2024	1 year 0 months	3.34%
April 1, 2025	1 year 0 months	3.32%
April 1, 2026	1 year 0 months	3.16%
April 1, 2027	1 year 0 months	3.08%
April 1, 2028	1 year 0 months	3.33%
April 1, 2029	1 year 0 months	3.37%
April 1, 2030	1 year 0 months	2.83%
April 1, 2031	1 year 0 months	2.69%
April 1, 2032	1 year 0 months	2.68%
April 1, 2033	1 year 0 months	2.68%
April 1, 2034	1 year 0 months	2.67%
April 1, 2035	1 year 0 months	2.66%
April 1, 2036	1 year 0 months	2.72%
April 1, 2037	1 year 0 months	2.71%
April 1, 2038	Remaining	2.69%

**Component:**

**Initial Investment**

Initial Cost Paid By Agency (base-year \$):	\$0
Initial Cost Financed (base-year \$):	\$0
Annual Rate of Increase:	1.8%
Expected Asset Life:	0 years 0 months
Residual Value Factor:	0%

**Cost-Phasing**

Cost Adjustment Factor: 1.8%

Years/Months (from Date)	Date	Portion
0 years 0 months	November 1, 2009	100%

## NIST BLCC 5.3-08: Detailed LCC Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

### General Information

File Name: C:\Program Files\BLCC5\projects\belleyre mountain.xml  
 Date of Study: Mon Dec 22 16:50:58 EST 2008  
 Analysis Type: Federal Analysis, Financed Project  
 Project Name: Belleayre Mountain  
 Project Location: New York  
 Analyst: Ron Slosberg  
 Base Date: November 1, 2009  
 Study Period: 20 years 0 months (November 1, 2009 through October 31, 2029)  
 Discount Rate: 5.5%  
 Discounting Convention: End-of-Year

Discount and Escalation Rates are NOMINAL (inclusive of general inflation)

### Alternative: Baseline - Rental Diesel Air Compressors

#### Initial Cost Data (not Discounted)

##### Initial Capital Costs Paid By Agency

(adjusted for price escalation)

Initial Capital Costs for All Components: \$0

#### Component:

##### Cost-Phasing

Date	Portion	Yearly Cost
November 1, 2009	100%	\$0
-----		
Total (for Component)		\$0

#### Initial Capital Costs Financed

(base-year dollars)

Initial Capital Costs for All Components: \$0

#### Component:

Initial Cost Financed \$0

#### Energy Costs: Electricity

(base-year dollars)

Average	Average	Average	Average
Annual Usage	Price/Unit	Annual Cost	Annual Demand
1,294,193.0 kWh	\$0.09050	\$117,124	\$19,935
			Annual Rebate
			\$0

#### Energy Costs: Distillate Fuel Oil (#1, #2)

(base-year dollars)

Average	Average	Average	Average
Annual Usage	Price/Unit	Annual Cost	Annual Demand
257,746.0 Gal	\$2.94000	\$757,773	\$0
			Annual Rebate
			\$0

### Life-Cycle Cost Analysis

	Present Value	Annual Value
Initial Capital Costs Paid By Agency	\$0	\$0

#### Contract-Related Costs

Annually Recurring Contract Costs	\$4,813,489	\$402,819
Non-Annually Recurring Contract Costs	\$0	\$0
-----		

Subtotal (for Contract):	\$4,813,489	\$402,819
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**Energy Costs**

Energy Consumption Costs	\$10,887,145	\$911,097
Energy Demand Charges	\$241,265	\$20,190
Energy Utility Rebates	\$0	\$0

Subtotal (for Energy):	\$11,128,410	\$931,287
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Water Usage Costs	\$0	\$0
Water Disposal Costs	\$0	\$0

**Operating, Maintenance & Repair Costs**

Component:		
Annually Recurring Costs	\$0	\$0
Non-Annually Recurring Costs	\$0	\$0

Subtotal (for OM&R):	\$0	\$0
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**Replacements to Capital Components**

Component:	\$0	\$0
------------	-----	-----

Subtotal (for Replacements):	\$0	\$0
------------------------------	-----	-----

**Residual Value of Original Capital Components**

Component:	\$0	\$0
------------	-----	-----

Subtotal (for Residual Value):	\$0	\$0
--------------------------------	-----	-----

**Residual Value of Capital Replacements**

Component:	\$0	\$0
------------	-----	-----

Subtotal (for Residual Value):	\$0	\$0
--------------------------------	-----	-----

<b>Total Life-Cycle Cost</b>	<b>\$15,941,898</b>	<b>\$1,334,107</b>
------------------------------	---------------------	--------------------

**Emissions Summary**

Energy Name	Annual	Life-Cycle
Electricity:		
CO2	982,770.24 kg	19,652,714.14 kg
SO2	3,027.85 kg	60,548.66 kg
NOx	1,383.94 kg	27,675.02 kg
Distillate Fuel Oil (#1, #2):		
CO2	2,839,010.38 kg	56,772,434.78 kg
SO2	20,308.13 kg	406,106.98 kg
NOx	2,559.15 kg	51,176.08 kg
Total:		
CO2	3,821,780.62 kg	76,425,148.92 kg
SO2	23,335.98 kg	466,655.64 kg
NOx	3,943.10 kg	78,851.11 kg

**Alternative: ECM - Efficient Electric Air Compressors  
Initial Cost Data (not Discounted)**

**Initial Capital Costs Paid By Agency**  
(adjusted for price escalation)

Initial Capital Costs for All Components: \$0

**Component:**

**Cost-Phasing**

Date	Portion	Yearly Cost
November 1, 2009	100%	\$0
-----		
Total (for Component)		\$0

**Initial Capital Costs Financed**

(base-year dollars)

Initial Capital Costs for All Components: \$0

**Component:**

Initial Cost Financed \$0

**Energy Costs: Electricity**

(base-year dollars)

Average		Average	Average	Average
Annual Usage	Price/Unit	Annual Cost	Annual Demand	Annual Rebate
4,408,459.0 kWh	\$0.09050	\$398,966	\$122,355	\$0

**Energy Costs: Distillate Fuel Oil (#1, #2)**

(base-year dollars)

Average		Average	Average	Average
Annual Usage	Price/Unit	Annual Cost	Annual Demand	Annual Rebate
0.0 Gal	\$2.94000	\$0	\$0	\$0

**Life-Cycle Cost Analysis**

	Present Value	Annual Value
Initial Capital Costs Paid By Agency	\$0	\$0
<b>Contract-Related Costs</b>		
Annually Recurring Contract Costs	\$6,196,728	\$518,577
Non-Annually Recurring Contract Costs	\$0	\$0
-----		
Subtotal (for Contract):	\$6,196,728	\$518,577
<b>Energy Costs</b>		
Energy Consumption Costs	\$4,828,509	\$404,076
Energy Demand Charges	\$1,480,810	\$123,922
Energy Utility Rebates	\$0	\$0
-----		
Subtotal (for Energy):	\$6,309,320	\$527,999
Water Usage Costs	\$0	\$0
Water Disposal Costs	\$0	\$0
<b>Operating, Maintenance &amp; Repair Costs</b>		
Component:		
Annually Recurring Costs	\$0	\$0
Non-Annually Recurring Costs	\$0	\$0
-----		

Subtotal (for OM&R): \$0 \$0

**Replacements to Capital Components**

Component: \$0 \$0

-----  
Subtotal (for Replacements): \$0 \$0

**Residual Value of Original Capital Components**

Component: \$0 \$0

-----  
Subtotal (for Residual Value): \$0 \$0

**Residual Value of Capital Replacements**

Component: \$0 \$0

-----  
Subtotal (for Residual Value): \$0 \$0

**Total Life-Cycle Cost** \$12,506,048 \$1,046,576

**Emissions Summary**

Energy Name	Annual	Life-Cycle
Electricity:		
CO2	3,347,647.77 kg	66,943,790.09 kg
SO2	10,313.87 kg	206,249.23 kg
NOx	4,714.17 kg	94,270.49 kg
Distillate Fuel Oil (#1, #2):		
CO2	0.00 kg	0.00 kg
SO2	0.00 kg	0.00 kg
NOx	0.00 kg	0.00 kg
Total:		
CO2	3,347,647.77 kg	66,943,790.09 kg
SO2	10,313.87 kg	206,249.23 kg
NOx	4,714.17 kg	94,270.49 kg

## NIST BLCC 5.3-08: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

### Base Case: Baseline - Rental Diesel Air Compressors

### Alternative: ECM - Efficient Electric Air Compressors

#### General Information

File Name: C:\Program Files\BLCC5\projects\belleyre mountain.xml  
 Date of Study: Mon Dec 22 16:22:35 EST 2008  
 Project Name: Belleayre Mountain  
 Project Location: New York  
 Analysis Type: Federal Analysis, Financed Project  
 Analyst: Ron Slosberg  
 Base Date: November 1, 2009  
 Study Period: 20 years 0 months (November 1, 2009 through October 31, 2029)  
 Discount Rate: 5.5%  
 Discounting Convention: End-of-Year

## Comparison of Present-Value Costs

### PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
<b>Initial Investment Costs Paid By Agency:</b>			
Capital Requirements as of Base Date	\$0	\$0	\$0
<b>Future Costs:</b>			
Recurring and Non-Recurring Contract Costs	\$4,813,489	\$6,196,728	-\$1,383,240
Energy Consumption Costs	\$10,887,145	\$4,828,509	\$6,058,635
Energy Demand Charges	\$241,265	\$1,480,810	-\$1,239,546
Energy Utility Rebates	\$0	\$0	\$0
Water Costs	\$0	\$0	\$0
Recurring and Non-Recurring OM&R Costs	\$0	\$0	\$0
Capital Replacements	\$0	\$0	\$0
Residual Value at End of Study Period	\$0	\$0	\$0
	-----	-----	-----
Subtotal (for Future Cost Items)	\$15,941,898	\$12,506,048	\$3,435,850
	-----	-----	-----
<b>Total PV Life-Cycle Cost</b>	<b>\$15,941,898</b>	<b>\$12,506,048</b>	<b>\$3,435,850</b>

### Net Savings from Alternative Compared with Base Case

PV of Operational Savings	\$4,819,090
- PV of Differential Costs	\$1,383,240
	-----
<b>Net Savings</b>	<b>\$3,435,850</b>

**NOTE: Meaningful SIR, AIRR and Payback can not be computed for Financed Projects.**

### Comparison of Contract Payments and Savings from Alternative (undiscounted)

Year Beginning	Savings in Contract Costs	Savings in Energy Costs	Savings in Total Operational Costs	Savings in Total Costs
Nov 2009	-\$506,170	\$371,279	\$371,279	-\$134,891
Nov 2010	-\$496,702	\$370,340	\$370,340	-\$126,362
Nov 2011	-\$486,924	\$359,603	\$359,603	-\$127,320
Nov 2012	-\$476,880	\$360,482	\$360,482	-\$116,398
Nov 2013	-\$466,534	\$359,601	\$359,601	-\$106,933
Nov 2014	-\$455,879	\$346,541	\$346,541	-\$109,337
Nov 2015	-\$444,873	\$338,980	\$338,980	-\$105,894
Nov 2016	-\$433,568	\$344,204	\$344,204	-\$89,365

Year	Base Case	Alternative	Base Case	Alternative
Nov 2017	-\$421,925	\$364,107	\$364,107	-\$57,818
Nov 2018	-\$409,932	\$394,678	\$394,678	-\$15,254
Nov 2019	\$424,419	\$415,928	\$415,928	\$840,347
Nov 2020	\$437,141	\$428,741	\$428,741	\$865,882
Nov 2021	\$450,248	\$440,224	\$440,224	\$890,472
Nov 2022	\$463,746	\$450,368	\$450,368	\$914,114
Nov 2023	\$477,687	\$465,554	\$465,554	\$943,241
Nov 2024	\$492,008	\$484,930	\$484,930	\$976,938
Nov 2025	\$506,758	\$505,252	\$505,252	\$1,012,010
Nov 2026	\$521,949	\$523,512	\$523,512	\$1,045,461
Nov 2027	\$537,641	\$543,549	\$543,549	\$1,081,191
Nov 2028	\$553,715	\$566,116	\$566,116	\$1,119,831

## Energy Savings Summary

### Energy Savings Summary (in stated units)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	1,294,193.0 kWh	4,408,459.0 kWh	-3,114,266.0 kWh	-62,276,793.6 kWh
Distillate Fuel Oil (#1, #2)	257,746.0 Gal	0.0 Gal	257,746.0 Gal	5,154,214.3 Gal

### Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Electricity	4,416.0 MBtu	15,042.3 MBtu	-10,626.3 MBtu	-212,497.2 MBtu
Distillate Fuel Oil (#1, #2)	39,117.4 MBtu	0.0 MBtu	39,117.4 MBtu	782,240.6 MBtu

## Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
<b>Electricity</b>				
CO2	982,770.24 kg	3,347,647.77 kg	-2,364,877.53 kg	-47,291,075.95 kg
SO2	3,027.85 kg	10,313.87 kg	-7,286.03 kg	-145,700.56 kg
NOx	1,383.94 kg	4,714.17 kg	-3,330.23 kg	-66,595.46 kg
<b>Distillate Fuel Oil (#1, #2)</b>				
CO2	2,839,010.38 kg	0.00 kg	2,839,010.38 kg	56,772,434.78 kg
SO2	20,308.13 kg	0.00 kg	20,308.13 kg	406,106.98 kg
NOx	2,559.15 kg	0.00 kg	2,559.15 kg	51,176.08 kg
<b>Total:</b>				
CO2	3,821,780.62 kg	3,347,647.77 kg	474,132.85 kg	9,481,358.84 kg
SO2	23,335.98 kg	10,313.87 kg	13,022.10 kg	260,406.42 kg
NOx	3,943.10 kg	4,714.17 kg	-771.07 kg	-15,419.38 kg